Flood Risk Assessment

Proposed Large-scale Residential Development Planning Application No. 1 at Flemington Lane, Balbriggan, Co. Dublin.

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Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	07 May 2026	L. Sawyer/C. Maher	P. Ingle	
No. 2	28 August 2026	C. Maher	P. Ingle	

Comments

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

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This report is confidential to the Client, and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

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1. Introduction

This Flood Risk Assessment has been prepared by Waterman Moylan Engineering Consultants, on behalf of the Client, Lagan Homes, as part of a planning submission for a proposed Large-scale Residential Development comprising 144no. residential units at Flemington Lane, Balbriggan, Fingal, Co. Dublin.

This FRA has been carried out in accordance with the Department of Housing and Local Government (DEHLG) and the Office of Public Works (OPW) document *"The Planning Process and Flood Risk Management Guidelines for Planning Authorities"* published in November 2009. This Flood Risk Assessment references the Eastern CFRAM Study Catchment Analysis. This Assessment identifies and sets out possible mitigation measures against potential risks of flooding from various sources. Sources of possible flooding include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical error.

This report provides an assessment of the subject site for flood risk purposes only.

Supplementary documentation referred to when compiling this report, includes:

- Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments
- The SuDS Manual (CIRIA C753)
- Flemington Local Area Plan 2023-2029
- Fingal County Development Plan 2023-2029
- Strategic Flood Risk Assessment of the Fingal County Development Plan 2023-2029
- Strategic Flood Risk Assessment of the Flemington Local Area Plan 2023-2029
- Dublin City Council Sustainable Drainage Design and Evaluation Guide

2. Subject Site

2.1 Existing Site Location

The site is located at Flemington and Bremore, Balbriggan, Co. Fingal, Dublin, bounded to the south by Flemington Lane and residential dwellings, and to the north and west by agricultural lands.

The lands, which are currently in agricultural use, slope generally from west to east. The Flemington Local Area Plan (LAP) lands, as depicted by the red line boundary in Figure 2-1 is approximately 17.2 hectares (ha). The LAP is comprised of 4-no. Character Areas. The subject planning application, Application 1, encompasses Character Area no. 4. The balance of the development area and remaining Character Areas 1, 2 & 3 will be subject to a separate planning application, Application 2.

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

The subject site of this report with a total site area of c. 4.4 ha, is as per the yellow boundary line, indicated on Figure 2-2.

Refer to Waterman Moylan Drawing-no. FLE-WMC-CA4-ZZ-DR-C-P0010 Proposed Site Location Plan for the precise site location and surrounding lands of the subject development, Planning Application 1.

An aerial view of the subject site can be seen in Figure 2-2, below.

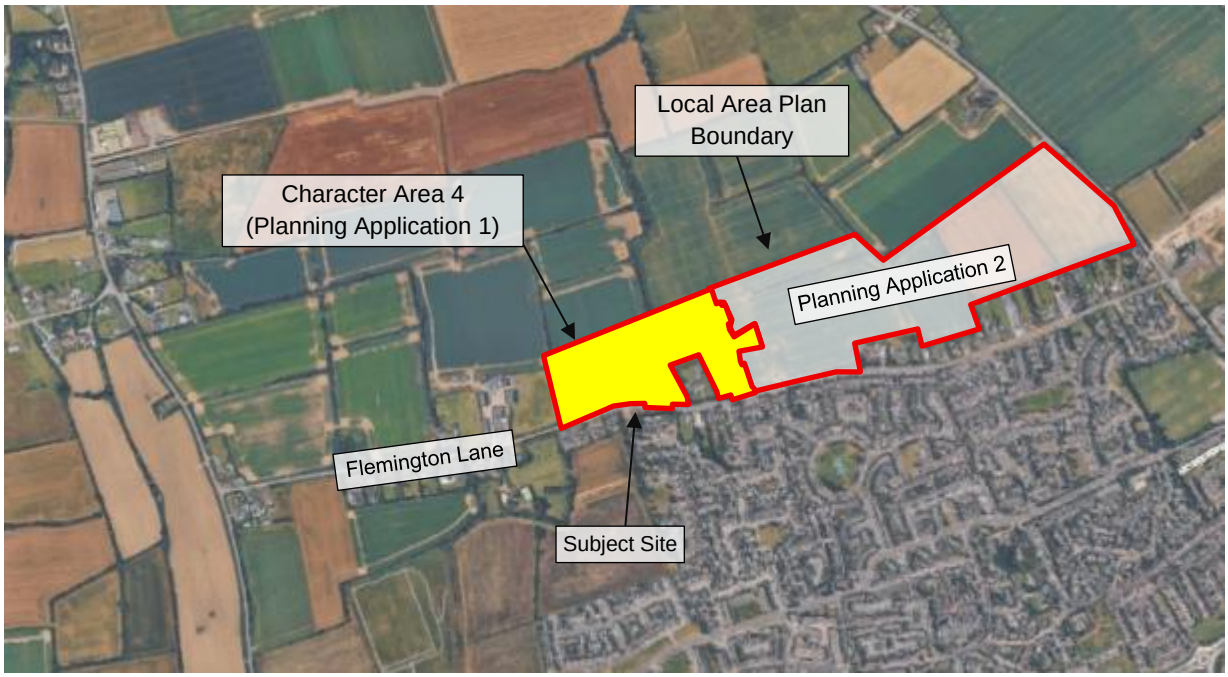

Figure 2-2: Aerial View of the Planning Application 1 Subject Site (Source: Google Maps)

2.2 Existing Site Description

2.2.1 Site Topography

The subject site has an area, and redline boundary, of c. 4.4 ha and falls from west to east with a gradient of approximately 1 in 80. The site is currently in greenfield condition and is used for agricultural purposes.

The existing topography consists of naturally high ground elevations along the western boundary of the site, with levels ranging from 41.72m OD Malin to 39.34m OD Malin. The site falls to the east where the lowest ground elevations are distributed, these levels range from 33.77m OD Malin to 33.22m OD Malin. The local high point on the site (41.72 m OD Malin) is located in the southwest portion of the lands, and the local low point (33.22m OD Malin) is located in the east area of the lands.

Refer to Figure 2-3 for an illustration of the subject site and existing ground elevations within the site.

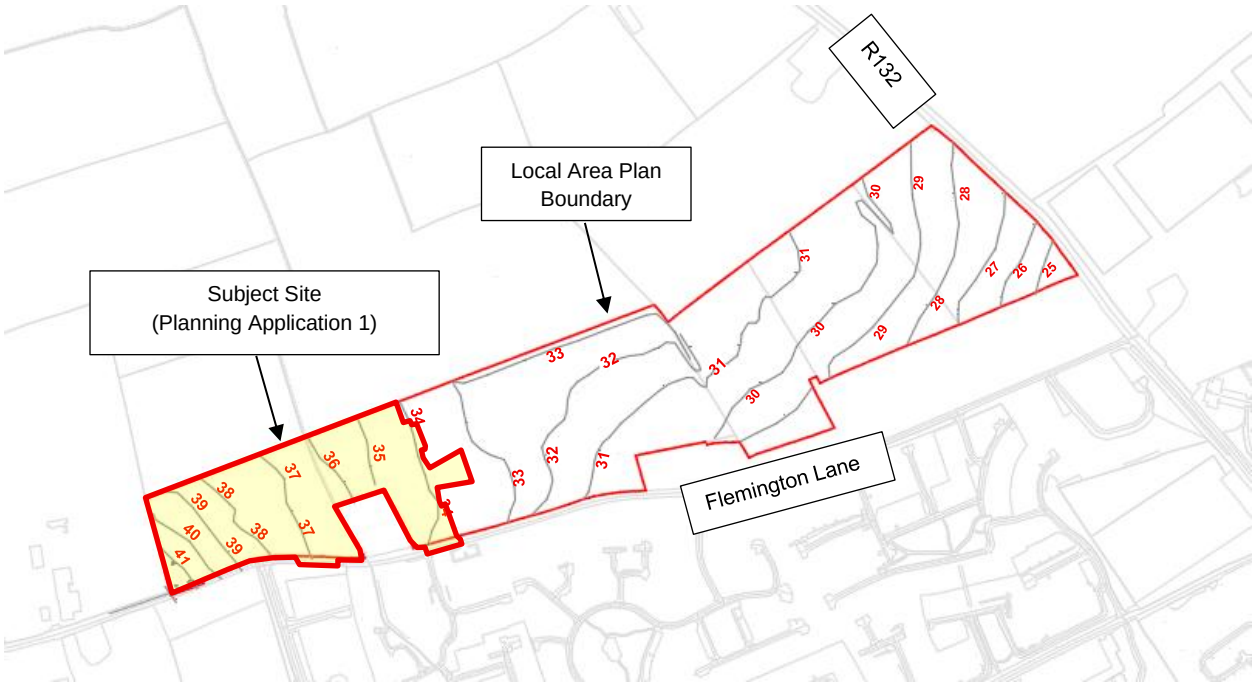

Figure 2-3: Subject Site Topography and Contours

2.2.2 Soil Characteristics – Infiltration Rates

An infiltration assessment was undertaken for the wider LAP lands as part of this application. Infiltration testing was carried out at five trial pit locations, including one within the subject site (Trial Pit A). Groundwater was encountered at approximately 1.10 m below existing ground level at this location, indicating that the subject site is not suitable for infiltration.

2.3 Existing Watercourses

According to the Environmental Protection Agency (EPA) existing watercourse map of the subject site, the site lies within 2-no. surface water sub-catchments. The majority of the Application 1 site is located within the Delvin_SC_010 Water Framework Directive (WFD) Subcatchment with the remaining eastern portion located in the Palmerstown_SC_010 WFD Subcatchment. Surface water drainage from both sub catchments ultimately discharge to the Irish Sea, to the east of the subject site.

An existing watercourse referred to as river waterbody with code IE_EA_08D010400 exists c. 486m to the north of the site and flows in a west-east direction. In addition, an existing watercourse referred to as river waterbody IE_EA_08M010900 exists c. 130m to the south of the site and flows in a north-south direction.

An existing dry ditch traverses the eastern third of the site in a north–south direction. A high point of approximately 35.89 m OD Malin is located near the midpoint of the ditch, such that flows would drain northwards and southwards from this point, broadly aligning with the Subcatchment boundaries. The ditch appears to be an historic agricultural feature and, at the time of survey, was dry with no evidence of active surface water conveyance. The existing ditch and hedgerow will be maintained as part of the subject application with culvert systems proposed at crossings points.

Refer to Figure 2-4 for an extract from the Environmental Protection Agency (EPA) website, showing a location of the subject lands in relation to the existing watercourses mentioned above.

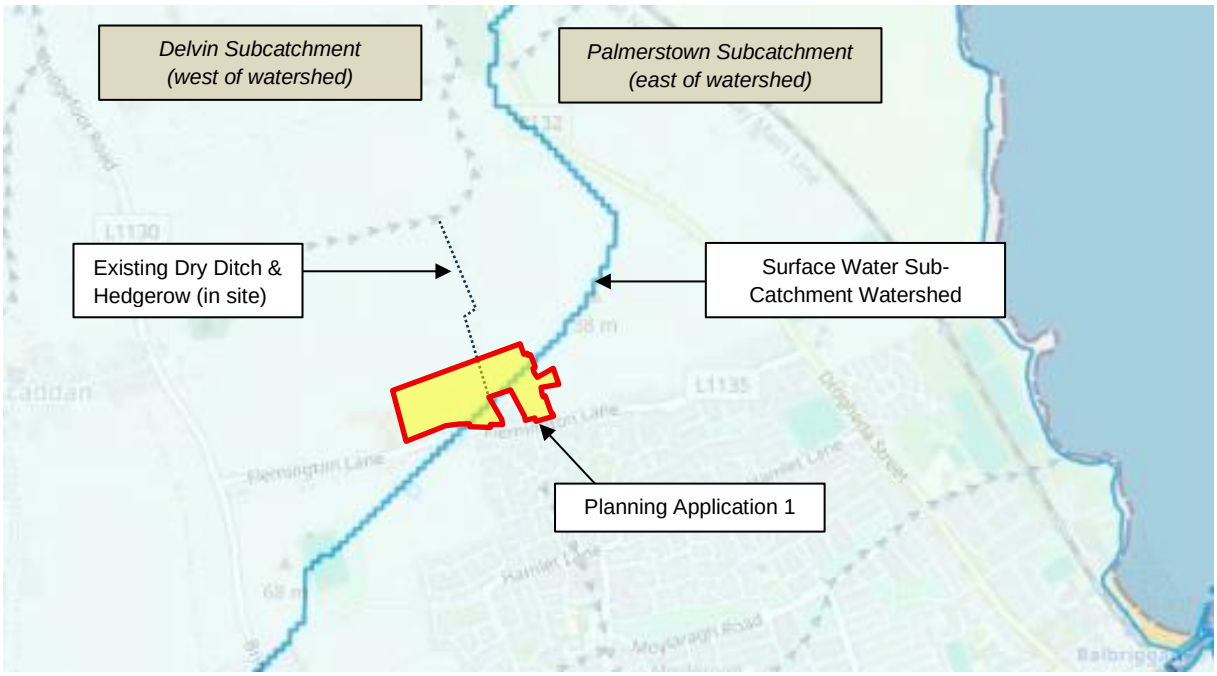

Figure 2-4: Subject Site Location relative to Existing Watercourses (Source: EPA Water Map)

2.4 Proposed Development

The proposed large scale residential development (LRD) consists of 146no. dwellings in the form of 120no. houses and 26no. apartments in the following mix – 13no. 1-bed, 29no. 2-bed, 91no. 3-bed and 13no. 4-bed, and childcare facility with play space, scooter parking, car parking and drop off area on Flemington Lane. All housing will be one or two storey in height. The apartment buildings will be three storey in height. The creche will be single storey with a first storey pop up.

Three new vehicular accesses off Flemington Lane are proposed to serve the development. The proposal also provides for public open space including a Multi-Use Games Area (MUGA), communal open space associated with apartments, landscaping, boundary treatments, public lighting, car parking, motorcycle parking, bicycle parking and structures, an active travel hub and cycle route, bin storage structures, works to Flemington Lane itself including two pedestrian crossing points, 2no. ESB substations, infrastructure services and all other associated site development works.

3. Flood Risk

3.1 Introduction

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

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

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

Each type will be investigated from a Source, Pathway and Receptor perspective, followed by an assessment of the likelihood of a flood occurring, and the possible consequences. An illustration of this model can be seen in Figure 3-1, taken directly from the Guidelines (EHLF/OPW).

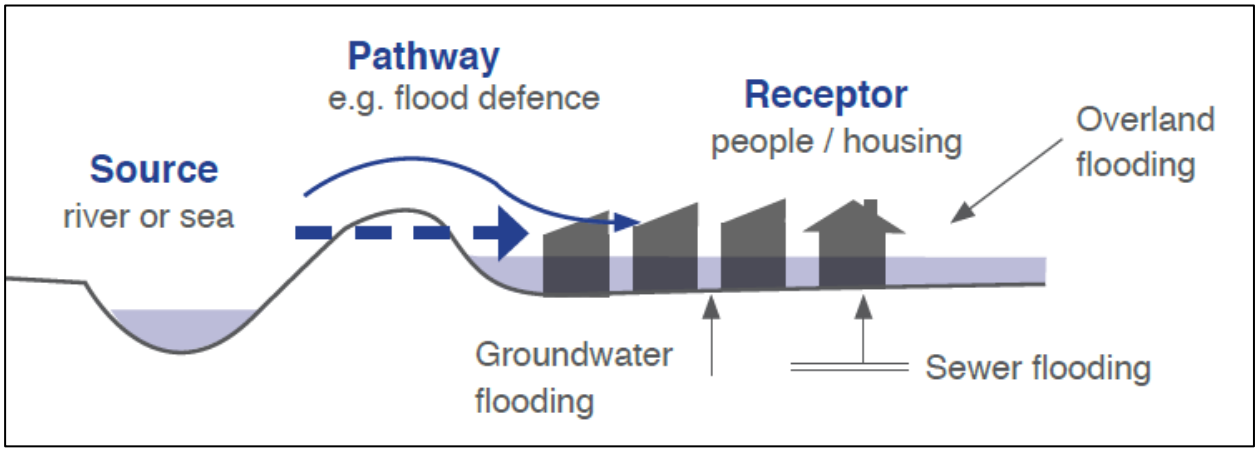

Figure 3-1: Source-Pathway-Receptor S-P-R Model

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

The likelihood and the consequences of flooding (overall risk) fall into three categories; low, moderate and high, as described in the Guidelines (EHLF/OPW) and set out in Table 3-2.

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

Flood Risk = Likelihood of flooding X Consequences of flooding

3.1.1 Assessing Likelihood

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

Table 3-1: Guidelines for Assessing Likelihood

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

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

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

3.1.2 Assessing Consequence

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

3.1.3 Assessing Risk

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

Table 3-2: 3x3 Risk Matrix

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

3.2 Flood Zones

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

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

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

Flood zone maps are used to establish the level of flooding for a site, an example of this can be seen in the indicative map shown in Figure 3-2.

Figure 3-2: Indicative flood zone map extract from the Guidelines (DEHLF/OPW)

3.3 Sequential Approach and Justification Test

3.3.1 Sequential Approach

A sequential approach to planning is a vital tool in ensuring that development, particularly new development, is first and foremost directed towards the land that is at low risk of flooding. Sequential approaches are already established and working effectively in other areas in the plan-making and development management processes. The sequential approach principles are described in Figure 3-3, taken from the

Guidelines (DEHLF/OPW). The sequential approach should be applied to all stages of the planning and development management process, particularly the planning stage. The mechanism for use of the sequential approach can be seen in Figure 3-4.

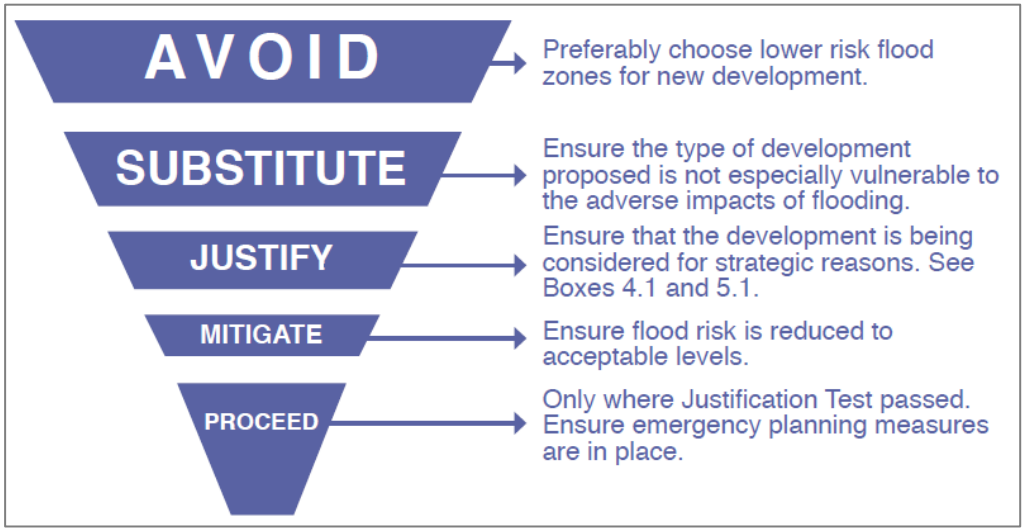

Figure 3-3: Sequential Approach Principles in Flood Risk Management

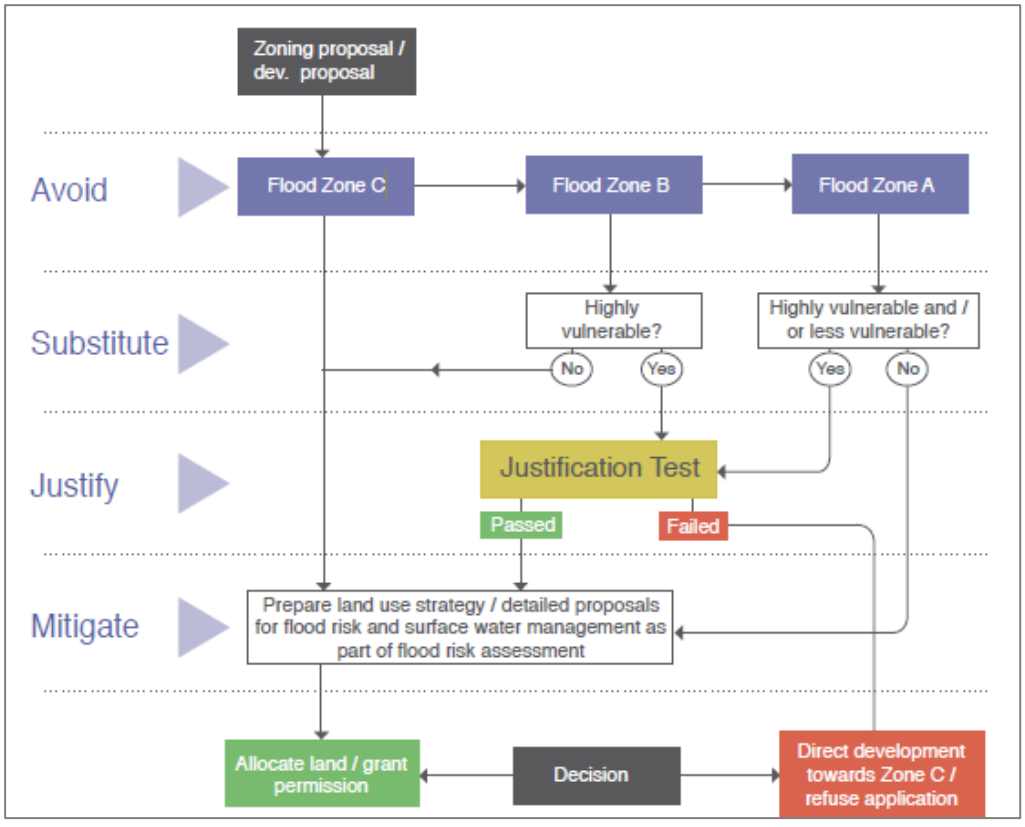

Figure 3-4: Sequential Approach Mechanisms

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

3.3.2 Justification Test

A matrix of vulnerability versus flood zone clearly outlines which types of development require a Justification Test.

The vulnerability of a site is categorized into 3 levels, highly vulnerable, less vulnerable, and water compatible. Figure 3-5 taken from the Guidelines (DEHLG/OPW) illustrates these categories.

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

Figure 3-5: Vulnerability Classes

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

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

  As this subject site falls within the 'Highly-vulnerable development' category according to Figure 3-5, when assessing the matrix vs. vulnerability of the development – with a Flood Zone C development – it is considered to be an "appropriate" development and therefore does not require a Justification Test be completed. Refer to Table 3-4 for the matrix of vulnerability vs. flood zone relevant to the subject site.

Table 3-4: Matrix of vulnerability vs. flood zone - Justification Test

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

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

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

4. Coastal Flooding – Irish Sea

4.1 Source

Coastal flooding occurs due to elevated sea levels, mainly driven by storm surges. This results in the overflowing of the sea or tidally influenced rivers onto the land. This type of flooding is primarily influenced by high tides and storm surges, which are caused by factors like low atmospheric pressure and strong winds, along with wave action.

According to the Fingal County Council Climate Change Action Plan (2024-2029), the highest tide ever recorded in Dublin City was on the 3rd of January 2014, reaching 3.014 m OD Malin. The lowest existing ground level on the subject site is 33.20 m OD Malin with the lowest proposed finished floor level (FFL) of the proposed development is set at 33.40 m OD Malin, resulting in the lowest existing level being 30.186 m OD Malin above the highest tide ever recorded.

4.2 Pathway

The Irish Sea is approximately c. 637m east of the Local Area Plan (LAP) lands and c. 1,30 km east of the subject site. The pathway from the Irish Sea would be through agricultural lands and over road infrastructure. Any potential pathway for coastal flooding would extend inland across intervening agricultural lands and road infrastructure. Notwithstanding the site's relative proximity to the coast, the difference in elevation between the Irish Sea and the subject site indicates that the risk of coastal flooding is very low.

In addition, the Flemington Local Area Plan (LAP) notes that no coastal risks of flooding have been identified, and the lands shall not give rise to future coastal flooding events. A risk from coastal flooding is therefore considered negligible and no flood mitigation measures need to be implemented.

There is no practical pathway for coastal flooding to the LAP lands nor subject site.

The location of the subject lands in relation to the Irish Sea is shown in a Google Earth image extracted to Figure 4-1.

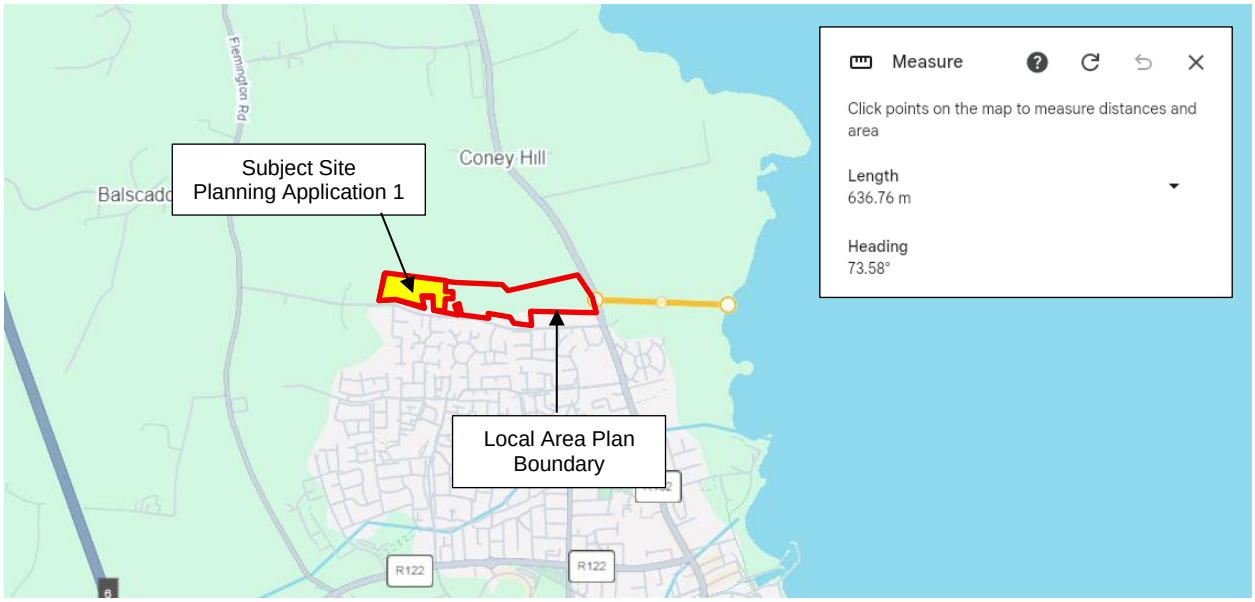

Figure 4-1: Google Earth Extract showing Subject Site in Relation to the Irish Sea

4.3 Receptor

As there is no possible or practical pathway for coastal flooding to the subject site, therefore no receptor of coastal flooding exists.

4.4 Likelihood

There is no likelihood of flooding from coastal sources to the subject site as there is no pathway of this type of flooding.

The Fingal Strategic Flood Risk Assessment (SFRA) indicates no areas in the subject site of Flemington are at risk of flooding from coastal or sources and that the site is located entirely within Flood Zone C.

The Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) includes a coastal flood extent map for the Balbriggan area, extracted in Figure 4-2, below.

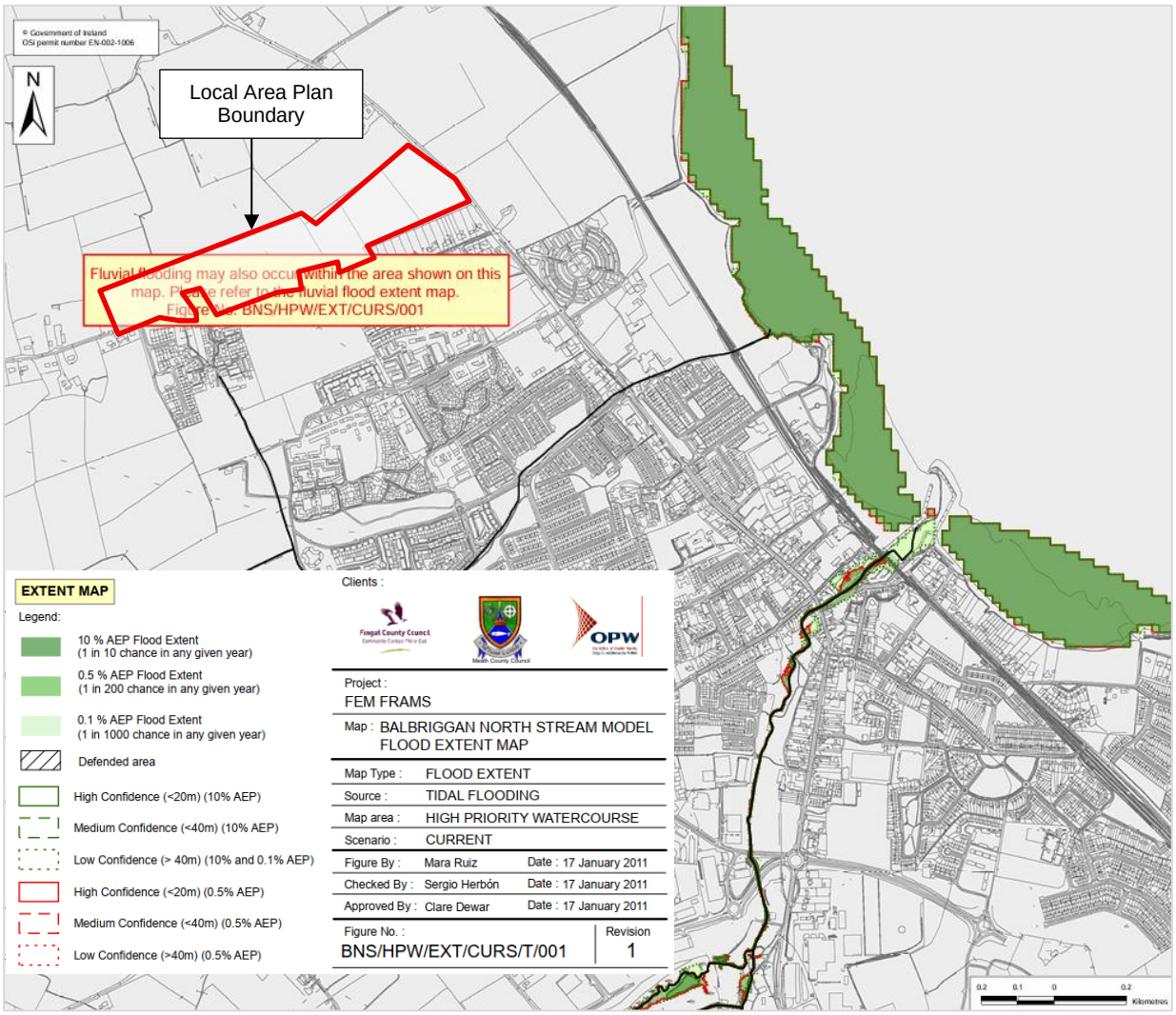

Figure 4-2: Balbriggan North Stream Model Flood Extent Map BNS/HPW/EXT/CURS/T/001 (Source: Floodinfo.ie)

As can be seen from the above map, the LAP lands and subject site are not at risk of coastal flooding. The 0.1%, 1%, and 10% Annual Exceedance Probability (AEP) flood events do not impact the LAP lands or subject site.

The likelihood of coastal flooding is thus considered negligible.

4.5 Consequence

With no likelihood of coastal flooding, the consequence is thus considered negligible.

4.6 Risk

With a negligible likelihood and negligible consequence of flooding from coastal sources, the resultant risk is also considered to be negligible for the subject development.

4.7 Flood Risk Mitigation Measures

None required.

5. Fluvial Flooding

5.1 Source

Fluvial flooding is caused by rivers, watercourses or ditches exceeding their capacity and excess water spilling out onto the adjacent floodplain.

5.2 Pathway

There are no practical pathways from identified river waterbodies in the vicinity of the subject site to the LAP lands nor the subject development. The closest located river waterbody with code IE_EA_08D010400 discussed in Section 2.3 to the subject site is c. 486 m to the north, as depicted in Figure 5-1, below.

Google Earth indicates that the lands slope downwards from the subject site to the north, as such, no practical pathway exists for this potential fluvial flood source.

Figure 5-1: Subject Site Location relative to Existing Watercourses

The river waterbody with code IE_EA_08M010900 located c. 130m south of the subject site flows in a north-south direction, and similarly, the existing lands slope downwards from the subject site to the river to the south. Consequently, no practical pathway exists for this potential fluvial flood source either.

5.3 Likelihood

The Fingal Strategic Flood Risk Assessment (SFRA) indicates no areas in the subject site of Flemington are at risk of flooding from fluvial sources and that the site is located entirety is within Flood Zone C.

The Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) include a fluvial flood extent map for the Balbriggan area, extracted in Figure 5-2, below.

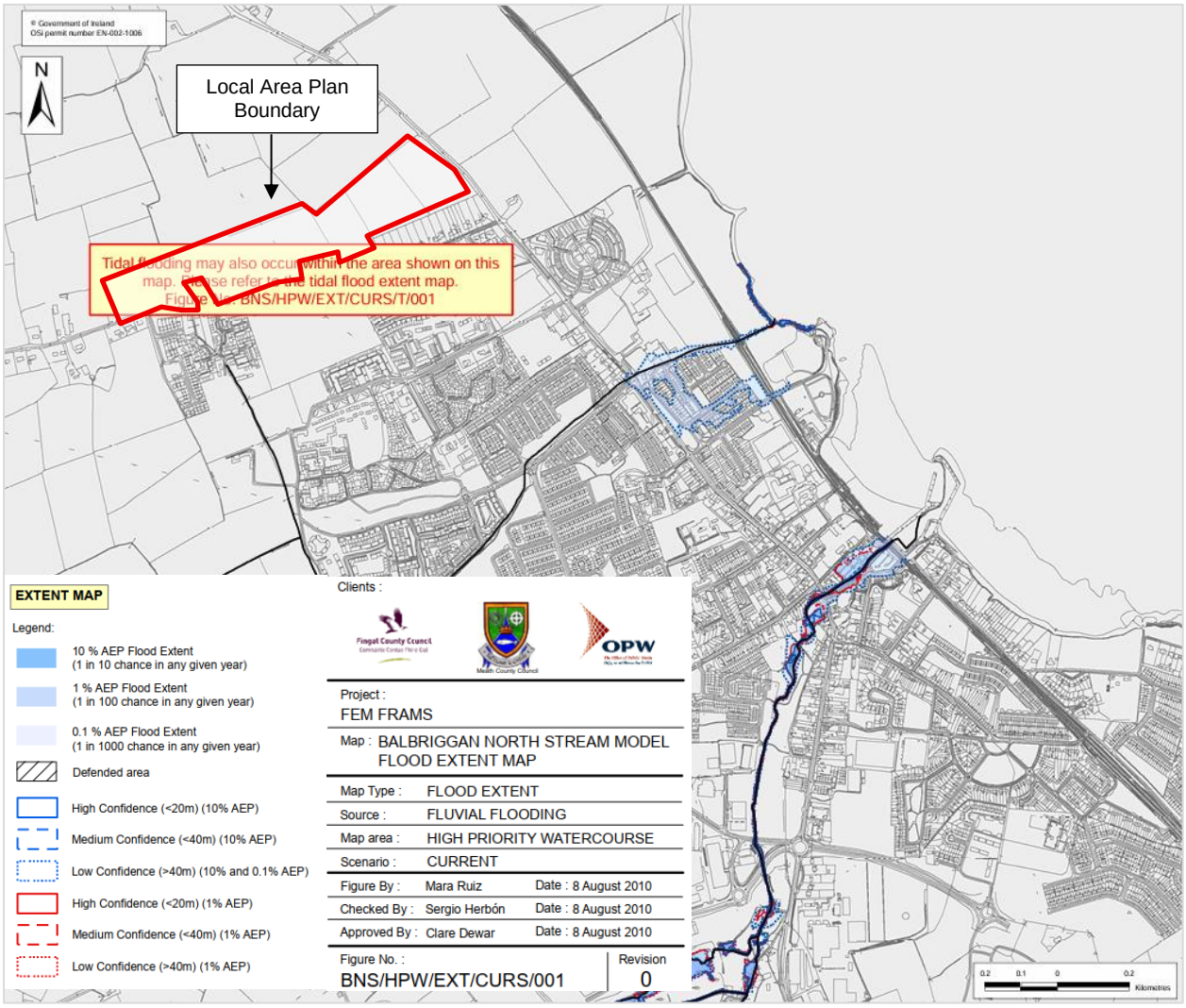

Figure 5-2: Balbriggan North Stream Model Flood Extent Map BNS/HPW/EXT/CURS/001 (Source: Floodinfo.ie)

As confirmed by the above fluvial flood extents map, no potential fluvial flooding is predicted to occur at the subject site.

The likelihood of fluvial flooding is thus considered to be low.

5.4 Consequence

The consequence of fluvial flooding, in the unlikely event it was to occur, would be the flooding of green spaces areas, roads, and footpaths. The consequence of such flooding is considered to be low.

5.5 Risk

With a low likelihood and low consequence of flooding from fluvial sources, referring to Table 3-2, the resultant risk is considered to be extremely low for the subject development.

5.6 Flood Risk Mitigation Measures

As the risk is considered extremely low, there are no mitigation measures required.

6. Pluvial

6.1 Source

The source of pluvial flooding is heavy rainfall.

6.2 Pathways & Receptors

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

Table 6-1: Pluvial Pathway and Receptor Summary

	Pathway	Receptor
1	Surcharging of the proposed internal drainage systems during heavy rain events leading to internal flooding	Proposed development – internal roads, footpaths and green space attenuation areas
2	Surcharging from the existing surrounding drainage system leads to flooding within the subject site by surcharging surface water pipes	Proposed development – access roads, footpaths, and cycle track adjacent to Flemington Lane
3	Surface water discharging from the subject site to the existing drainage network leads to downstream flooding	Downstream properties and public roads
4	Overland flooding from surrounding areas flowing onto the subject site	Proposed development – internal roads, footpaths and green space areas
5	Overland flooding from the subject site flowing onto surrounding areas	Downstream properties and roads

6.3 Likelihood

6.3.1 Surcharging of the proposed internal drainage systems during heavy rain events leading to internal flooding

The proposed surface water drainage system is designed to accommodate the 1 in 100-year rainfall event, including a 20% allowance for climate change. The system allows for controlled surcharge within the pipe network and attenuation features, without resulting in flooding of buildings or critical infrastructure.

As such, the risk of internal flooding arising from surcharging is considered to be low. In exceedance events, any additional flows will be managed via overland flow routes, ensuring that water is directed away from vulnerable receptors.

6.3.2 Surcharging from the existing surrounding drainage system leads to flooding within the subject site by surcharging surface water pipes

The OPW's National Flood Hazard Maps have been consulted to identify recorded instances of flooding in the vicinity of the site. There is no record of flooding due to network surcharging in the vicinity of the site.

The nearest record of historical flooding to the subject site was 0.50 km south of the subject site occurring in the year 2000. No flooding has been recorded since. Refer to Figure 6-1 for the OPW past flood event map for details of the historic flood location.

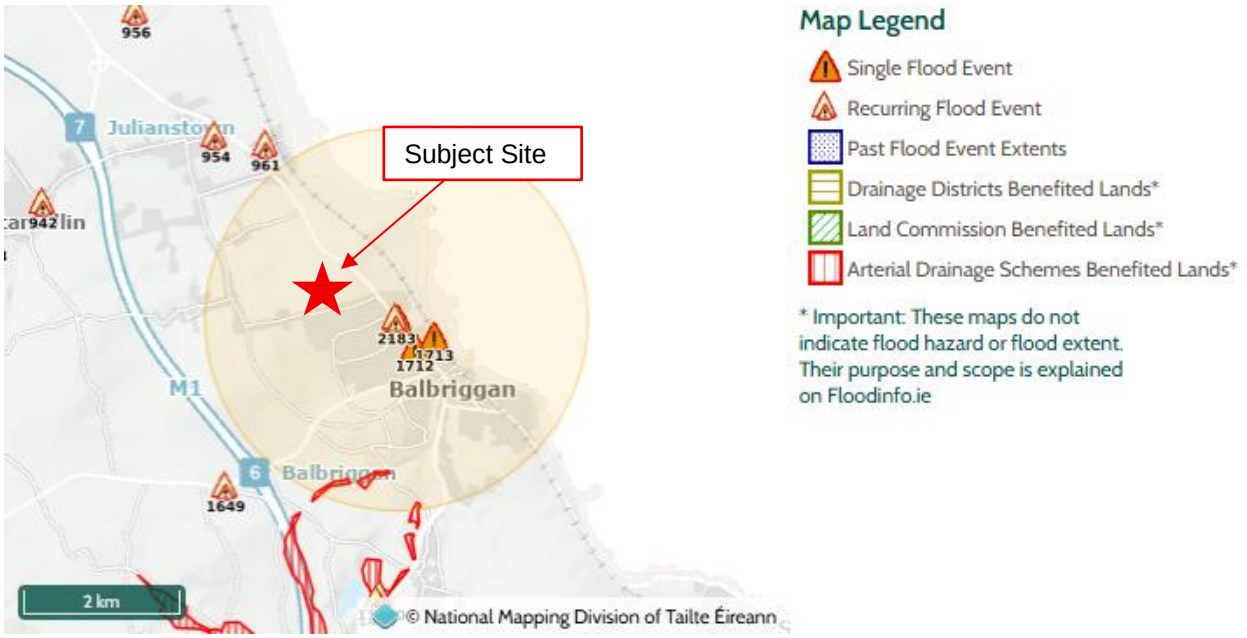

Figure 6-1: OPW Past Flood Event Map

The likelihood of flooding occurring on the subject lands due to surcharging from the surrounding drainage system is thus considered to be low.

6.3.3 Surface water discharging from the subject site to the existing drainage network leads to downstream flooding

The existing surrounding network consists of a 750 mm diameter storm sewer to the south of the subject site, within Flemington Lane.

The site will be designed with nature-based sustainable urban drainage (SuDS) features including permeable surfacing, bio-retention tree pits, swales, rain gardens, and detention basins. The surface water runoff from the development will be attenuated and released into the public drainage system at the pre-developed greenfield runoff rate of the subject site by use of flow control devices, ensuring runoff is reduced and controlled. The on-site attenuation is designed to accommodate the 1-in-100-year extreme storm event with a 20% climate change factor included.

Considering the surface water network will be designed to accommodate the required flood flows, will capture and attenuate runoff via SuDS features and release runoff into the public network at the greenfield runoff rate, there is a low likelihood of the subject site causing flooding to the existing drainage network.

The greenfield runoff rate for the subject development is 8.46 l/s (2l/s/ha) and will be achieve through the use of flow control devices placed downstream of the proposed attenuation facilities, before connecting into the existing public surface water network.

The likelihood of surface water discharge from the subject development causing potential flooding risks to the surrounding environments and network is thus considered to be low.

6.3.4 Internal flooding due to overland flooding from surrounding areas

The Office of Public Works (OPW) records for predictive and historic flood maps mentioned under Section 6.3.2 has reference. The nearest past flood event occurred at flood node ID-1712, located on R132 in

Bremore, c. 0.50 km south of the subject site, and experienced a past flood event in Nov of 2000 (25-years ago) citing flooding of roads due to a surface water drainage capacity problem. No further flooding at this node has been recorded since.

The likelihood of flooding from surrounding areas, overland, is considered low for this subject site.

6.3.5 Overland flooding from the subject site causing downstream flooding

Surface water runoff from the proposed development will be attenuated and discharged to the public drainage network at the pre-development greenfield runoff rate via flow control devices. The proposed attenuation systems are designed to accommodate the 1 in 100-year return period rainfall event, including a 20% allowance for climate change.

As runoff will be captured, attenuated, and discharged at greenfield rates through SuDS features, the proposed development will not increase runoff rates relative to the existing scenario. Accordingly, the likelihood of the development contributing to overland flooding or adversely impacting downstream receptors is considered to be low.

The likelihood of overland flooding from the subject site causing downstream flooding is considered to be low.

6.4 Consequence

The consequence of pluvial surface water flooding is considered to be **low** with open green spaces area, footpaths, roads, and private gardens potentially being flooded.

Finished floor levels and adjacent road levels have been set to ensure an overland flood route exists within the internal roads network to convey any flooding away from building and structures.

Various SuDS features are included in the design to capture, convey, slow, and attenuate surface water runoff before discharging the runoff at pre-development rates.

6.5 Risk

Referencing Table 3-2: 3x3 Risk Matrix, the following risks are noted for the 5 pathway types:

6.5.1 Surcharging of the proposed on-site drainage systems

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

6.5.2 Surcharging from the existing surrounding drainage system

With a low likelihood and low consequence of flooding the site from the existing surface water network, the resultant risk is extremely low. No mitigation measures are required.

6.5.3 Surface water discharging from the subject site

With a low likelihood and low consequence of flooding downstream of the site due to excess discharge surface water from the site, the resultant risk is extremely low. No mitigation measures are required.

6.5.4 Overland flooding from surrounding areas

With a low likelihood and low consequence of overland flooding from surrounding areas, the resultant risk is extremely low. No mitigation measures are required.

6.5.5 Overland flooding from the subject site

With a low likelihood and low consequence of overland flooding from the subject site, the resultant risk is extremely low. No mitigation measures are required.

6.6 Flood Risk Mitigation Measures

The following are flood risk management strategies proposed to minimise the risk of pluvial flooding for each risk:

6.6.1 Surcharging of the proposed on-site drainage systems

The risk of flooding the internal roads, open green space, and low-lying areas is minimised with adequate sizing of the on-site surface water network and the proposed SuDS features (permeable surfacing/paving, bio-retention tree pits, swales, rain gardens and detention basins) and the setting of appropriate finished floor levels above designed road levels. Appropriate flood routes are designed into the development to ensure runoff drains overland out of the site.

6.6.2 Surcharging from the existing surrounding drainage systems

None required.

6.6.3 Surface water discharging from the subject site

None required.

6.6.4 Overland flooding from surrounding areas

None required.

6.6.5 Overland flooding from the subject site

None required.

6.7 Residual Risk

As a result of the design measures detailed above in Section 6.6, there is a low residual risk of flooding from each of the pluvial pathways mentioned above.

7. Groundwater

7.1 Source

During periods with prolonged rainfall, the groundwater can rise towards ground level.

7.2 Pathway

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

7.3 Receptor

The receptors for ground water flooding would be underground services and private gardens.

7.4 Likelihood

According to the Geological Survey Ireland (GSI) online groundwater flooding map viewer, flooding of this type has not occurred in Balbriggan, Flemington. Refer to Figure 7-1 for an extract of this map for which shows the location of the subject site and no ground water flooding in the vicinity.

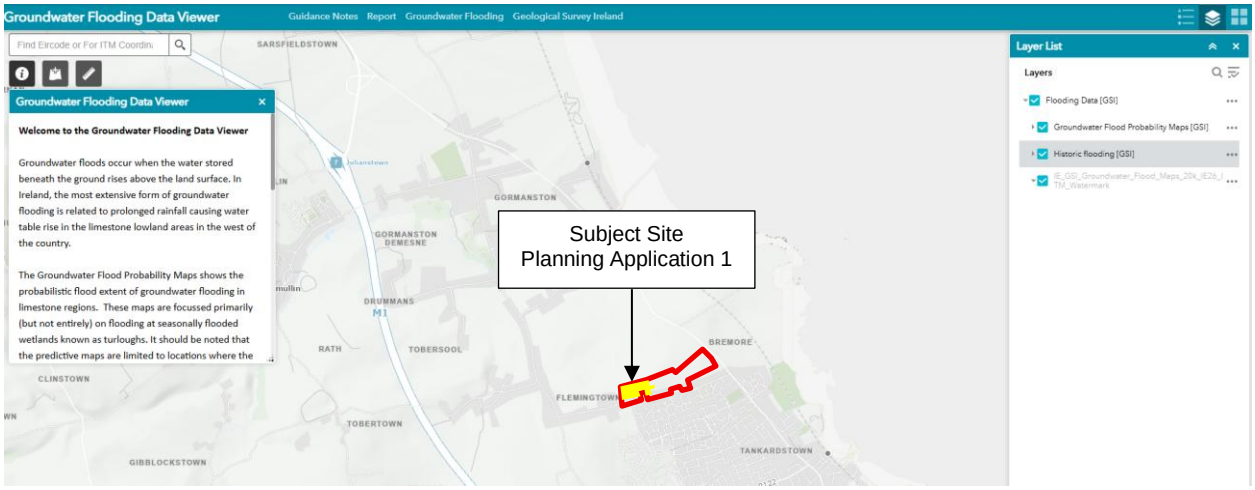

Figure 7-1: Extract of Online GSI Groundwater Flooding Data Map

A site visit was undertaken in April 2026 to carry out infiltration testing across the LAP lands. Infiltration testing was completed at five trial pit locations, including one within the subject site (Trial Pit A). At this location, groundwater was encountered at approximately 1.10 m below existing ground level.

The groundwater level recorded is relatively shallow and may be encountered during deeper excavations associated with infrastructure works, such as main drainage installation. As such, temporary groundwater ingress may occur during construction activities.

However, these impacts are expected to be localised and short-term in nature. Standard construction practices, including temporary dewatering measures (e.g. sump pumping or wellpoint systems), can be readily implemented to manage groundwater during excavation works.

No significant constraints to the proposed development are anticipated as a result of the observed groundwater conditions.

The likelihood of flooding from groundwater is thus considered to be moderate.

7.5 Consequence

There is a moderate consequence to permanent infrastructure (post construction) from groundwater flooding, with underground services and building foundations exposed to the rising water levels.

7.6 Risk

Given a moderate likelihood and moderate consequence, referring to Table 3-2: 3x3 Risk Matrix, the resulting risk is considered moderate.

Flood mitigation measures have been incorporated into the design, with buildings and roads typically located above existing ground above the groundwater level, with adequate overland flood routing incorporated into eh design. It is also noted there are no basements proposed as part of the proposed development.

7.7 Flood Risk Mitigation Measures

Temporary groundwater ingress during construction will be managed through standard dewatering techniques, ensuring dry and stable working conditions. These measures are routine and will be implemented as required.

Post construction mitigation measures shall include suitable finished floor levels, sealed drainage infrastructure, and, where required, subsoil drainage systems to manage groundwater.

7.8 Residual Risk

As a result of the flood risk management outlined above, the residual risk associated with groundwater is considered to be low.

8. Human / Mechanical Errors

8.1 Source

This surface water network within the subject site is the source of possible flooding from the system if it was to become blocked.

8.2 Pathway

The pathway is via gulleys, manhole lids, and the above ground detention basins within the development.

8.3 Receptor

If the proposed private drainage system blocks this could lead to possible flooding within the open spaces, the internal roads, footpaths, and private gardens.

8.4 Likelihood

There is a high possibility of flooding on the subject site if the surface water network was to block.

8.5 Consequence

The surface water network would surcharge and overflow through gullies, and manhole lids and over the top of the proposed attenuation areas, it is therefore considered that the consequence of such flooding is moderate.

8.6 Risk

Referencing Table 3-2: 3x3 Risk Matrix, with a high likelihood and moderate consequence, there is a high risk of surface water overflowing within the development, should the surface water network block.

8.7 Flood Risk Mitigation Measures

The following flood mitigation measures have been implemented for the development:

Levels on-site have been designed such that in the event of the surface water system surcharging, surface water will escape from the proposed development, away from building structures, onto the adjacent public road, by overland flood routing. This ensures flood routing without damaging properties.

The FFLs of the proposed buildings are designed above the adjacent road levels.

The surface water network must be inspected and maintained to ensure blockages do not occur.

8.8 Residual Risk

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

9. Conclusions and Recommendations

The subject lands have been analysed for risks from flooding from the Irish sea, fluvial flooding (rivers), pluvial flooding (heavy rainfall), groundwater, and failures of mechanical systems. Through careful design and appropriate mitigation measures, the risks and consequences of flooding have been mitigated across the development.

Surface water runoff from the site does not impact developments upstream or downstream of the subject site. Refer to Table 9-1 for the summary of risks and mitigation measures for each of the potential flooding sources/types.

Table 9-1: Summary of Flood Risks for the Site

Source	Pathway	Receptor	Likelihood	Consequence	Risk	Mitigation Measure	Residual Risk
Coastal	Overland from East	Proposed Development	Negligible	Negligible	Negligible	None needed	**None**
Fluvial	Overland from South	Proposed Development	Low	Low	Extremely Low	None needed	**Low**
Pluvial	Private and Public Drainage Systems	Proposed Development	Low	Low	Low	Appropriate drainage design, setting FFLs & appropriate exceedance routes	**Low**
Ground Water	Ground	Proposed Development	Moderate	Moderate	Low	Temporary dewatering measures. Sealed drainage infrastructure.	**Low**
Human / Mechanical Error	Drainage network	Proposed Development	High	Moderate	High	Appropriate drainage design, setting FFLs & appropriate exceedance routes	**Low**

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