

Broomhill Road Tallaght Flood Risk Assessment

Technical Report

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Contract

This report describes work commissioned by Kavanagh Burke, on behalf of Garyaron Homes Ltd, by a letter dated 06/04/2022. Garyaron Homes Ltd's representative for the contract was Declan O'Sullivan of Kavanagh Burke. Orla Hannon and Ross Bryant of JBA Consulting carried out this work.

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Abbreviations

AEP.....	Annual Exceedance Probability
CFRAM	Catchment Flood Risk Assessment and Management
DoEHLG.....	Department of the Environment, Heritage and Local Government
FARL.....	FEH index of flood attenuation due to reservoirs and lakes
FB	Freeboard
FFL.....	Finish Floor Levels
FRA.....	Flood Risk Assessment
FSR.....	Flood Studies Report
FSU.....	Flood Studies Update
GSI.....	Geological Survey of Ireland
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RFI	Request for Further Information
RR.....	Rainfall-Runoff
SAAR	Standard Average Annual Rainfall (mm)
SFRA	Strategic Flood Risk Assessment
URBEXT	FEH index of fractional urban extent
WL.....	Water Level

1 Introduction

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) the proposed development must undergo a Flood Risk Assessment to ensure sustainability and effective management of flood risk.

1.1 Terms of Reference and Scope

JBA Consulting was appointed by Garyaron Homes Ltd to prepare a Flood Risk Assessment (FRA) for the proposed development of a site located at Broomhill Road, Tallaght, Dublin 4. The report was prepared in response to a request for a Flood Risk Assessment.

1.2 Flood Risk Assessment; Aims and Objectives

This study is being completed to inform the future development of the site as it relates to flood risk. It aims to identify, quantify and communicate to Planning Authority officials and other stakeholders the risk of flooding to land, property and people and the measures that would be recommended to manage the risk.

The objectives of this FRA are to:

- Identify potential sources of flood risk;
- Confirm the level of flood risk and identify key hydraulic features;
- Assess the impact that the proposed development has on flood risk;
- Develop appropriate flood risk mitigation and management measures which will allow for the long-term development of the site.

Recommendations for development have been provided in the context of the OPW / DECLG planning guidance, "The Planning System and Flood Risk Management". A review of the likely effects of climate change, and the long term impacts this may have on any development has also been undertaken.

For general information on flooding, the definition of flood risk, flood zones and other terms see 'Understanding Flood Risk' in Appendix A.

1.3 Development Proposal

Garyaron Homes intends to apply to An Bord Pleanála for a 5 year planning permission for a Strategic Housing Development scheme on lands at Broomhill Road, Tallaght, Dublin 24, D24 XA52 and Unit 51, Broomhill Road, Tallaght, Dublin 24, D24E124 on a site of approximately 1.4 ha.

The proposed development will consist of: (a) the demolition (total area approx. 4,319.9 sqm) of the existing buildings on site and the existing front boundary treatment; and (b) the construction of a new residential and mixed use scheme of 242 no. apartment units in 5 no. blocks (Blocks A to E) ranging from 4 to 7 storeys in height as follows:

- Block A (5 storeys) comprising 40 no. apartments (4 no. 1 bed, 31 no. 2 bed and 5 no. 3 bed units)
- Block B and C (7 storeys) comprising 102 no. apartments (45 no. 1 bed and 57 no. 2 bed units)
- Block D (5 - 7 storeys) comprising 36 no. apartments (16 no. 1 bed and 20 no. 2 bed units)
- Block E (4 - 5 storeys) comprising 64 no. apartments (31 no. 1 bed and 33 no. 2 bed units)

Block D will accommodate a Childcare Facility/creche of approx. 465 sqm at ground floor level.

The proposal will also provide for a café of approx. 50.9 sqm at the ground floor of Block C. Residential amenity areas will be provided in the form of a reception of approx. 125.1sqm, resident lounge of approx. 45sqm, a letting office of approx. 11.8sqm, a rentable room/studio space of 39sqm, a public gym of approx. 128.5sqm and a public co-working space of approx. 128.4sqm, all at the ground floor level of Blocks B & C.

Each residential unit will be afforded with private open space in the form of a balcony or terrace. Communal open space of 1,797.4sqm is proposed in the form of 2no. roof top terraces at Blocks D and E, courtyard space at ground level, outdoor seating and planting and pedestrian and cyclist

links. Public open space of 1,400sqm is also proposed in the form of outdoor seating, paved areas, a lawn area, play areas and an outdoor seating area to the front of the proposed café at Block C.

A total of 136no. car parking spaces are provided at ground floor level, including 7 no. Accessible spaces at surface level; and 426 no. bicycle spaces (Visitor and Resident in bike stands and secure stacked bike spaces) are proposed.

The development shall be served via a new vehicular access point from Broomhill Road. Upgrade works are proposed to the vehicular access point to facilitate the proposed development and to provide for improved access and egress for the overall development. New pedestrian and cyclist access points will be provided on to Broomhill Drive from the site.

The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works; boundary treatment; internal roads and footpaths; waste storage areas and electrical services and all associated site development works. The proposed site layout is displayed in Figure 1-1 below.



Figure 1-1: Proposed Site Layout

1.4 Report Structure

Section 2 of this report gives an overview of the study requirements. Section 3 contains background information and initial assessment. The Flood Risk Assessment (FRA) and site-specific mitigation details are included in Section 4. The Justification Test is applied in Section 5 while Conclusions are provided in Section 6.

2 Site Background

This section describes the proposed mixed use development site on Broomhill Road, Tallaght, Dublin 24, including watercourses, geology and wider geographical area.

2.1 Location

The proposed development site is located on Broomhill Road, Tallaght, Dublin 24, refer to Figure 2-1. The site is located in an urban area surrounded by commercial properties. Access to the site is via Broomhill Road along the site's western boundary. Airton Road is to the south of the site while Broomhill Terrace is along the northern boundary. An existing building is within the site boundary which will be demolished as part of the proposed development.

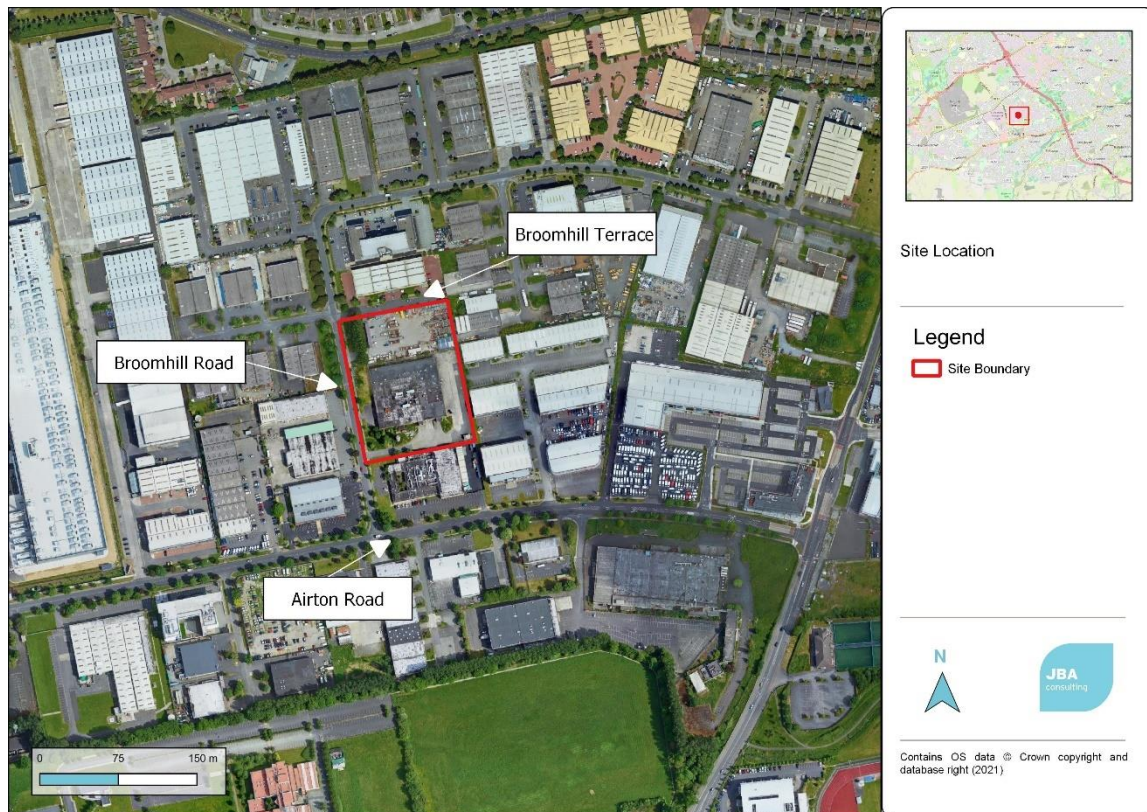


Figure 2-1: Site Location

2.2 Watercourses

The Tymon River is the main hydrological feature in the area which is located c. 200m to the south of the site, refer to Figure 2-2 below. It is a tributary of the River Poddle. The Tymon River flows through the grounds of I.T Tallaght, south of the site, before travelling through Bancroft Park and Tymon Park before it meets the Poddle River. The river flows in an easterly direction.

The Tallaght Stream is a tributary of the Dodder River. This watercourse also flows in an easterly direction approx. 1km south of the site.



Figure 2-2: Local Watercourses

2.3 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied and an extract of the geological map is presented in Figure 2-3. The subsoil is Made Ground. The underlying bedrock is Calp which is described as dark grey to black limestone and shale.

The ground water vulnerability of the site is Low. 2No. dug wells and 1No. Borehole located approx. 150m south were completed in 1998. They indicate a depth of bedrock of 2.0-5.8m.

There are no GSI groundwater flooding probability maps available for the area on the floodinfo.ie website. The GSI Winter 2015/2016 Surface Water Flooding and the GSI Maximum Historic Groundwater Flooding do not indicate any history of flooding to the site or the surrounding area.

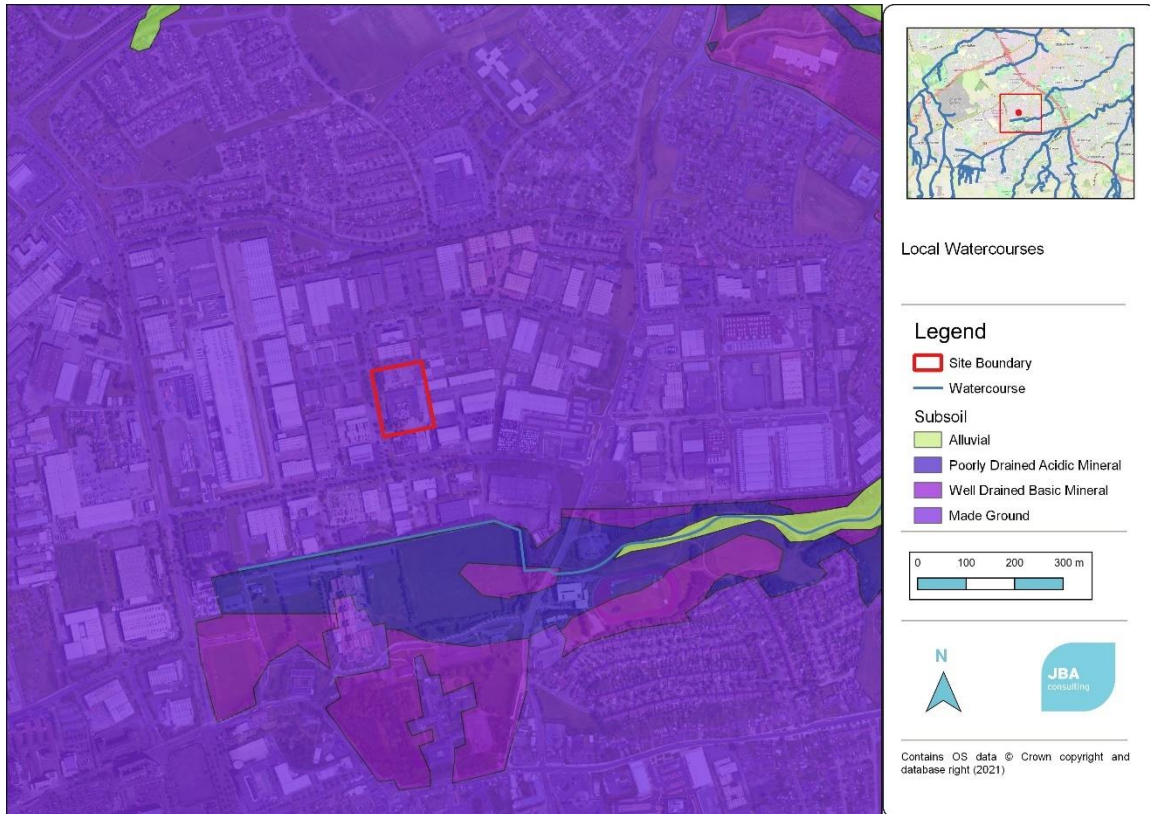


Figure 2-3: Site Subsoils

2.4 Tallaght Town Centre Local Area Plan 2020

Under the Local Area Plan (LAP) for Tallaght Town Centre 2020, the subject site has been zoned for 'REGEN' / Regeneration, refer to Figure 2-4. This zoning is to facilitate enterprise and/or residential-led regeneration. A Strategic Flood Risk Assessment (SFRA) was completed as part of the LAP and is discussed further in Section 3.2.2.

The SFRA states "Any re-development of existing commercial properties within Flood Zone A/B will require a site specific FRA. All Tallaght IT lands zoned as Town Centre and the Regeneration zoned lands to the north within Flood Zone A/B should (as part of any overall masterplan for the Tallaght IT/ regeneration scheme) integrate SUDS and open greenspace landscaping so as to maintain the same floodplain volume as part of a detailed drainage impact assessment/flood risk management strategy."¹

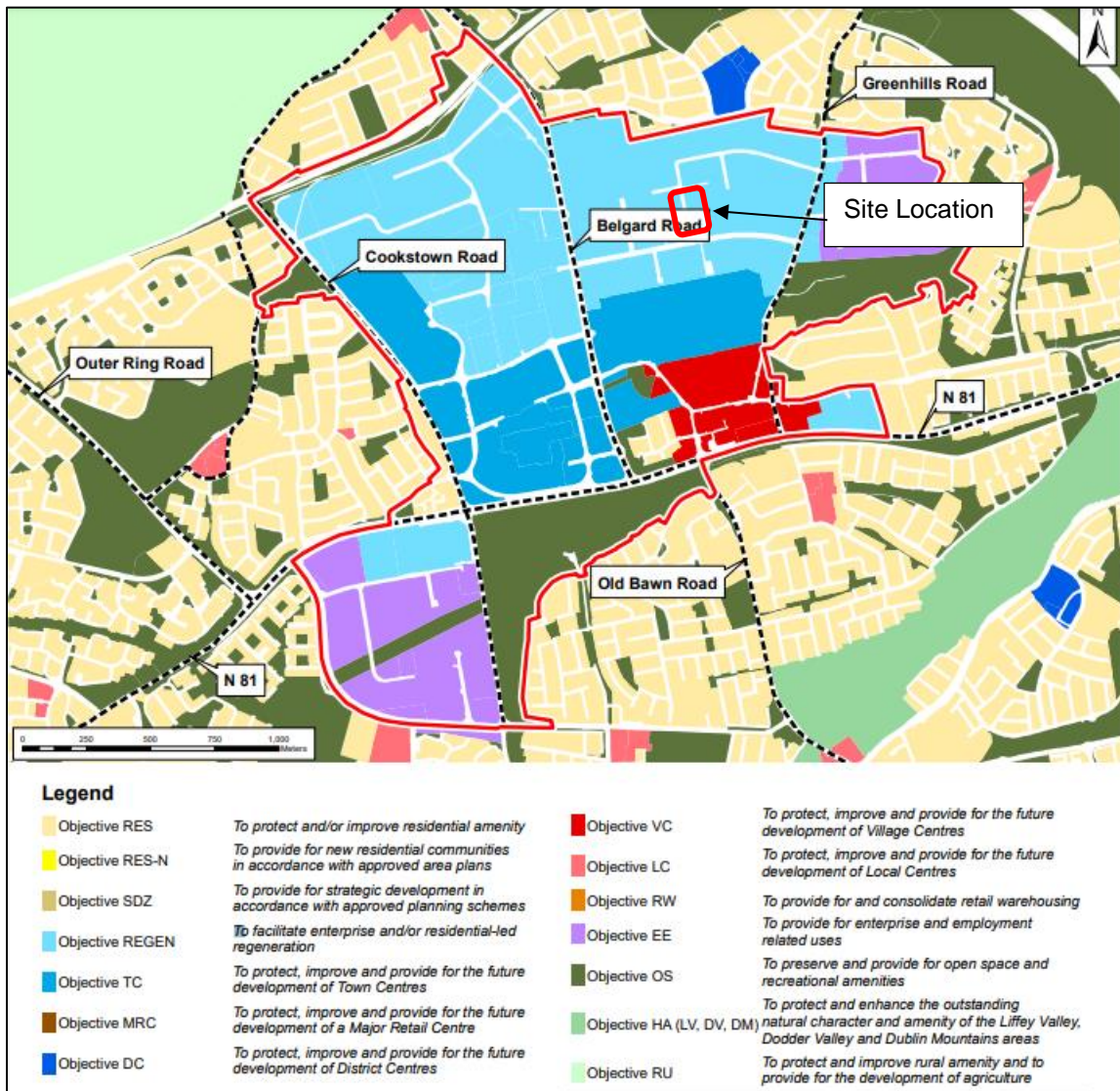


Figure 2-4: Tallaght LAP Land Use Zoning

¹ <https://www.sdcc.ie/en/services/planning/local-area-plans/tallaght-current/appendix-1-strategic-flood-risk-assessment.pdf> Section 6.2

3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site is conducted using historical and predictive information. This identifies any sources of potential flood risk to the site and reviews historic flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections.

3.1 Flood History

Several sources of flood information were reviewed to establish any recorded flood history at, or near the site. This includes the OPW's website, <http://www.floodinfo.ie> and general internet searches. No flooding incidents were recorded at the site. The nearest flood event recorded on floodinfo.ie is approx. 1.5km south of the site in the Tallaght Stream catchment. The flooding occurred at Dodder Park Road and Lower Dodder Road as a result of heaving rainfall in November 2000.

The River Poddle, which the Tymon River is a tributary of, is known to flood. It has on numerous occasions burst its banks at a number of locations. The most recently of which was in October 2011, resulting in risk to human life as well as significant damage to properties and surrounding areas. It is for this reason the Poddle FAS is in the works. There is no mention of flood history along the Tymon River adjacent to the site.

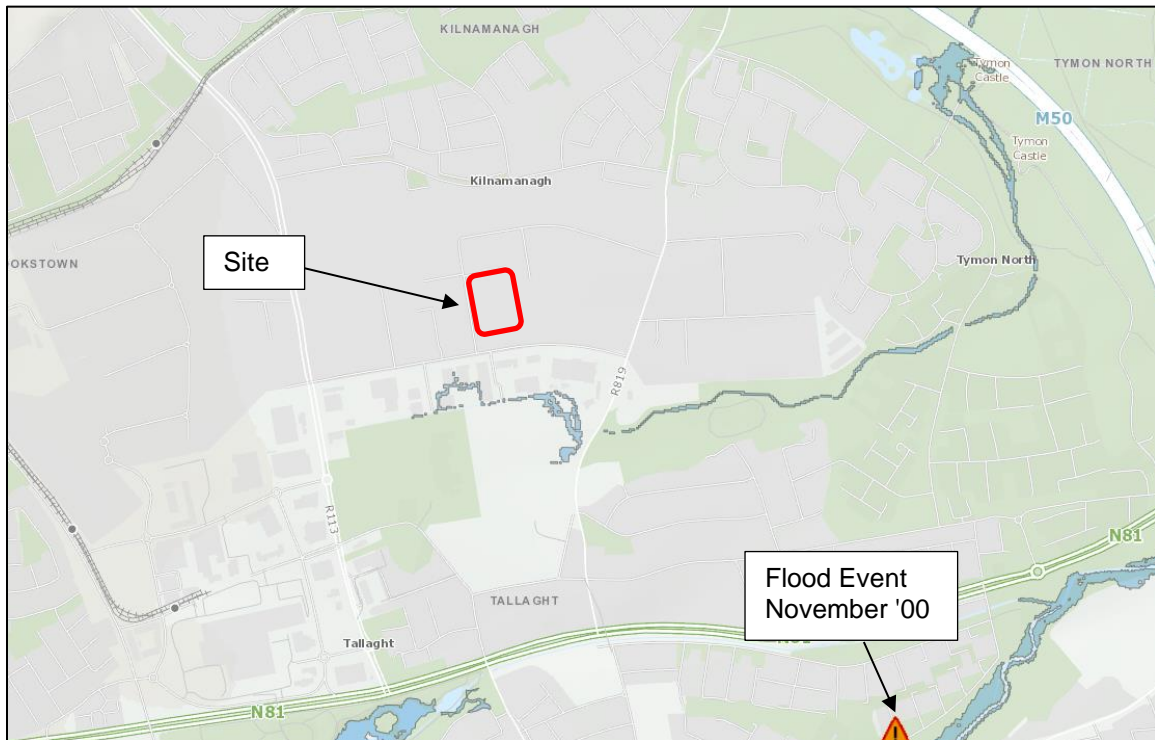


Figure 3-1: Floodinfo.ie Past Flood Events

3.2 Predicative Flooding

The subject area has been a subject of a number of predicative flood mapping or modelling studies and other related studies and plans:

- Eastern Catchment Flood Risk Assessment and Management Study (CFRAM)
- Poddle Flood Alleviation Scheme
- Tallaght Town Centre Local Area Plan (2020)

The level of detail presented by each method varies according to the quality of the information used and the approaches involved. The Poddle Flood Alleviation Scheme is the most detailed assessment of flood extent and supersedes the fluvial flood outlines presented by the OPW CFRAM study.

3.2.1 OPW Eastern CFRAM

The Eastern CFRAM covers approximately 6,300km² and involves detailed hydraulic modelling of rivers and their tributaries along with coastal flooding.

Flood maps are publicly available for 10%, 1% and 0.1% AEP and cover the Tymon River to the south of the site. Flood maps have been finalised for Tallaght Town Centre and an extract of the flood map covering the site is presented Figure 3-2. The CFRAM map suggests that the site is not inundated in any of the fluvial AEP events.

Flood levels for the modelled events are also provided as part of the CFRAM study. Water levels at the nearest nodes to the site are provided in Table 3-1 below.

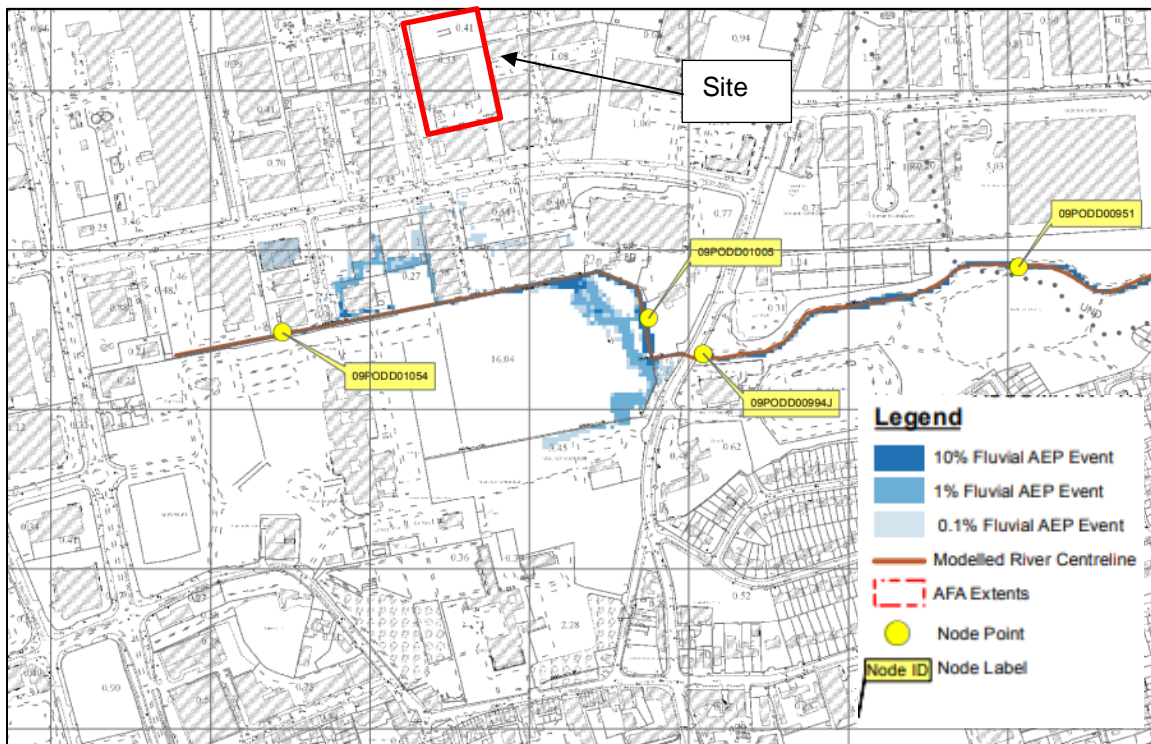


Figure 3-2: CFRAM Flood Map Extract

Table 3-1: CFRAM Fluvial Flood Levels

CFRAM Node	1% AEP Water Level (m)	0.1% AEP Water Level (m)
09PODD01054	92.91	93.03
09PODD01005	87.97	87.99

3.2.2 Tallaght Town Centre Local Area Plan 2020 / Poddle FAS

A Strategic Flood Risk Assessment (SFRA) was carried out for the Tallaght Town Centre LAP as required by the 'The Planning System and Flood Risk Management Guidelines for Planning Authorities'.

Flood extents in the SFRA are based on those produced for the Poddle Flood Alleviation Scheme (FAS) in 2018. The project is currently within the design phase and flood maps have been produced for the River Poddle/Tymon River. The aim of the scheme is to provide protection from the 1% AEP flood event, but it does not extend to the section of Tymon River adjacent to the site. The Poddle FAS is the main source of flood mapping for the Tymon River and supersedes the Eastern CFRAM. Detailed fluvial and pluvial flood mapping has been provided for the Poddle catchment within the study area.

Figure 3-3 shows the combined flood extents for the site. These show the hydraulic model outputs for the 1% and 0.1% AEP events when both the watercourse and surface water network were modelled. The site has a low probability of flooding from the 1% AEP event, but the 0.1% AEP extents are shown to inundate the proposed site. However, inundation is not associated with flooding from the Tymon River but rather an overland flow route from the north as a result of surface water flooding. This is confirmed after review of the topography in the area (refer to Section 3.3.3).



Figure 3-3: Tallaght LAP Flood Extent Map Extract

3.3 Flood Sources

The initial stage of a Flood Risk Assessment requires the identification and consideration of probable sources of flooding. Following the initial phase of this Flood Risk Assessment, it is possible to summarise the level of potential risk posed by each source of flooding. The flood sources are described below.

3.3.1 Fluvial

The Tymon River is nearest watercourse to the site. The Tallaght LAP/Poddle FAS identified the site as being inundated in the 0.1% AEP event. After studying the local topography and also flooding data from the OPW CFRAM studies, no pathway is evident from either of the watercourse to the proposed development site. The site is not impacted from fluvial sources.

3.3.2 Tidal

The development site is located inland so tidal flood risk has therefore been screened out at this stage.

3.3.3 Pluvial/ Surface Water

Pluvial, or surface water, flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer. It is usually associated with high intensity rainfall. Flood risk from pluvial sources exists in all areas. Adequate storm water drainage systems will minimise the pluvial flood risk. It is also important that increases in surface water runoff as a result of the development, including changes from greenfield to paved area, are managed.

The hydraulic modelling completed as part of the Poddle FAS which includes both the Tymon River and the surface water network indicates a moderate probability of flooding to the site. The local topography suggests an overland flow route from surface water exceedance in the 0.1% AEP event flows in a southern direction towards the Tymon River and enters the southwest corner of the site, refer to Figure 3-4.

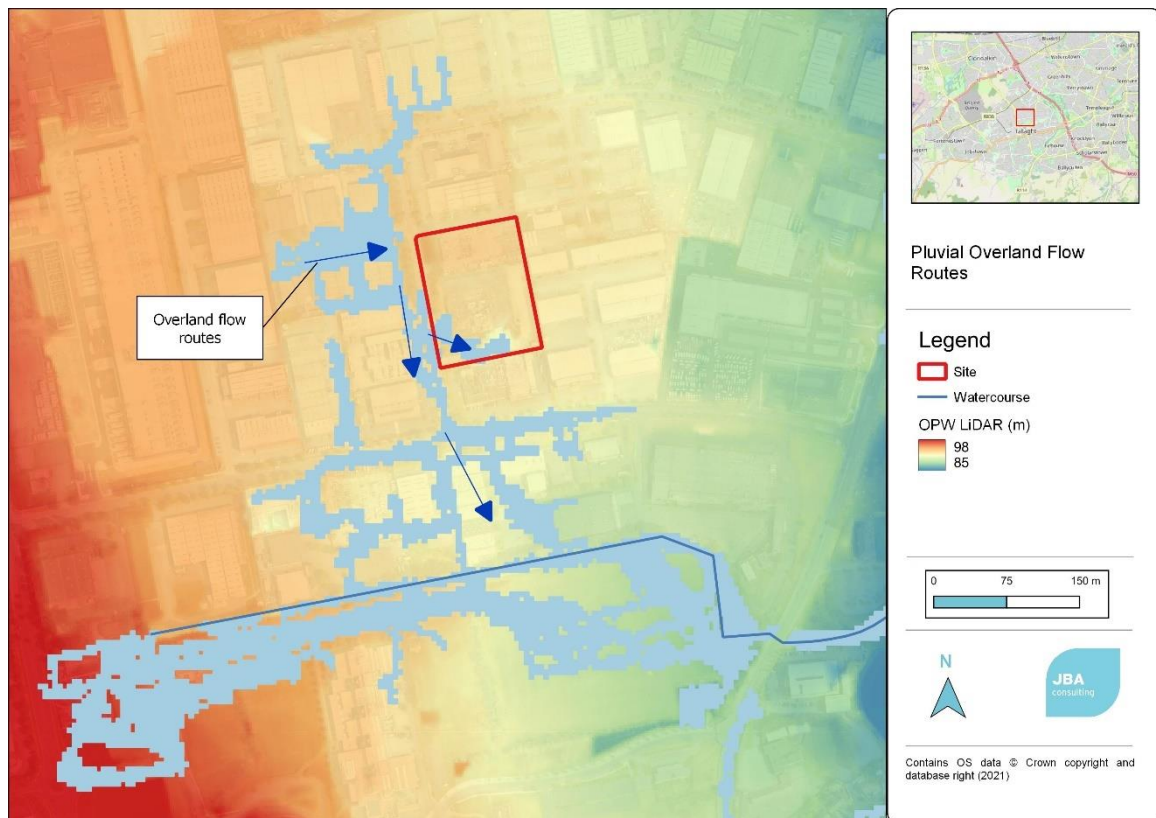


Figure 3-4: Pluvial Overland Flow Route

3.3.4 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry.

Groundwater flood risk is confirmed to be low by the GSI mapping and there is no known risk of groundwater flooding in the area, thus it has been screened out at this stage.

4 Flood Risk Assessment

4.1 Flood Risk

The proposed development site is located in Flood Zone B as per the Tallaght LAP. This means the probability of flooding from rivers is low (less than 0.1% or 1 in 1000). However, it is noted that the flooding of the site is from pluvial sources from the north, as discussed in Section 3.3.3 above.

Figure 4-1 below shows the proposed site layout overlaying the existing flood extents. The proposed ground levels of the site mean the overland flow path will now enter the site via the vehicular entrance, refer to Figure 4-2. The car parking area has the lowest levels on site meaning the pluvial flood water will pond here. The ponding within the car park will be dealt with as part of the surface water mitigation measures on site, refer to Section 4.2.2. The proposed buildings therefore have a low risk of inundation from pluvial flooding.

As the site is identified as being partially within Flood Zone B, the Justification Test is applied. Refer to Section 5 below.



Figure 4-1: Existing Pluvial Flood Risk Overlaying Proposed Site Design



Figure 4-2: Post-Development Pluvial Flow Paths

4.2 Mitigation

4.2.1 Finished Floor Levels

The proposed finished floor levels (FFLs) of the development range from 92.65mOD to 93.15mOD. This places the FFL a minimum of 150mm above surrounding ground levels. This will avoid ingress of surface water and allow for climate change.

4.2.2 Surface Water Runoff

There are two underground Stormtech attenuation tanks proposed for the site. These are located along the car parking areas. They have a combined attenuation volume of 917m³. The landscaping of the site is such that any surface water on the site will be directed towards open green spaces and the carparking areas, which is the lowest lying section of the site (refer to Figure 4-2). In the car parking areas, the surface water will be picked up by the road gullies and enter the surface water system. There are also SUDS measures proposed for the site, which include pervious paving to all carparking spaces and pedestrian areas. Green roofs are also proposed for the roofs of the apartment blocks. When calculating the storage for the attenuation tanks, all surfaces were assumed to be impervious for a conservative approach. Therefore, there is additional drainage capacity within the pervious areas.

As part of the Tallaght LAP, the floodplain is to be maintained using SUDS measures and open greenspace landscaping. As identified in Section 3.3.3, an overland surface water flow path flows south along the Broomhill Road and enters the existing site. The total surface water ponding within the site is approx. 100m³, which is calculated using ground levels and flood extents within the site. As part of the new development, this overland flow path will now enter the site via the vehicular entrance into the car parking area at the southwest. As this area is the lowest section of the site, the water will pond here where it will enter the previous car parking spaces with any excess ponding entering the surface water system.

4.2.3 Access

Access to the site is maintained in the 1% AEP event as there is no identified flood risk. In the 0.1% AEP event, surface water is estimated to pond along the southern car park and entrance. The water depths are estimated to be very low (<50mm) so domestic and emergency vehicles can still access the site. This flood water will also drain away via the permeable paving or will be collected by the surface water system. Pedestrian access can still be maintained in the 0.1% AEP event.

4.3 Residual Risks

Residual risks are the risks remaining after all risk avoidance, substitution and mitigation measures have been taken. Two residual risks have been identified and are discussed in detail below.

4.3.1 Climate change

The impact of future climate change on the proposed development was also considered. As the 1% AEP + Climate Change (CC) pluvial flood extents are not available, the Tallaght LAP recommends substituting the 0.1% AEP flood extents to represent the 1% AEP + CC event. The site is therefore at risk from the 1% AEP + CC pluvial event, but this will be mitigated through the surface water design and ground levels directing flow into the low-lying areas such as the car park. There is also 150mm freeboard between the FFL and the hard standing ground levels to reduce the risk of inundation.

4.3.2 Drainage system design exceedance or failure events.

In the event of a drainage system design exceedance or failure event, flood waters will be directed towards the low-lying sections of the site. This is the green open space within the site and the car parking areas along the eastern and southern boundary. There is also a minimum freeboard of approx. 150mm between the open space levels and the FFLs of the proposed development.

5 The Justification Test for Development Management

As discussed in Section 4.1, the site is identified as being at a low risk of flooding from fluvial sources but is identified as being at risk in the 0.1% AEP pluvial event. However, the pluvial flow path is identified as Flood Zone B in the Tallaght LAP. The development is a high vulnerability development type and so the Justification Test (JT) is required, as indicated in The Planning System and Flood Risk Management, refer to Figure 5-1 below.

The planning guidance appropriate to this development is, "The Planning System and Flood Risk Management" and sets out a framework within which the planning authority should consider proposals for new development in areas of flood risk. This framework is called the Justification Test for Development Management.

In the following text, each of the criteria within the JT is responded to as they relate to the proposed development. For ease of reading, where the responses are supported by technical detail, which is contained in this report, an appropriate chapter has been referenced.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Figure 5-1: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test

5.1 Justification Test: Part 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 the planning guidelines.

Under the Local Area Plan (LAP) for Tallaght Town Centre 2020, the subject site has been zoned for 'REGEN' / Regeneration. This zoning is to facilitate enterprise and/or residential-led regeneration. It is considered that the proposed development complies with the land use zoning at the site.

Conclusion: It has been outlined that the proposed residential development complies with the Regeneration land use zoning onsite.

5.2 Justification Test: Part 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

As part of the FRA, a surface water overland flow path is shown to inundate part of the site in the 0.1% AEP pluvial event. This overland flow will be maintained within the site boundary as per the Tallaght LAP guidelines and also to prevent an increase in flood risk elsewhere. The surface water mitigation measures proposed for the site (Stormtech attenuation tanks, SUDS measures e.g., pervious paving) means the pluvial flooding will enter the surface water system and reduce the overall flood risk to the site.

Conclusion: Flood risk will not be increased elsewhere as a result of the development as the surface water flow route into the site will be maintained. The flood risk within the site will also be reduced as it will be mitigated against by the proposed surface water system and SuDS measures.

(ii) the development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

The FFL of the development will be located above the 0.1% AEP pluvial flood level plus an additional 150mm freeboard. This also places the development above the 1% AEP climate change event (as substituted by the 0.1% AEP event).

Conclusion: All developments onsite will be located above the 0.1% AEP flood level with a 150mm freeboard. Therefore, the flood risk to people and property onsite has been minimised.

(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.

The FFL of the proposed developments are placed above the 1% AEP + CC event (when substituted by the 0.1% AEP event) with 150mm freeboard, therefore they are at a low risk of flooding from future events. Access to the site is not impacted in the 1% AEP event. The vehicular entrance is inundated in the 0.1% AEP pluvial event, but flood levels are low enough that domestic vehicles and emergency service vehicles can still access the site. Pedestrian access can still be maintained in the 0.1% AEP event.

The residual risk associated with drainage system design exceedance or failure have also both been considered. The freeboard between the 0.1% AEP flood levels is sufficient (150mm) that in the event of either of these residual risks occurring at the same time as the 0.1% AEP, the properties have a lower risk of inundation. Ground levels within the site mean any flood water within the site will be directed away from the buildings and towards the open greenspaces and/or car parking areas.

Conclusion: The impacts of climate change have been assessed and they were confirmed to be low as the FFL are above the 1% AEP+CC levels. Access is still maintained in the 1% and 0.1% AEP event. Therefore, residual risks have been accounted for within the design. Impacts as a result of drainage system design exceedance was also considered and are shown to have a low risk due to the freeboard of the properties and the slope of the site leading away from the buildings.

(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.

To address Part iv of the JT, please refer to supplementary planning report provided as part of the application.

6 Conclusion

JBA Consulting has undertaken a detailed Flood Risk Assessment for the proposed development located on Broomhill Road, Tallaght, Dublin 24. An existing building is within the site boundary which will be demolished as part of the proposed development. The proposed development will consist of the construction of a new residential and mixed-use scheme of 242 no. apartment units in 5 no. block and all associated site works.

From reviewing the available sources of flooding the site has been shown to be at risk of inundation from the 0.1% AEP pluvial flood event. No historic flooding was identified at the site or surrounding area. The nearest watercourse to the site is the Tymon River located c. 200m to the south and has no identified flow pathways to the site.

The proposed site design means the overland flow route will be maintained within the site boundary. It will enter the site via the vehicular entrance where there are pervious car parking spaces, and any excess surface water can enter the surface water network. The car parking area is the lowest lying part of the site so all surface water on the site will be directed towards this area, as well as the open green spaces.

The proposed minimum floor level for the site places the developments above the 0.1% AEP pluvial event plus an additional 150mm freeboard. This level also protects the development from the 1% AEP climate change flood event. The residual risk of drainage system design exceedance or the impacts of future climate change will also be lessened due to the freeboard of the development and the slope of the proposed development towards open spaces and the car parking areas.

The Justification Test was applied and passed as the development can manage the risk to itself and surrounding lands.

The Flood Risk Assessment was undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and is in agreement with the core principles contained within.

Appendices

A Appendix - Understanding Flood Risk

Flood Risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood Risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

A.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period years, a 1% AEP flood 1 in 100 chance of occurring in any given year. In this report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table: Conversion between return periods and annual exceedance probabilities

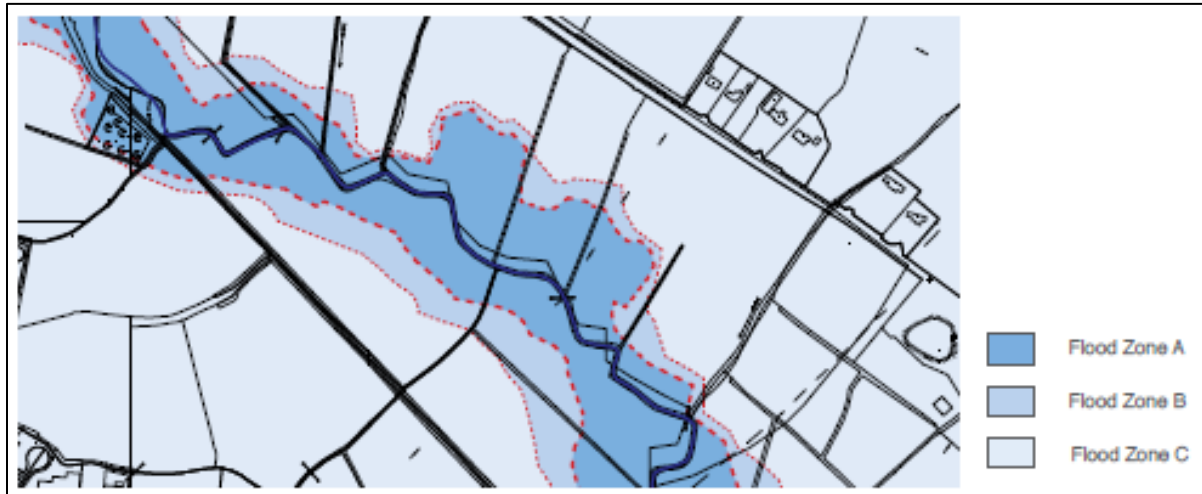
Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

A.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purpose of the Planning Guidelines, there are 3 types of levels of flood zones, A, B and C.

Zone	Description
Flood Zone A	Where the probability of flooding is highest, greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/ tidal Flooding
Flood Zone B	Moderate probability of flooding, between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/ tidal.
Flood Zone C	Lowest probability of flooding, less than 0.1% from both rivers and coastal/ tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences which will be maintained in perpetuity.



A.3 Consequences of Flooding

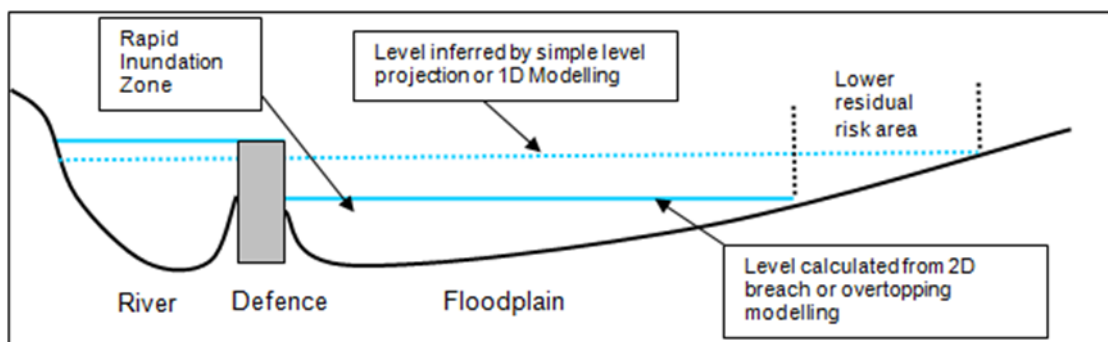
Consequences of flooding depend on the Hazards caused by flooding (depth of water, speed of flow. Rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure of the population, presence and reliability of mitigation measures etc.)

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on type of development, nature, which are detailed in Table X of the Guidelines, and are summarised as:

- **Highly vulnerable**, including residential properties, essential infrastructure and emergency service facilities
- **Less vulnerable**, such as retail and commercial and local transport infrastructure, such as changing rooms.
- **Water compatible**, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

A.4 Residual Risk

The presence of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level or a breach occurs. This known as residual risk:



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