



# Proposed Residential Development at Farrankelly, Delgany, Co. Wicklow



## Flood Risk Assessment

September 2019



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### Flood Risk Assessment

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# Flood Risk Assessment

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## 1. INTRODUCTION

As part of the preliminary design process, Roughan & O'Donovan Consulting Engineers has carried out a Flood Risk Assessment for a proposed Housing Scheme Farrankelly, Delgany, County Wicklow. This report has been prepared to assess the flood risk to the site and adjacent lands as a result of the proposed development.

## 2. METHODOLOGY

### 2.1 Introduction

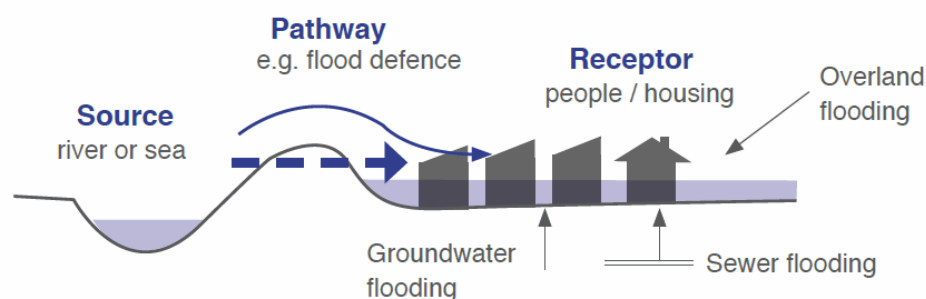
This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLLG) in 2009.

### 2.2 Definition of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model reproduced from 'The Guidelines'.



**Figure 2.1 Source-Pathway-Receptor Model**

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- Stage I Flood Risk Identification – to identify whether there may be any flooding or surface water management issues.
- Stage II Initial Flood Risk Assessment – to confirm sources of flooding that may affect an area or proposed development, 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.

- Stage III 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.

## 2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance Probability is the inverse of return period as shown in Table 2.1 below.

**Table 2.1 Correlation between return period and AEP**

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

## 2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in The Guidelines:

### Flood Zone A

Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

### Flood Zone B

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 and between 0.1% or 1 in 1000 or 0.5% or 1 in 200 for coastal flooding);

### Flood Zone C

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 plan areas which are not in zones A or B.

It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.



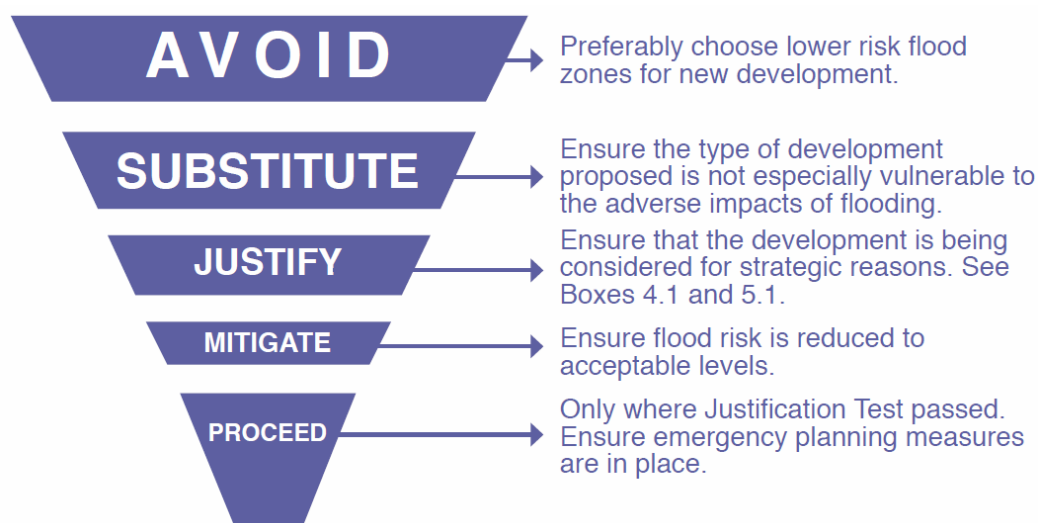
## 2.5 Objectives and Principles of the Planning Guidelines

The principal actions when considering flood risk are set out in the planning guidelines and are summarised below:

- *“Flood hazard and potential risk should be determined at the earliest stage of the planning process...”*
- *“Development should preferentially be located in areas with little or no flood hazard thereby avoiding or minimising the risk...”*
- *“Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available...”*
- *“Where development is necessary in areas at risk of flooding an appropriate land use should be selected”*
- *A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques...”*
- *“Land required for current and future flood management... should be proactively identified...”*
- *“Flood risk to, and arising from, new development should be managed through location, layout and design incorporating Sustainable Drainage Systems (SuDS) and compensation for any loss of floodplain...”*
- *Strategic environmental assessment (SEA) of regional planning guidelines, development plans and local area plans should include flood risk as one of the key environmental criteria...”*

## 2.6 The Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2.2 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.



**Figure 2.2 Sequential Approach (Source: The Planning System and Flood Risk Management)**

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. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 2.2 below illustrates the types of development that would be required to meet the Justification Test.

**Table 2.2 Matrix of Vulnerability Versus Flood Zone to Illustrate Appropriate Development and that Required to Meet the Justification Test (Source: The Planning System and Flood Risk Management)**

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

### 3. PROJECT SCOPE

The proposed development involves the construction of 426 no. of housing units broken down into 178 no. of semi-detached houses, 47 no. of town houses, 20 no. of detached houses, 88 no. of duplex houses, 3 apartment blocks with 93 no. of apartments, sport pitches and a creche with the provision of car parking spaces on the grounds to the north-west of Eden Gate and to the west of Kilcoole Road in Farrankelly, Co. Wicklow. The proposed development has a gross site area of approximately 21 hectares.

There is a proposed Greenway that is going to be located to the northern part of the site which will run by the Three Trout Stream. As part of the Greenway development a small pedestrian bridge will be constructed over the Three Trout stream. It is anticipated that this structure will be mainly built from timber, and will span the entire streambed. Details of this structure are to be agreed with Wicklow County Council. While the OPW have indicated that this structure will not require a Section 50 application, they have stated that this will only be confirmed at construction stage. However it is a requirement that the structure does not impact on the flows in the stream.

As all of the proposed development is going to be built in within the proposed boundary, the flood risk identification is to be carried out to examine if the area within the red boundary line will be prone to flooding. Then a determination will be made as to the appropriate flood zone designation for the subject site.

Site boundary with flood study areas is shown in red in Figure 3.1.



**Figure 3.1 Site Boundary**

## 4. FLOOD RISK IDENTIFICATION

### 4.1 General

This Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the vicinity of the proposed site that may warrant further investigation.

### 4.2 Information Sources Consulted

The following information sources were consulted as part of the Stage I Flood Risk Identification:

**Table 4.1 Information Sources Consulted**

Source	Comments
OPW Preliminary Flood Risk Assessment (PFRA) maps consulted	Fluvial, Pluvial, Coastal and Groundwater flooding examined; maps.opw.ie
Catchment Flood Risk Assessment and Management Study (CFRAM)	OPW mapping scrutinized
OPW flood records	www.floodmaps.ie www.floodinfo.ie
OPW drainage districts	<a href="http://maps.opw.ie/drainage/map/">http://maps.opw.ie/drainage/map/</a>
Geological Survey of Ireland (GSI) Maps	GSI Teagasc subsoils map consulted to identify if alluvium is present at development site that may indicate the presence of a watercourse and floodplain
Historical Maps	OSI Geo Hive 25" and 6" Historic Mapping

#### 4.2.1 Previous Flood Risk Assessments and Predictive Flood Maps

##### (i) OPW Preliminary Flood Risk Assessment

The PFRA is a national screening exercise, based on available and readily-derivable information, to identify areas where there may be a significant risk associated with flooding (referred to as Areas for Further Assessment, or AFA's). As part of the PFRA study, maps of the country were produced showing the indicative fluvial, coastal, pluvial and groundwater flood extents.

##### **Study Area**

The PFRA map shows that the study area has no indication that it would be prone to flooding and is considered to be in Flood zone C.

The *PFRA Maps for the area are reproduced in Appendix A.*

##### (ii) Catchment Flood Risk Assessment and Management Study

The Project area is covered within the Eastern CFRAM study area. The CFRAM programme led by the OPW, provides a detailed assessment of flooding in areas identified as AFA's during the PFRA study. Catchment wide Flood Risk Management Plans were also developed as part of the programme.

The published CFRAM mapping for the proposed development site indicates that the subject site is in Flood Zone C with no flooding events occurring in this area.

CFRAM study mapping show a more accurate model of coastal and river flooding in comparison to PFRA flooding study maps.

*The published CFRAM flood maps are reproduced in Appendix B.*

**(iii) OPW Flood Records**

The OPW National Flood Hazard Mapping Web Site, [www.floodmaps.ie](http://www.floodmaps.ie), was examined to identify any recorded flood events within the vicinity of the proposed development site.

There are no records of flooding in the vicinity of the proposed development on the OPW flood hazard website.

*The OPW Flood Hazard Mapping is reproduced in Appendix C.*

**(iv) OPW Drainage Districts**

Drainage Districts are areas where drainage schemes to improve land for agricultural purposes were constructed. Under the Arterial Drainage Act, 1945 the OPW undertook a number of arterial drainage schemes to improve land for agricultural production. The OPW has a statutory duty to maintain these schemes, which is delivered through their arterial drainage maintenance programme. The OPW does not have powers to undertake river or channel maintenance other than where these rivers form part of an arterial drainage scheme or flood relief schemes.

The drainage district maps do not indicate that the site falls within any benefited lands.

*The OPW Drainage Districts are reproduced in Appendix D.*

**(v) GSI Maps**

GSI Teagasc subsoil map was sourced from the GSI Groundwater Data Viewer, it shows the subsoil characteristics of the site of interest.

The proposed development site around Three Trout Stream is indicated to be comprised of gravels derived from sandstone, granites, quartzites and shales, and alluvium soil. Area where most of the proposed development is going to be built is comprised of till derived from Cambrian sandstones and shales and Till derived from limestones.

The subject site is located on a sloping hill, that runs down from south-westerly direction towards the river to the north. Due to the nature of the site and soils present in it, the site should not be prone to flooding.

*Refer to Appendix E for GSI maps.*

**(vi) Historical Maps**

Historical flood maps are consulted to identify if the subject site has undergone flooding previously. These historical records are usually kept by the current

responsible authority. The enclosed historical map has been prepared using GeoHive (a web-based access to authoritative Irish spatial data from multiple providers, including Ordnance Survey Ireland). No areas of flooding were indicated on the 6" Cassini or 25" maps.

*Refer to Appendix F for Historical Maps.*

#### **(vii) Mid-High Flood Extents Future Scenario**

The OPW National Flood Hazard Mapping Web Site, [www.floodinfo.ie](http://www.floodinfo.ie), was examined to identify any recorded flood events within the vicinity of the proposed development site taking into account climate change. The records show river and coastal flooding in a mid-range to high end future scenario that takes into account the potential effects of climate change.

River and coastal flood maps modelled by OPW show the potential impacts of climate change in the future of the flood extents in a mid-range future scenario that indicate the increase of rainfall by 20% and sea level rise by 500mm, while the high-end future scenario shows increase in rainfall of 30% and sea level rising 1000mm.

There is a certain degree of flooding in the lands close to the Three Trout Stream as it is a floodplain. However, as there are no dwellings proposed in the area, it would appear from the Mid-High Flood Extents Future Scenario models modelled by OPW that the area does not fall under any flooding extents in a future case scenario. Therefore the site is in Flood zone C.

*Refer to Appendix G for Mid-High Flood Extents Future Scenario*

## **5. CONCLUSIONS**

In accordance with Stage 1 of the approach outlined in the Guidelines, the possible sources of flooding associated with this development have been identified. These are summarised in Table 5.1 (taken from Appendix A of the Guidelines).

**Table 5.1 Possible Sources of Flooding Associated with the Farrankelly Site**

<b>Source</b>	<b>Pathway</b>	<b>Receptor</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
Tidal	Overland flow, out of bank	Cairn Homes Housing Scheme Farrankelly	Low Possibility	High (site near a tidal waterbody)	Low (site not indicated to be impacted by tidal flooding)
Fluvial	Overland flow, out of bank	Cairn Homes Housing Scheme Farrankelly	Low Possibility	Medium (site relatively close to river body)	Low (site not shown to be impacted by fluvial flooding)

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Surface Water	Overland flow	Cairn Homes Housing Scheme Farrankelly	Low Possibility	Medium (no reported surface water flooding at the site)	Low (if appropriate drainage system is incorporated in development and maintained appropriately)
Ground Water	Rising levels	Cairn Homes Housing Scheme Farrankelly	Low Possibility	Low (no indication of high ground water)	Low (due to well drained nature of soil)

The information provided in this section identifies that there is little a risk of Pluvial flooding at the subject site. All sources indicate that the proposed development is within Flood Zone C. Due to the proposed location of the structures within Flood Zone C, the development does not require a justification test and the development is suitable for the proposed development in accordance with the Guidelines (2009). The proposed pedestrian bridge is within flood Zone A but is deemed to be an appropriate development for this zone and hence no further report is needed.

#### 5.1 Summary Conclusion

- PFRA study flooding maps show that the application site is within Flood Zone C. Also, taking into account that CFRAM study, flood mapping cases show a more accurate flooding scenario than PFRA flood mapping cases. Therefore the subject site is deemed to be in within Flood Zone C and is very unlikely that the proposed site would flood. There is a certain degree of flooding in the lands close to the Three Trout Stream as it is a floodplain. However, as there are no dwellings proposed in the area. It would appear from the studies carried out in PFRA's and CFRAM's that any flooding would not reach the proposed development.
- There is no compensatory storage required in this particular study area.
- From the data collected and the sources that are mentioned in this flood risk assessment report, it can be concluded that the subject site will not be impacted by flooding associated with Cairn Homes Housing Scheme, Farrankelly site.

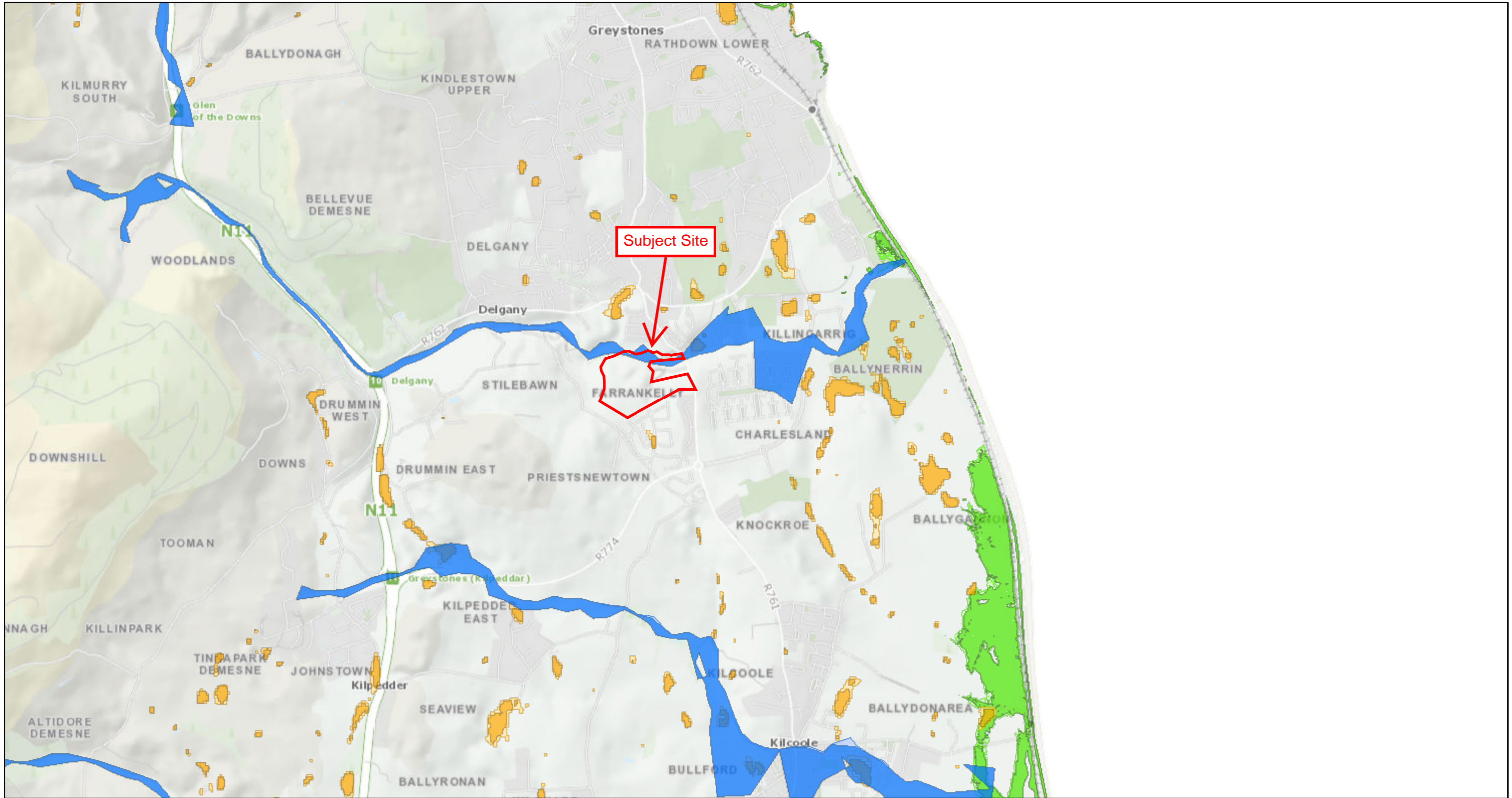












## **APPENDIX A PFRA MAPS**



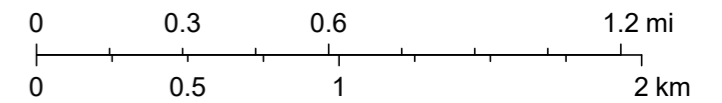
# Myplan Web Map



June 26, 2019

- |  |  |   |  |   |                           |
|--|--|---|--|---|---------------------------|
|  | Fluvial - Indicative 1% AEP (100-yr) Event |  | Pluvial - Extreme Event                      |  | Groundwater Flood Extents |
|  | Fluvial - Extreme Event                    |  | Coastal - Indicative 0.5% AEP (200-yr) Event |  | Watermark                 |
|  | Pluvial - Indicative 1% AEP (100-yr) Event |  | Coastal - Extreme Event                      |   |                           |

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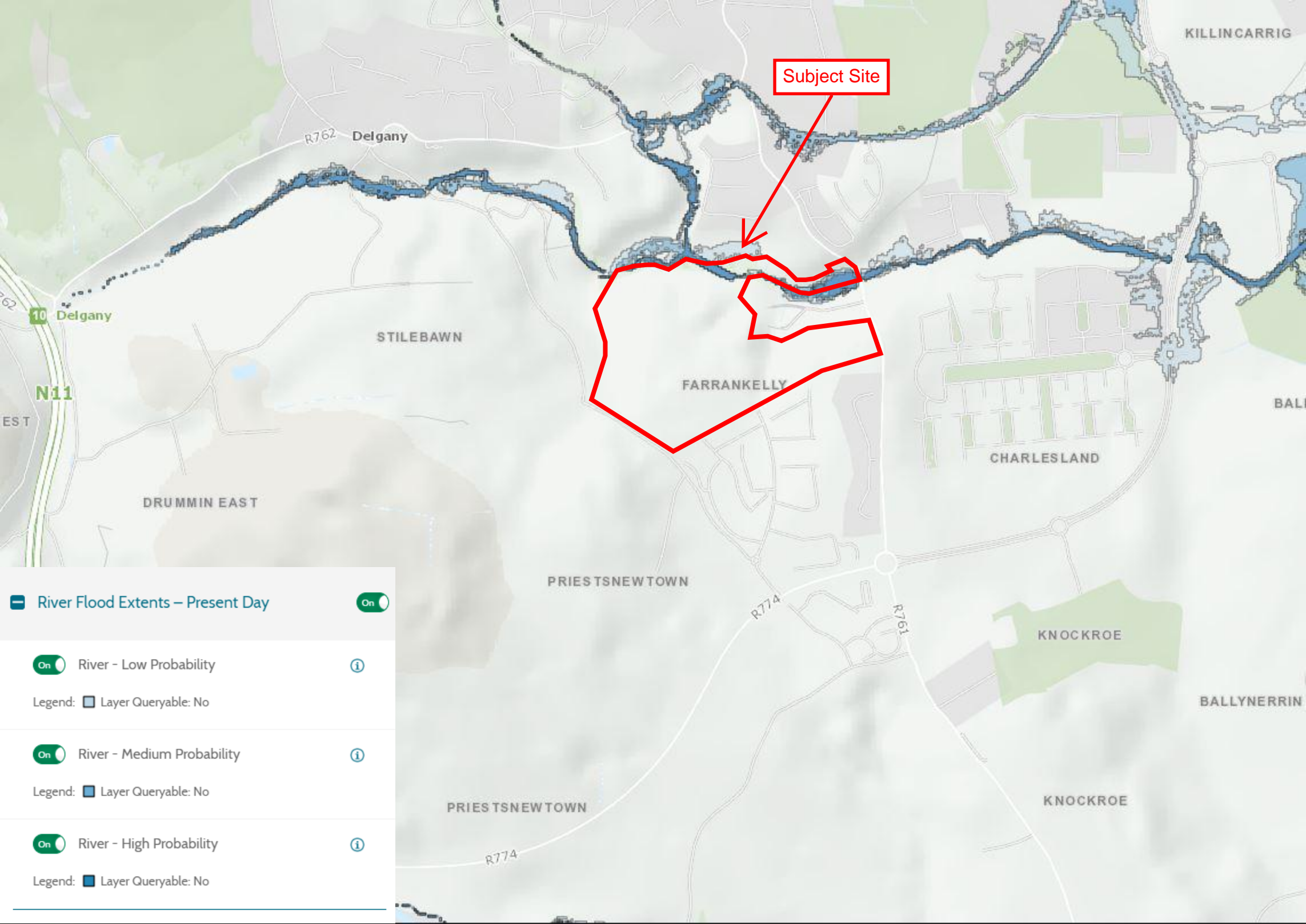


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## **APPENDIX B CFRAM MAPS**





Subject Site

River Flood Extents – Present Day

River - Low Probability

Legend:  Layer Queryable: No

River - Medium Probability

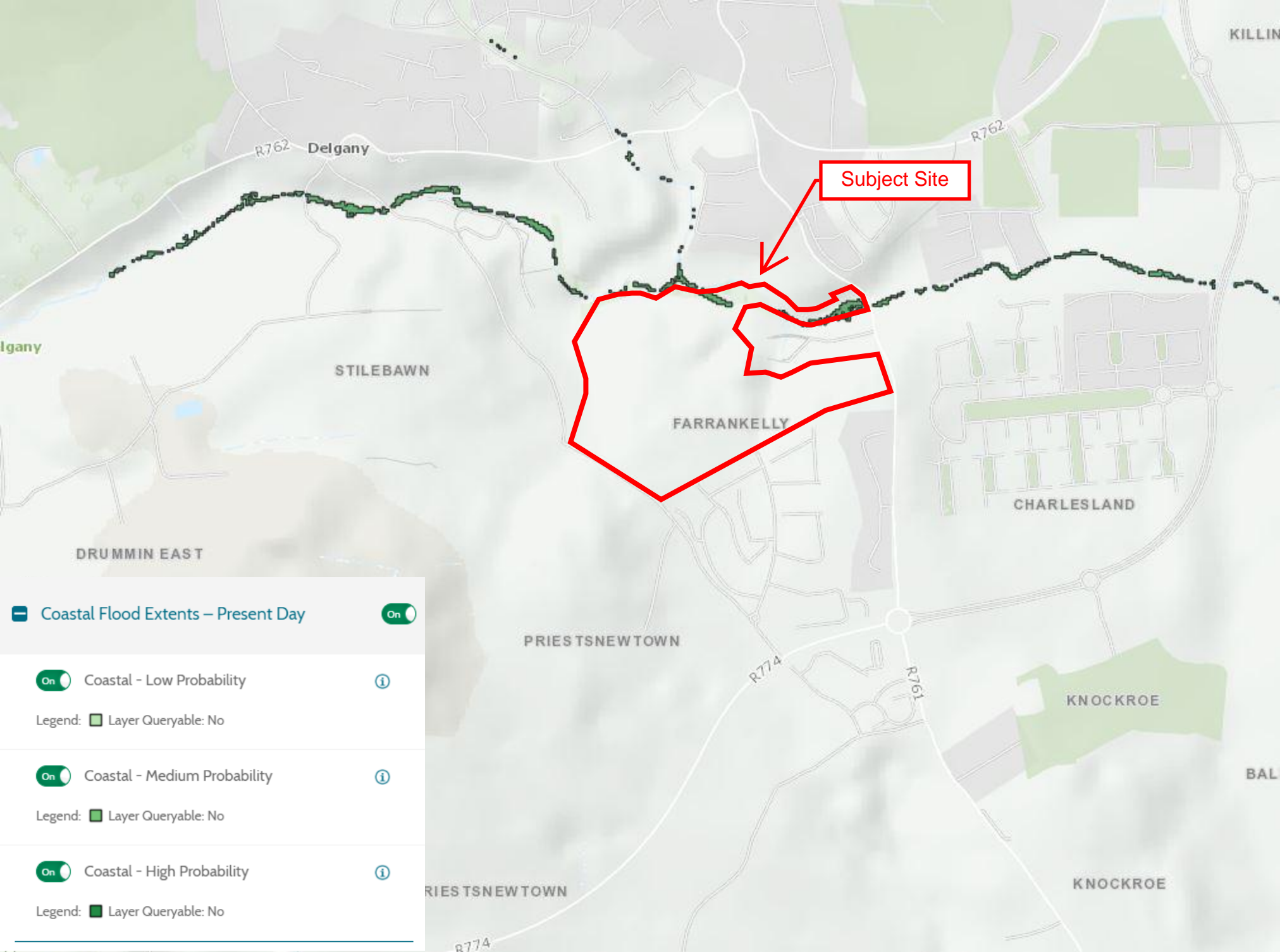
Legend:  Layer Queryable: No

River - High Probability

Legend:  Layer Queryable: No







Subject Site

STILEBAWN

FARRANKELLY

CHARLESLAND

DRUMMIN EAST

PRIES TSNEWTOWN

KNOCKROE

PRIES TSNEWTOWN

KNOCKROE

Coastal Flood Extents - Present Day

On

Coastal - Low Probability

i

Legend: Layer Queryable: No

Coastal - Medium Probability

i

Legend: Layer Queryable: No

Coastal - High Probability

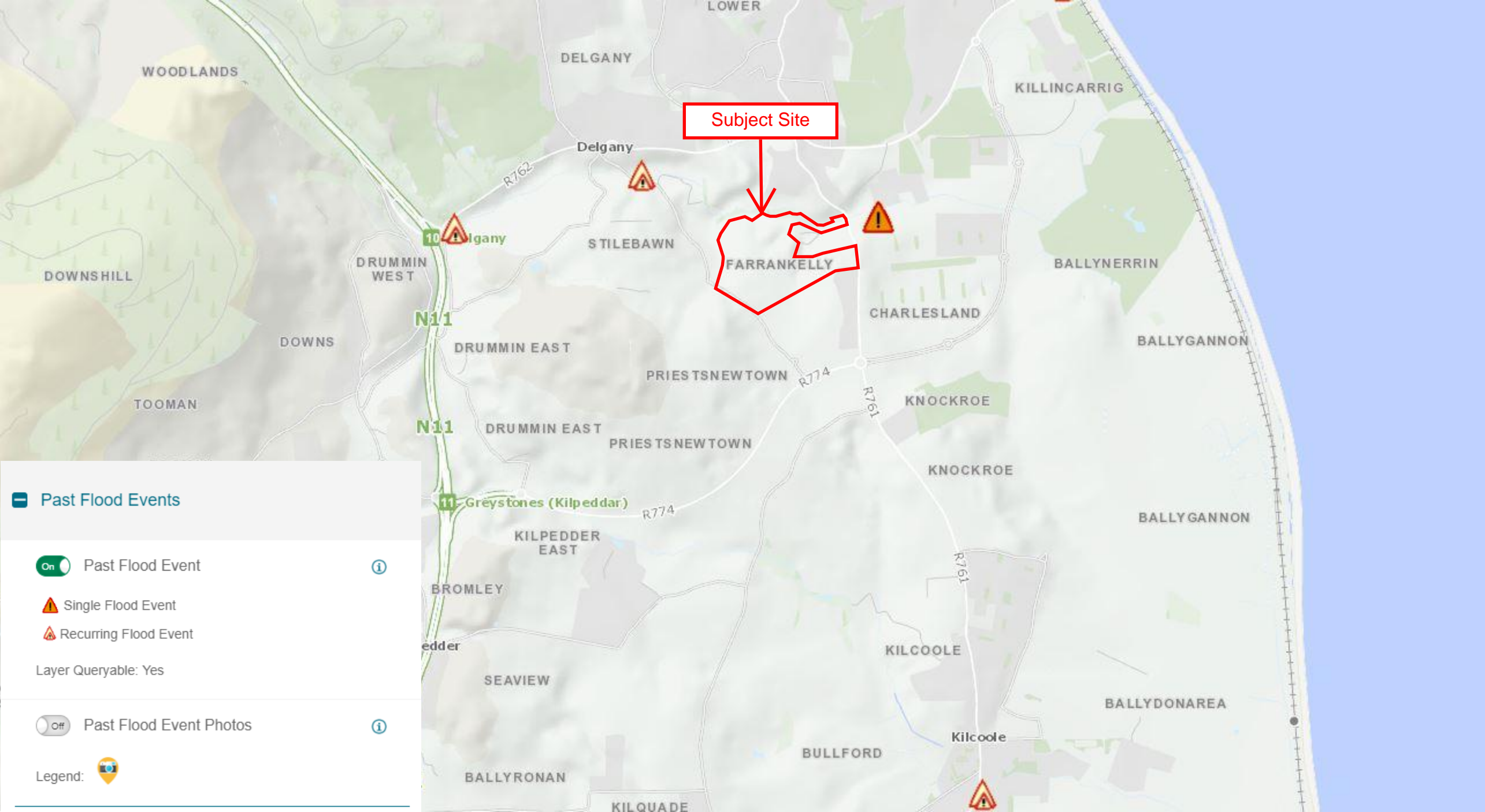
i

Legend: Layer Queryable: No



## **APPENDIX C OPW FLOOD RECORDS**





Subject Site

FARRANKELLY

**Past Flood Events**

Past Flood Event ⓘ

- Single Flood Event
- Recurring Flood Event

Layer Queryable: Yes

Past Flood Event Photos ⓘ

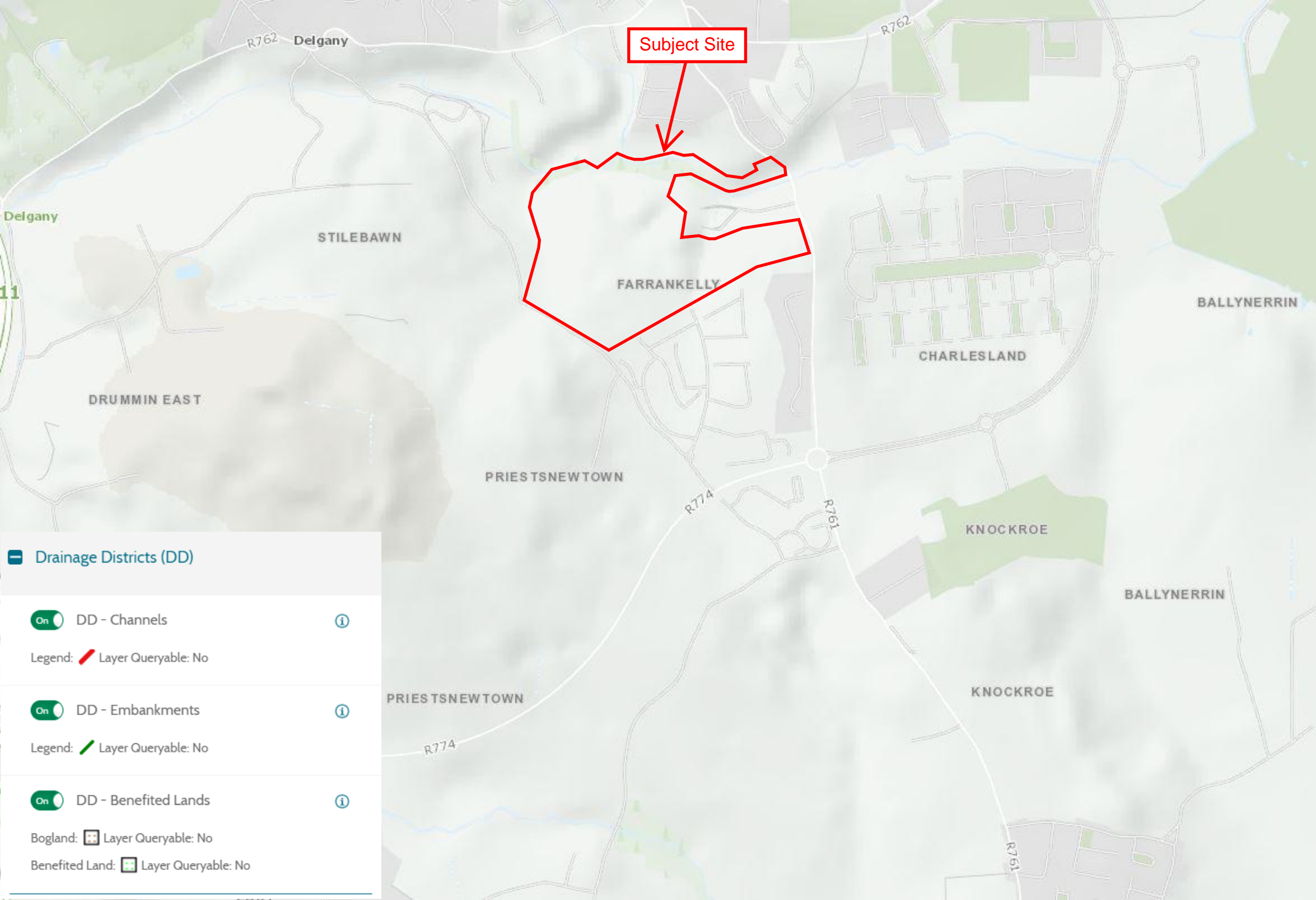
Legend:



## **APPENDIX D OPW DRAINAGE DISTRICTS**











Subject Site

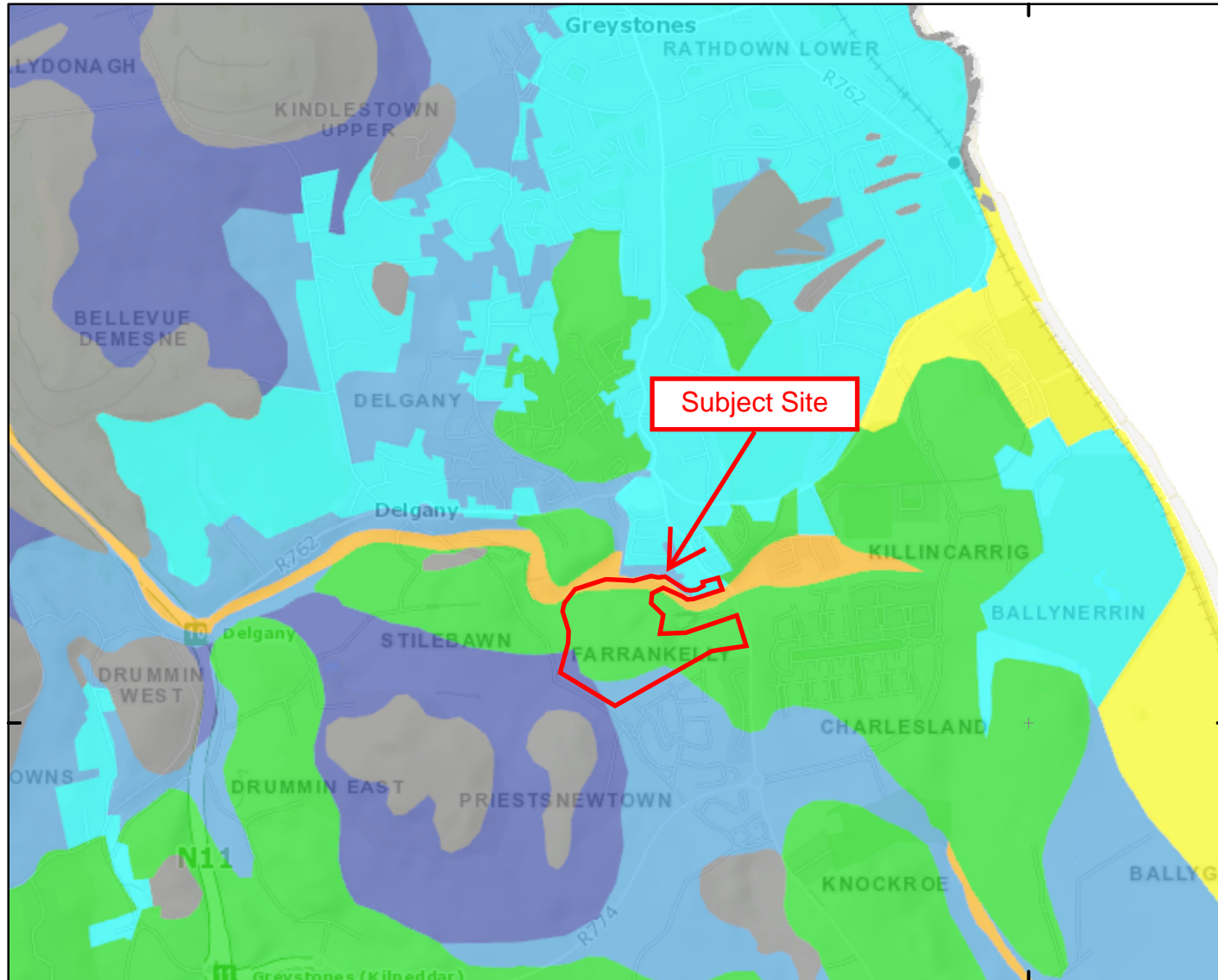
**Drainage Districts (DD)**

- DD - Channels (i)  
Legend:  Layer Queryable: No
- DD - Embankments (i)  
Legend:  Layer Queryable: No
- DD - Benefited Lands (i)  
Bogland:  Layer Queryable: No  
Benefited Land:  Layer Queryable: No



## **APPENDIX E GSI SUBSOIL MAPS**





## Legend

### Teagasc Subsoils

- A - Alluvium
- Ac - Alluvium (clayey)
- Ag - Alluvium (gravelly)
- Asi - Asi
- BktPt - Blanket peat
- FenPt - Fen peat
- RsPt - Raised peat (intact)
- Cut - Cutover raised peat
- AcEsk - Esker comprised of gravels of acidic reaction
- BasEsk - Esker comprised of gravels of basic reaction
- GBI - Gravels derived from basic igneous rocks
- GCh - Gravels derived from cherts
- GCSs - Gravels derived from Cambrian sandstones
- GCSsS - Gravels derived from Cambrian sandstones and shales
- GDCs - Gravels derived from Devonian and Carboniferous sandstones
- GDSs - Gravels derived from Devonian sandstones
- GLPDSs - Gravels derived from Lower Palaeozoic and Devonian sandstones
- GLPS - Gravels derived from Lower Palaeozoic shales
- GLPSs - Gravels derived from Lower Palaeozoic sandstones
- GLPSSs - Gravels derived from Lower Palaeozoic sandstones and shales
- GLs - Gravels derived from limestones
- GNSSs - Gravels derived from Namurian sandstones and shales
- GMp - Gravels derived from metamorphic rocks
- GGr - Gravels derived from granites
- GQz - Gravels derived from quartzites
- Rck - Bedrock outcrop or subcrop
- KaRck - Karstified bedrock outcrop or subcrop
- Scree - Scree
- L - Lacustrine sediments
- Lc - Lacustrine clays
- Ls - Lacustrine sands
- Lsi - Lacustrine silts
- Mrl - Lake marl
- MGs - Marine gravels and sands (often raised)
- Mbs - Marine beach sands
- Msi - Marine silts
- Mc - Marine clays
- Mesc - Estuarine silts and clays
- Marsh - Marsh
- TdMr - Tidal marsh
- Ae0 - Aeolian sediments
- Ws - Windblown sands
- Wsd - Windblown sands in dunes
- Made - Made ground
- IrSTAv - Irish Sea Till derived from acid volcanic rocks
- IrSTCSsS - Irish Sea Till derived from Cambrian sandstones and shales
- IrSTDsS - Irish Sea Till derived from Devonian sandstones
- IrSTLPSsS - Irish Sea Till derived from Lower Palaeozoic sandstones and shales
- IrSTLs - Irish Sea Till derived from limestones
- TAv - Till derived from acid volcanic rocks
- TBI - Till derived from basic igneous rocks
- TCh - Till derived from cherts
- TCSsCh - Till derived from Carboniferous sandstones and cherts
- TCSsS - Till derived from Cambrian sandstones and shales
- TDCSs - Till derived from Devonian and Carboniferous sandstones
- TDCSsS - Till derived from Devonian and Carboniferous sandstones and shales
- TDSs - Till derived from Devonian sandstones
- TGr - Till derived from granites
- TLPDSs - Till derived from Lower Palaeozoic and Devonian sandstones
- TLPS - Till derived from Lower Palaeozoic shales
- TLPSSs - Till derived from Lower Palaeozoic sandstones
- TLPSSsS - Till derived from Lower Palaeozoic sandstones and shales
- TLs - Till derived from limestones
- TMp - Till derived from metamorphic rocks
- TNSSs - Till derived from Namurian sandstones and shales
- TNCSSs - Till derived from Namurian and Carboniferous sandstones and shales
- TQz - Till derived from quartzites

Proposed site location

Scale: 1:25,000

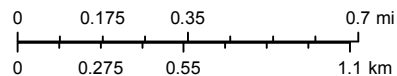
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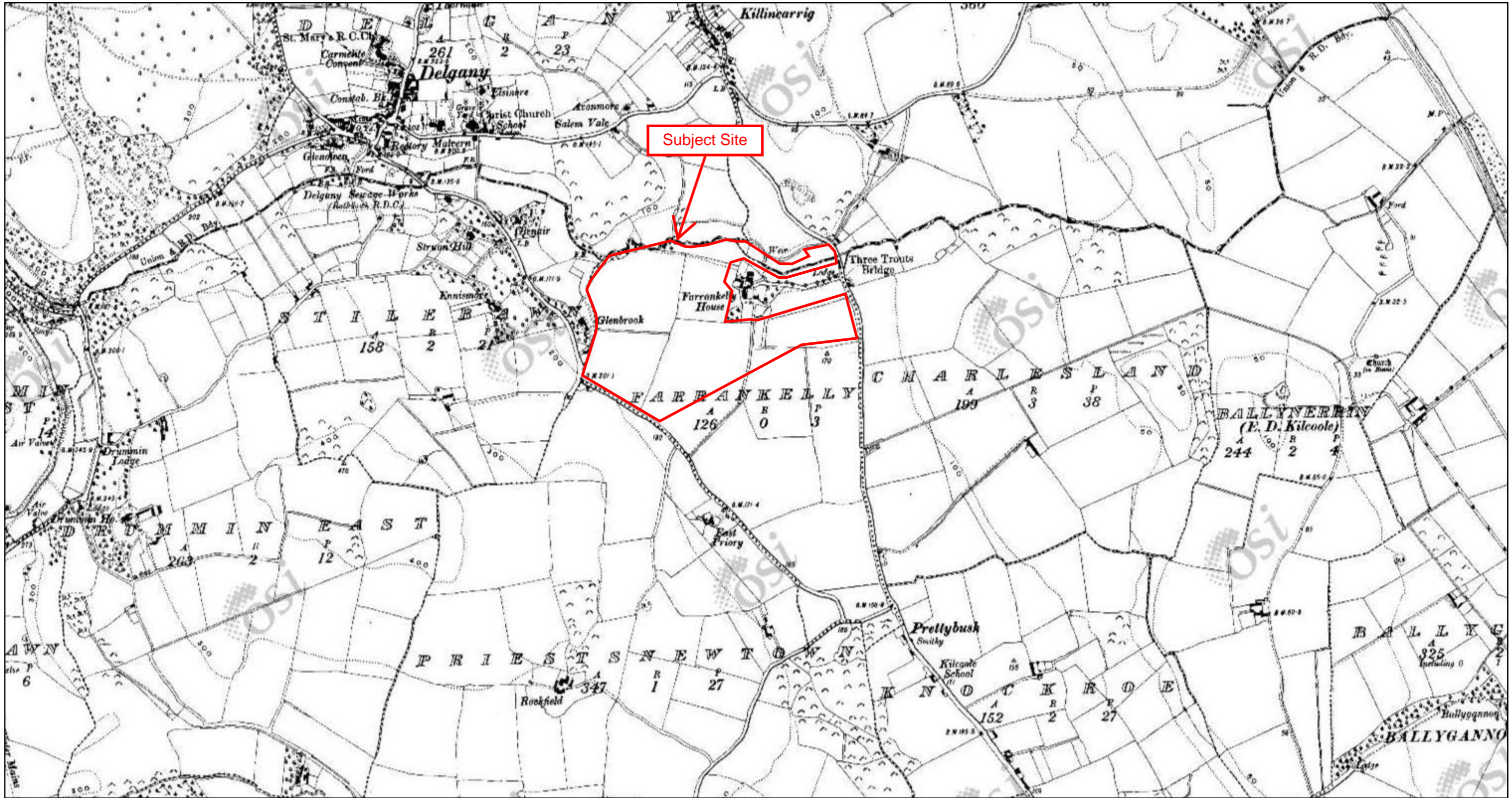


## **APPENDIX F HISTORICAL MAPS**



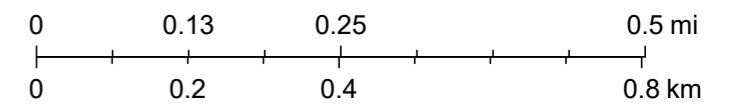


# Myplan Web Map



June 26, 2019

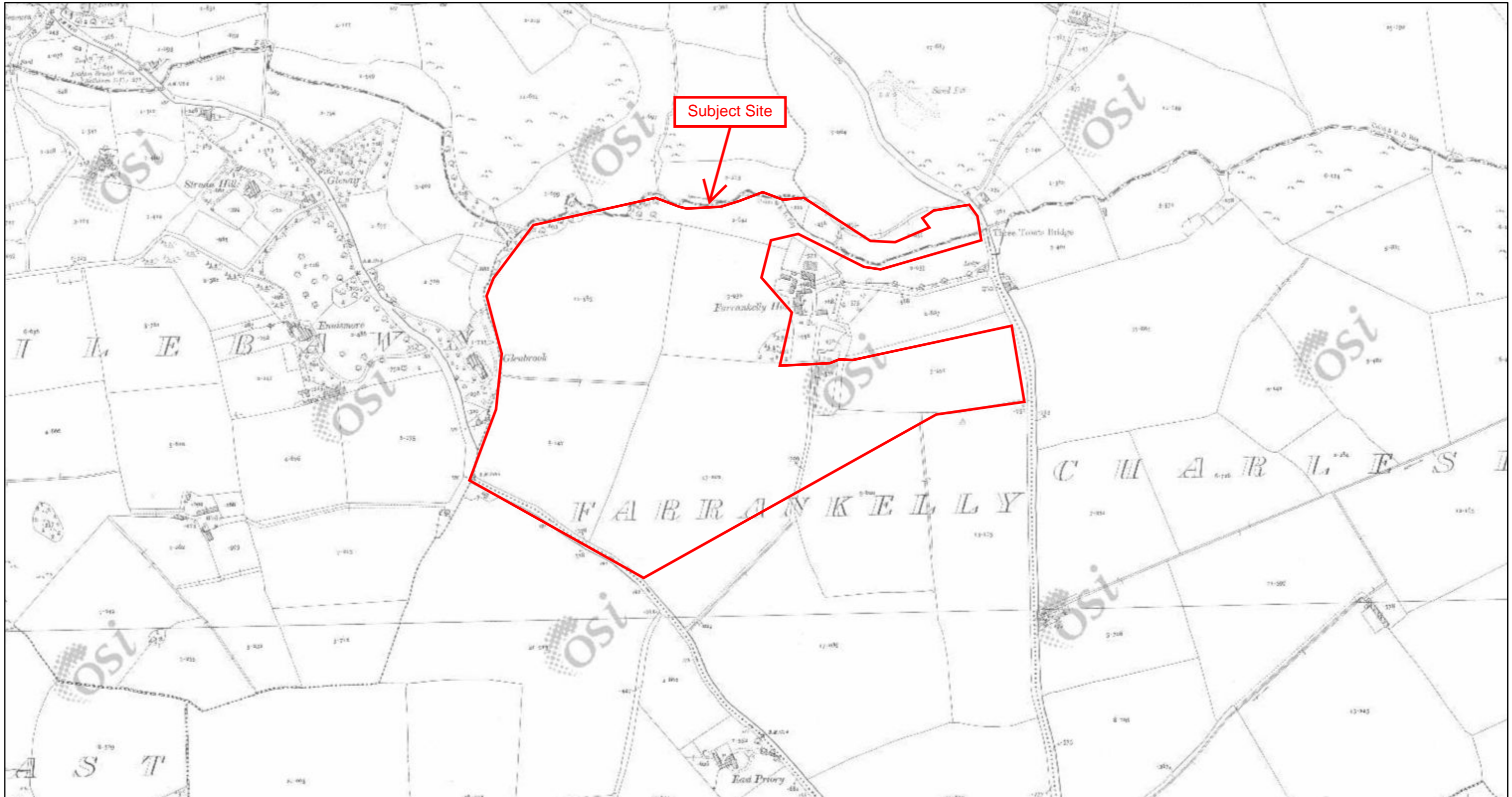
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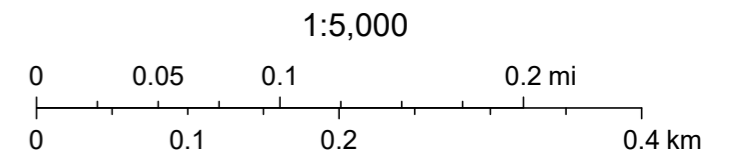
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# Myplan Web Map



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## **APPENDIX G**

### **MID-HIGH FLOOD EXTENTS FUTURE SCENARIO**



- River Flood Extents – Mid-Range Future Scenario**
  - River - Low Probability ⓘ  
Legend:  Layer Queryable: No
  - River - Medium Probability ⓘ  
Legend:  Layer Queryable: No
  - River - High Probability ⓘ  
Legend:  Layer Queryable: No
- River Flood Extents – High-End Future Scenario**
  - River - Low Probability ⓘ  
Legend:  Layer Queryable: No
  - River - Medium Probability ⓘ  
Legend:  Layer Queryable: No
  - River - High Probability ⓘ  
Legend:  Layer Queryable: No
- Coastal Flood Extents – Mid-Range Future Scenario**
  - Coastal - Low Probability ⓘ  
Legend:  Layer Queryable: No
  - Coastal - Medium Probability ⓘ  
Legend:  Layer Queryable: No
  - Coastal - High Probability ⓘ  
Legend:  Layer Queryable: No
- Coastal Flood Extents – High-End Future Scenario**
  - Coastal - Low Probability ⓘ  
Legend:  Layer Queryable: No
  - Coastal - Medium Probability ⓘ  
Legend:  Layer Queryable: No
  - Coastal - High Probability ⓘ  
Legend:  Layer Queryable: No

