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Bow Lane West Lane
Dublin 8

SITE SPECIFIC FLOOD
RISK ASSESSMENT

ONCE Civil & Structural
Ltd

PLAN NO: 5400/22
A.I. REC: 05/04/23

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1. Introduction

This report has been prepared to undertake a Site Specific Flood Risk Assessment (SSFRA) for a proposed development site at Bow Lane West, Dublin 8. The development consists of the construction of dwelling.

The purpose of this SSFRA is to assess the potential flood risk to the proposed development site and to assess the impact that development of the site may or may not have on the hydrological regime of the area.

Quoted ground levels or estimated flood levels relate to ordnance datum Malin unless stated otherwise.

This Site Specific Flood Risk Assessment study has been undertaken in consideration of the following guidance documents:-

'The Planning System and Flood Risk Management – Guidelines for Planning Authorities'
DOEHLG 2009.

'Dublin City Development Plan 2022-2028 – Strategic Flood Risk Assessment'

2. Proposed Site Description

2.1 General

The proposed development site is located at Bow Lane West, Dublin 8, which is a mixed-use street with the boundary of Saint Patrick's Hospital (formally Swifts Hospital) forming the north side of the street. Historically Bow Lane had a number of commercial/factory buildings on it, some of which remain. These are interspersed with residential terrace dwellings. The site is currently occupied by a two-storey residential building which was historically a public house.

The total area of the proposed development site is approximately 1137m².

The location of the proposed development site is illustrated in *Figure 1* below

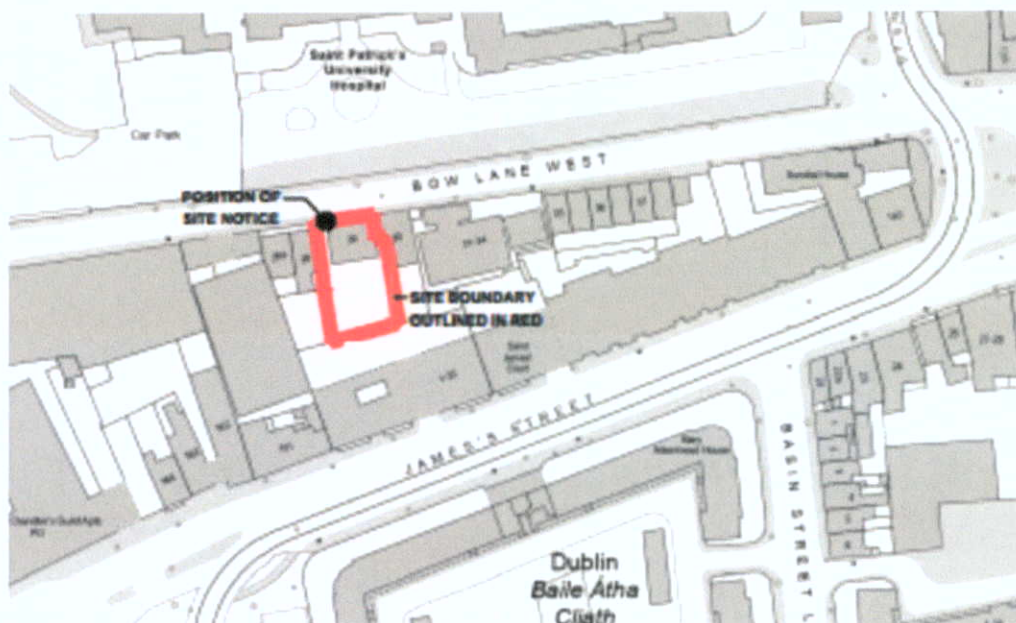


Figure 1 - Site Location

2.2 Existing Topography Levels at Site

The proposed development site is generally flat with a minimal slope. The existing ground elevation is approximately 10.8mOD (Malin). The finished floor level of proposed dwellings is circa 10.8mOD (Malin)

2.3 Local Hydrology, Land use & Existing Drainage

Illustrated in Figure 2 below, the most immediate surface hydrological feature in the general vicinity of the site is the River Camac that flows 234 m North West of the site.

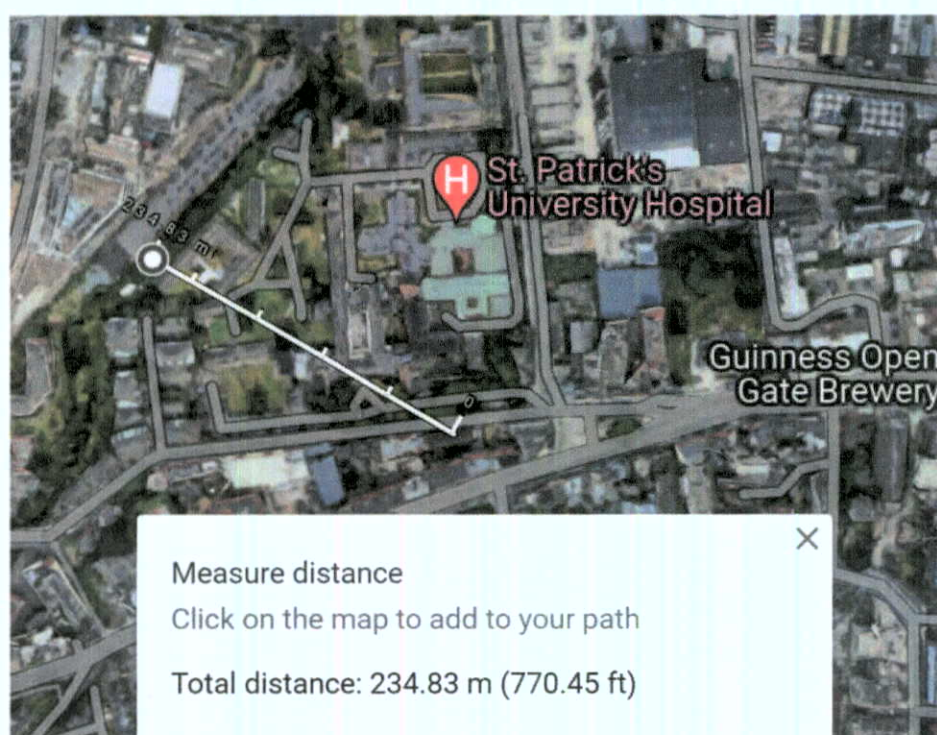


Figure 2 - Site Location in relation to hydrological features

3. Initial Flood Risk Assessment

The flood risk assessment for the proposed development site is undertaken in three principal stages, these being 'Step 1 – Screening', 'Step 2 – Scoping' and 'Step 3 – Assessing'.

3.1 Possible Flooding Mechanisms

Table 1 below summaries the possible flooding mechanisms in consideration of the proposed development site:-

Source/Pathway	Significant?	Comment/Reason
Tidal/Coastal	yes	The proposed development site is located close to the River Camac and Dublin Bay which are tidally influenced at this location
Fluvial	Yes	The River Camac is located 234 m beside the northern boundary of the site
Pluvial (urban drainage)	Possible	There are several urban drainage and water supply infrastructure features located close to the boundary of the site
Pluvial (overland flow)	No	The site is not a significantly elevated lands and does not provide any important surface water discharge point to adjacent lands
Blockage	No	There are no significant hydraulic structures within the immediate vicinity of the site.
Groundwater	No	There are no significant springs or groundwater discharges mapped or recorded in the immediate vicinity of the site.

Table 1

The primary potential flood risk to the proposed development site can be attributed to an extreme fluvial and / or tidally influenced flood event in the River Camac. Secondary flood risk can be attributed to pluvial flooding from the urban drainage network and water supply infrastructure in the vicinity of the site.

In accordance with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities - DOEHLG 2009' these potential flood risks are analyzed in the subsequent 'Screening Assessment' and 'Scoping Assessment' section of this study report.

4. Screening Assessment

The purpose of the screening assessment is to establish the level of flooding risk that may or may not exist for a particular site and to collate and assess existing current or historical information and data which may indicate the level or extent of any flood risk.

If there is a potential flood risk issue then the flood risk assessment procedure should move to 'Step 2 – Scoping Assessment' or if no potential flood risk is identified from the screening stage then the overall flood risk assessment can end at 'Step 1'.

The following information and data were collated as part of the flood risk screening assessment for the proposed development site:-

4.1 OPW/EPA/Local Authority Hydrometric Data

Existing sources of OPW, EPA and local authority hydrometric data were investigated.

4.2 OPW PFRA Predictative Flood Mapping

Preliminary Flood Risk Assessment (PFRA) Mapping for Ireland was produced by the OPW in 2011. The CFRAM program led by the OPW, provides a detailed assessment of flooding in areas identified as Area for Further Assessment (AFA's) during the PFRA study. Catchment wide Flood Risk Management Plans were also developed as part of the program.

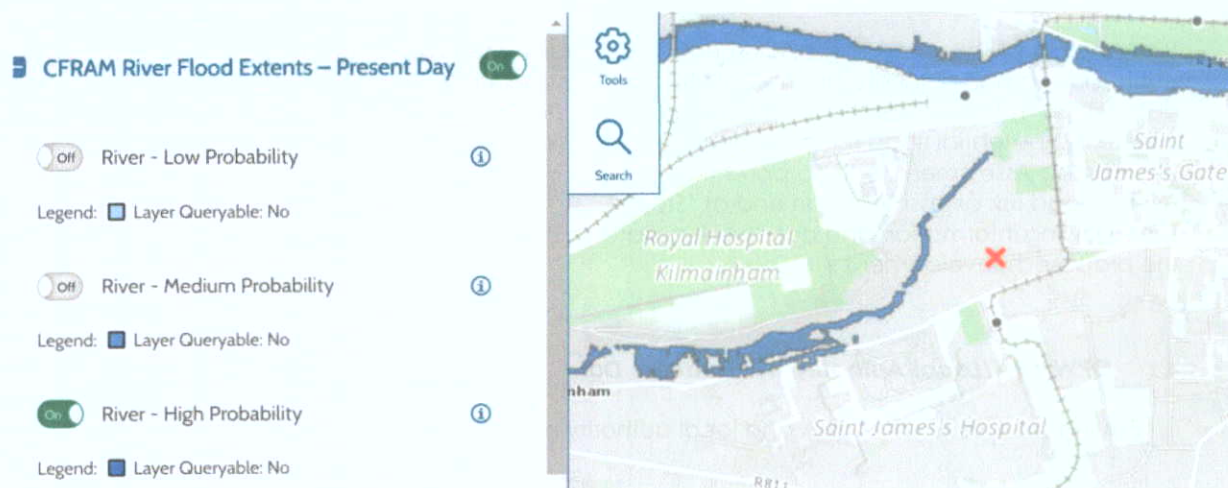


Figure 3 OPW map FLUVIAL Depth 0.1 %AEP (SITE LOCATION MARKED X)

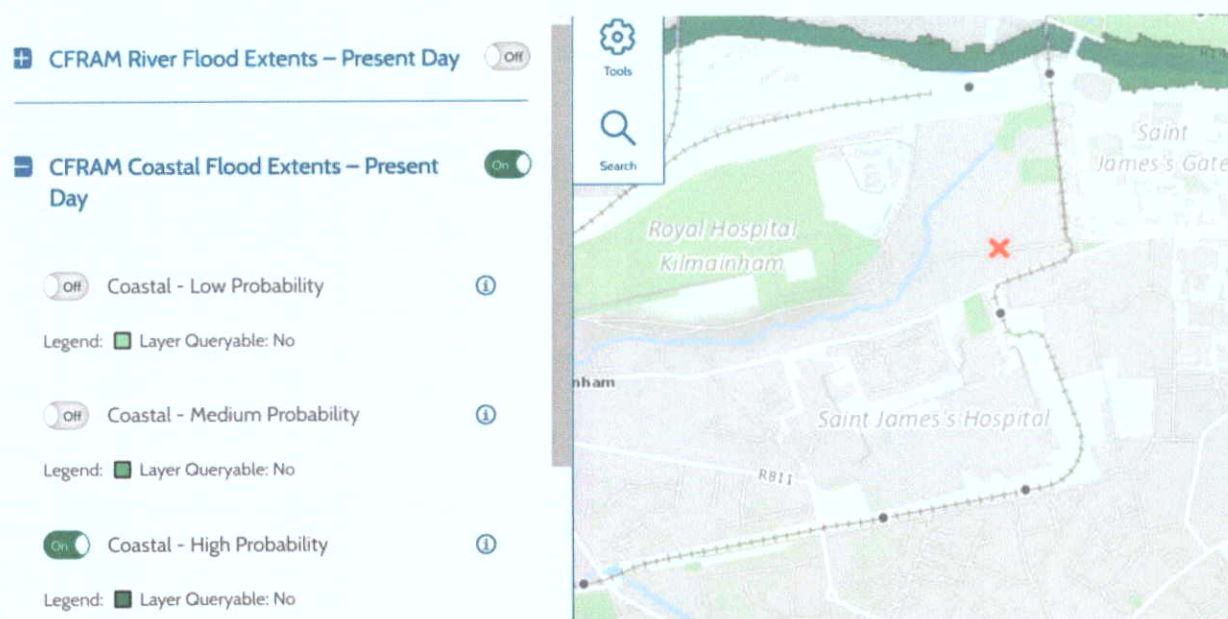


Figure 4 OPW map COASTAL Depth 0.1 %AEP (SITE LOCATION MARKED X)

4.3 OPW Flood Maps Website

The OPW Flood Maps Website (www.floods.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrences in the vicinity of the proposed development site. Figure 5 below illustrates mapping from the Flood Maps website in the vicinity of the site.

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restriction and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.

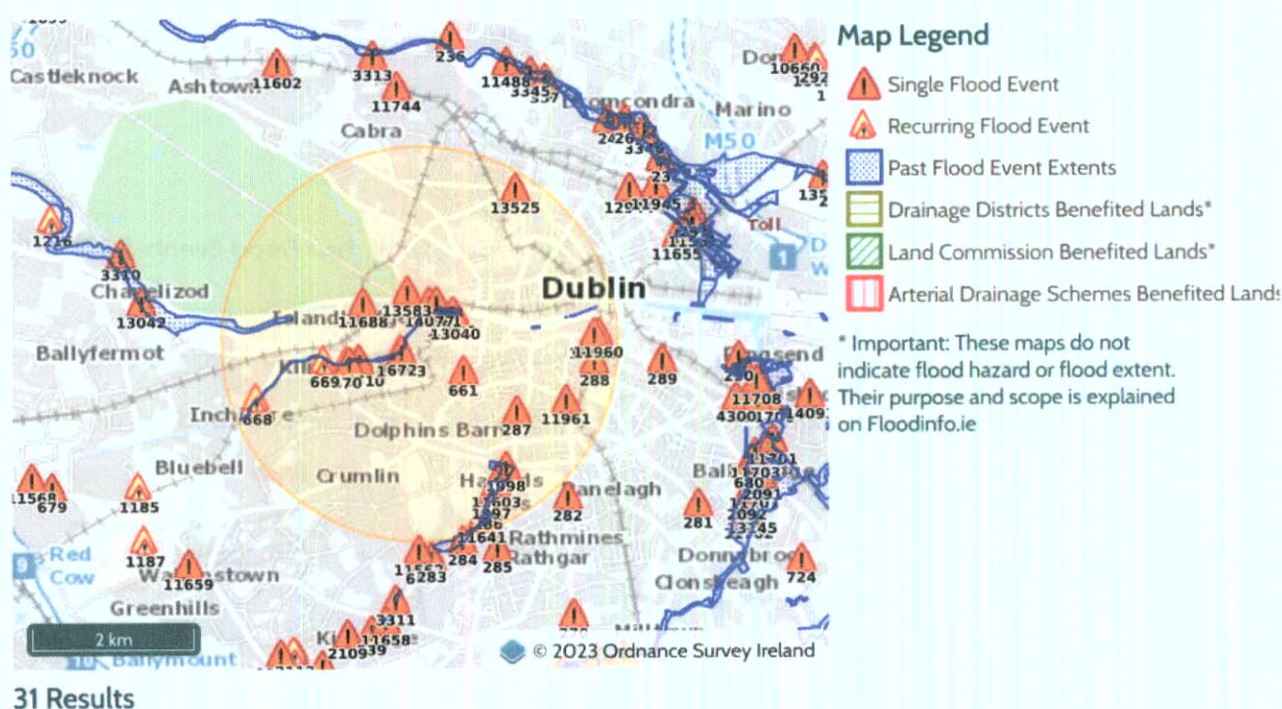


Figure 5 – OPW Past Flood Events Maps

Figure 5 above indicates that there are 31 recorded or anecdotal instances of flooding in the vicinity (4km) of the proposed development site.

There are no recorded incidences at or adjacent to the site.

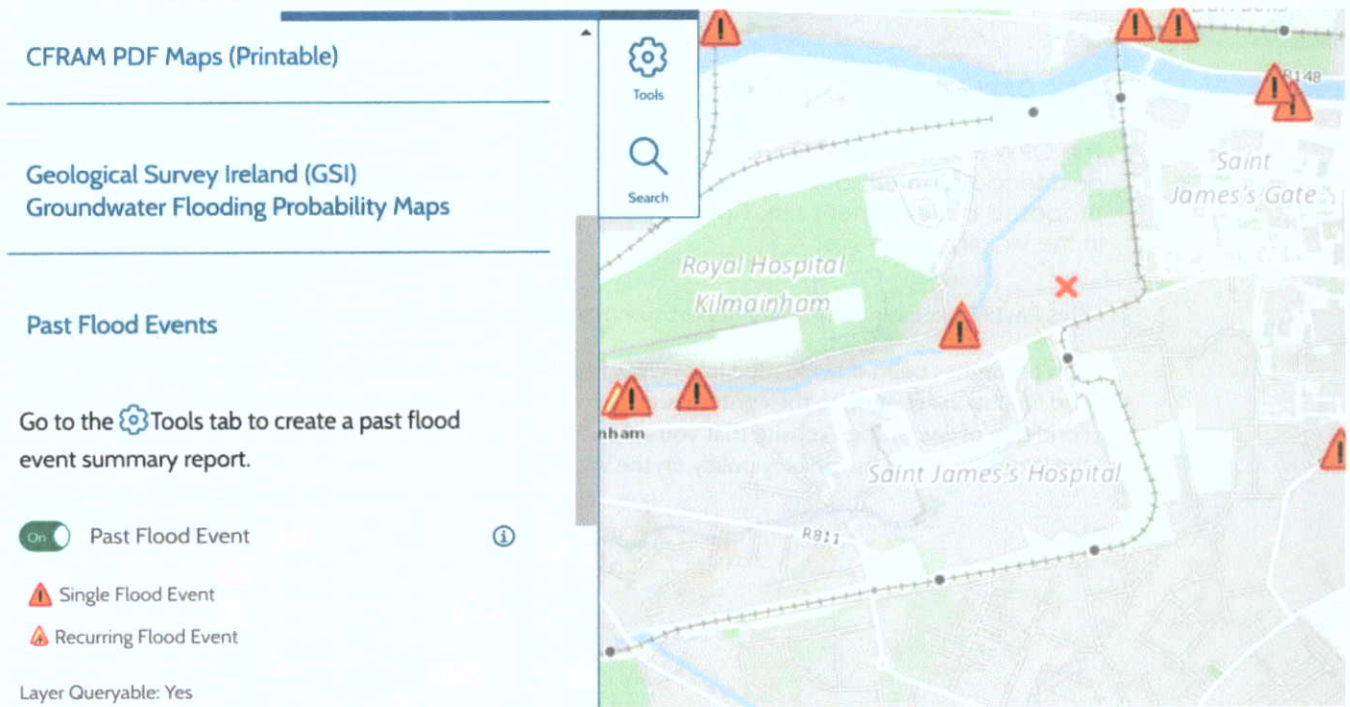


Figure 5a – OPW Past Flood Events Maps adjacent to the site

4.4 Historical Flooding

Available historic mapping for the area was consulted, as this can provide evidence of historical flooding incidences or occurrences.

Figures 6 below show the historic mapping for the area of the proposed development site.

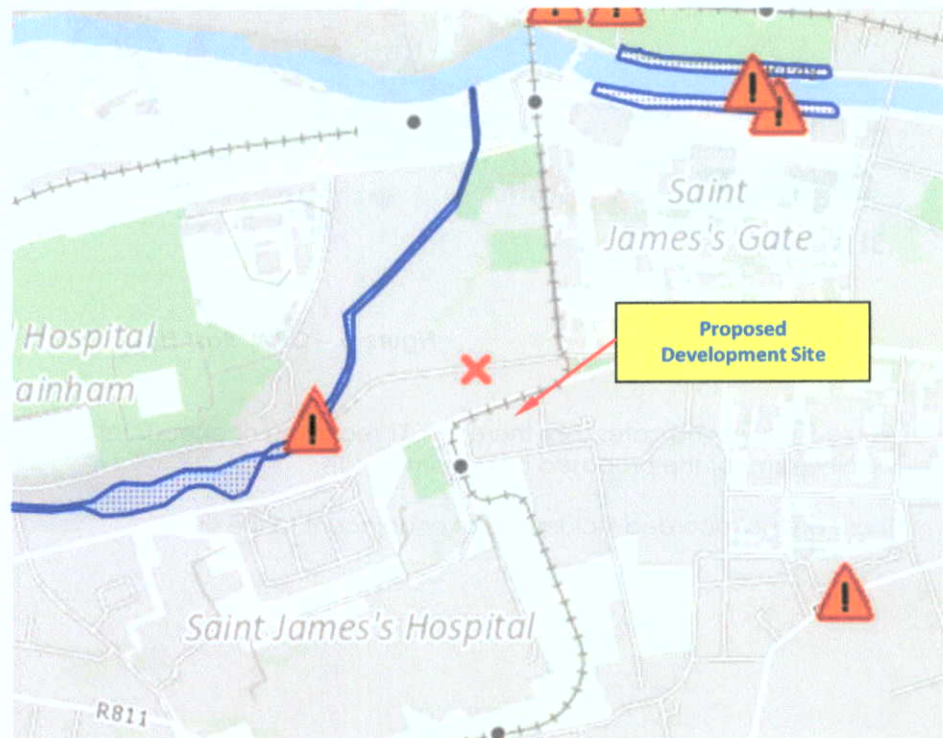
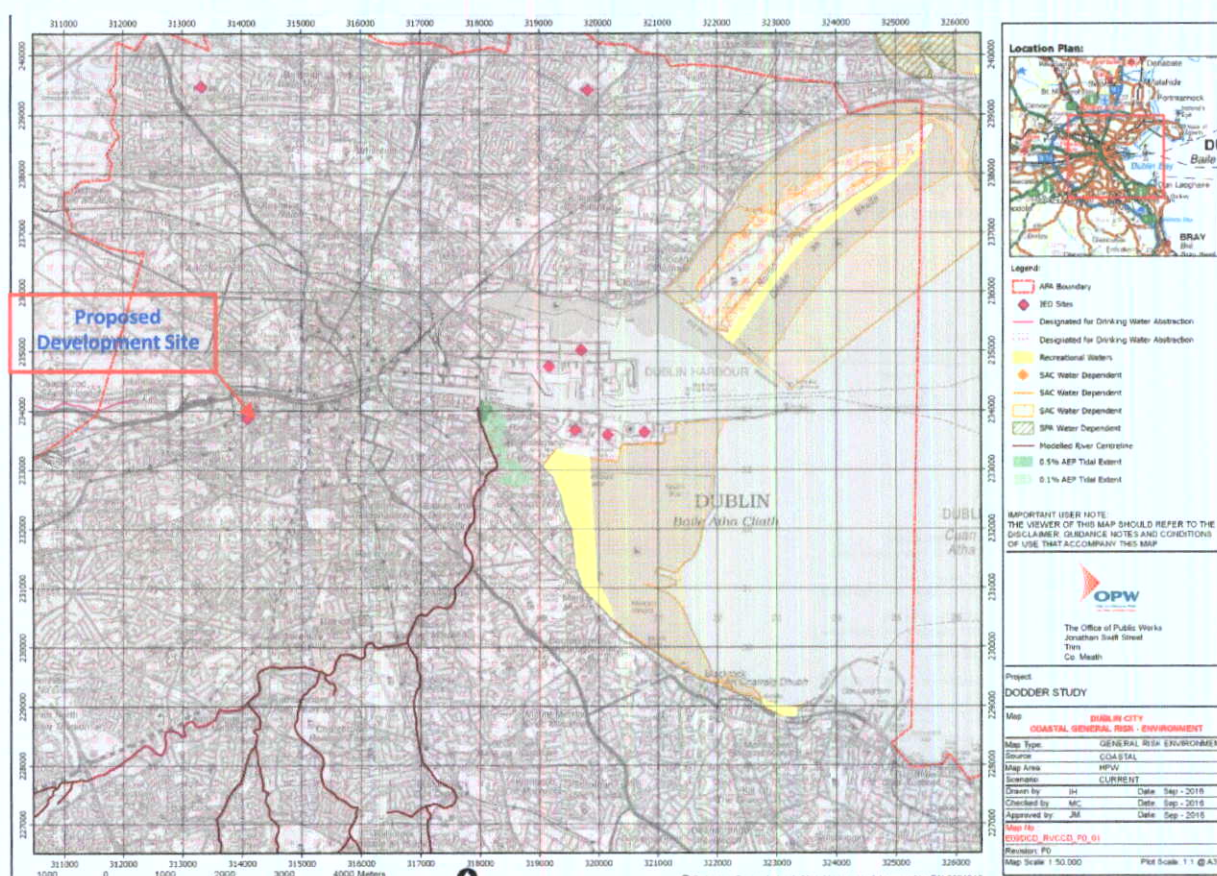


Figure 6– Historical Flooding

The historic mapping does not indicate any historical or anecdotal instances of flooding within or adjacent to the boundary of the proposed development site.

4.5 Coastal Flooding

As illustrated in Figure 8 below (extracted from CFRAMS coastal flood map E09DCD_RVCCD_F0_01) the proposed development site does not fall within mapped coastal flood zone 0.1 %AEP tidal event.



4.6 Dublin Fluvial Study

The Dublin Fluvial Study has been undertaken by the OPW and current scenario Fluvial flood maps were issued in August 2016. Fluvial flood risk extent and depth maps for the Dublin environs have been produced. The Dublin Fluvial Study flood map number E09LIF_EXFCD_F1_02 illustrates predictive flood extents in the vicinity of the proposed development site. As illustrated in Figure 9 below indicative extreme 10% AEP (1 in 10 year), 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) pluvial flood zones are mapped with no flooding on the proposed development site.

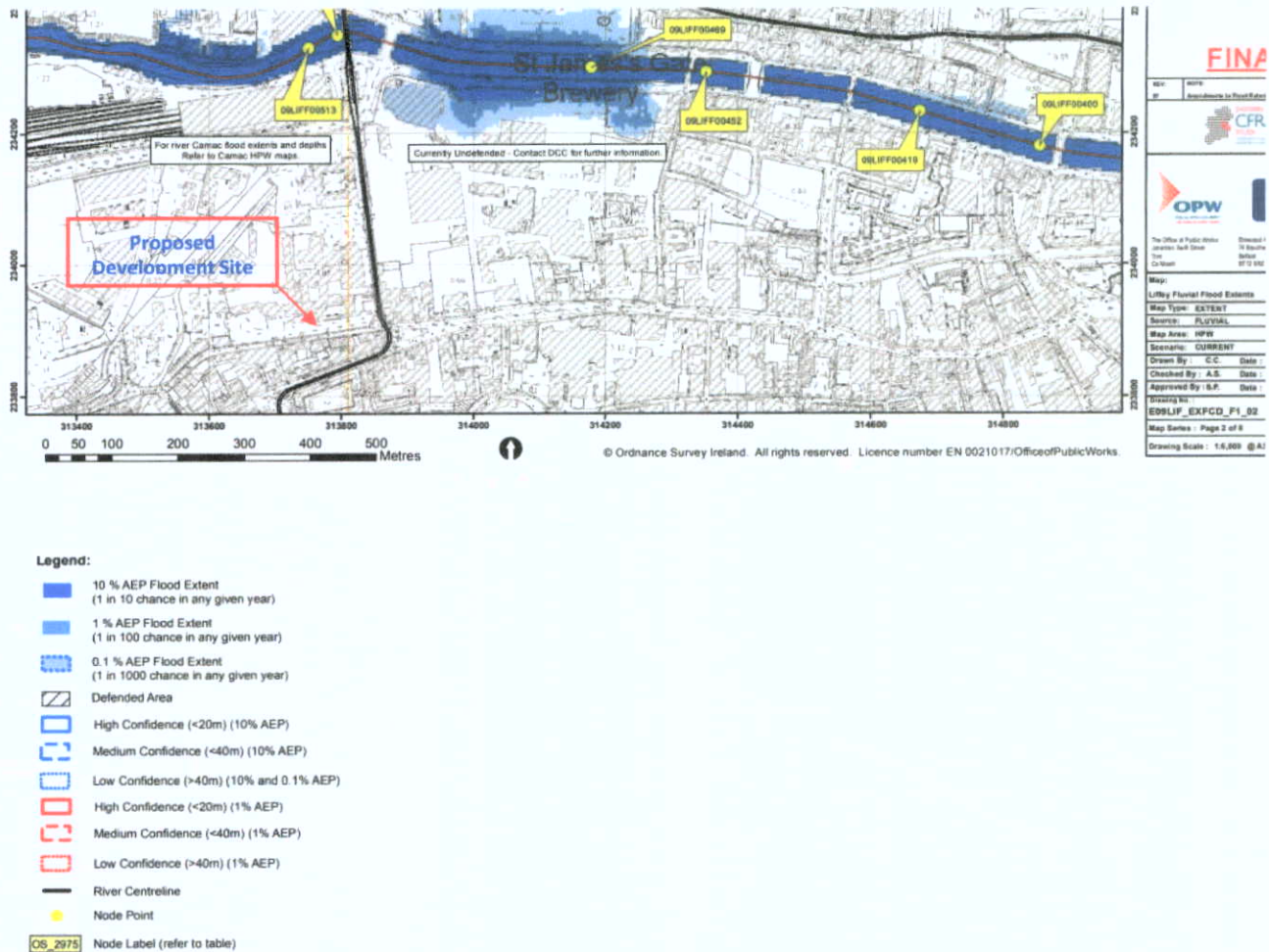


Figure 9 – Dublin Fluvial Study Map

Table 2 below summaries the predictive tidal flood depths on the proposed development site for the current scenario 0.1% AEP and 0.5% AEP COASTAL flood events.

Scenario	Extreme Tidal Flood Depth		
	0.5% AEP	0.1%AEP	
	Depth (m)	Depth (m)	
Current	0	0	

Table2 – Predicted Tidal Water Levels

Table 3 below summaries the predictive fluvial flood depths on the proposed development site for the current scenario 1% AEP and 0.1% AEP Fluvial flood events.

Scenario	Extreme Pluvial Flood Depth		
		1%AEP	0,1% AEP
		Depth (m)	Depth (m)
Current		0	0

Table3 – Predicted Pluvial Water Levels

As listed in Tables above, there are no potential flooding of the proposed development site for the current scenario 0.1% AEP Fluvial flood events.

4.7 Irish Coastal Protection Strategy Study (ICPSS)

The ICPSS, which was undertaken by the OPW, was completed in 2013 and modelled a combination of tide levels and storm surges in order to estimate extreme event water levels and to map potential coastal flood extents for various return period events along the Irish coastline.

Coastal / tidal flood extent mapping was produced for the 0.5% and 0.1% return periods including allowances for projected future climate changes. In addition to the current scenario, two scenarios were considered representing a Mid-Range and High End Future Scenario, based on sea level rises of + 500mm and +1000mm respectively.

Figure 10, below ICPSS flood map illustrate the predicted extreme 0.5% AEP (1 in 200 year coastal flood extents in the vicinity of the proposed development site for the mid-range future scenarios.

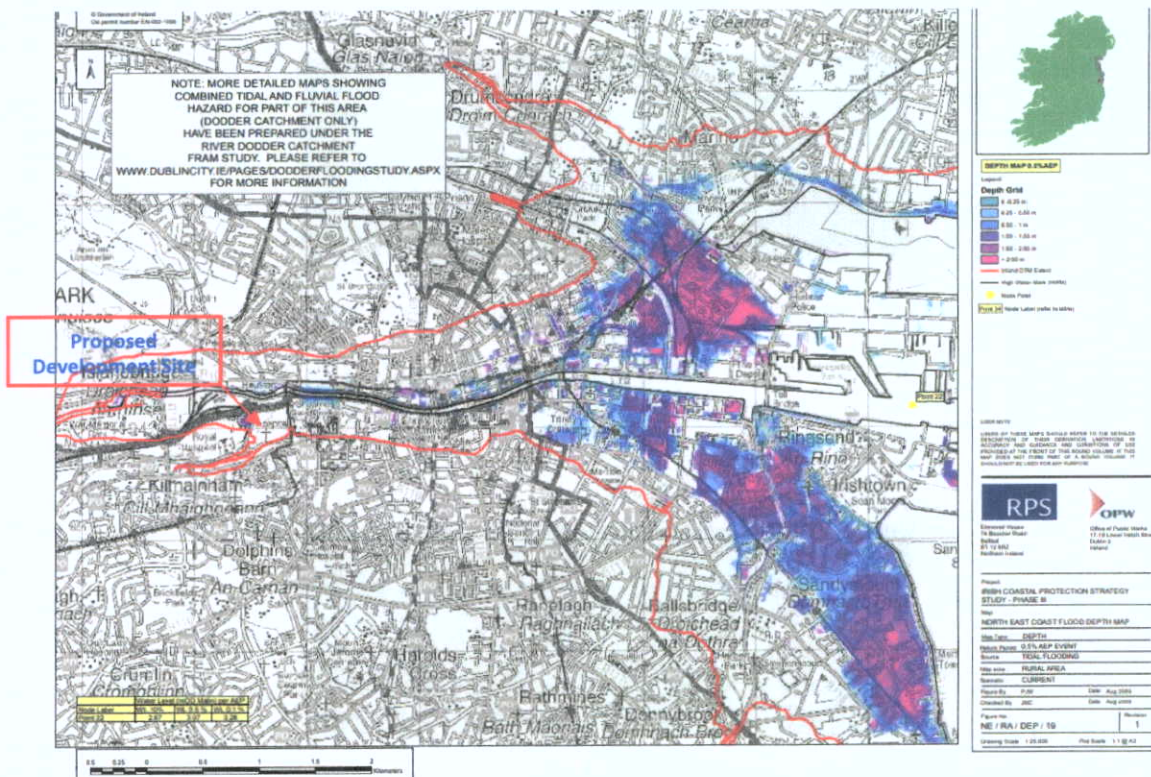
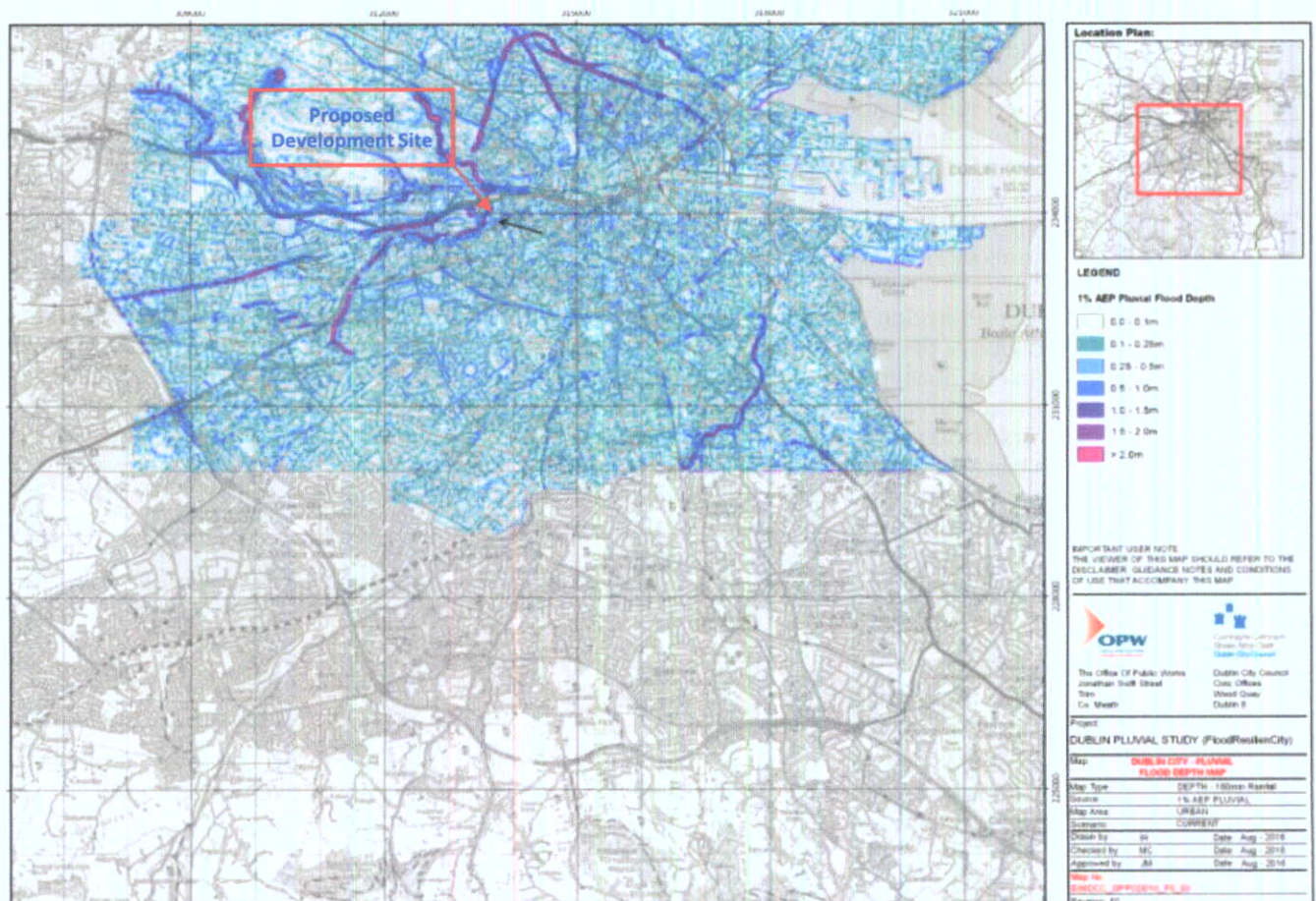


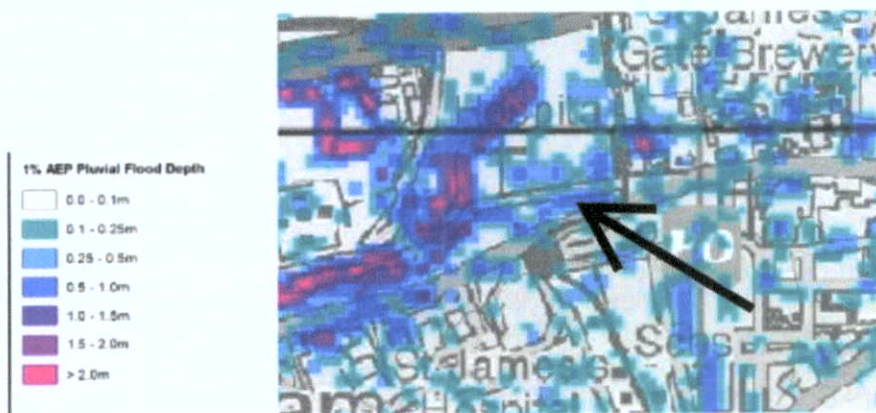
Figure 10 – ICPSS Mid-Range Future Scenario Tidal Flood Extent Map

The ICPSS mapping for the area also provides information on predicted tidal flood levels at several node points in Dublin Bay. There is no potential flooding at the location of the proposed development site.

4.8 Dublin Pluvial Study

The Dublin Pluvial Study has been undertaken by the OPW and current scenario Pluvial flood maps were issued in August 2016. Pluvial flood risk extent and depth maps for the Dublin environs have been produced. The Dublin Pluvial Study flood map number E09DCC_DPPCD010_F0_03 illustrates predictive flood extents in the vicinity of the proposed development site. As illustrated in Figure 11 below indicative extreme 10% AEP (1 in 10 year), 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) pluvial flood zones are mapped on the proposed development site.





The predicted flood level is 1.0-1.5m above the existing ground level at the location of this site.

5. Scoping Assessment

The purpose of the scoping stage is to identify possible flood risks and to implement the necessary level of detail and assessment to assess these possible risks, and to ensure these can be adequately addressed in the flood risk assessment. The scoping exercise should also identify that sufficient quantitative information is already available to complete a flood risk assessment appropriate to the scale and nature of the development.

The above screening assessment indicates that areas of the proposed development site may potentially be primarily at risk of extreme pluvial flooding.

In consideration of the information collated as part of the screening exercise and the availability of other information and data specific to the proposed site, it is considered that sufficient quantitative information to complete an appropriate flood risk assessment can be derived from the information collated as part of the screening exercise alone. In particular, the Pluvial flood extent maps available for the area produced as part of the Eastern CFRAM study are based on the results of detailed hydrological and hydraulic modelling in the vicinity of the proposed site, and therefore provide a reasonably accurate delineation of flood zones and prediction of extreme flood levels at this location.

The site specific potential or possible flood risk to the proposed development site is assessed in the subsequent 'Assessing Flood Risk' stage of this study report.

6. Assessing Flood Risk

The above screening assessment indicates that the proposed development may be susceptible to direct Pluvial flood risk due to an extreme flood event. The following section assesses the flood risk to and from the proposed development site.

Pluvial flood risk is normally assessed for a 1% AEP (1 in 100 Year) and a 0.1% AEP (1 in 1000 Year) flood event in accordance with most county development plans and in accordance with the DOEHLG guidelines 'The Planning System and Flood Risk Management Guidelines'.

6.1 Estimation of Extreme Fluvial & Costal Flood Levels.

Table 3 above summaries the predictive Pluvial flood depths on the proposed development

site for the current scenario 10% AEP, 1% AEP and 0.1% AEP Pluvial flood events. an extreme 0.1% AEP flood level of 1.0 – 1.5mm depth on site.

Average existing ground levels at the site are approximately 10.80m, therefore the level of flood inundation that may potentially occur at the site is 11.80aOD.

The proposed development site would therefore be impacted by a Pluvial flood event and therefore falls within Flood Zone 'A' Pluvial.

- Zone A: High probability of flooding – Where the estimated average probability of flooding from rivers and sea is highest (greater than 1% annually or more frequent than 1 in 100 years for river flooding or greater than 0.5% annually or more frequently than 1 in 200 years respectively for coastal flooding). Most forms of development are deemed to be inappropriate here unless the requirements of the Justification Test for Plan Making are met. Only water compatible development would normally be allowed.

6.1.1 Climate Change Scenario

Reference is made to 'Dublin City Development Plan 2022-2028 – Strategic Flood Risk Assessment'

Two climate change scenarios are presented in the development plan. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "extreme" future scenario at the upper boundaries of future projections. As laid out in the Climate Adaptation Strategy, new development should include consideration of climate change impacts on fluvial, pluvial and tidal source of flooding.

The OPW guidance recommended two climate change scenarios are considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The allowances should be applied to the 1% AEP fluvial or 0.5% AEP tidal levels. Where a development is critical or extremely vulnerable (see Table 4-1) the impact of climate change on 0.1% AEP flows should also be applied, and greater climate change allowances tested for resilience purposes. These climate change allowances are particularly important at the development management stage of planning and will ensure that proposed development is designed and constructed according to current local and national Government advice. The impact of 20% climate change, the Mid-Range Future Scenario (MRFS) is referenced in this report. Allowances for climate change in relation to river flows and sea levels are given in Table 4 below. This is an extract from DCC SFRA table 4.1

Table 4-1: Climate Change Allowances by Vulnerability and Flood Source

Development vulnerability	Fluvial climate change allowance (increase in flows)	Tidal climate change allowance (increase in sea level)	Storm water / surface water
Less vulnerable	20%	0.5m (MRFS)	20% increase in rainfall
Highly vulnerable	20%	0.5m (MRFS)	
Critical or extremely vulnerable (e.g. hospitals, major sub-stations, blue light services)	30%	1.0m (HEFS)	30% increase in rainfall

Table 4 – Allowances for climate change

Further work on the impacts of climate change on flood levels was undertaken as part of the Eastern CFRAM Study and the ICPSS. The studies provided flood extents for both fluvial and coastal risk, which are available on www.floodinfo.ie. Assessment of climate change impacts can be carried out in a number of ways. For watercourses that fall within the Eastern CFRAM study area, flood extents and water levels for the MRFS and HEFS have been developed. For other fluvial watercourses a conservative approach would be to take the 0.1% AEP event levels and extent as representing the 1% AEP event plus climate change. Where access to the hydraulic river model is readily available a run with climate change could be carried out, or hand calculations undertaken to determine the likely impact of additional flows on river levels.

The average site level is measured at 10.8M

In consideration of the Mid-Range future climate change scenario, the relevant 0.1% (1 in 1000 year) Pluvial flood levels applicable to the proposed development site is 10.80m +1.0 m=11.8 aOD.

Section 8 below provides outline recommendations for flood risk management and mitigation measures appropriate to the proposed development site.

Water Mains

It is anticipated that any flooding due to a burst or damage to the water main in the footpath would likely cause these waters to spill out onto the road network. The site is surrounded by a low level masonry wall which will contain the majority of flood water and would therefore not present a significant pluvial flood risk to the site.

Apart from the site entrance point, overall the secondary and residual pluvial flood risk to the proposed development site due to the surcharge or failure of the urban drainage and water supply network is considered to be **LOW**.

7. Proposed Development in the Context of the Guidelines

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' three flood zones are designated in consideration of flood risk to a particular development site.

Flood Zone 'A' – where the probability of flooding from rivers and watercourses is the highest (greater than 1% or 1 in 100 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'B' – where the probability of flooding from rivers and watercourses is moderate (between 0.1% or 1 in 1000 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'C' – where the probability of flooding from rivers and watercourses is low or negligible (less than 0.1% or 1 in 1000 year for both river and watercourse and coastal flooding). Flood Zone 'C' covers all areas that are not in Zones 'A' or 'B'.

The 'Planning System and Flood Risk Management Guidelines' list the planning implications for each flood zone, as summarized below:-

Zone A – High Probability of Flooding. Most types of development would not be considered in this zone unless the Justification Test is satisfied. Development in this zone should be only be considered in exceptional circumstances, such as in city and town centers, or in the case of essential infrastructure that cannot be located elsewhere, and where the 'Planning System and Flood Risk Management Guidelines' justification test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space and outdoor sports and reaction would be considered appropriate in this zone.

Zone B – Moderate Probability of Flooding. Highly vulnerable development such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses, strategic transport and utilities infrastructure would generally be considered inappropriate in this zone, unless the requirements of the justification test can be met. Less vulnerable development such as retail, commercial and industrial uses and recreational facilities might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone 'C' and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to the development can be adequately managed and that development in this zone will not adversely affect adjacent lands and properties.

Zone C – Low to Negligible Probability of Flooding. Development in this zone is appropriate from a flood risk perspective. Developments in this zone are generally not considered at risk of fluvial flooding and would not adversely affect adjacent lands and properties from a flood risk perspective. In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' this Site Specific Flood Risk Assessment has determined that the proposed development site may fall within a fluvial and tidal Flood Zone 'B'. In accordance with the 'Planning System & Flood Risk Management Guidelines, DOEGLG, 2009' development proposals for the site may be subject to the requirements of the Justification Test.

8. Discussion

Minor Development Section 5.28 of The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009 identifies certain types of development as being 'minor works' and, therefore, exempt from the Justification Test. Such development relates to works associated with existing developments, such as extensions, renovations and rebuilding of existing development, small scale infill and changes of use.

The risks of flooding should accompany such applications. This must demonstrate that the development

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would not increase flood risks, by introducing significant numbers of additional people into the flood plain and/or putting additional pressure on emergency services or existing flood management infrastructure. The development must not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities. Where possible, the design of built elements in these applications should demonstrate principles of flood resilient design. (See: The Planning System and Flood Risk Management Guidelines for Planning Authorities Technical Appendices, 2009, Section 4 – Designing for Residual Flood Risk.) Generally the approach to deal with flood protection would involve raising the ground floor levels above the level of extreme high tides. However, in some parts of the plan area, which are already developed, ground floor levels for flood protection could lead to floor levels being much higher than adjacent streets, thus creating a hostile streetscape for pedestrians. This would cause problems for infill development sites if floor levels were required to be significantly higher than those of neighboring properties. In this regard, for the key development sites in the plan area it has been recognized that ground floor levels below predicted high tide levels could be allowed, in limited circumstances, on a site-by-site basis, for commercial and business developments. However, if this is the case, then these would be required to be of flood resistant construction using water resistant materials and electrical fittings placed at higher levels. Residential uses would not be permitted at ground floor levels in high risk zones. It should be noted that for residential buildings within Flood Zone A or B, bedroom accommodation shall not be permitted at basement or ground floor. Steps taken to ensure operability during and recovery after a flood event for both residential and commercial developments. Emergency access must be considered as in many cases flood resilience will not be easily achieved in the existing built environment. The requirement for providing compensatory storage for minor developments has been reviewed and can generally be relaxed, even where finished floor levels have been raised. This is because the development concerns land which has previously been developed and would already have limited capacity to mitigate flooding.

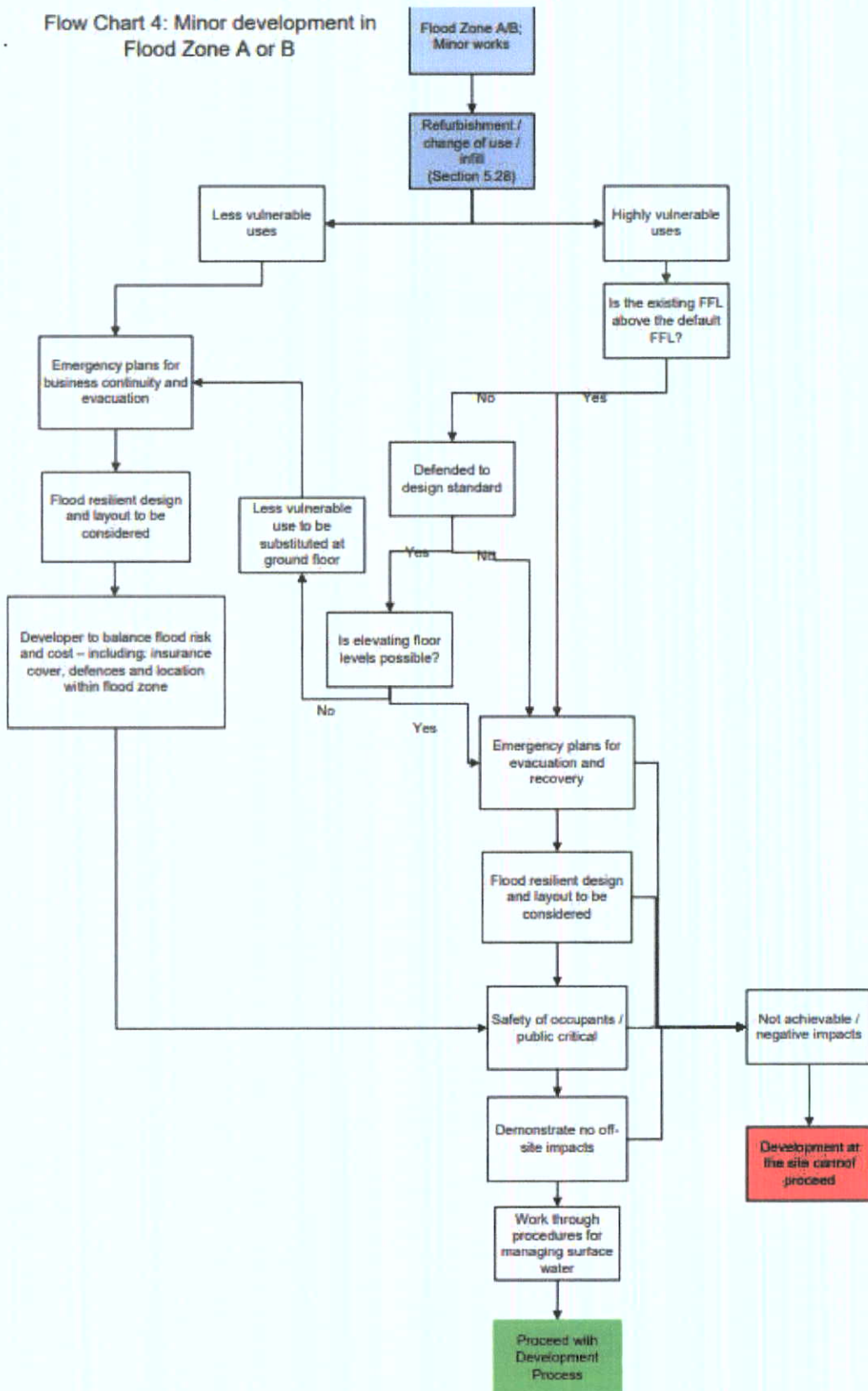
The above analysis and flood zone delineation undertaken as part of this Site Specific Flood Risk Assessment (SSFRA) indicates that the proposed development site may fall within a current scenario Pluvial 0.1% AEP (1 in 1000 year) Flood Zone A.

The footprint area of the proposed development site is approximately 390m² the development as proposed is not expected to result in any significant displacement of extreme 0.1% AEP Pluvial flood waters, is not expected to obstruct flood conveyance routes and is not expected to result in an adverse impact to the hydrological regime of the area or significantly increase flood risk elsewhere.

In consideration of the estimated current scenario and future scenario extreme flood levels listed above, it would not be feasible to construct proposed finished ground floor levels above predicted extreme flood levels. In order to enable a sustainable development of the site it is therefore recommended that appropriate flood risk management and mitigation measures are implement as part of the development proposals for the site.

Section 10 below provides outline recommendations for flood risk management and mitigation Measures appropriate to the proposed development site.

Flow Chart 4: Minor development in Flood Zone A or B



9. Justification Test for Development Management

In the context of the 'Dublin City Development Plan 2022-2028 – Strategic Flood Risk Assessment' and in consideration of the scenario that the proposed development site is not defended, the analysis and flood zone delineation undertaken as part of this Site Specific Flood Risk Assessment (SSFRA) indicates that the proposed development site may fall within a current scenario Pluvial 0.1% AEP (1 in 1000 year) Flood Zone A.

Table 1.2 of the guidelines list the vulnerability class of various types of development. In consideration of the development proposals for the site (residential development) the development is considered as 'Highly Vulnerable Development'.

Table 1.3 of the guidelines (duplicated below) provides a matrix of different vulnerability classes of development in relation to Flood Zones A, B and C, and lists if development is appropriate in each Zone and where the Justification Test should be applied.

Table 1-3: Matrix of Vulnerability Versus Flood Zone to Illustrate Appropriate Development and that Required to Meet the Justification Test

	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

With reference to the table above, the form of development proposed at the site is considered as 'Highly Vulnerable Development' and the development potentially falls within a potential Flood Zone A, therefore development proposals for the site will be subject to the Justification Test.

9.1 Application of the Justification Test

Reference is made to 'Dublin City Development Plan 2022-2028 – Strategic Flood Risk Assessment'. When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 1.3, the following criteria must be satisfied:

"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 has been zoned as "Z1 to provide & improve residential amenities" . Refer to 4.10 above.

"The proposal has been subject to an appropriate flood risk assessment that demonstrates:

- (1) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;"*

A site specific flood risk assessment has been prepared for the site. The site is susceptible to a 0.5% AEP and 0.1% AEP Mid-Range & High-End future climate change scenario tidal flood events and 0.1% AEP High End future climate change coastal flood event.

The footprint area of the proposed structures within the site is approximately 390m2, therefore the development as proposed is not expected to result in any significant displacement of extreme flood waters, is not expected to obstruct Pluvial flood conveyance routes and is not expected to result in an adverse impact to the hydrological regime of the area or significantly increase flood risk elsewhere.

The proposed development will include a residential unit on the ground level. This is a common feature on Bow Lane. Previous application 3127/21 was approved with residential units at a level of 10.24 below the finished ground level of this development.

Proposed flood resistance & resilience measures for the site will reduce the flood risk for the development.

- (2) "The development proposal includes measures to minimize flood risk to people, property, the economy and the environment as far as reasonably possible;"*

Proposed flood resistance & resilience measures for the site are set out in sections 10.1 & 10.2, to minimize

the risk to the property. A proposed flood evacuation plan is set out in section 10.3, to minimize the risk to occupants.

- (3) *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 proposed flood protection measures are site specific to the development of private residential units with individual direct access to the public road network. There is negligible residual risks to the area or Emergency services access

- (4) *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.*

The proposed residential development is situated in a city centre location. There is no proposed new road network or infrastructure. Individual direct access is proposed to the existing public road network. The existing streetscapes will not be affected.

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

We refer to Area 10 Strategic Flood Risk Assessment (SFRA) for Dublin City Development Plan 2022-2028. The urban settlement is targeted for growth under the National Spatial Strategy, Regional Planning Guidelines, and statutory plans, as defined under the provisions of the Planning and Development Act 2000, as amended.

Justification Test for Development Plans

1. Part 1 of the Justification Test is covered under Section 3.2.1 in the main body of the SFRA report.

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

(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement.

Answer: Yes: This area is an established residential suburb of Dublin City. This sounding area is largely characterised by an urban mix form of residential and former commercial warehouse units. The site is 2KM from the City Centre and 250m from a LUAS stop.

Development in this area is a mixture of high density commercial and residential with infill development of both. There are a number of hotels, large residential buildings as well as high profile buildings. This area is considered essential to the expansion of City.

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

Answer: The area is a built up established residential / commercial artery out of the city centre. Most of the lands in this area would be built up residential. The Flood Cell also covers some lands owned by the HSE and Irish Rail

(iii) Is within or adjoining the core of an established or designated urban settlement.

Answer: Yes: The lands form part of an established suburb of the City.

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

Answer: Yes: The lands form part of an established inner urban community of the City

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

Answer: There are no suitable alternative lands for the particular uses or development type in areas at lower risk of flooding, within or adjoining the urban settlement.

3. Specific Flood Risk Assessment

- The ground floor level of the proposed site would be at risk from the extreme flood event. Most of the flood cell is defended against the estimated 100 year fluvial flooding from the Camac. As the progression of the flood defence works is ongoing, any site specific FRA should include a review and commentary on up-to-date risks. Where the defences have been completed, the FRA should follow the general guidance for development in defended locations. Where the defences have not been completed, all but very small scale extensions and changes of use would be considered premature.

- A flood storage area upstream of the Tallaght stream junction with the main river has been identified to provide additional protection against increase river flows arising from climate change. It is essential that this land, which sits within the functional area of South Dublin County Council, is protected for this function.

Conclusion: The subject area passes the Justification Test for Development Plans.

10. Flood Risk Management & Mitigation Measures

Section 6 above discusses the potential floodwater depths that may occur at the location of the proposed development in consideration of a current scenario 0.1% AEP Pluvial flood event.

In order to demonstrate compliance with 'The Planning System and Flood Risk Management Guidelines' and to ensure a sustainable development it is therefore recommended that the proposed development incorporates appropriate flood resistance and flood resilience measures in consideration of the mid-range future scenario flood level

Flood resistance measures are defined as 'the installation of resistance measures to prevent floodwater from reaching or entering a property.

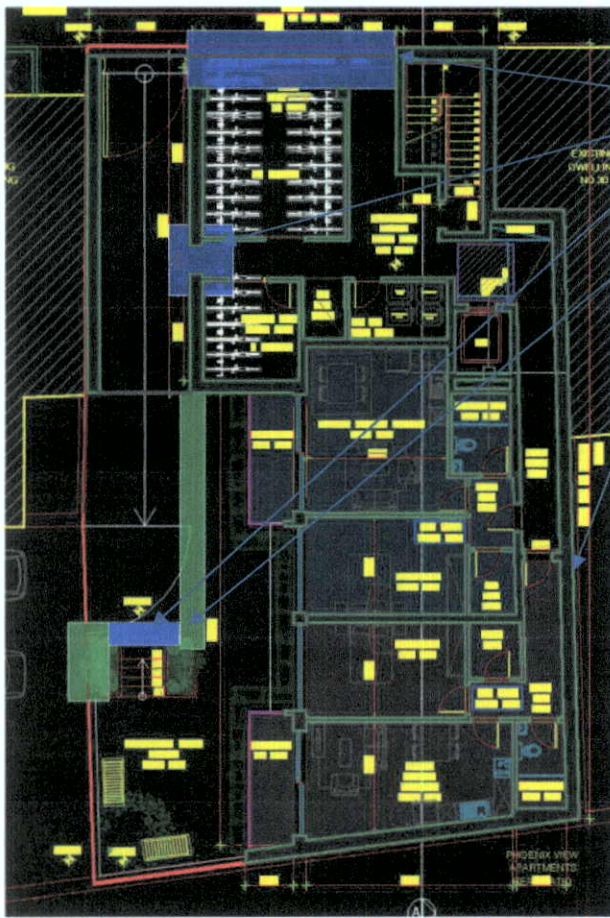
Flood resilience measures are defined as 'the implementation of permanent methods or techniques that can be carried out at property level i.e. inside a property, to minimize damage caused by floodwaters that have entered a property.

It is recommended that the proposed development incorporates appropriate flood resistance and flood resilient measures as outlined in the relevant Dublin City Council 'Property Flood Protection Guide' and relevant CIRIA and DEFRA guidance documents in relation to flood mitigation and flood resilience measures. It is also recommended that the owners of the proposed housing development implements and operate a Flood Evacuation Plan for the facility. Outline recommendations for the scope and contents of a suitable Flood Evacuation Plan are presented in Section 10.3 below.

10.1 Flood Resistance Measures

As a minimum, it is recommended that the following summary flood resistance measures be implemented for the proposed development.

- Slotted movable or demountable flood gates should be provided to the entrance exterior doors and capable of installation to a level of at least 1.0m above proposed finished floor levels. When not in use, flood gates should be stored in an easily accessible location. In lieu of flood gates, a readily available supply of sandbags should be retained at the site in an easily accessible location.



Flood gates on entrance to stores and steps

Flood resilient walls to boundary and Patio communal space

Flood resilient measures



Example of demountable flood gates

- A flood marker post should be fixed at a secure and easily visible location on the external boundary of the property. The marker post should be marked at a level of 0.15m above the existing ground level, at which point any flood inundation should trigger the Flood Evacuation Plan (see recommendations below).
- Any proposed foul and surface water drainage system within the boundary of the development should be fitted with lockable external manhole covers capable of resisting uplift pressures in the event of the sewerage system becoming surcharged.
- Air bricks in external walls would be sealed using 'SMART' air bricks.



Anti-Flood Airbrick

- Any pipes or cables that protrude through external walls at a level below 11.8m OD should be adequately sealed.
- Non-return valves, or anti-flood valves, should be fitted to the drainage network connecting the property to the local authority sewerage system.



Backwater Valve

10.2 Flood Resilience Resistance Measures

Design for flood resilient construction accepts that floodwater will enter buildings and provides for this in the design and specification of internal building services and finishes. These measures limit damage caused by floodwater and allow relatively quick recovery. This can be achieved by using wall and floor materials such as ceramic tiling that can be cleaned and dried relatively easily, provided that the substrate materials (e.g. blockwork) are also resilient. Electrics, appliances and kitchen fittings may also be raised above floor level, and one-way valves may be incorporated into drainage pipes. It is recommended that the following flood resilience measures be incorporated for the proposed development

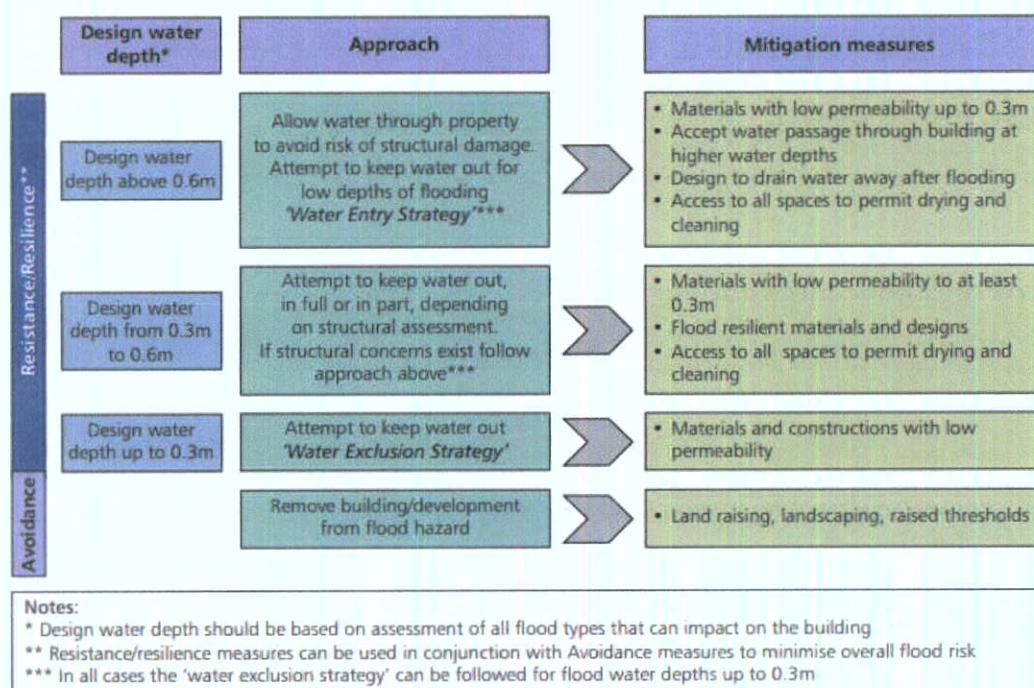
- Where possible, ground floor electrical appliances should be placed on shelves or plinths in order to raise the appliance above the ground floor level.
- Ground floor service meters (electric, gas, telecoms, etc.) should be enclosed in plastic housings and should be fitted above the potential mid-range future scenario 0.1% AEP flood level of 12.3m OD (1.0m flood depth +0.5).
- Ground floor fuses boxes, electrical sockets and wiring should be constructed above the potential mid-range future scenario 0.1% AEP flood level of 11.8m OD.
- Ground floor boilers and water heaters should be wall fitted above the potential mid-range future scenario 0.1% AEP flood level of 11.8m OD.
- Internal layout and the careful design of internal space can be an effective measure to reduce the impact of flooding. For example, living accommodation, essential services, storage space for provisions and equipment should be designed to be located above the predicted flood level. In addition, siting of living accommodation (particularly sleeping areas) above flood level, may be an appropriate design option in areas at risk of flooding. In all cases, the requirements for safe access, refuge and evacuation should always be incorporated into the design of development.

Flood-Resistant wall tanking of walls and floors to min 0.1% AEP flood level of 11.8m OD. The main entry points for floodwater into buildings are doors and windows (including gaps in sealant around frames), vents, air-bricks and gaps around conduits or pipes passing through external building fabric. Floodwater may also arise through sanitary appliances as a result of backflow through the drainage system. There are a range of proprietary flood protection devices available on the market that are designed specifically to resist the

passage of floodwater. These include removable barriers designed to fit openings, vent covers and stoppers designed to fit WC pans. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also be borne in mind that devices such as vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations. "Improving the Flood Performance of New Buildings" published by the Department of Communities and Local Government in the UK. In a water entry strategy, emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m).

Design approaches and flood resilient design and construction

This document, based on evidence from laboratory tests, technical evidence and industry experience, helps a designer to determine the best option or design strategy for flood management at a building site level from knowledge of basic flood parameters (e.g. depth, frequency and duration) which would normally be determined in a flood risk assessment at the planning stage. Depending on these parameters (in particular flood depth) and after utilising options for flood avoidance at site level, designers may adopt a **water exclusion strategy** or a **water entry strategy** as illustrated in the figure below:



Flood

Evacuation Plan

In consideration of the type, form and intended use of the proposed development and the perceived flood risk in the area (in consideration of the undefended scenario), it is recommended that a Flood Evacuation Plan be implemented for the proposed development. The specific scope, form, layout and contents of the Flood Evacuation Plan will need to be developed by the facility operator in order to comply with their specific standards, procedures and codes of practice, however, it is recommended that any Flood Evacuation Plan for the development contains, as a minimum, the following detail, information and procedures:-

(1) Site Location Maps

The Flood Evacuation Plan should contain a 1:1000 scale map indicating the location of the development in the context of the surrounding urban environment.

(2) Responsible Personnel & Contact Details

The name of the relevant responsible manager or warden of the facility should be provided, together with day time and night time contact telephone numbers.

(3) Summary of Potential Flood Risk

A summary of the primary potential flood risk to the development should be provided, including the primary source of flooding and the maximum potential flood depths that may occur at the development (as listed above).

(4) Safe Access & Egress

In the event of a significant flood event and where evacuation is required, persons should only exit the building via the front doorway and the raised pathway. No egress to the rear of the property should be permitted.

(5) Safe Refuge Area

In the event of a significant flood event and where safe egress from the building cannot be achieved, the upper floors of the building should be utilized as a safe refuge area. No ground floor locations should be permitted as safe refuge areas.

(6) Isolation of Services

The flood evacuation plan should contain details and procedures on how to isolate or turn off any gas supply, electricity supply and water mains supply. A designated person should be assigned responsibility for isolation of services.

(7) Flood Kit

A flood kit, appropriate to the maximum number of potential residents, should be maintained at the property. As a minimum flood kits should contain torches, blankets, warm clothing and waterproofs, a first aid kit and any essential medication, a list of useful telephone numbers, a supply of bottled water, a supply of non-perishable food items, a portable radio, waterproof boots.

On completion, and prior to occupancy of the proposed sheltered housing development, copies of the completed flood evacuation plan should be submitted to the relevant emergency services.

11. Summary Conclusions and Recommendations

In consideration of the findings of this site specific flood risk assessment and analysis the following conclusions and recommendations are made in respect of the proposed development site

- A Site Specific Flood Risk (SSFRA) assessment, appropriate to the type and scale of development proposed, and in accordance with 'The Planning System and Flood Risk Management Guidelines – DoEHLG-2009' has been undertaken.
- The area of the proposed development site has been screened, scoped and assessed for flood risk in accordance with the above guidelines.
- The primary flood risk to the proposed development site can be attributed to potential mid-range future scenario Pluvial flooding in the vicinity of the site. The site is at risk of flooding from a current scenario & high-end future scenario Pluvial influenced flood event.
- The proposed development site is not particularly at risk direct fluvial flooding infrastructure in the vicinity of the site.

The Ground floor space would be susceptible to flooding by a Mid-Range future climate change scenario 0.1% AEP (1 in 1000 year) & 1 %AEP tidal flood event .

- The proposed development is indicated as having a finished ground floor level of 10.8 OD, therefore the proposed ground floor may be susceptible to flooding during the occurrence of a Mid-Range future climate change tidal flood event 0.1% AEP flood design level of 11.8m OD (1.5m flood depth +0.3).

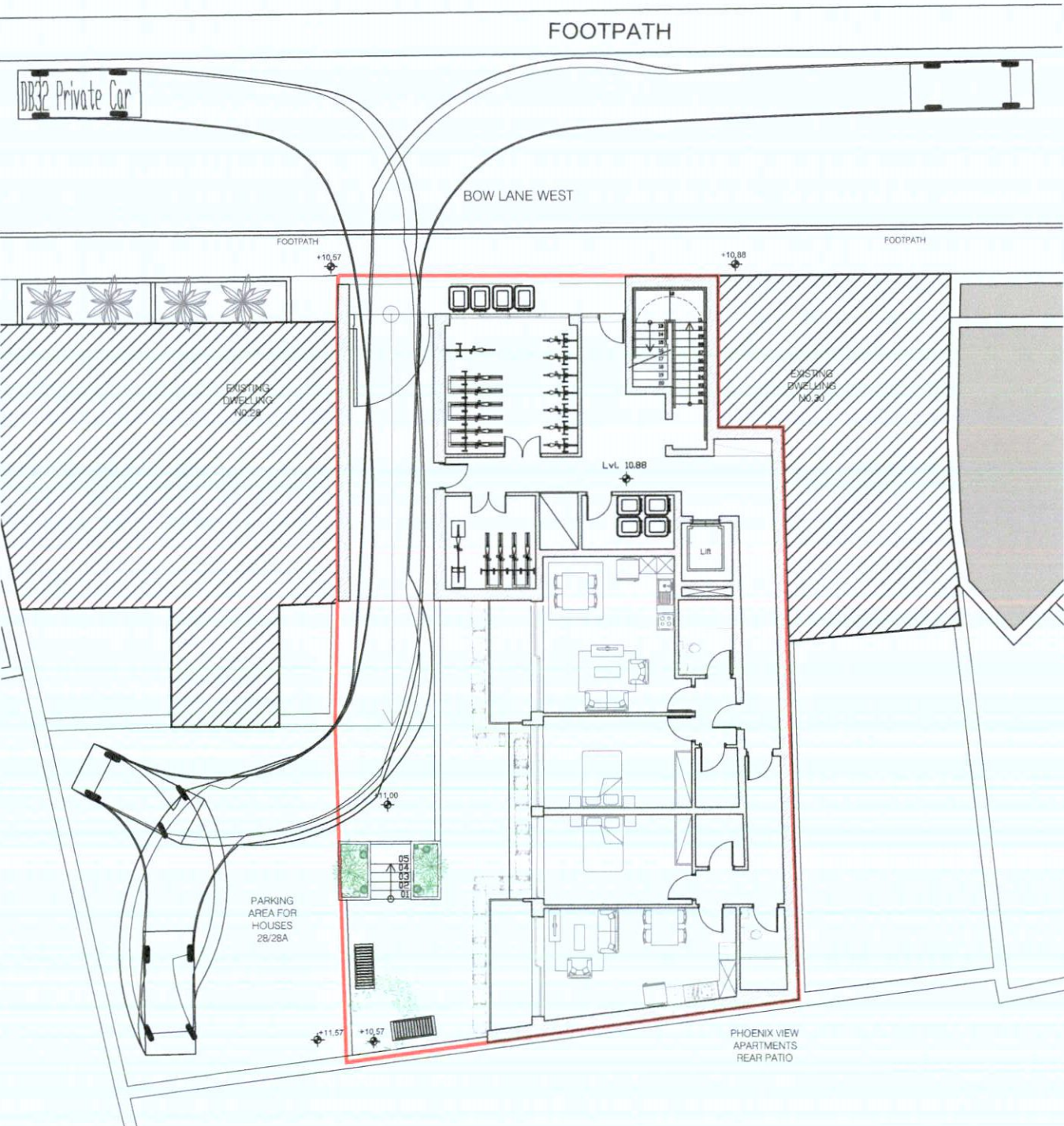
In order to enable a sustainable development it is therefore recommended that the flood risk management and mitigation measures listed in this SSFRA are implemented as part of the development proposals for the site in consideration of the predicted Mid-Range future climate change tidal flood level of 12.2m OD.

- In consideration of the findings of this Site Specific Flood Risk Assessment, and in the context of 'Dublin City Development Plan 2022-2028 – Strategic Flood Risk Assessment' the proposed development site falls within Flood Zone 'A' and is subject to the requirements of The Justification Test.
- In consideration of the analysis and recommendations of this Site Specific Flood Risk Assessment, the development as proposed is not expected to result in an adverse impact to the hydrological regime of the area and is not expected to adversely impact on adjacent lands or properties or increase flood risk elsewhere.
- The development as proposed is therefore considered to be appropriate from a flood risk perspective.
- Dublin City Council flood defenses are under construction. The Flood defenses incorporating the estimated 200-year tide level, plus 650mm for climate change. It is proposed to implement a flood resistance and resilience measures

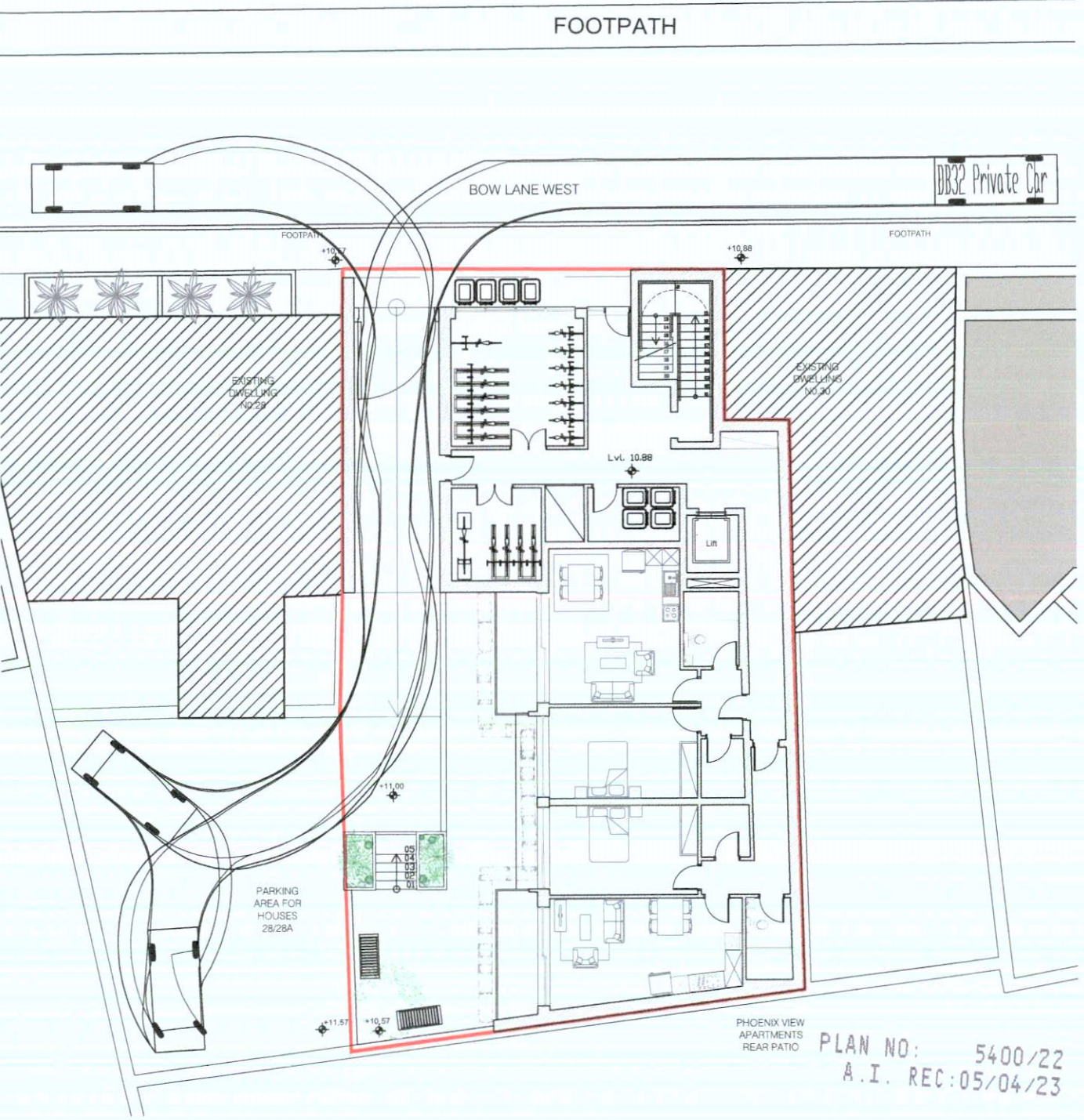
PLAN NO: 5400/22
A.I. REC: 05/04/23

NOTE:
ALL STEEL TO BE S355 EXC2 GRADE
UNLESS NOTED

CAR PARKING OF THE WILLOW
GROVE MENTAL HEALTH
ADOLESCENT UNIT



CAR PARKING OF THE WILLOW
GROVE MENTAL HEALTH
ADOLESCENT UNIT



PLAN NO: 5400/22
A.I. REC: 05/04/23

- NOTES:**
- This drawing to be read in conjunction with all relevant Architects and Engineers drawings.
 - All concrete to be grade 35N/20 with a crushing strength of 35N/mm² after 28 days.
 - Minimum of 150mm bearing on all precast elements.
 - Reinforcement to have a minimum of 40mm clear cover of concrete unless otherwise noted.
 - Do not scale drawing.
 - All dimensions in millimeters unless otherwise stated.
 - Foundations to be formed at least equal depth to existing foundations on suitable bearing strata with capacity of 100 kN/sq.m. to be inspected by engineers office.
 - Engineers office to be notified 24 hours before concrete pour.
 - Foundation design subject to no presence of water. Engineers office to be notified if soil conditions differ.
 - D.P.C., D.P.M. and Radon Barrier to Architects specification.
 - Refer to Architects drawings for setting dimensions and finishing details.
 - All dimensions and setting out to be confirmed and checked with Architects drawings. Any discrepancies to be disclosed to architects and Engineers office.
 - All building works to comply with current building regulations.

LEGEND:

- Denotes new blockwork
- Denotes new brickwork
- Denotes new stud walls
- Denotes existing structure
- Denotes support steel under
- Denotes support walls under
- Denotes direction of span of new floor joists
- Denotes slope direction of roof

Job Title:	29 BOW LANE WEST DUBLIN 8 DOB V44T	Client:	PAT O'BRIEN & NICOLA COX	Scale:	A1 @ 1:100	4 Bridgecourt Office Park Walkinstown Avenue Dublin 12 Tel / Fax: 01-426 4883 / 01-429 7971 email: mail@once.co www.once.co
Drawing Title:	VEHICLE TRACKING SWEEP ANALYSIS	Drawing number:	6113/01	Date:	MAR'23	

once
consultant engineers