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Glenveagh Homes

## Proposed Residential Development, Drumbiggle, Ennis, Co. Clare

### Flood Risk Assessment



# Proposed Residential Development, Drumbiggil, Ennis, Co. Clare

## Flood Risk Assessment

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## Table of Contents

1.0	INTRODUCTION .....	3
2.0	FLOOD RISK MANAGEMENT GUIDANCE .....	5
2.1	The Planning System and Flood Risk Management Guidelines .....	5
2.1.1	<i>Flood Zones and Vulnerability Classes</i> .....	5
2.1.2	<i>The Justification Test</i> .....	6
2.2	The Flood Risk Management Climate Change Adaptation Plan .....	7
2.3	Clare County Development Plan 2017-2023 .....	8
3.0	INITIAL FLOOD RISK ASESSMENT .....	10
3.1	Past Flood Events .....	10
3.2	OPW Preliminary Flood Risk Assessment (PFRA) Study .....	11
3.3	Irish Coastal Protection Strategy Study (ICPSS) .....	12
3.4	Catchment Flood Risk Assessment and Management Study .....	13
3.4.1	<i>Fluvial Flood Risk (CFRAM)</i> .....	13
3.4.2	<i>Tidal Flood Risk (CFRAM)</i> .....	14
3.5	Geological Survey Ireland Mapping .....	15
4.0	DETAILED FLOOD RISK ASESSMENT .....	18
4.1	Fluvial Flooding.....	18
4.2	Pluvial Flooding .....	18
4.3	Groundwater Flooding .....	19
4.4	Coastal Flooding.....	19
4.5	The Justification Test .....	19
5.0	CONCLUSIONS.....	20

**Table of Figures**

Figure 1–1 Site Location..... 3

Figure 1–2 Proposed Residential Development..... 4

Figure 2–1 Criteria of the Justification Test..... 6

Figure 2–2 Ennis Settlement Plan [excerpt of Map No. PLP-18-0001-24]8

Figure 2–3 Ennis Infrastructure, Environment and Flood Risk Zones [excerpt of Map I7] ..... 9

Figure 3–1 OPW Flood Map of Past Flood Events..... 10

Figure 3–2 Aerial Photo of Flooding in Keelty Area West of Ennis Co Clare-Feb 2002 (OPW) ..... 10

Figure 3–3 Indicative Flood Mapping [extract from PFRA Map 161]..... 11

Figure 3–4 ICPSS Flood Mapping in vicinity of subject site ..... 12

Figure 3–5 Shannon CFRAM Existing Fluvial Flood Extents ..... 13

Figure 3–6 Shannon CFRAM MRFS Fluvial Flood Extents..... 14

Figure 3–7 Shannon CFRAM Existing Coastal-Tidal Flood Extents..... 14

Figure 3–8 GSI Mapping of Karst Features ..... 15

Figure 3–9 GSI Mapping of Groundwater Flooding ..... 16

Figure 3–10 GSI Mapping of Historic Groundwater & Groundwater/Surface Water Flooding and Winter 2015/2016 Surface Water Flooding..... 17

**Table of Tables**

Table 2-1 Decision Matrix for Determining the Appropriateness of a Development..... 5

Table 2-2 Climate Change Adaptation Allowances for Future Flood Risk Scenarios ..... 7

## 1.0 INTRODUCTION

TOBIN Consulting Engineers were appointed by Glenveagh Homes Ltd. to undertake a Flood Risk Assessment (FRA) for their lands (see Figure 1–1) and proposed residential development (see Figure 1–2) at Drumbiggle in Ennis, Co. Clare.

The greenfield site is located approximately 2km southwest of the town centre, alongside Ennis Golf Club and the N85, adjacent to the River Claureen (also known as the River Inch).

Existing ground levels are approximately 5mOD at the northern redline boundary at the River Claureen, with levels within the developable area ranging from approximately 13.4mOD at the northeastern corner to approximately 31.2mOD at the southwestern corner.

The purpose of this report is to identify, quantify, and communicate the risks of flooding, if any, to the proposed development.

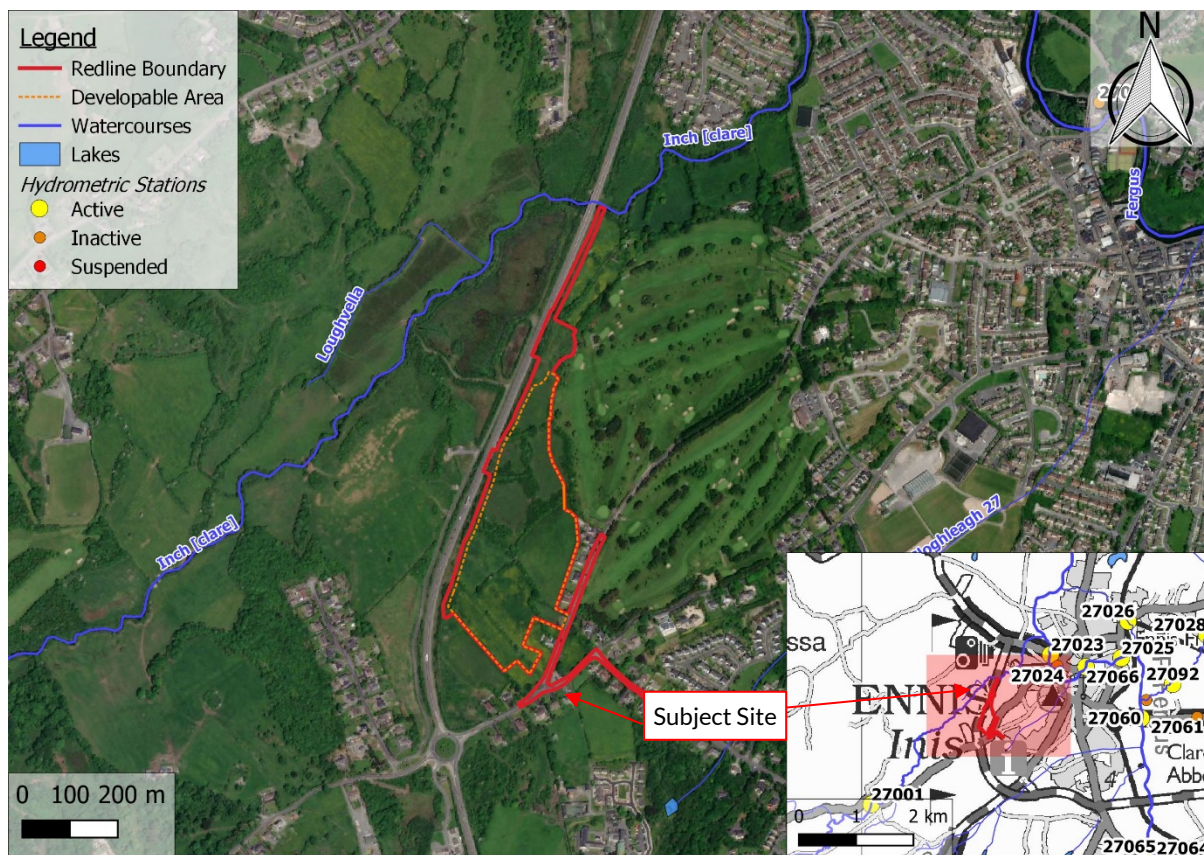


Figure 1–1 Site Location

The development will consist of:

1. The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2. A 400.7m<sup>2</sup> creche/childcare facility;
3. The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4. The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an



uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;

5. All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. Clare.

An Environmental Impact Assessment Report and a Natura Impact Statement has been prepared in respect of the proposed development.

Drainage design includes the provision of an open infiltration basin within the redline boundary, outside of the developable area, with a stormwater outfall downstream of the N85 Bridge at the River Claureen. Access to the site will be via an entrance onto the R474 to the east of the site. Minimum Finished Floor Levels (FFLs) are set to 15.40mOD. See Figure 1–2.



*Figure 1–2 Proposed Residential Development*

## 2.0 FLOOD RISK MANAGEMENT GUIDANCE

This Stage 2 Flood Risk Assessment was carried out in accordance with the following flood risk management guidance documents:

- The Planning System and Flood Risk Management Guidelines for Planning Authorities
- Flood Risk Management Climate Change Sectoral Adaptation Plan
- Clare County Development Plan
  - Ennis Municipal District Plan (Volume 3a)

### 2.1 The Planning System and Flood Risk Management Guidelines

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) were published in 2009 by the Office of Public Works (OPW) and Department of the Environment, Heritage and Local Government (DoEHLG). Their aim is to ensure that flood risk is considered in development proposals and the assessment of planning applications.

#### 2.1.1 Flood Zones and Vulnerability Classes

The PSFRM Guidelines discuss flood risk in terms of flood zones A, B, and C, which correspond to areas of high, medium, or low probability of flooding, respectively. The extents of each flood zone are based on the Annual Exceedance Probability (AEP) of various flood events.

The PSFRM Guidelines also categorise different types of development into three vulnerability classes based on their sensitivity to flooding. Residential developments are considered “highly vulnerable” in terms of sensitivity to flooding.

Table 2-1 shows a decision matrix that indicates which types of development are appropriate in each flood zone and when the Justification Test (see Section 2.1.2) must be satisfied. The annual exceedance probabilities used to define each flood zone are also provided.

*Table 2-1 Decision Matrix for Determining the Appropriateness of a Development*

Flood Zone (Probability)	Annual Exceedance Probability (AEP)	Development Appropriateness		
		Highly Vulnerable	Less Vulnerable	Water Compatible
A (High)	<u>Fluvial &amp; Pluvial Flooding</u> More frequent than 1% AEP	Justification Test	Justification Test	Appropriate
	<u>Coastal Flooding</u> More frequent than 0.5% AEP			
B (Medium)	<u>Fluvial &amp; Pluvial Flooding</u> 0.1% to 1% AEP	Justification Test	Appropriate	Appropriate
	<u>Coastal Flooding</u> 0.1% to 0.5% AEP			
C (Low)	<u>Fluvial, Pluvial &amp; Coastal Flooding</u> Less frequent than 0.1% AEP	Appropriate	Appropriate	Appropriate

## 2.1.2 The Justification Test

Any proposed development being considered in an inappropriate flood zone (as determined by Table 2-1) must satisfy the criteria of the Justification Test outlined in Figure 2–1 (taken from the PSFRM Guidelines).

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

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

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
  - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
  - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
  - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
  - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

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

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

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

*Figure 2–1 Criteria of the Justification Test*



## 2.2 The Flood Risk Management Climate Change Adaptation Plan

The Flood Risk Management Climate Change Sectoral Adaptation Plan was published in 2019 under the National Adaptation Framework and Climate Action Plan. This plan outlines the OPW's approach to climate change adaptation in terms of flood risk management.

This approach is based on a current understanding of the potential impacts of climate change on flooding and flood risk. Research has shown that climate change is likely to worsen flooding through more extreme rainfall patterns, more severe river flows, and rising mean sea levels.

To account for these changes, the Adaptation Plan presents two future flood risk scenarios to consider when assessing flood risk:

- Mid-Range Future Scenario (MRFS)
- High-End Future Scenario (HEFS)

Table 2-2 indicates the allowances that should be added to estimates of extreme rainfall depths, peak flood flows, and mean sea levels for the future scenarios.

*Table 2-2 Climate Change Adaptation Allowances for Future Flood Risk Scenarios*

Parameter	Mid-Range Future Scenario (MRFS)	High-End Future Scenario (HEFS)
Extreme Rainfall Depths	+ 20%	+ 30%
Peak River Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 0.5 m	+ 1 m

## 2.3 Clare County Development Plan 2017-2023

The current Clare County Development Plan 2017-2023, as amended, provides a strategic framework for planning and sustainable development in Clare County.

The Council of the County of Clare at its meeting held on Monday 8<sup>th</sup> November 2021 resolved to extend the duration of the existing Clare County Development Plan 2017-2023 (as varied) up to the 29<sup>th</sup> April 2023<sup>1</sup>.

Volume 3a includes the written statements and maps for the settlements and clusters within the Municipal District of Ennis. The subject site is located within the Cahircalla More Neighbourhood; the developable area is zoned as a mixture of Residential and Low Density Residential.

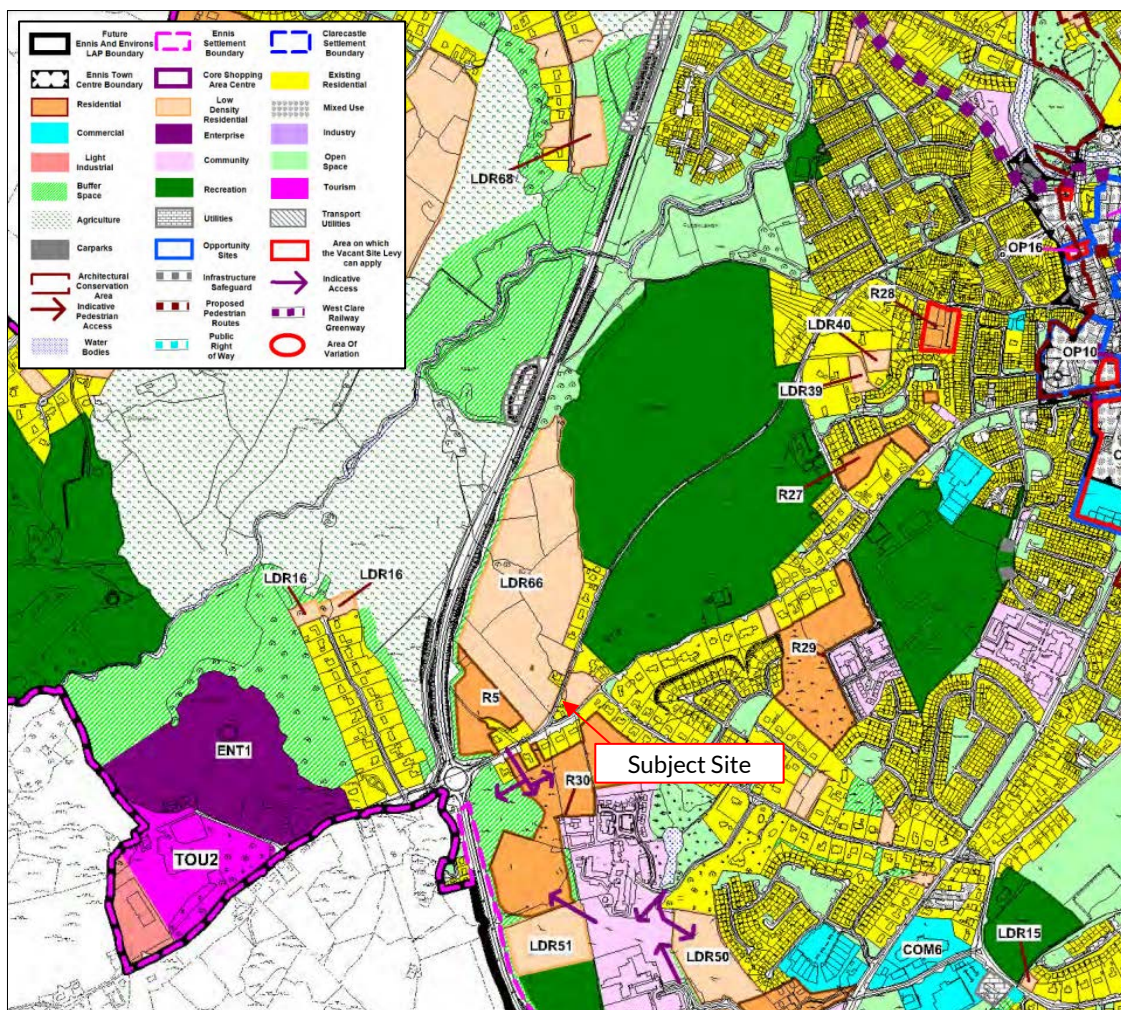


Figure 2—2 Ennis Settlement Plan [excerpt of Map No. PLP-18-0001-24]

Chapter 18 of the Clare County Development Plan outlines Clare County Council’s strategy for Climate Change Adaptation, Flood Risk and Low Carbon, with Section 18.6 outlining County policies for Flood Risk Management, referencing the Strategic Flood Risk Assessment (SFRA) and Flood Maps prepared to consider flood risk within the Plan boundary.

<sup>1</sup><https://www.clarecoco.ie/services/planning/publications/plans/resolution-to-extend-duration-of-clare-county-development-plan-2017-2023-44670.pdf>



As per Figure 2–3, the redline boundary includes a small section within Flood Zone A, while the majority of the redline and all of the developable area are located within Flood Zone C (outside the delineated Flood Risk Zones). The small section of the redline boundary located within Flood Zone A is located near a storm drain.

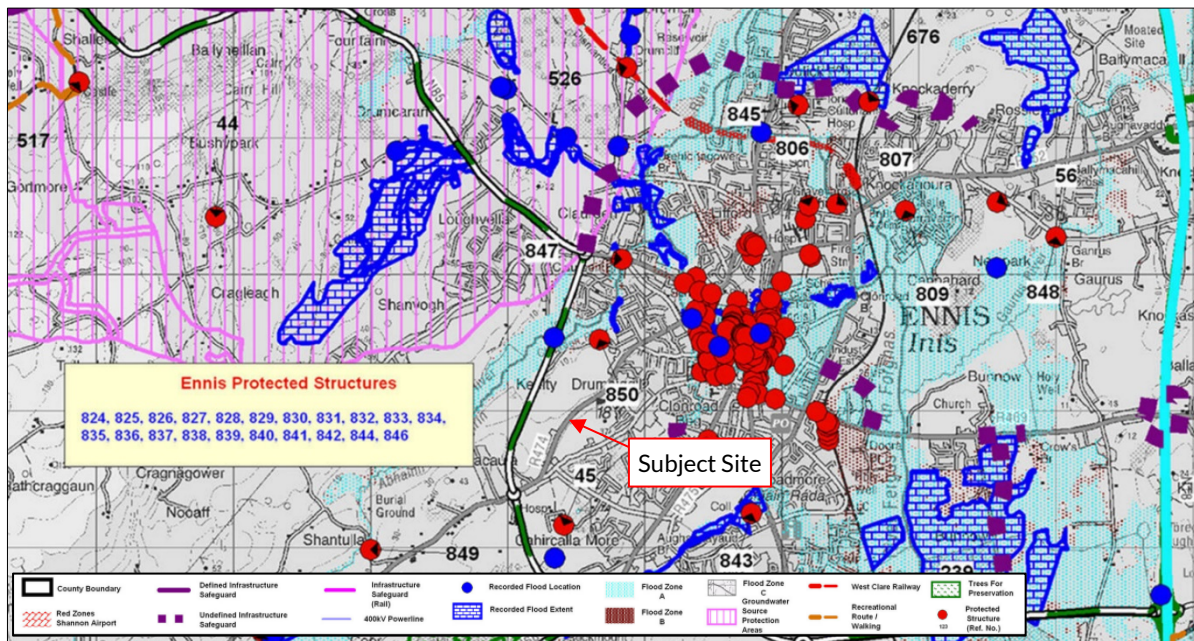


Figure 2–3 Ennis Infrastructure, Environment and Flood Risk Zones [excerpt of Map 17]

The Ennis Municipal District Plan (Volume 3a) further describes the completed, ongoing and proposed flood schemes within Ennis, including:

- The River Fergus Ennis Upper Certified Drainage Scheme (covering the area from Victoria Bridge to Bank Place Bridge);
- River Fergus Ennis Lower Certified Drainage Scheme (covering the area from Bank Place Bridge to Doora Bridge). This scheme was completed in 2014
- Tidal barrage at Clarecastle – constructed 1954;
- Upper Fergus Certified Drainage Scheme (OPW) Fergus Upper Flood Scheme – completed 2009;
- Gort Road Scheme- Lough Girroga Culvert (CCC/ OPW) completed 2011, provided an over flow pipe from Lough Girroga to the River Fergus via Gort Road Business Park;
- Aughanteeroe Scheme- completed 2010 (CCC/ OPW);
- Watery Road /Elm Park – completed 2013;
- Extension of Aughanteeroe Flood Scheme and Fíor Uisce Flood Scheme (CCC/ OPW);
- Lower Fergus Certified Drainage Scheme (OPW);
- Ennis South Flood Scheme – Proposal includes works at Ballybeg and St Flannan’s swallow holes and the right bank (west side) of the River Fergus between Doora Bridge and the tidal barrage at Clarecastle.

### 3.0 INITIAL FLOOD RISK ASSESSMENT

#### 3.1 Past Flood Events

The OPW's National Flood Information Portal<sup>2</sup> provides past flood event mapping with records of flooding reports, meeting minutes, photos, and/or hydrometric data. Based on the flood map shown in Figure 3–1, there are several recorded locations of historical or recurring flooding noted within Tullamore.

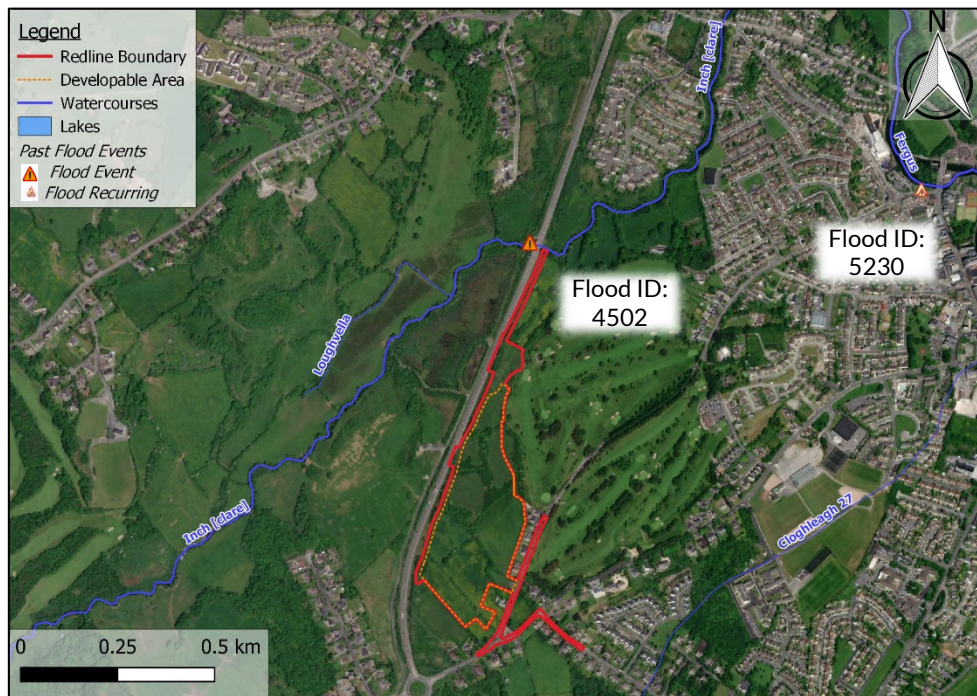


Figure 3–1 OPW Flood Map of Past Flood Events

February 2002 aerial photography shows lands adjacent to the River Claureen liable to flooding (Flood ID: 4502) prior to the construction of the N85.



Figure 3–2 Aerial Photo of Flooding in Keelty Area West of Ennis Co Clare- Feb 2002 (OPW)<sup>3</sup>

<sup>2</sup> floodinfo.ie

<sup>3</sup> [https://www.floodinfo.ie/map/pf\\_addinfo\\_photo/4502/#](https://www.floodinfo.ie/map/pf_addinfo_photo/4502/#)



### 3.2 OPW Preliminary Flood Risk Assessment (PFRA) Study

In 2009, the OPW produced a series of maps to assist in the development of a broad-scale FRA throughout Ireland. These maps were produced from several sources.

The OPW’s National Preliminary Flood Risk Assessment (PFRA) Overview Report from March 2012 noted that *“the flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location”*<sup>4</sup>.

Figure 3–3 provides an overview of the fluvial, coastal, pluvial, and groundwater indicative flood extents in the vicinity of the subject site.

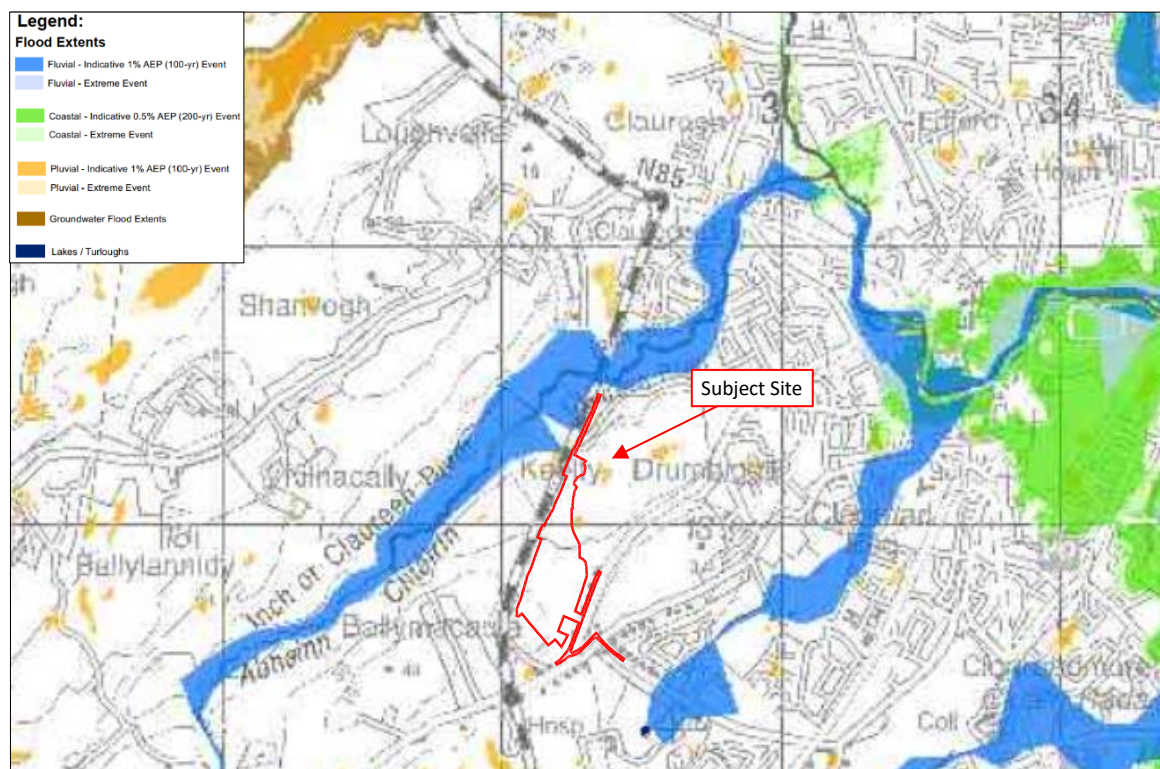


Figure 3–3 Indicative Flood Mapping [extract from PFRA Map 161]

The PFRA indicative mapping indicates an area adjacent to the eastern site boundary that may be liable to pluvial flooding, consistent with localised depressions noted within the topographic survey.

Limitations on potential sources of error associated with the PFRA maps include:

- Assumed channel capacity (due to absence of channel survey information)
- Absence of flood defences and other drainage improvements and channel structures (bridges, weirs, culverts)
- Local errors in the national Digital Terrain Model (DTM)

Improved hydraulic modelling was carried out through the Catchment Flood Risk Assessment and Management Study (CFRAM) in 2015 (discussed in Section 3.4) and is considered more accurate than the PFRA study as it utilised surveyed river geometry, including the recently completed flood relief works.

<sup>4</sup> The National Preliminary Flood Risk Assessment (PFRA) Overview Report, OPW (March 2012)



### 3.3 Irish Coastal Protection Strategy Study (ICPSS)

As part of the Irish Coastal Protection Strategy Study (ICPSS), RPS performed detailed hydraulic modelling of tidal flooding along the Irish Coast. The study produced ‘predictive’ flood maps which provide predicted coastal flood extents for a future scenario ‘design’ flood event.

The flood extent mapping (Figure 3–4) indicates the subjects site is located outside the predicted areas of coastal flooding.

For the MRFS, the study predicted 200-year and 1000-year water levels of 4.52mOD and 4.83mOD respectively [reference Point S22]<sup>5</sup>. Existing ground elevations at the developable area range from 13.4mOD to 31.2mOD.

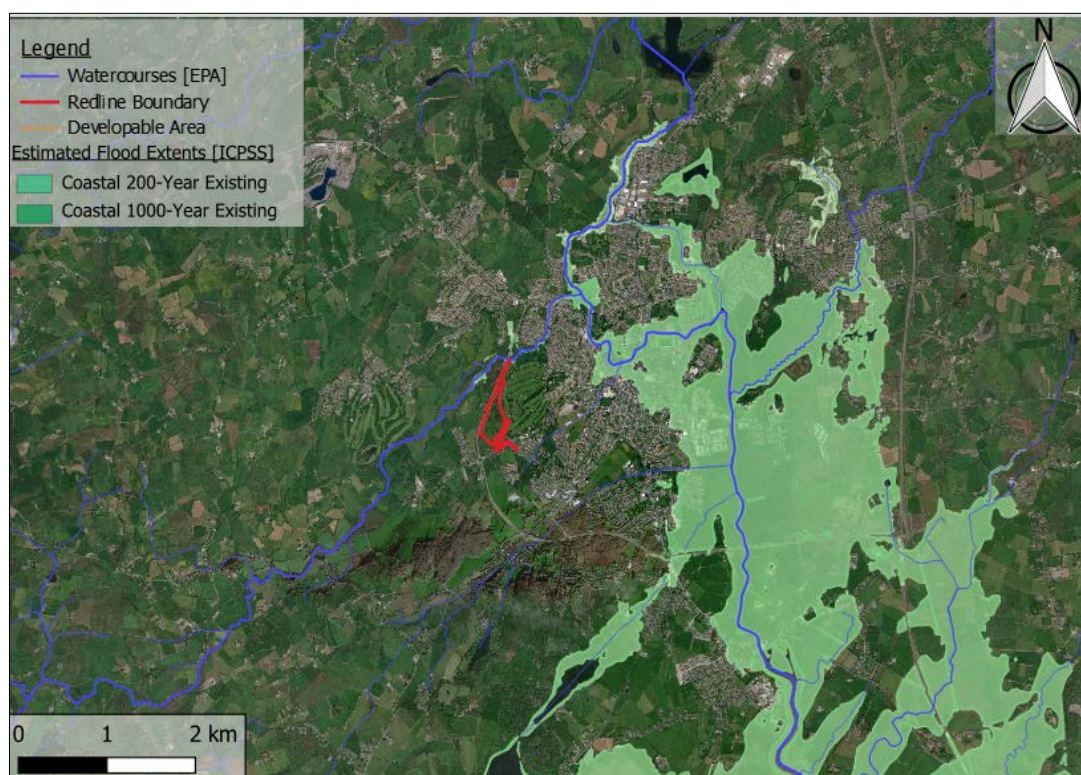


Figure 3–4 ICPSS Flood Mapping in vicinity of subject site

As per the ICPSS, “The maps have been produced at a strategic level to provide an overview of coastal flood hazard and risk in Ireland, and minor or local features may not have been included in their preparation. A DTM is used to generate the maps, which is a ‘bare earth’ model of the ground surface with the digital removal of man-made and natural landscape features such as vegetation, buildings, bridges and embankments. The mapping process can show some of these man-made features, such as bridges and embankments, as flooded on the flood maps, when in reality they do not flood”.

Due to the aforementioned limitations, the CFRAM study (discussed in Section 3.4) is considered more accurate than the ICPSS study.

<sup>5</sup> Irish Coastal Protection Strategy Study- Phase IV, Shannon Estuary Flood Extent Map, Figure No. SH / RA / EXT / MRFS / 22 (April 2012)

### 3.4 Catchment Flood Risk Assessment and Management Study

In 2015, the OPW produced flood maps<sup>1</sup> as part of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The flood extents in these maps are based on detailed modelling of Areas for Further Assessment identified by the National Preliminary Flood Risk Assessment.

#### 3.4.1 Fluvial Flood Risk (CFRAM)

CFRAM mapping of the existing 100-Year and 1000-Year fluvial flood extents, presented in the Figure below, indicates the northern portion of the redline boundary abutting the River Clauren may be liable to fluvial flooding; however, the developable area is not indicated as at risk of fluvial flooding from the River Clauren during a 0.1% AEP event.

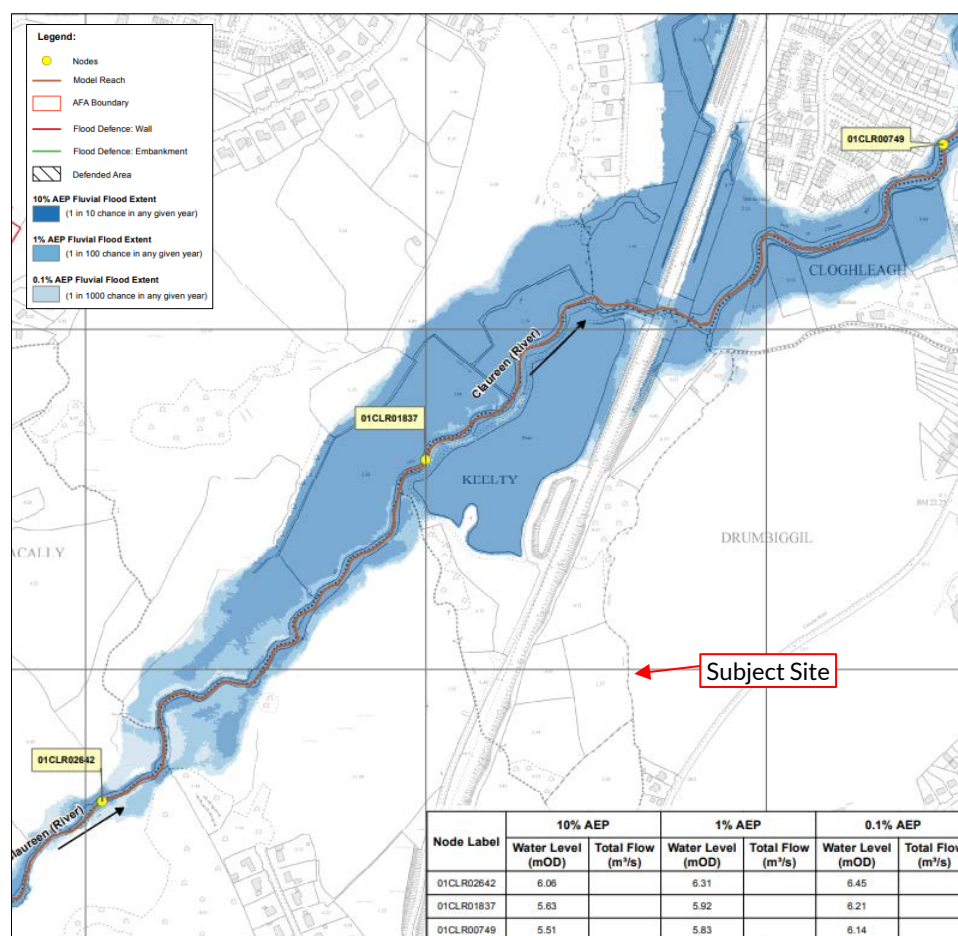


Figure 3–5 Shannon CFRAM Existing Fluvial Flood Extents<sup>6</sup>

Based on this updated CFRAM mapping, the developable area is located within Flood Zone C, outside of the 0.1% AEP fluvial flood extent. The CFRAM study estimates that water levels in the River Clauren floodplain, west and north of the subject site, for the current 0.1% AEP event of 6.21mOD and 6.14mOD respectively. Existing ground elevations at the developable area range from approximately 13.4mOD to 31.2mOD.

The Western CFRAM Study also included an assessment of the likely impact of climate change on flood risk in the area. The flood extents for a Mid-Range Future Scenario (MRFS) are shown in Figure 3–6.

<sup>6</sup> Shannon CFRAM Study Map No: S27ENS\_EXFCD\_F1\_13 (June 2016)





Figure 3–6 Shannon CFRAM MRFS Fluvial Flood Extents

### 3.4.2 Tidal Flood Risk (CFRAM)

Tidal flood mapping has been prepared for Ennis through the Shannon CFRAM Study and indicates tidally influenced flooding does not extend to the vicinity of the subject site.

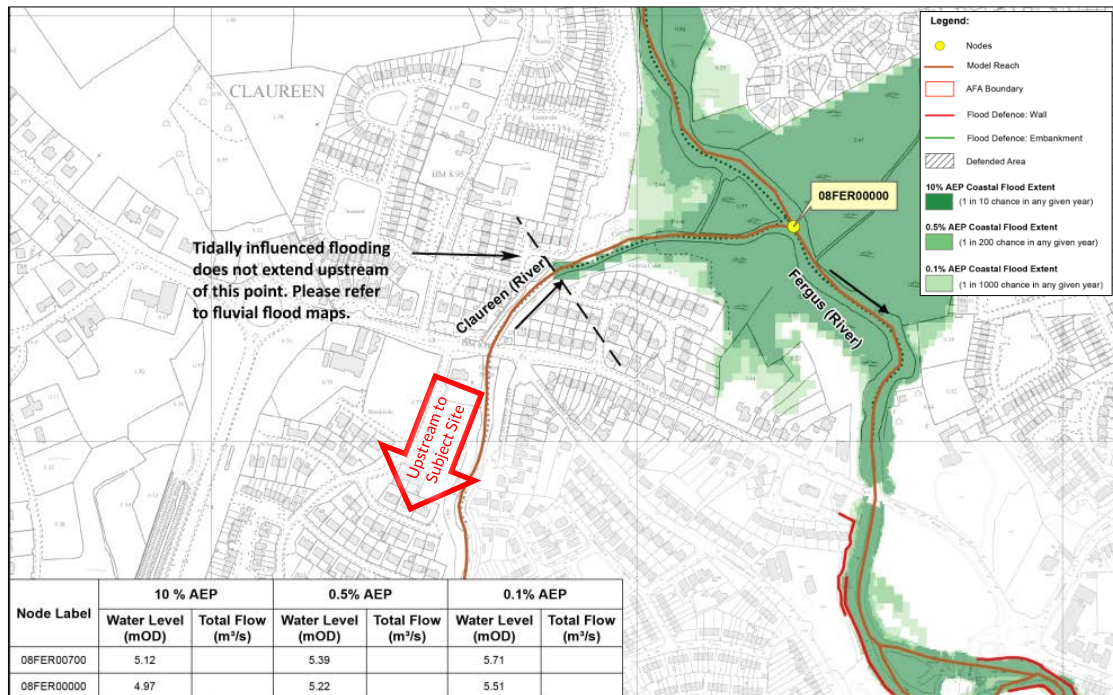


Figure 3–7 Shannon CFRAM Existing Coastal-Tidal Flood Extents<sup>7</sup>

<sup>7</sup> Shannon CFRAM Study Map No: S27ENS\_EXCCD\_F1\_12 (June 2016)



### 3.5 Geological Survey Ireland Mapping

The Geological Survey Ireland (GSI) provides mapping<sup>8</sup> with data related to Ireland’s subsurface. Based on the map shown in Figure 3—8, there are no karst feature (caves, springs, turloughs, etc.) or recorded or predicted<sup>9</sup> (GWflood SAR Mapping) areas of groundwater flooding in the surrounding 1km area of the subject site.

An area of historic and predicted groundwater flooding is indicated approximately 1.4km northwest of the subject site, across the adjacent N85 and River Claureen.

Based on area topography, any groundwater arising at local karst features would drain towards adjacent watercourses and are, therefore, not considered a flood risk to the proposed development site.

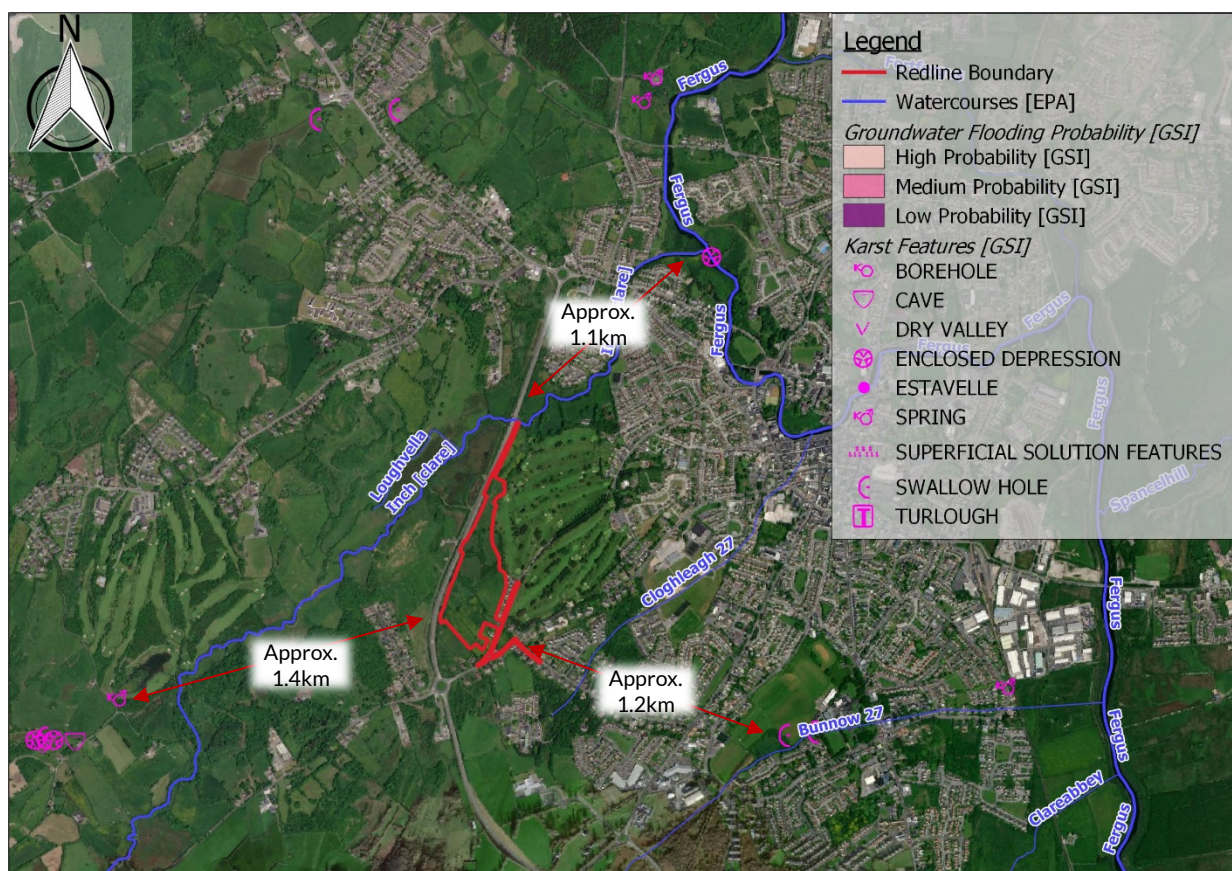
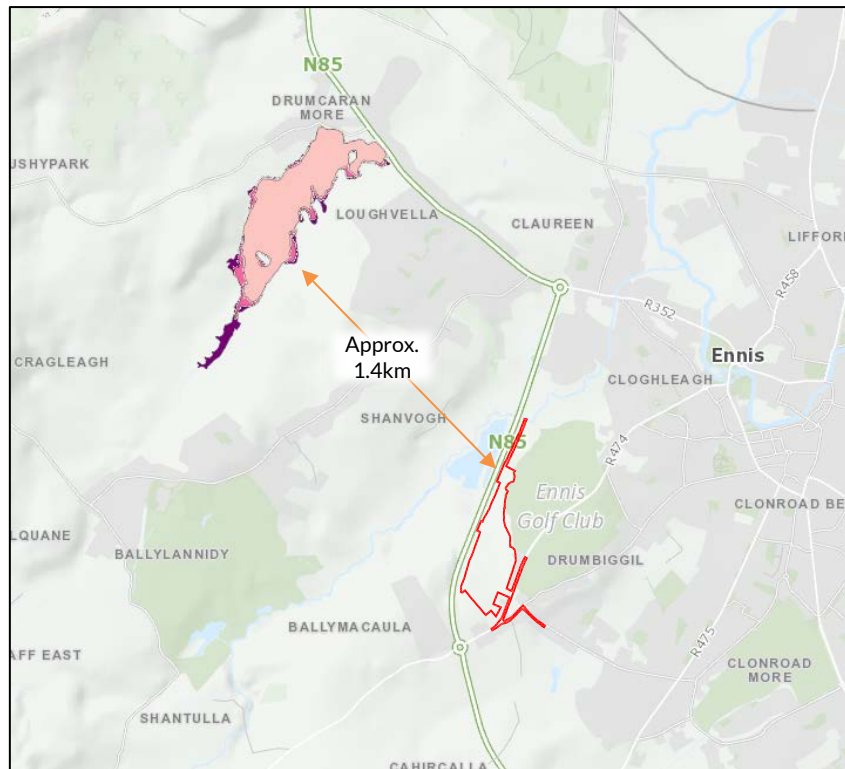


Figure 3—8 GSI Mapping of Karst Features

<sup>8</sup> <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx>

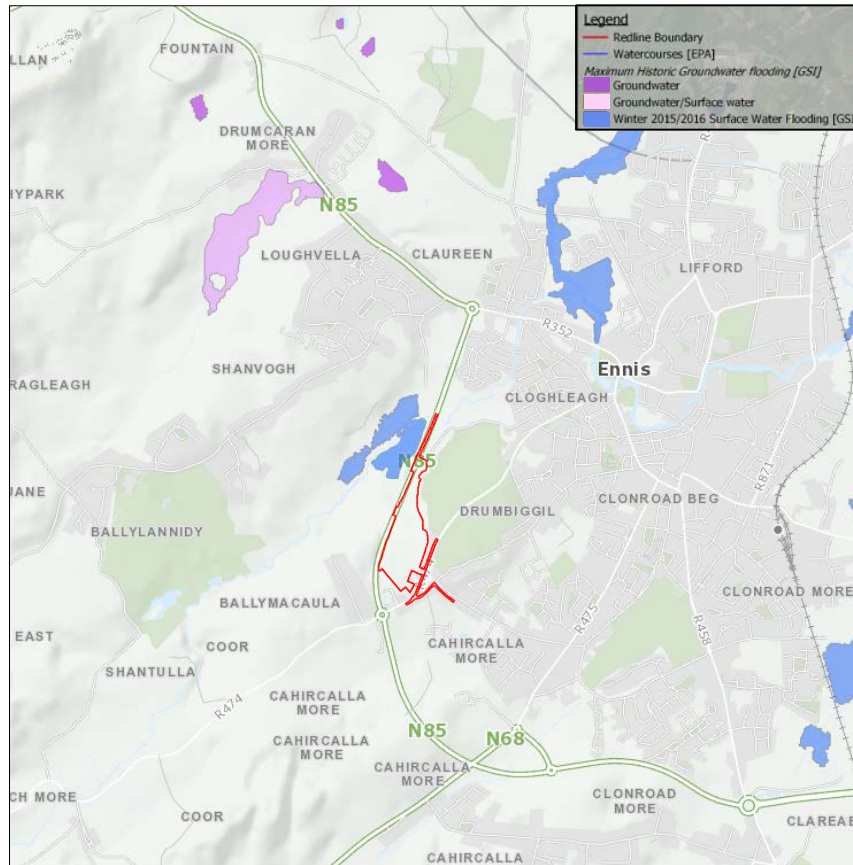
<sup>9</sup> McCormack, T., Naughton, O., Bradford, R., Companyà, J., Morrissey, P., Gill, L., Lee, M., (2020) *GWflood Project: Monitoring, Modelling and Mapping Karst Groundwater Flooding in Ireland*, Geological Survey Ireland Report



*Figure 3–9 GSI Mapping of Groundwater Flooding*

GSI further provides mapping of the historic flooding experience across Ireland in the Winter of 2015/2016. As shown in Figure 3–10, flooding was not experienced at the subject site, and was constrained to the west of the N85.





*Figure 3—10 GSI Mapping of Historic Groundwater & Groundwater/Surface Water Flooding and Winter 2015/2016 Surface Water Flooding*

## 4.0 DETAILED FLOOD RISK ASSESSMENT

The PSFRM Guidelines classify residential development as “highly vulnerable” in terms of its sensitivity to flooding. Such developments should be constructed in Flood Zone C, where there is less than a 0.1% Annual Exceedance Probability (AEP) of fluvial, pluvial, groundwater and coastal flooding.

### 4.1 Fluvial Flooding

The subject site is located approximately 2km southwest of the Ennis town centre, alongside Ennis Golf Club and the N85, adjacent to the River Claureen.

Based on the results of the Clare Strategic Flood Risk Assessment, and OPW modelling (PFRA, CFRAM) the developable area is located outside the predicted flood extents of the Claureen River (see Figure 2—3, Figure 3—3, Figure 3—5, Figure 3—6).

The proposed FFLs of the residential development ( $\geq 15.4\text{mOD}$ ) are more than 9m above the 0.1% AEP CFRAM fluvial flood levels (6.21mOD) in the adjacent River Claureen floodplain.

The subject site is located within the Claureen River catchment, and generated runoff will be discharged at greenfield runoff rates to the stormwater outfall downstream of the N85 bridge. The developable area and open attenuation pond are located outside the predicted flood extents of the Claureen River. All works within the floodplain are drainage associated, and will not impact existing ground levels, fluvial flow routes or floodplain storage.

Therefore, it is estimated that risk of fluvial flooding associated with the proposed development is minimal.

### 4.2 Pluvial Flooding

Based on the indicative pluvial flood mapping presented in the OPW Preliminary Flood Risk Assessment, it is estimated that an area along the eastern site boundary may be liable to pluvial flooding during an extreme 0.1% AEP pluvial flood event (see Figure 3—3).

Surface water arising at the site will be managed by a dedicated stormwater drainage system and on-site attenuation in accordance with Sustainable Drainage Systems (SuDS) principles. The proposed attenuation pond is located outside the predicted 0.1% AEP MRFS fluvial flood extents and has been designed such that the stormwater outfall to the Claureen River will discharge at greenfield runoff rates.

On this basis, it is predicted that the proposed development will not contribute to flood risk elsewhere in the area and will mitigate pluvial flooding within the proposed development.

The landscaping and topography of the developed site will provide safe exceedance flow paths and prevent surface water ponding to minimise residual risks associated with an extreme flood event or a scenario where the stormwater drainage system becomes blocked.

Therefore, it is estimated that risk of pluvial flooding associated with the proposed development is minimal.

### 4.3 Groundwater Flooding

Based on a review of Geological Survey Ireland (GSI) subsurface mapping of karst features, historic and predicted groundwater flooding in the area (Figure 3–8, Figure 3–10), and the PFRA study (Figure 3–3), there is no evidence to suggest liability to groundwater flooding at the proposed development site.

Karst features and areas of predicted groundwater flooding are noted in the area surrounding Ennis, however, these features are not considered to create risk of groundwater flooding at the proposed development due to their proximity to the local watercourses, which would receive runoff from groundwater before the subject site.

Therefore, it is estimated that risk of groundwater flooding associated with the proposed development is minimal.

### 4.4 Coastal Flooding

Based on previous flood studies for the area completed by the OPW (CFRAM, PFRA and ICPSS), the proposed development site is not at risk of tidal flooding during a 0.1% AEP MRFS tidal flood event, where coastal waters do not extend upstream to the vicinity of the subject site (see Figure 3–3, Figure 3–4, Figure 3–7).

The proposed FFLs of the residential development ( $\geq 15.4\text{mOD}$ ) are more than 9m above the predicted 0.1% AEP tidal flood levels (5.51mOD) in Ennis estimated by the CFRAM study in the downstream River Claureen floodplain.

Therefore, it is estimated that risk of coastal flooding associated with the proposed development is minimal.

### 4.5 The Justification Test

With reference to the PSFRM Guidelines, residential developments are classed as “highly vulnerable”, in terms of sensitivity to flooding. Such developments are considered appropriate in Flood Zone C—where there is less than a 0.1% Annual Exceedance Probability (AEP) of flooding.

Based on the findings of this Flood Risk Assessment, it is estimated that all proposed residential dwellings and access roads are appropriately located within Flood Zone C. The sequential approach, as outlined in the PSFRM guidelines, has been appropriately adopted, locating the developable area outside the area of predicted flood risk.

## 5.0 CONCLUSIONS

TOBIN Consulting Engineers were appointed by Glenveagh Homes Ltd to undertake a Flood Risk Assessment (FRA) for their proposed residential development at Drumbiggil, Ennis, Co. Clare.

The Planning System and Flood Risk Management (PSFRM) Guidelines (OPW/DoEHLG, 2009) classify residential development as “highly vulnerable” in terms of sensitivity to flooding. As such, the proposed development should be constructed in Flood Zone C, where there is less than a 0.1% Annual Exceedance Probability (AEP) of flooding.

The redline boundary of the site is approximately 11.12ha, while the developable area (8.9ha) is confined to lands appropriately zoned for development, and outside areas of flood risk. Any works outside the developable area are associated with drainage design, and all vulnerable elements are located within the developable area.

### Fluvial Flooding:

The redline boundary of the subject site is located adjacent to the Claureen River and N85 bridge. Developable areas are confined south, on existing ground with elevations ranging from approximately 13.4mOD to 31.2mOD.

Based on the results of hydraulic modelling carried out as part of the OPW’s PFRA and CFRAM programme, it is estimated that the developable area is located in Flood Zone C, where there is less than an 0.1% AEP of fluvial flooding. Given that all vulnerable infrastructure and access routes are located within the developable area, with FFLs providing more than 9m freeboard above predicted flood levels, it is predicted that fluvial flood risk to the development is minimal.

Within the redline boundary, areas adjacent to the N85 bridge are indicated as liable to fluvial flooding. All vulnerable elements, access routes, and the proposed attenuation pond are located outside the area of predicted flooding in a 0.1% AEP MRFS fluvial event. Works within the floodplain are associated with the stormwater outfall to the River Claureen, and will not impact existing ground levels. As such, the proposed development is not anticipated to impact fluvial flow routes or floodplain storage, and will not increase flood risk elsewhere.

### Pluvial Flooding:

Based on the indicative pluvial flood mapping presented in the OPW Preliminary Flood Risk Assessment, it is estimated that an area adjacent to the eastern site boundary may be liable to pluvial flooding.

Surface water arising at the site will be managed by a dedicated stormwater drainage system and on-site attenuation designed in accordance with SuDS limiting discharge from the site to greenfield runoff rates.

The landscaping and topography of the site will provide safe exceedance flow paths and prevent surface water ponding to minimise residual risks associated with extreme flooding or blockage of the stormwater drainage system, minimizing the potential for pluvial flooding.

### Groundwater Flooding:

There is no evidence to suggest groundwater as a potential source of flood risk to the proposed development site.

### Coastal Flooding:

Based on previous flood studies for the area, the proposed development site is not at risk of tidal flooding during a 0.1% AEP MRFS tidal flood event, where coastal waters do not extend upstream to the vicinity of the subject site.

Based on the findings of this Flood Risk Assessment, the proposed development is designed in accordance with the Planning System and Flood Risk Management Guidelines.

The sequential approach has been appropriately adopted, locating works within the developable area and all proposed residential dwellings and access roads within Flood Zone C.

As the developable area is located outside predicted flow paths and floodplain extents, and surface water arising at the site will be managed by a dedicated stormwater drainage system designed in accordance with SuDS limiting discharge from the site to greenfield runoff rates, it is predicted the development will not increase flood risk elsewhere.





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