Solkerry Ventures Limited

Site-Specific Flood Risk Assessment

Residential Development, Summerhill Road

IE003249

A1 C01

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TETRA TECH

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1.0 Introduction

Tetra Tech have been commissioned by Solkerry Ventures Limited to prepare a Site-Specific Flood Risk Assessment (FRA) with respect to a proposed residential development (hereafter referred to as the 'Proposed Development') located in Dunboyne, County Meath. This FRA will accompany the planning application for the Proposed Development.

Solkerry Ventures Limited are seeking permission to construct a residential development on the lands to the east of the R157, of Summerhill Road in Dunboyne, Co. Meath as shown in Figure 1-1.

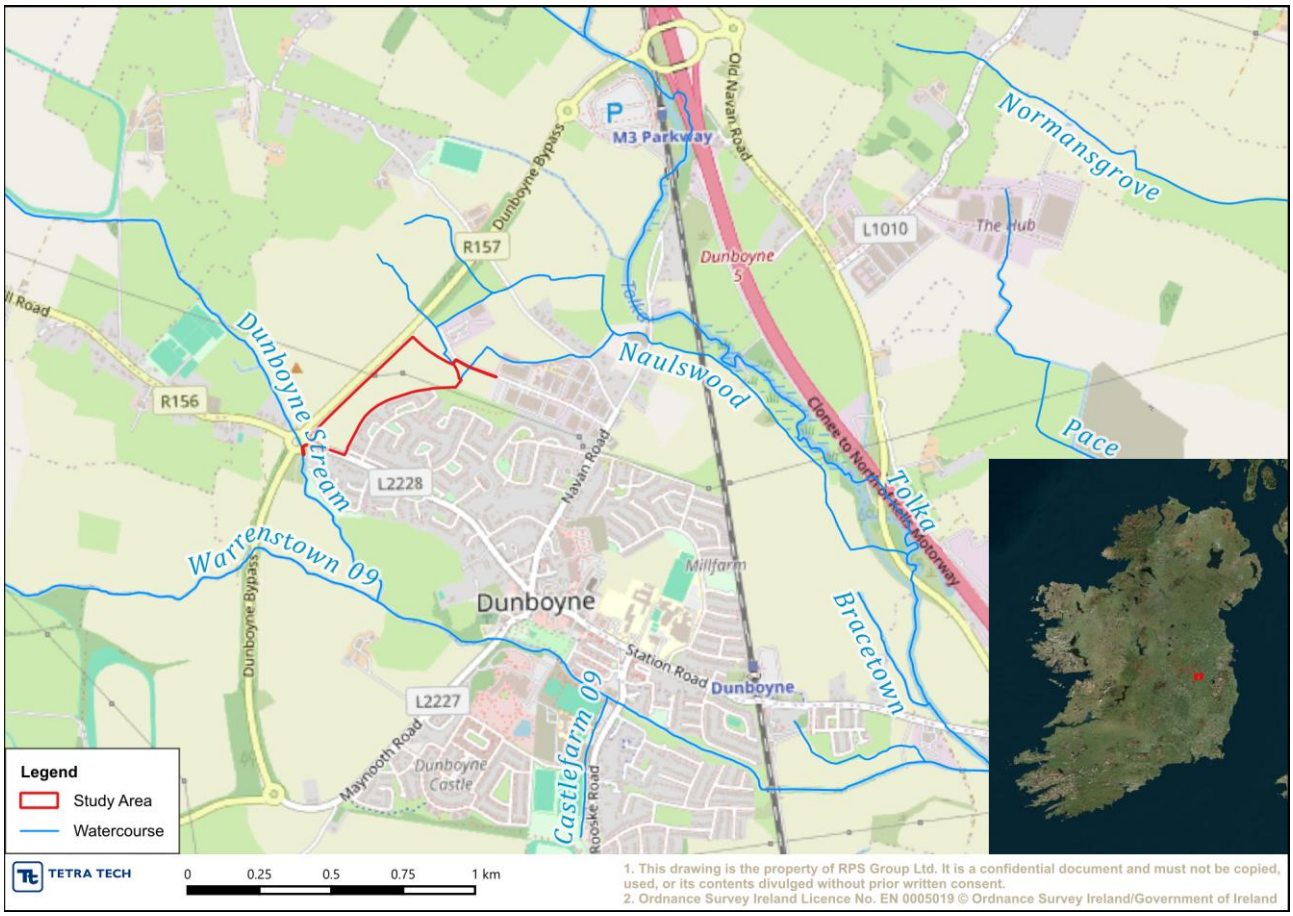


Figure 1-1: Site Location

1.1 Objectives

The objective of this report is to carry out a Site-Specific Flood Risk Assessment (FRA) of the Proposed Development. The FRA examines any flooding risks to the Proposed Development and assesses any impacts resulting from the Proposed Development on the existing flooding/hydrological regimes of the adjacent watercourses, lands, and properties.

This Flood Risk Assessment has been prepared under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) (hereinafter referred to as the "Planning Guidelines").

1.2 The Planning System and Flood Risk Management Guidelines

Flood Risk Assessments aim to identify, quantify and communicate to decision-makers and other stakeholders the risk of flooding to land, property and people. The purpose is to provide sufficient information to determine whether a proposed development or change in land use is appropriate from a flood risk perspective. A Flood Risk Assessment can be undertaken either over a large area or for a particular site to:

- Identify whether and the degree to which flood risk is an issue;
- Identify flood zones (if not already available);
- Inform decisions in relation to zoning and planning applications; and
- Develop appropriate flood risk mitigation and management measures for development sited in flood risk areas.

1.2.1 Flood Risk

Understanding flood risk is a key step in managing the impacts of flooding. Flood risk is a combination of the likelihood of flooding and the potential consequences arising:

Flood Risk = (Likelihood of flooding) x (Consequences of flooding)

The likelihood of flooding is defined as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. The consequences of flooding depend on the hazards associated with the flooding and the vulnerability of people, property and the environment potentially affected by a flood.

1.2.2 Types of Flooding

There are two main sources of flooding: inland flooding and coastal flooding.

1. Inland flooding is caused by prolonged and/or intense rainfall. This results in fluvial, pluvial or groundwater flooding acting independently or in combination.
    - Fluvial flooding occurs when a river overtops its banks due to a blockage in the channel or the channel capacity is exceeded.

- Pluvial flooding occurs when overland flow cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high-water level in the receiving watercourse.
- Groundwater flooding occurs when the level of water stored in the ground rises to meet the ground surface and flows out over it after a period of prolonged rainfall.

2. Coastal flooding is caused by higher sea levels than normal, largely due to storm surges, resulting in the sea overflowing onto the land. Key factors of coastal flooding include high tide level, storm surge and wave action.

   NB: The Proposed Development is located 20km inland and above 70 mOD. The site is therefore not impacted by coastal flooding.

1.2.3 Likelihood of Flooding (Flood Zones)

Flood zones are geographical areas within which the likelihood of flooding is in a particular range, and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types of flood zones defined for the purposes of flood risk planning guidelines:

Flood Zone A – Where the probability of flooding from rivers and the sea is highest (greater than 1%AEP or 1 in 100 years for river flooding or 0.5%AEP or 1 in 200 for coastal flooding).

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

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas not in zones A or B.

1.2.4 Consequences of Flooding (Flood Hazards and Development Vulnerability)

The Planning Guidelines provide three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Planning Guidelines, and are summarised as:

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

1.2.5 Sequential Approach

A sequential approach to the development process is essential when managing flood risk. This involves five principles in the management of flood risk: Avoidance, Substitution, Justification, Mitigation and Proceeding with the development. **Figure 1-2** extracted from Section 3.1 of the Planning Guidelines sets out the broad philosophy underpinning the sequential approach in flood risk management.

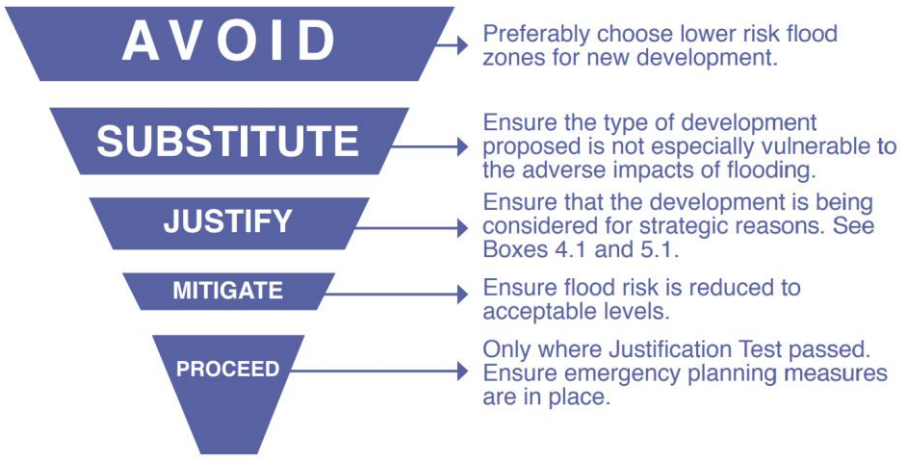


Figure 1-2: Sequential approach principles in flood risk management
(extract from the Planning Guidelines)

1.2.6 Justification Test

The Justification Test will be required where a development is deemed Highly Vulnerable and is located within Flood Zone A or Flood Zone B, or Less Vulnerable and located within Flood Zone A. The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. Table 1-1 presents the criteria to determine the requirement for completion of the Justification Test based on flood zone and vulnerability of the proposed development or land use.

Table 1-1: Matrix of Vulnerability vs Flood Zone

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

1.2.7 Staged Approach

A staged approach to flood risk should be adopted, carrying out only such appraisal and or assessment as is needed for the purposes of decision-making at the site-specific level. The need for progression to a more detailed stage is dependent on the outcomes of the former stage until the level of detail of the flood risk assessment is appropriate to support the individual planning application, or it has been demonstrated that flooding is not a relevant issue for the site.

The stages of appraisal and assessment are:

Stage 1 Flood Risk Identification

To identify whether there may be any flooding or surface water management issues related the proposed development site that may warrant further investigation.

Stage 2 Initial Flood Risk Assessment

To confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped.

Stage 3 Detailed Flood Risk Assessment

To assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.0 Development Overview

2.1 Existing Site

The site proposed for development lies between an established existing residential estate and the R157 Regional Road. Dunboyne Business Park is to the northeast of the site, whilst the southwest corner borders Summerhill Road.

It is an existing greenfield site of approximately 6.76 ha (gross) / 6.49 ha (net) actively used as agricultural land between the Dunboyne Stream and a land drainage ditch, as illustrated in Figure 2-1.



Figure 2-1: Existing Site Layout

2.2 Proposed Development Overview

The proposed development includes for residential development, roads, drainage and associated infrastructure as shown in Figure 2-2.



Figure 2-2: Proposed Site Layout

3.0 Existing Site Characteristics

3.1 Hydrology and Drainage

The Dunboyne Stream (also known as the Castle Stream) flows in a south-easterly direction from the R125 north of Mullagh towards Dunboyne, before joining the Tolka River at Clonee. Upstream of the site the catchment is long and narrow, with an area of approximately 10 km^2 primarily consisting of rural lands and open channel. Adjacent to the site, the Dunboyne Stream flows under the R157 where it is culverted in 2 sections under the roundabout, with an open channel reach in the centre of the roundabout. The watercourse returns to open channel downstream of the roundabout where it joins with the Warrenstown Stream before flowing under Maynooth Road and through the central urban area of Dunboyne.

The eastern land drainage ditch collects rainfall run-off from the local fields north of the site with a catchment area of approximately 0.368 km^2, before passing through a culvert under the R157. The drain splits into two before reaching the site boundary with one channel diverting eastward to join the Naulswood Stream, whilst the other flows south and continues along the northeast boundary of the site before joining the Bennetstown Stream. The Bennetstown Stream is culverted for nearly its full length from the site until just upstream of, where it joins the Naulswood Stream. The Naulswood Stream then passes under the railway line to join the Tolka River.

Catchment boundaries for each watercourse are delineated using the Flood Studies Update (FSU) ungauged node dataset as shown in Figure 3-1. The closest FSU node on the eastern drainage channel is approximately 750m downstream of the site and includes the catchments of the Bennetstown Stream and Naulswood Stream. The catchment area upstream of the site is only a fraction of the total area to this node (09_1422_1).

A summary of the catchment characteristics is provided in **Table 3-1**.

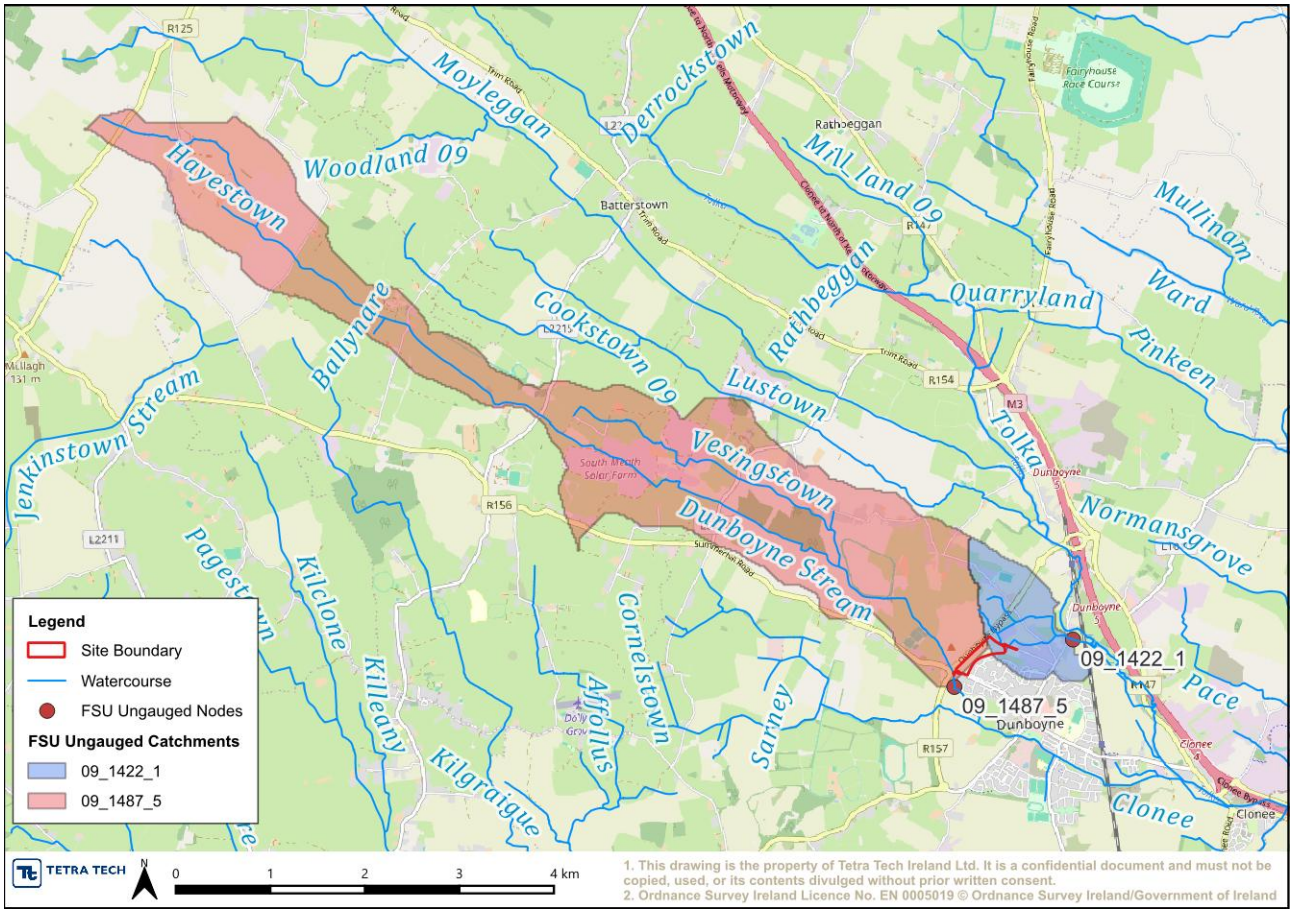


Figure 3-1: Catchments and Watercourses

Table 3-1: Catchment Characteristics

FSU Catchment I.D.	09_1487_5	09_1422_1
Watercourse	Dunboyne Stream	Naulswood
AREA	10.184	1.061
BFIsoils	0.449	0.658
SAAR	817.25	787.1
FARL	1.00	1.00
DRAIND	1.642	1.935
S1085	4.363	2.23195
ARTDRAIN2	0.00	0.00
URBEXT	0.0718	0.1716

3.2 Geology and Soils

The site is underlain by dark limestone and shale bedrock, identified from the Geological Survey Ireland Spatial Resources Bedrock Geology Map[1]. EPA Maps Water[2] indicates the site and surrounding area is located on a Locally Important Aquifer which is moderately productive in local zones.

Geological Survey Ireland Karst Datasets[3] indicate no karst features on site or in the surrounding area.

According to the National Soils Hydrology Map[4], the southern half of the site is underlain by well drained soils, and the northern half is underlain by poorly drained soils, as illustrated in **Figure 3-2**. Alluvium can be seen lining the Dunboyne Stream to the west of the site, lining the Tolka River.

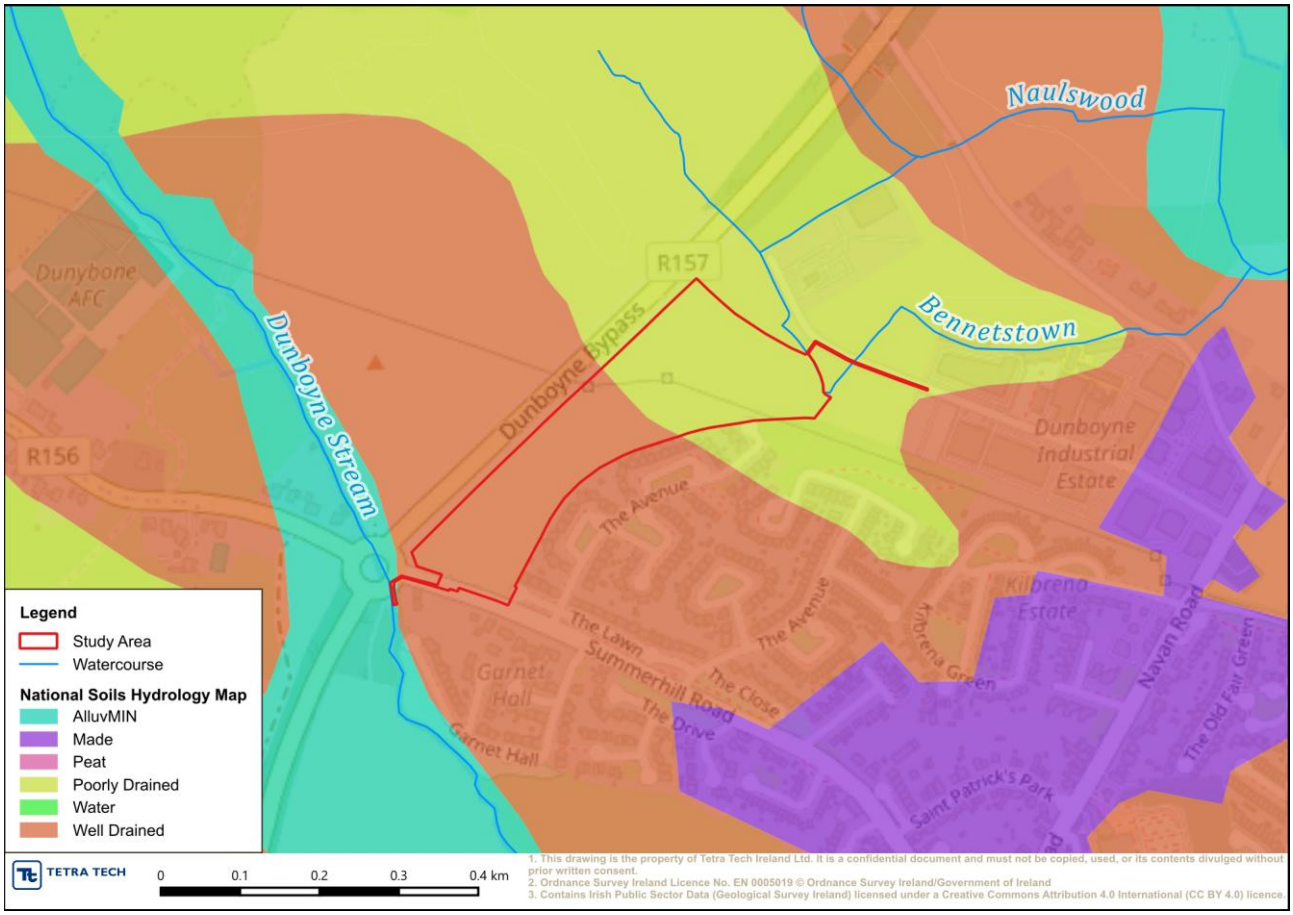


Figure 3-2: Soil Hydrology

[1] Geological Survey Ireland Spatial Resources

[2] EPA Maps

[3] IE GSI Karst Datasets

[4] National Soils Hydrology Map - Dataset - data.gov.ie

3.3 Topography

Topographic survey has been complete for the site, the OPW LiDAR[5] database also includes the site location. The two datasets depict highly similar levels, giving them a high degree of certainty.

The topography of the site is generally flat with a gradual fall from south to north of approximately 1 m over approximately 500 m, shown in **Figure 3-3**.

The R157 road to the northwest of the site is at a higher elevation than the site as it ramps down from a bridge crossing to the north.

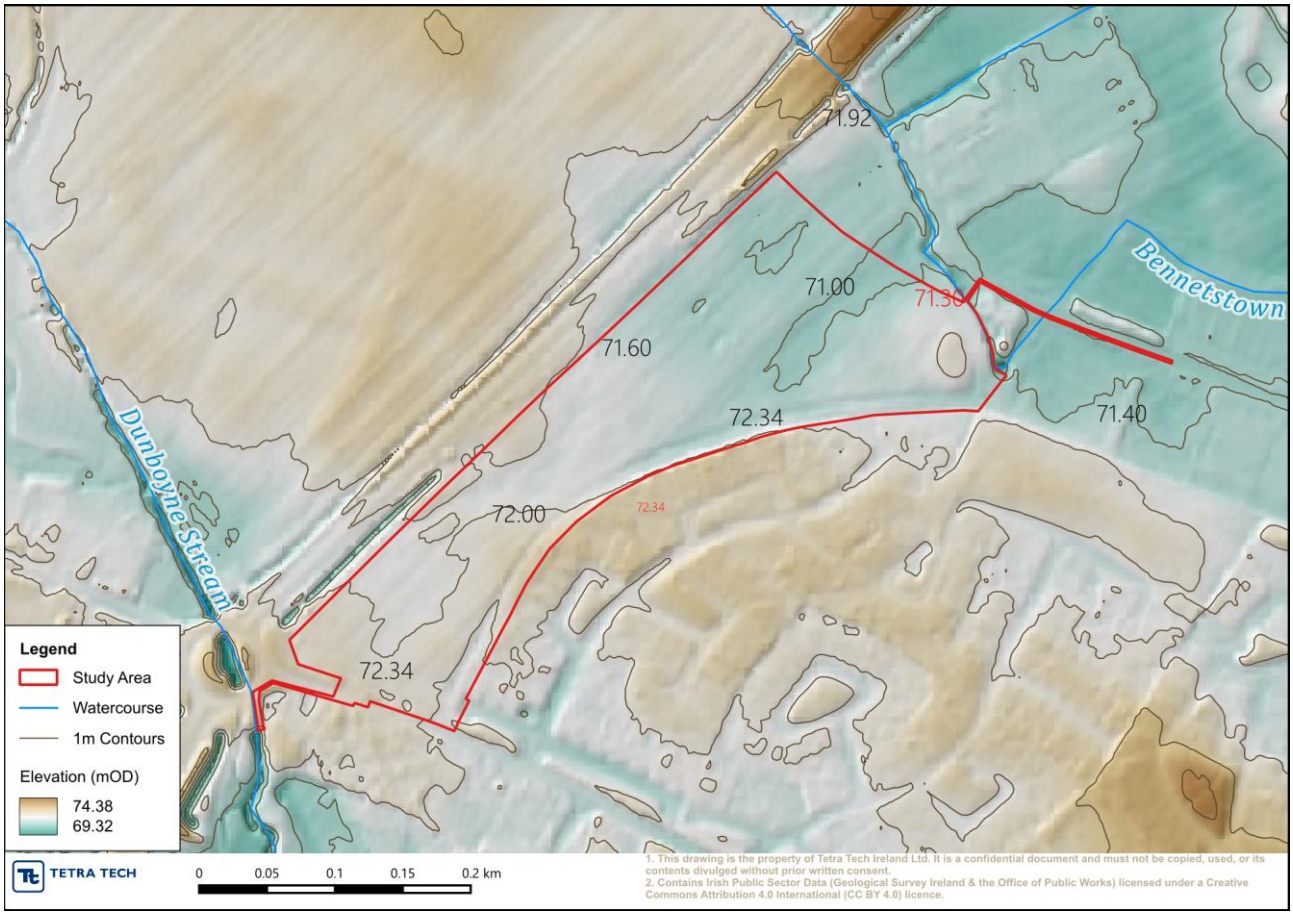


Figure 3-3: Topography

[5] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b7c4b0e763964070ad69bf8c1572c9f5

3.4 Meath County Development Plan 2021-2027 (as varied)

The County Development Plan sets out how each county will grow to meet the needs of residents, workers and visitors.

3.4.1 Land Use Zone

The Proposed Development is zoned as A2 – New Residential. The objective of this zoning is to provide for new residential communities with ancillary community facilities, neighbourhood facilities and employment uses as considered appropriate for the status of the centre in the Settlement Hierarchy.

3.4.2 Relevant Flood Risk Policy

It is policy of Meath County Council to:

INF POL 16 – To ensure that all planning applications for new development have regard to the surface water management policies provided for in the GDSDS.

INF POL 18 – To implement the “Planning System and Flood Risk Management – Guidelines for Planning Authorities” (DoEHLG/OPW, 2009) through the use of the sequential approach and application of Justification Tests for Development Management and Development Plans, during the period of this Plan.

INF POL 19 – To implement the findings and recommendations of the Strategic Flood Risk Assessment prepared in conjunction with the County Development Plan review, ensuring climate change is taken into account.

INF POL 20 – To require that a Flood Risk Assessment is carried out for any development proposal, where flood risk may be an issue in accordance with the “Planning System and Flood Risk Management – Guidelines for Planning Authorities” (DoECLG/OPW, 2009). This assessment shall be appropriate to the scale and nature of risk to and from the potential development and shall consider the impact of climate change.

INF POL 22 – To retain a strip of 10 metres on either side of all channels/flood defence embankments where required, to facilitate access thereto.

INF POL 25 – To have regard to the recommendations of the Fingal East Meath Flood Risk Assessment and Management Study (FEMFRAMS) and the Eastern Catchment Flood Risk Assessment and Management Study (CFRAMS).

INF OBJ 14 – To require the use of SuDS within Local Authority Developments and other infrastructural projects in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

INF OBJ 16 – To ensure that all new developments comply with Section 3.12 of the Greater Dublin Regional Code of Practice for Drainage Works V6 which sets out the requirements for new developments to allow for Climate Change.

INF OBJ 18 – To ensure that new developments provide for the separation of foul and surface water drainage networks within application site boundaries.

INF OBJ 19 – To ensure that developments permitted by the Council which involve discharge of wastewater to surface waters or groundwaters comply with the requirements of the EU Environmental Objectives (Surface Waters) Regulations and EU Environmental Objectives (Groundwater) Regulations.

INF OBJ 20 – To implement the Planning System and Flood Risk Management-Guidelines for Planning Authorities (DoEHLG/OPW 2009) or any updated guidelines. A site-specific Flood Risk Assessment should be submitted where appropriate.

INF OBJ 21 – To restrict new development within floodplains other than development which satisfies the Justification Test, as outlined in the Planning System and Flood Risk Management Guidelines 2009 for Planning Authorities (or any updated guidelines).

INF OBJ 22 – To ensure flood relief measures are suitably designed to protect the conservation objectives of Natura 2000 sites, and to avoid direct or indirect impacts upon qualifying interests or Natura 2000 sites.

INF OBJ 23 – To protect and enhance the County's floodplains, wetlands and coastal areas subject to flooding as "green infrastructure" which provide space for storage and conveyance of floodwater, and ensure that development does not impact on important wetland sites within river/stream catchments.

INF OBJ 25 – To require the use of Sustainable Urban Drainage Systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

INF OBJ 27 – To encourage the use of Green Roof technology particularly on apartment, commercial, leisure and educational buildings.

3.4.3 Variation No.5

Variation No. 5 to the Meath County Development Plan 2021-227 (as varied) was adopted by Meath County Council on 08 June 2026. This variation included amendment to the CDP for Dunboyne/Clonee/Place. The following specific objective was introduced for the lands subject to this assessment.

Flood Risk Management

DCE OBJ 23

Planning applications for development proposals on the lands that are subject to Spot Objective DCE OBJ 23 shall be accompanied by a Site Specific Flood Risk Assessment carried out in accordance with the requirements of the "Planning System and Flood Risk Management – Guidelines for Planning Authorities."

4.0 Stage 1 – Flood Risk Identification

This section identifies existing flood risk information at or near the site. This includes reports of previous flooding, historical flood mapping, and previous predictive flood studies and risk assessments.

4.1 Flooding History

4.1.1 Floodinfo.ie

Floodinfo.ie was developed and is maintained by the OPW as a mapped dataset from the National Flood Data Archive. Between the years of 2004 and 2006 a data collection programme including over 50 organisations collected information about flooding, including photographs, consultants' reports, recordings at gauging stations, eyewitness accounts, letters from the public, and official meeting minutes. Since 2006, supplementary information has been added to the record as it has become available.

Floodinfo.ie does not identify historic drainage schemes such as the Arterial Drainage Schemes, Drainage Districts, or the Land Commission impacting the site.

Three flood events are recorded within 2.5 km of the site boundary as listed in The R157 and roundabout with Summerhill Road was also constructed between 2006 and 2012 which has significantly changed the overland flow paths and hydraulic conditions adjacent to the site since the 2002 flood event.

Table 4-1, with locations shown in Figure 4-1. Notably all three past flood events recorded within 2.5 km of the site have been related to the Tolka River overtopping its banks after prolonged heavy rainfall and flooding its floodplains.

The largest flood recorded within the area occurred in 2002, resulting in significant flooding of residential areas in Dunboyne and Clonee, including flooding of Dunboyne Village from the Dunboyne (Castle) Stream. An indicative outline of the flood extent of this event is provided in Figure 4-1. The *UoM 9 – Liffey and Dublin Bay Hydraulic Modelling Report – Dunboyne AFA* (JBA, 2019) notes that:

"the flood event of November 2002 … was estimated to be within the range of a 1% AEP event in Dunboyne".

This flood event preceded the Tolka Flood Relief Scheme, which provided significant conveyance enhancements to the Dunboyne (Castle) Stream. Flood modelling completed by JBA (2019) demonstrated that:

"The revised model extent of the Castle Stream through Dunboyne identifies the significant benefits of the Tolka FRS. Significant dredging and improved conveyance of the Castle Stream has dramatically reduced the modelled flood extents."

The R157 and roundabout with Summerhill Road was also constructed between 2006 and 2012 which has significantly changed the overland flow paths and hydraulic conditions adjacent to the site since the 2002 flood event.

Table 4-1: Floodinfo.ie Past Flood Event Local Area Summary

Flood ID	Location	Date(s) of Report(s)	Recorded date of occurrence	Frequency	Description
ID-861	Woodpark, Black Bull Bridge to Pace	15/04/2005	Recurring	Periodically recurring flood event	Extensive area of Tolka River flood plain flooded after heavy rain.
ID-2088	River Tolka, Co. Meath	07/11/2000 /11/2002 03/03/2003 /10/2003	Single Event	N/A	Extensive area of Tolka River flood plain flooded after prolonged heavy rain.
ID-3546	River Tolka, Co. Meath	07/11/2000 /10/2003	Single Event	N/A	Extensive area of Tolka River flood plain flooded after prolonged heavy rain.

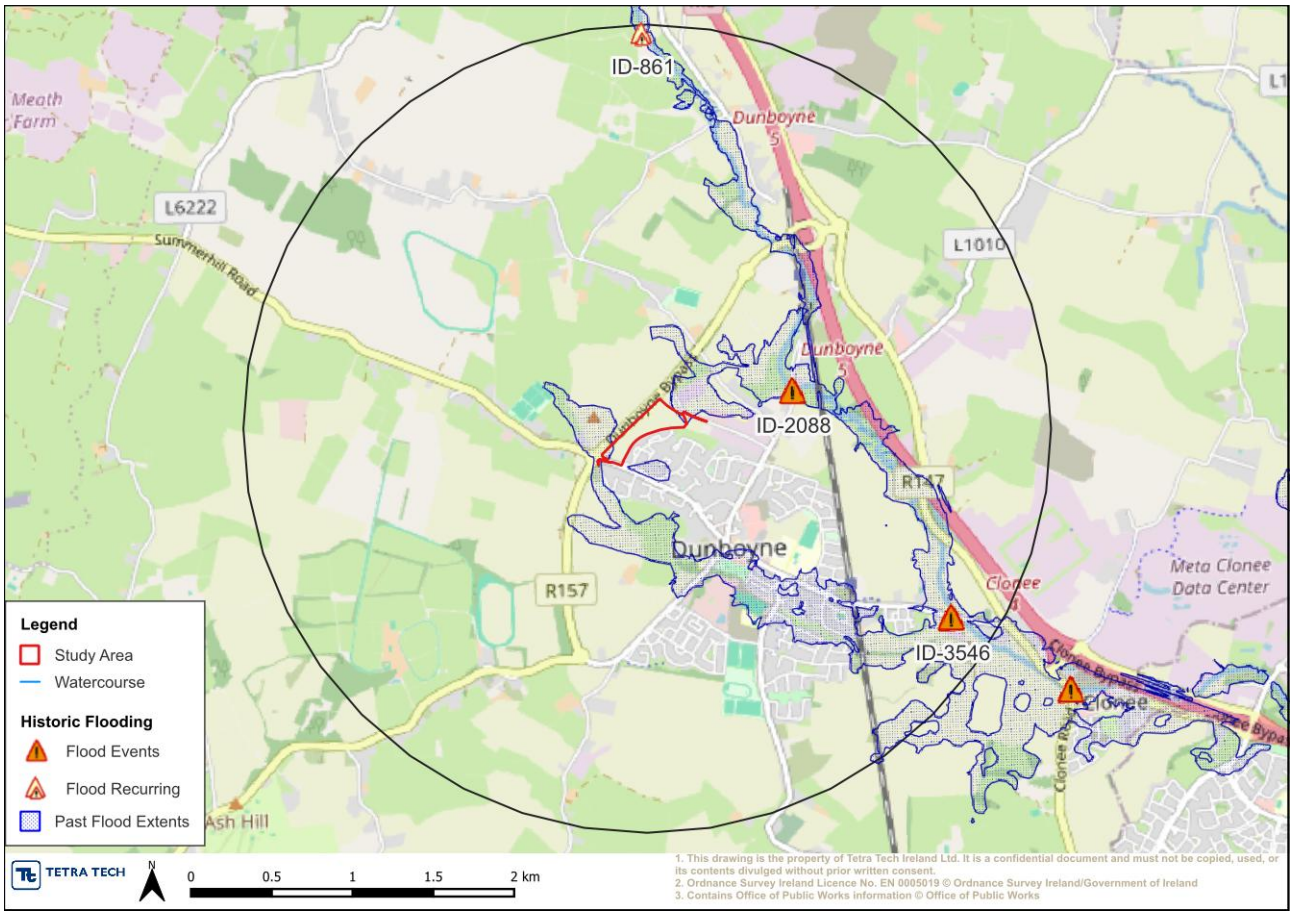


Figure 4-1: OPW Past Flood Events

4.1.2 Tailte Éireann Historical Mapping

The historic 6-inch map from Tailte Éireann[6] shows the site location and surrounding area largely unchanged compared to current mapping. No historic wetlands have been identified.

4.1.3 GSI Historical Surface Water Flooding

The GSI Synthetic Aperture Radar (SAR) Seasonal Flood Maps show flood extents within the north of the site. The source of these extents is not classified, therefore the source is unknown.

The GSI Maximum Historic Groundwater Flooding show no Groundwater/ Surface Water flood extents interacting with the site.



Figure 4-2: GSI Historical Surface Water Flooding

[6] https://osi.maps.arcgis.com

4.1.4 Internet Search

An internet search was carried out on 24th April 2026 to identify any past flooding events in proximity to the Proposed Development. Key words used in this search include “flood”, “flooding”, “Dunboyne”, “Castle Stream”, and “Tolka River”.

Multiple sources cover the Tolka River 2002 flood event which caused significant flooding and property damage. Dunboyne was affected by this flood event.

4.1.5 OPW Predictive Fluvial Flooding

The Office of Public Works (OPW) has produced two principal predictive fluvial flood datasets that inform this assessment: the Catchment Flood Risk Assessment and Management (CFRAM) study and the National Indicative Fluvial Mapping (NIFM) study. Both datasets are used in combination as they cover different watercourses and together provide the most comprehensive, nationally-available indicative fluvial flood information.

4.1.5.1 Catchment Flood Risk and Management Fluvial Flooding

The CFRAM Flood Maps are predictive maps showing areas likely to be inundated during design flood events expressed as Annual Exceedance Probabilities (AEP). They cover Areas for Further Assessment (AFAs) and Medium Priority Watercourses (MPWs) and include flood extents, depths, risk summaries and planning-style Flood Zone maps.

The OPW notes the maps **“may be used to identify areas where further assessment would be required if development is being considered within or adjacent to the flood extents shown.”** However, they also caution that the maps are indicative and **“should not be used as the sole basis for defining flood risk at property scale or for making planning decisions”** without further site-specific assessment.

4.1.5.2 National Indicative Fluvial Mapping

The National Indicative Fluvial Mapping (NIFM) project produced second generation indicative fluvial flood spatial data that are of a higher quality and accuracy to those produced for the first cycle PFRA[7]. The indicative fluvial flood maps were finalised in December 2020.

The OPW notes that the maps **“may be used in the Stage I Flood Risk Assessment (Flood Risk Identification) to identify areas where further assessment would be required if development is being considered within or adjacent to the flood extents shown on the maps”**. However, they also note that, **“the maps only provide an indication of areas that may be prone to flooding. They are not necessarily locally accurate, and should not be used as the sole basis for defining the Flood Zones nor for making decisions on planning applications”**[8]

[7] National Indicative Fluvial Mapping: Applying and Updating FSU Data to Support Revised Flood Risk Mapping For Ireland, Irish National Hydrology Conference (Brown et al, 2019) Microsoft Word - 06 - Emma Brown - National Indicative fluvial mapping

[8] NIFM User Guidance Notes - Floodinfo.ie

NIFM was developed subsequent to CFRAM and therefore provides coverage of watercourses not included in the CFRAM programme. Users should note that NIFM modelling excludes watercourses with upstream catchment areas smaller than 5 km^2. Consequently, the NIFM dataset contains modelled cut-off points beyond which no flood extents are provided. These cut-offs do not imply an absence of flooding but instead reflect the modelling threshold.

As illustrated in **Figure 4-3**, the Dunboyne Stream, to the west of the site boundary, has flood extents modelled by the NIFM study covering the southwest of the site. The site is not included in the CFRAM study.

The land drainage ditch to the northeast of the site, which flows into the Naulswood and Bennetstown Streams, have not been included in either the NIFM or CFRAM studies as its upstream catchment sizes do not meet the 5 km^2 threshold.

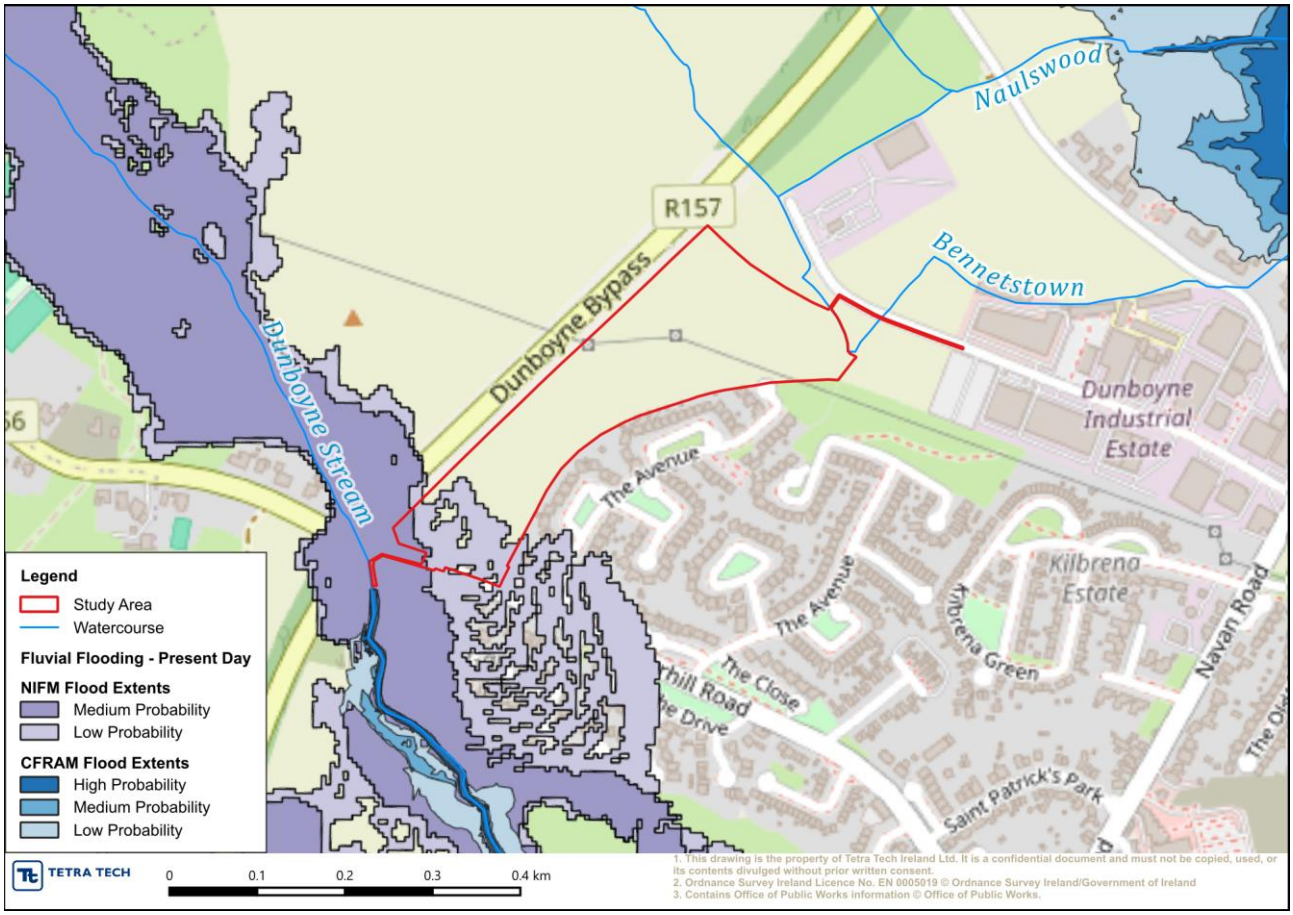


Figure 4-3: CFRAM/NIFM Combination Fluvial Flood Extents

4.1.6 GSI Predictive Groundwater Flooding

There is no GSI predictive groundwater flooding[9] in the Proposed Development site.

4.1.7 Meath County Development Plan 2021-2027 (as varied) Strategic Flood Risk Assessment (CDP SFRA)

The Meath County Development Plan 2021-2027 Strategic Flood Risk Assessment was reviewed for the site and surrounding area. It includes various data sources including CFRAM, FEM FRAMS, Tolka River Flooding Study, and PFRA Study. No additional predictive flood extents were identified beyond those already referenced, namely those modelled in CFRAM and NIFM studies.

4.1.8 UoM – Liffey and Dublin Bay Hydraulic Modelling Report – Dunboyne AFA (JBA 2019)

This report was produced for the Office of Public Works in 2019 and summarises the hydraulic modelling work for the Dunboyne Area for Further Assessment (AFA) High Priority Watercourse (HPW) hydraulic model. The study was commissioned "*due to the significant changes in the catchment since the previous study, this study has now assessed the Dunboyne River and Castle Stream, both of which have been identified as High Priority Watercourse (HPW) for inclusion into the CFRAM AFA deliverables of mapping".*

This modelling study incorporated the Tolka Flood Relief Scheme, including conveyance improvements to the Dunboyne (Castle) Stream, and also included the R157 and roundabout culverts.

Flood mapping produced during this study demonstrates no overtopping of the R157 for the 1% AEP event including uncertainty bounds to account for sensitivity to various hydraulic and hydrologic sensitivities. An extract of the 1% AEP flood map provided in the JBA 2019 report is provided in Figure 4-4.

[9] Groundwater Flooding Data Viewer

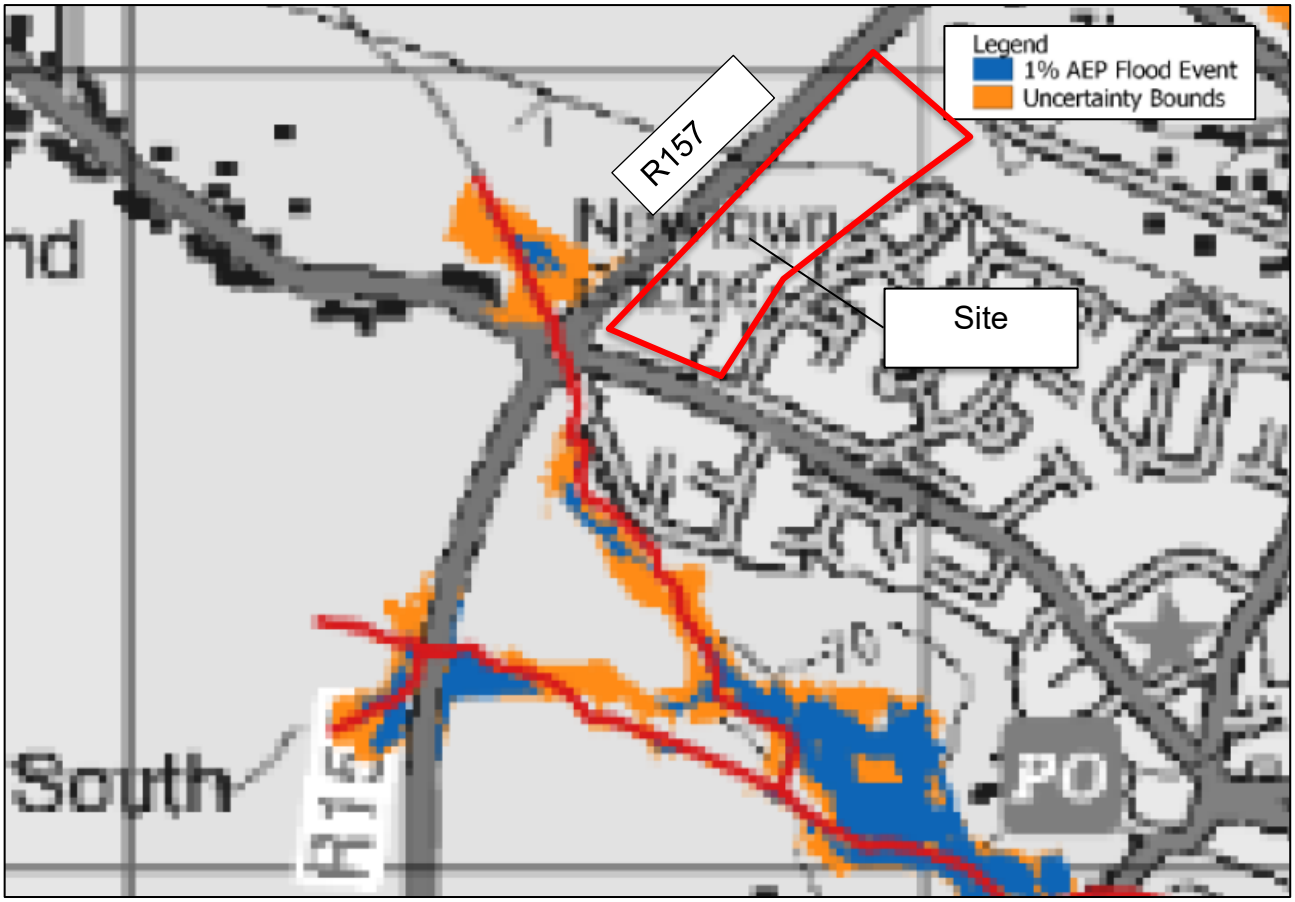


Figure 4-4: 1% AEP Flood Extents (JBA, 2019)

4.2 Stage 1 – Summary

Throughout Stage 1, this report has identified the existing flood risk information at or near the site, including reports of previous flooding, historical flood mapping, and available predictive flood studies and risk assessments.

A summary of the identified sources of flood risk to the site and the possible flood mechanisms are presented through a Source-Pathway-Receptor model as provided in Table 4-2.

The Source-Pathway-Receptor model demonstrates that the Proposed Development site is at potential risk of fluvial and pluvial flooding. Due to the inland location of the site, coastal flood risk to the site is low. As no groundwater flooding has been identified on site, the groundwater flood risk to the site is low. Therefore, the flood risk from coastal and groundwater sources can be screened out at this stage.

The identification of flood risk within Stage 1 concludes that:

- There is a medium potential risk of fluvial flooding to the site
- There is a low to medium potential risk of pluvial flooding to the site
- There is a low potential risk of coastal flooding to the site
- There is a low potential risk of groundwater flooding to the site

As a result, the FRA is required to progress to Stage 2 to further consider the potential flood risk to the site from fluvial and pluvial flood sources.

Table 4-2: Identification of Flood Risk

Source	Pathway	Receptor	Likelihood (remote, possible, likely)	Consequences (low, medium, high)	Risk (low, medium, high)	Comment
Tidal/Coastal	None	N/A	Remote	Low	Low	The site is located approximately 70 mOD and more than 20 km inland it is not impacted by coastal flooding.
Fluvial Dunboyne Stream	Increased river levels overtopping existing riverbanks	Residential Units, Internal Roads	Possible	High	Medium	The Dunboyne Stream flows to the west of the site boundary. NIFM shows flood extents interacting with the southern end of the site. Flood zones A and B have been mapped on the southern section of the site. However, the subsequent JBA 2019 flood mapping indicates a significantly reduced risk of flooding to the site. Therefore, the fluvial flood risk from the Dunboyne Stream to the Proposed Development is considered medium.
Fluvial East Site Drain	Increased river levels overtopping existing riverbanks	Residential Units, Internal Roads	Possible	High	Medium	The drainage ditch to the east of the site does not meet the 5 km^2 upstream catchment area threshold of NIFM. Therefore, the watercourse on site has not been included in nationally available flood indication modelling, namely CFRAM and NIFM studies. Due to the lack of flood modelling on site, the flood zones are unknown, however due to the vulnerability of the Proposed Development and possible risk of fluvial flooding from this watercourse, a medium risk has been assumed.
Pluvial	Surface water run-off	Residential Units, Internal Roads	Possible	High	Low to Medium	GSI SAR Seasonal Flood Maps depict surface inundation in the north of the site. Notably, the surface water inundation has no classified source. The site is underlain by limestone bedrock, and the north of the site is underlain by poorly drained soils while the south is underlain by well drained

						soils (Section **Error! Reference source not found.**). The topographic data shows local depressions in the north of the site (Section 3.3). These factors indicate that pluvial flood risk is possible with a low to medium risk.
Groundwater	Rising Groundwater Level	Residential Units, Internal Roads	Possible	High	Low	GSI SAR Seasonal Flood Maps depict surface inundation in the north of the site. Notably, the surface water inundation has no classified source. The site is underlain by limestone bedrock, and the north of the site is underlain by poorly drained soils while the south is underlain by well drained soils (Section **Error! Reference source not found.**). These factors indicate that groundwater flood risk is possible with a low risk.

5.0 Stage 2 – Initial Flood Risk Assessment

This section reports the undertaking of an initial flood risk assessment which was used to confirm sources of flooding that may affect the proposed development site and to appraise the adequacy of existing information.

5.1 Sources of Flooding

The identification of flood risk within Stage 1 concludes that:

- There is a medium risk of fluvial flooding to the site
- There is a low to medium risk of pluvial flooding to the site
- There is a low risk of coastal flooding to the site
- There is a low risk of groundwater flooding to the site

5.2 Appraisal of Information

Sufficient information is available to determine that the risk of flooding from coastal and groundwater sources is low and that no further assessment of these sources of flood risk is required.

Having reviewed the information assembled in Section **Error! Reference source not found.**, the fringes of the site are indicatively identified to have been impacted by the flood event in 2002, the largest event recorded in Dunboyne and estimated to be equivalent to a 1% AEP flood event. Since this flood event occurred, significant catchment changes have resulted, including construction of the Tolka Flood Relief Scheme which significantly improved conveyance of the Dunboyne (Castle) Stream downstream of the site, and construction of the R157 and roundabout which provides a raised hydraulic barrier to overland and out of bank flow to the site from the Dunboyne (Castle) Stream. Flood mapping produced by JBA in 2019 on behalf of the OPW demonstrates that the resulting catchment changes have significantly reduced the risk of flooding to the site. As the drainage ditch to the northeast of the site falls below the 5km^2 upstream catchment area threshold, it has not been included in either CFRAM or NIFM of JBA 2019 studies. Due to the lack of flood modelling for this watercourse, further assessment of this watercourse is required.

GSI SAR Seasonal Flood Maps depict surface inundation in the north of the site. The site is underlain by limestone bedrock, and the north of the site is underlain by poorly drained soils while the south is underlain by well drained soils (Section **Error! Reference source not found.**). The topographic data shows local depressions in the north of the site (Section 3.3). These factors indicate that pluvial flood risk is possible with a low to medium risk.

Appropriate surface water management will be in place on site as part of the Proposed Development, compliant with the requirements of the Meath County Development Plan

2021-2027 as amended and the supporting Strategic Flood Risk Assessment. As the proposed surface water management will appropriately manage pluvial flood risk, it can therefore be screened out at this stage of the FRA without need for further assessment.

5.3 Stage 2 – Summary

The proposed development is classified as highly vulnerable, and therefore the consequence of flooding from any relevant source is high.

The Stage 2 Initial Flood Risk Assessment has extended Stage 1 Flood Risk Identification by combining desk-based datasets, national mapping and on-site observations to evaluate the relevant flood sources to the site. The Proposed Development demonstrates through provision of an appropriate Surface Water Management Plan that potential flood risk associated with pluvial flooding are appropriately managed within the design and further detailed analysis of this flood source, along with coastal and groundwater flooding, is not required in Stage 3.

Preliminary assessment of available flood mapping demonstrates that fluvial flooding is still a potential flood risk as the north-eastern drainage ditch has not previously been assessed, and the site is located at the upper mapping limit of the JBA 2019 flood mapping.

Overall, the available Stage 2 information remains insufficient to define flood zones or to quantify flood extents and depths to the standard required for a highly vulnerable development. Therefore, a Stage 3 Detailed Flood Risk Assessment is required including a hydraulic model to define fluvial flood zones on site.

6.0 STAGE III – DETAILED FLOOD RISK ASSESSMENT

This section assesses flood risk issues in sufficient detail and provides a quantitative appraisal of potential flood risk to the proposed development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will involve construction of a hydraulic model of the watercourses across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

6.1 Sources of Flooding

The initial assessment of flood risk within Stage II concluded that:

- There is a low risk of coastal flooding to the proposed development
- There is a low risk of pluvial flooding to the proposed development
- There is a low risk of groundwater flooding to the development
- There is a potential risk of fluvial flooding to the site

Stages I and II have screened out flooding from coastal sources and demonstrated that there is a low risk of flooding to the proposed development from pluvial and groundwater flood sources. Fluvial flood risk remains a potential flood risk to the development and requires a hydraulic model in order to be quantified and assessed.

6.2 Hydraulic Modelling

TUFLOW flood modelling software was used to create a dynamically linked 1D-2D hydraulic model of the watercourses and floodplains within the study area. Approximately 1.5 km^2 was included in the model. Two watercourses were modelled, namely, the Dunboyne (Castle) Stream and the eastern land drainage ditch.

6.2.1 Flood Zones

There are three classifications of flood zones defined within Planning Guidelines:

Flood Zone A – where the probability of flooding from rivers and the sea is highest

Flood Zone B – where the probability of flooding from rivers and the sea is moderate

Flood Zone C – where the probability of flooding from rivers and the sea is low. Flood Zone C covers all areas not in zones A or B

The flood model outputs as shown in Figure 6-1 demonstrate that the site is located within Flood Zone C despite some minor overtopping of the R157 (Dunboyne Bypass) in Flood Zone B. The roadside drainage network of the R157 intercepts this flow preventing it from entering the site.

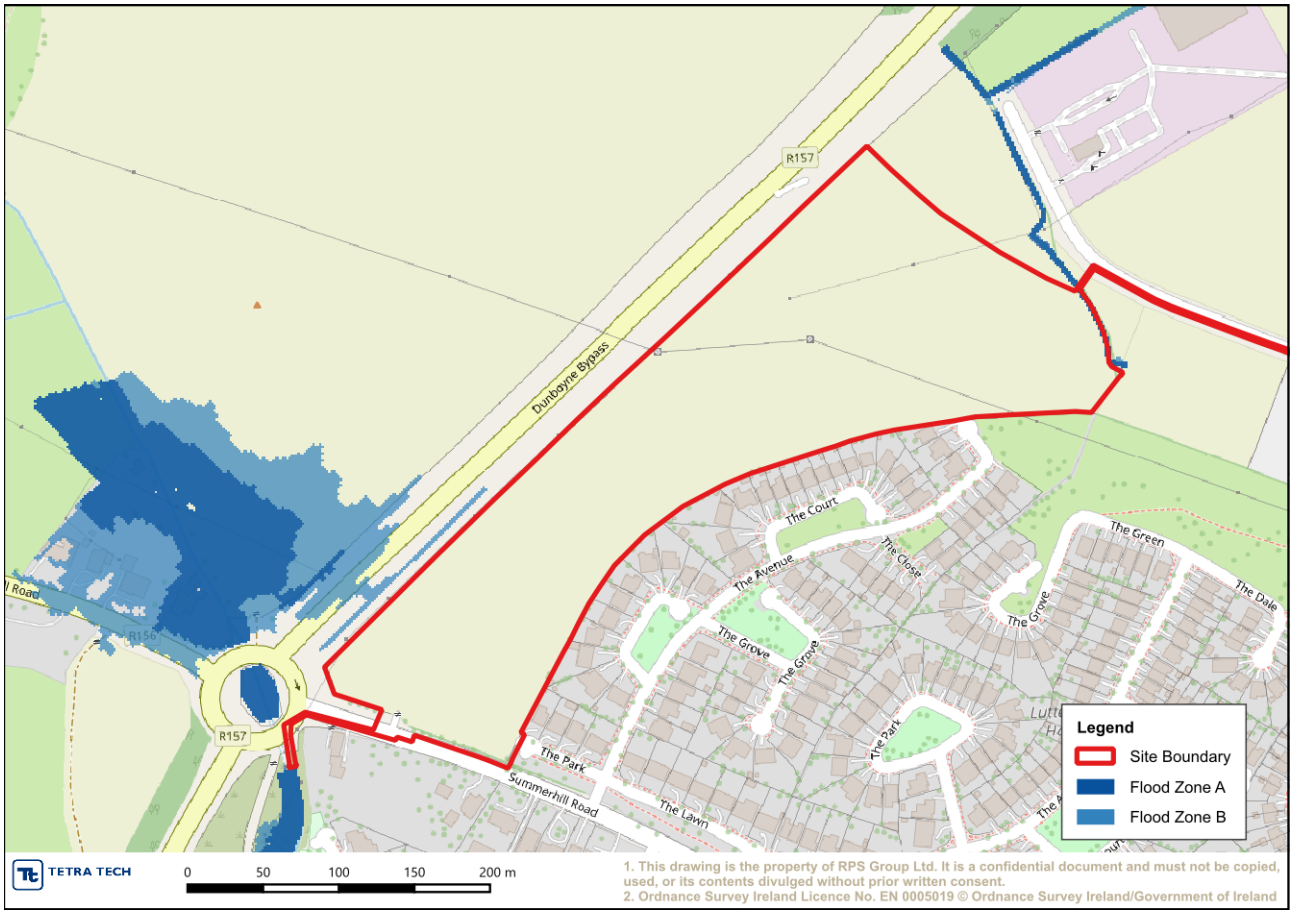


Figure 6-1: Flood Zones

6.3 Proposed Mitigation Measures

Detailed flood modelling has confirmed that the site is not at risk of inundation from the 0.1% AEP fluvial flood events. This places the site within Flood Zone C. As such the Justification Test is not applicable, and the proposal follows the sequential approach by avoiding areas of flood risk. Notwithstanding, mitigation measures are proposed to provide a precautionary approach in accordance with the Planning Guidelines with consideration of pluvial flood risk, residual risk and climate change.

6.3.1 Finished Floor Levels

Finished flood levels throughout the development will demonstrate an allowance for climate change with an appropriate freeboard.

6.3.2 Surface Water Drainage

Surface water drainage from the Proposed Development has been designed in compliance with the Meath CDP 2021-2027 (as varied) to manage the risk of pluvial flooding, including the use of SuDS features and retention of surface water discharge to greenfield runoff rates.

6.4 Potential Impacts Elsewhere

As the site is within Flood Zone C, it is demonstrated that there will not be an increase in risk elsewhere resulting from the proposed development.

6.5 Residual Risk Management

Residual risks are the risks which remain after all risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures can only reduce risk, not eliminate it.

Two main residual risks are identified relating to either blockage of structures over adjacent watercourses, or blockage of the proposed surface water drainage network.

6.5.1 Blockage of Watercourse Culverts

Blockage of culverts on the Dunboyne (Castle) Stream is considered unlikely due to the size of the culverts under the R157 roundabout and the limited yield of potential blockage material upstream owing to cultivated agricultural land being the primary land use. In the event that blockage may occur, finished floor levels throughout the proposed development mitigates the flood risk to property with any excess overland flows to be channelled through the road network away from assets and infrastructure.

6.5.2 Blockage of Surface Water Drainage Network

The Proposed Development's surface water drainage system incorporates features designed to collect silt and debris and help prevent blockages within the drainage network. Oil/petrol interceptors are also provided to remove hydrocarbons and potential contaminants before runoff enters the attenuation system, reducing the risk of pollution-related blockages.

While these design elements reduce the likelihood of blockages, a residual risk remains due to the potential accumulation of silt, debris, or other materials within gullies, pipes, or other drainage components. The catchpit manholes are designed to be accessible and simple to clean, facilitating routine maintenance to manage this risk and ensure continued system performance. If a blockage did occur leading to surcharge of the drainage network, surcharged water would be contained within the roadways and sloping away from the buildings.

6.6 Access & Egress

Access and Egress from Summerhill Road is within Flood Zone C, with a low risk of flooding. In the event of an emergency, pedestrians and vehicles will be able to access and egress the site without flood impacts for events up to and including the 0.1% AEP.

6.7 Climate Change

The Proposed Development has been designed with finished floor levels (FFLs) set above the predicted flood level, incorporating allowances for future climate change.

Furthermore, the surface water drainage and attenuation systems have been designed to accommodate increased rainfall intensity, with a 20% climate change allowance applied to the design storm event.

6.8 Stage III – Summary

The hydraulic modelling completed in Stage 3 has confirmed that the JBA modelling completed in 2019 is a more realistic predicted flood extent for the site and that the NIFM, as identified with the Meath CDP 2021-2027 SFRA (as varied) is overly conservative in its representation of flood risk at this location.

Flood Mapping developed through a detailed dynamically linked 1D-2D hydraulic model has shown that flooding from the Dunboyne Stream does not reach the site in flood events up to and including the 0.1%AEP. Meanwhile, the contributing catchment area of the eastern land drain is so small that the risk of flooding is low, with water remaining in channel adjacent to the site for events up to and including the 0.1%AEP flood event.

The flood mapping presented demonstrates that the Proposed Development is located within Flood Zone C and is appropriate for residential development in accordance with the Planning Guidelines, without need for the Justification Test.

7.0 Conclusion

This report has been prepared in the context of The Planning System and Flood Risk Management – Guidelines for Planning Authorities, November 2009 published by the Office of Public Works and the Department of Environment, Heritage and Local Government.

The assessment of flood risk within Stages I, II and III concluded that:

- The Proposed Development is located within Flood Zone C.
- Coastal flood risk is insignificant due the site's inland location.
- No Groundwater flood risk is identified
- Pluvial flood risk will be managed by an appropriately designed drainage system.
- There is no increase in flood risk elsewhere caused by the proposed development.
- The flood risk assessment has identified that the site is appropriate for the development as proposed.

Overall, the assessment concludes that the site is in Flood Zone C with a low risk of flooding. Potential for pluvial flooding, residual flood risks and consideration of climate change are effectively managed through setting of appropriate finished floor levels and a robust and sustainable site drainage design including SuDS. As such, the development complies with the relevant policies and guidelines and is therefore appropriate for development from a flood risk perspective.