

Cork County GAA Board

# Proposed Residential Development at Kilbarry, Cork

## Flood Risk Assessment

June 2022



# Document Control Sheet

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## APPENDIX 1: FLOOD MAPS REPORTS

## SECTION 1: Introduction

### 1.1 General

J. B. Barry and Partners Limited was commissioned by Cork County GAA Board to undertake a site-specific Flood Risk Assessment (FRA) in respect of an SHD planning application for a proposed residential development at Kilbarry, Cork. The aim of the FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development.

The FRA has been carried out in accordance with 'The Planning System and Flood Risk Management Guidelines' (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW).

The proposed development site is located in Kilbarry, approximately 3km north of Cork city centre as shown in *Figure 1-1* below.



**Figure 1-1: Location of Proposed Development (Source: Google Maps, annotation by J.B. Barry & Partners)**

### 1.2 Proposed Development

The proposed development will consist of the construction of 319 No. residential units and associated ancillary site works. *Figure 1-2* below shows the proposed development site layout. The site falls significantly from south to north.



**Figure 1-2: Proposed Development Site Layout**

## SECTION 2: Flood Risk Assessment Methodology

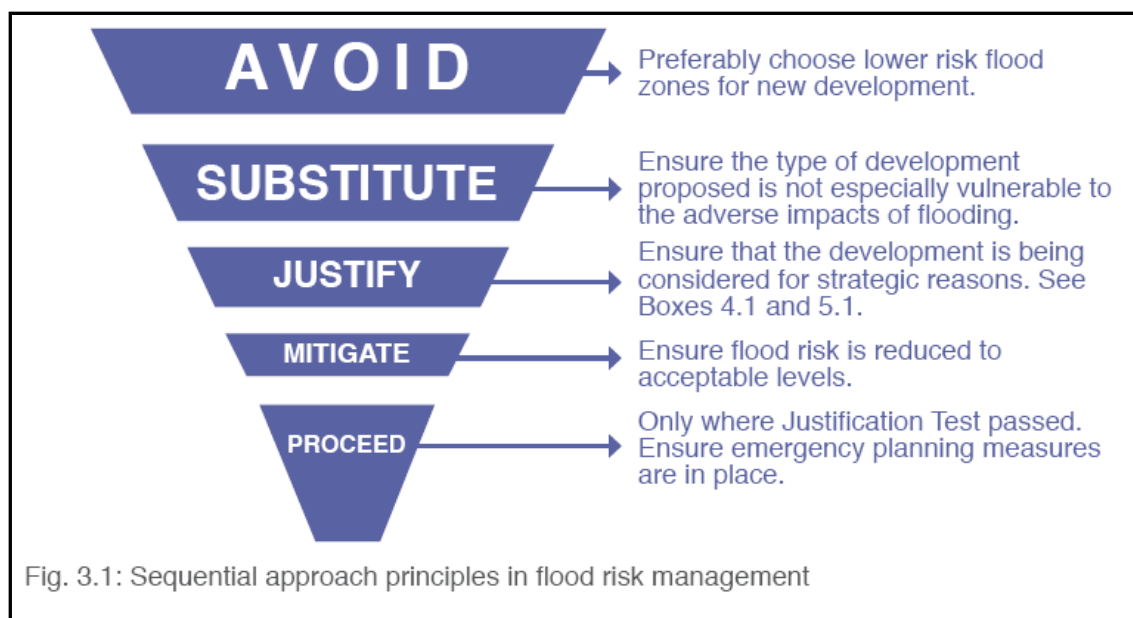
### 2.1 Methodology

The methodology used for the flood risk assessment for the proposed development is based on 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009)'. The FRM Guidelines require the planning system at national, regional and local levels to:

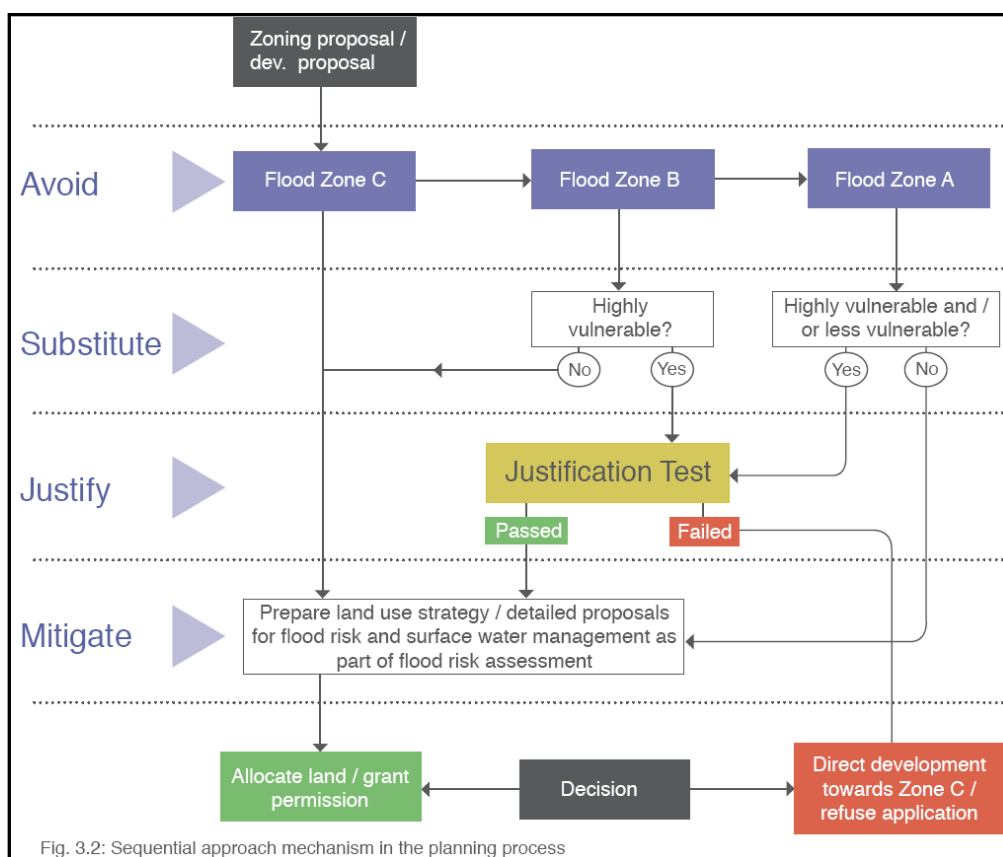
- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 3.1 of the FRM Guidelines below) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.



While Figure 3.1 of The FRM Guidelines sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 3.2 of the Guidelines (shown below) describes the mechanism of the sequential approach for use in the planning process.



According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. 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 Flood Zones, namely,

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year for river flooding or 0.5% 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% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Flood Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Table 3.1 of the FRM Guidelines (see below) shows the classification of the vulnerability to flooding of different types of development.

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

Table 3.1 Classification of vulnerability of different types of development

Table 3.2 of the FRM Guidelines (shown below) identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since dwelling homes are classified as 'Highly vulnerable development' the section highlighted in Table 3.2 presents the required actions for each 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

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.



The FRM Guidelines (Chapter 2) outlines the following three stages of flood risk assessment:

**Stage 1: Flood risk identification** – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.

**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 determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.

**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, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

## 2.2 Data Collection

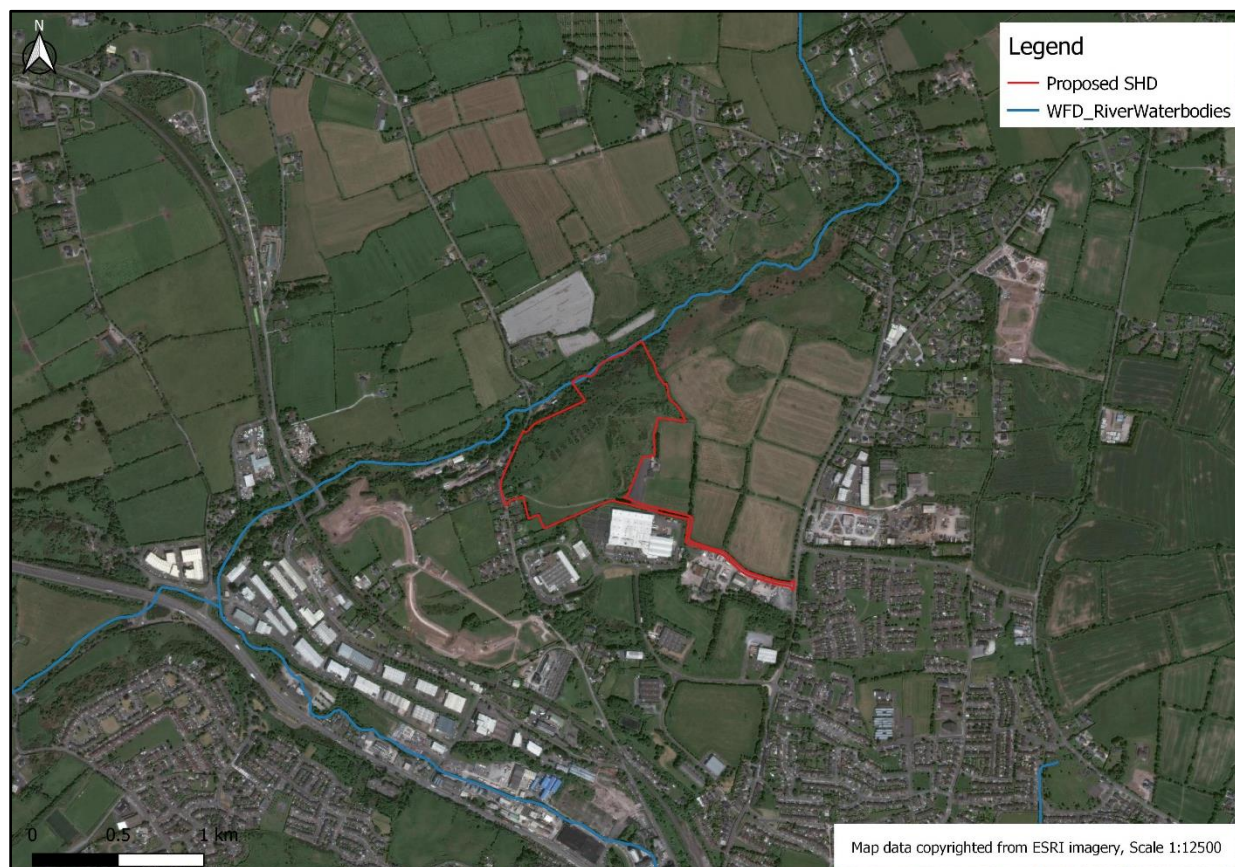
Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic flood data was obtained from the National Flood Hazard Mapping website [www.floodinfo.ie](http://www.floodinfo.ie);
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website [www.gsi.ie](http://www.gsi.ie);
- National CFRAM Study;
- Cork City Council Development Plan 2015 – 2021;
- Cork City Council Flood Maps;

## SECTION 3: Existing Hydrological Environment

### 3.1 Salient Hydrological Features

The main hydrological feature of the area is the River Bride. The River Bride is a tributary to the River Lee and flows in a south westerly direction forming the northern boundary of the site. *Figure 3-1* below illustrates the main hydrological features associated with the site.



**Figure 3-1: Hydrological Features of the Area (Source: FSU Web Portal, annotation by J.B. Barry & Partners)**

### 3.2 Existing Geology and Hydrogeology of the Area

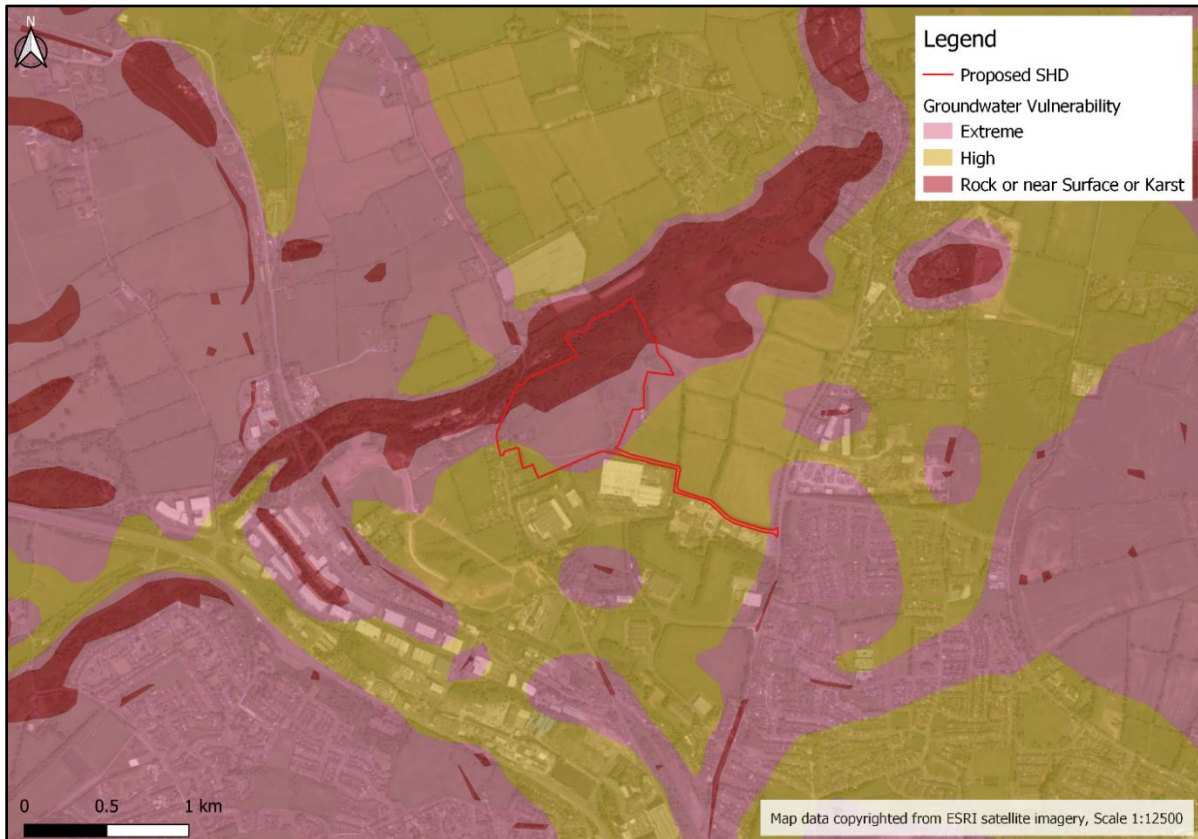
The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at [www.gsi.ie](http://www.gsi.ie) on subsoil type and aquifer vulnerability. The maps presented in *Figure 3-2* and *Figure 3-3* depict the subsoil type and aquifer vulnerability for the proposed development site. The GSI subsoil mapping (*Figure 3-2*) indicates that made ground is the dominant ground condition within the environs of the proposed development site due to the urban nature of the site. There are also traces of alluvium located at the River Bride.



**Figure 3-2: GSI Subsoil Mapping (Source: [www.gsi.ie](http://www.gsi.ie), annotation by J.B. Barry & Partners)**

Furthermore, the interactive web-mapping site classifies the aquifer vulnerability in this region as having an extreme vulnerability rating (*Figure 3-3*). The GSI state that "Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities". The GSI further describes that the vulnerability of groundwater depends on:

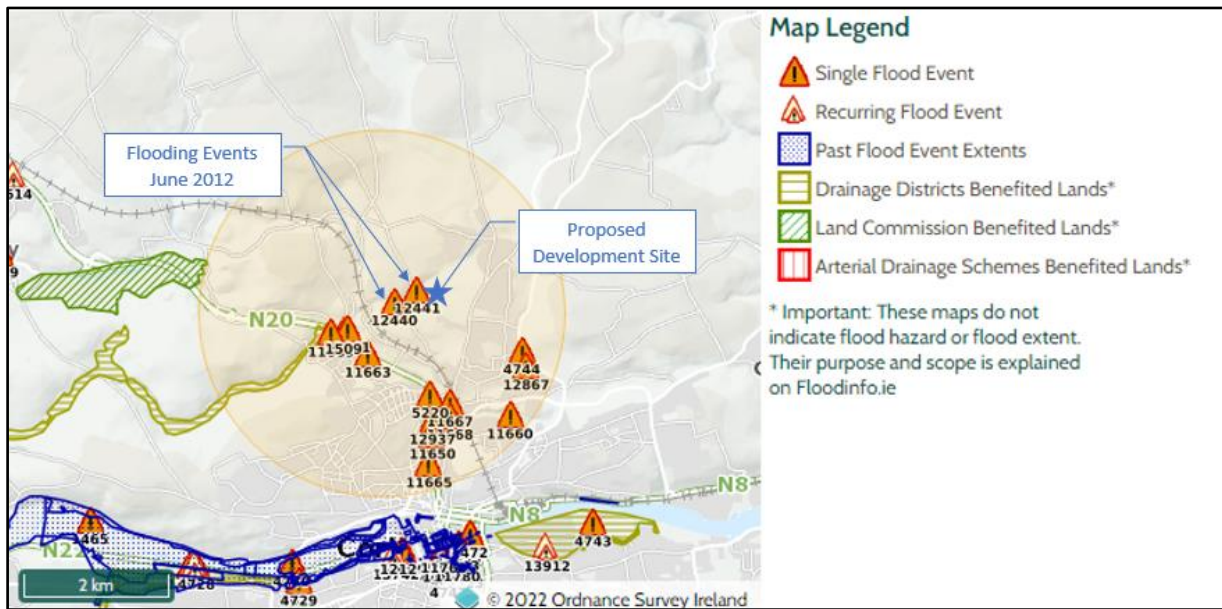
- The time of travel of infiltrating water (and contaminants);
- The relative quantity of contaminants that can reach the groundwater; and
- The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate



**Figure 3-3: GSI Aquifer Vulnerability Mapping (Source: [www.gsi.ie](http://www.gsi.ie), annotation by J.B. Barry & Partners)**

### 3.3 Flood Regime of the Area

The National Flood Hazard Mapping Website [www.floodinfo.ie](http://www.floodinfo.ie) does not show any records of historic flooding occurring at the proposed development site. However, it does show instances of flooding nearby to the site, most notably at the residential property to the northwest of the site along the Old Mallow Road in June 2012. Flooding also occurred at a commercial property approximately 350m to the west of the site on the same date. This flooding was caused by the River Bride overflowing its banks. The recorded floods within the vicinity of the site are shown in *Figure 3-4* below and reports on the flooding incidents compiled by the local authority and OPW are presented in Appendix 1.



**Figure 3-4: Location of historic flooding in the vicinity of the proposed site (Source: [www.floodinfo.ie](http://www.floodinfo.ie) annotation by J.B. Barry & Partners)**

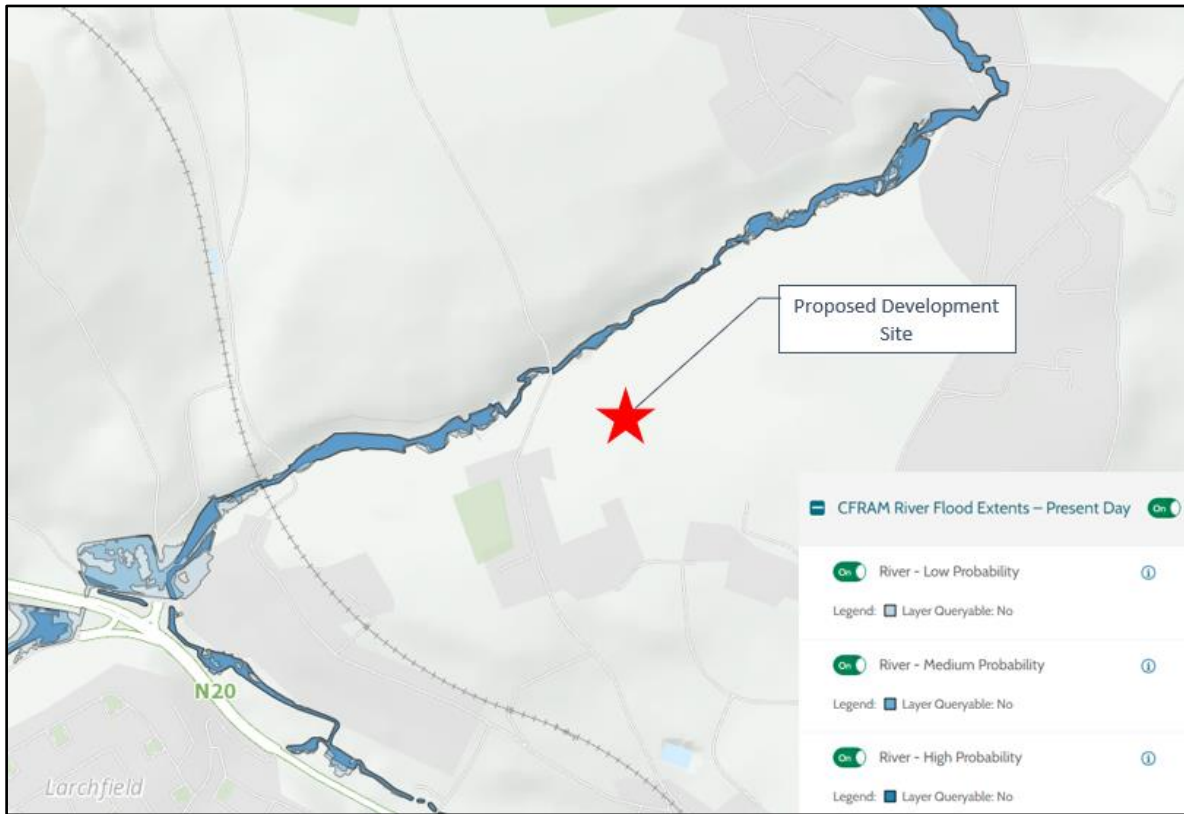
There have been instances of recurring flooding further downstream of the River Bride in Blackpool village. Floodinfo.ie has records of flooding in Blackpool as recently as 2012. The source of the flooding at Blackpool is from the River Bride. Due to the existing risk of flooding downstream at Blackpool, it is essential that surface runoff to the River Bride is not increased as a result of the proposed development.

## 3.4 Existing Flood Studies

### 3.4.1 CFRAM Study

The OPW, as lead agency for flood risk management in Ireland, is producing Flood Risk Management Plans (FRMP), in line with National Flood Policy and the requirements of the EU Floods Directive. Draft FRMP's are currently being produced by the OPW under the CFRAM Study. The Draft FRMP's make use of the information provided through the flood maps that have previously been produced under the CFRAMS Programme and previous parallel projects. The Draft FRMP's set out a range of proposed measures and actions to manage and reduce flood risk within the catchments and coastal reaches covered by each Draft Plan, focusing on the 300 areas of potentially significant flood risk around Ireland that were identified under the PFRA. The Flood Maps associated with the FRMP's are currently being finalised and will be made available online to view when the Draft Plans are published for consultation.

Figure 3-5 below is an extract from the CFRAMS website showing the flood extent concerning the proposed development site. The map shows that the flood extent of the River Bride extends to the northern most portion of the proposed development site. However, it should be noted that no proposed development will occur at this portion of the site. As seen in Figure 1-2 there is a very steep rise from the river to the remainder of the site at the northern boundary and it is intended to leave this portion of the site as green open space area. The existing ground level in the northern portion of the site where flooding is confined to is c. +50mOD whereas the existing ground level where the development is proposed is between +68mOD and +89mOD. All highly vulnerable development will be constructed outside of the River Bride 0.1% AEP flood extent and is therefore located within **Flood Zone C**.



**Figure 3-5: Extract CFRAMS Fluvial Flood Extent Map**

### 3.4.2 Cork City Council Development Plan 2015-2021

The development plan for Cork City came into effect in 2015 and it sets out Cork City Council’s policies for the development of the city to 2021 and beyond. This includes detailed planning strategy and land use zoning as appropriate for the areas of the district including Kilbarry. In accordance with best practice, Cork City Council has provided an interactive indicative flood risk mapping on a county wide basis which is included in the Local Area Plan.

An extract from the flood risk map prepared for Kilbarry is shown below in Figure 3-6. Observation of Figure 3-6 demonstrates that the northern portion of the proposed development site lies within the 1% AEP flood plain of the River Bride. This is consistent with the CFRAM flood mapping. As discussed previously, no development will occur in this portion of the proposed development site and there is a steep rise from the river to the remainder of the site. As such the development site is considered to be located within **Flood Zone C** where the risk of flooding is lowest.



**Figure 3-6: Extract from the Interactive Cork City Council Flood Risk Mapping (Source: [www.corkcoco.com](http://www.corkcoco.com), annotation by J.B. Barry & Partners)**

## SECTION 4: Flood Risk Assessment

### 4.1 Introduction

As outlined in Section 2 of this report the FRM guidelines identifies three stages of Flood Risk Assessment namely;

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

### 4.2 Flood Risk Identification

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk-based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

#### Coastal Flood Risk

The CFRAMS Map in *Figure 3-5* and Cork City Council flood maps in *Figure 3-6* both indicate that the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within **Flood Zone C** for Coastal flood risk, where the risk of flooding is low.

#### Fluvial Flood Risk

The CFRAMS Map in *Figure 3-5* and Cork City Council flood maps in *Figure 3-6* both indicate that the northern portion of the proposed development site is at risk to flooding from the River Bride. However, no development will take place at this portion of the site. All development including highly vulnerable development will occur outside of any fluvial flood extent. Therefore, the proposed development site lies within Fluvial **Flood Zone C** – low flood risk. The OPW Summary Local Area Report shows no indication of previous fluvial related flooding at the proposed site, however, there has been instances of fluvial flooding nearby and downstream to the site caused by the River Bride.

#### Groundwater Flood Risk

The aquifer vulnerability map (refer to *Figure 3-3*) classifies the site as having an 'extreme vulnerability' which indicates a high water table and hence a risk of groundwater related flooding. However, there is no historical evidence of groundwater flooding at the site. There is no indication on the maps of any springs or wells on this site. Groundwater risk is therefore not considered to be significant.

#### Pluvial Flood Risk

The OPW Summary Local Area Report shows no indication of previous pluvial related flooding at the site. During extreme rainfall events the application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network. With these mitigation measures in place pluvial flood risk is not considered to be significant.

#### Artificial Drainage Systems Flood Risk

No artificial drainage systems have been identified at the proposed site, and consequently artificial drainage systems flood risk is not relevant.



## 4.3 Initial Flood Risk Assessment

The Flood Risk Assessment has identified that there is a low flood risk to the development on site. Under the sequential approach identified in the FRM Guidelines a three-step approach is required to confirm the appropriateness of the development in terms of flood risk.

### **Step 1: Identification of the Flood Zone at the proposed development site**

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zones for each of the sites were determined.

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year for river flooding or 0.5% 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 year and 1% or 1 in 100 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year for coastal flooding); and
- **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).

As discussed in Section 4.2 above, the proposed development site lies within **Flood Zone C** – where risk of flooding is lowest.

### **Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)**

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines.

As described in Section 1.2 above, the proposed development is for residential purposes. This is classified as 'highly vulnerable development'.

### **Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development**

The proposed development site is located in Flood Zone C and is categorised as Highly Vulnerable Development. Table 3.2 of the FRM guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM guidelines) stipulate that a justification test is not required for such a development and is deemed appropriate development for the flood zone categories. *Figure 4-1* below highlights the matrix of vulnerability versus 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

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

**Figure 4-1: Matrix of Vulnerability versus Flood Zone to illustrate appropriate development**

## 4.4 Detailed Flood Risk Assessment

Following from Stage 2 – Initial Flood Risk Assessment, it was determined that there is no requirement to undertake a detailed flood risk assessment on the proposed development. The vulnerability matrix as shown in *Figure 4-1* identifies that there is no need for a Justification Test to be undertaken.

## SECTION 5: Conclusions

### 5.1 Summary of Results

A flood risk assessment for the proposed SHD at Kilbarry, Co. Cork has been undertaken in accordance with the methodology recommended in the FRM Guidelines. The following is the summary of the flood risk assessment:

- The River Bride flows in a south westerly direction and forms the northern boundary of the site. Historical flood data gathered from [www.floodinfo.ie](http://www.floodinfo.ie) has indicated that the river flooded a residence adjacent to the site and there is a history of flooding downstream of the site, however, there are no records of flooding on the site itself.
- The CFRAMS Map and Cork City Council Flood Map both indicate that the norther portion of the site is prone to fluvial flooding. However, no development will occur at this portion of the site. All highly vulnerable infrastructure will be constructed on a significantly higher part of the site where there is no risk of fluvial flooding. Therefore, the site lies within **Flood Zone C**.
- The type of development is defined as 'Highly Vulnerable Development'. Using the sequential approach mechanism, it is assessed that a justification test is not required for the proposed development.

### 5.2 Recommendations

It is recommended that no works or equipment/material storage be permitted in the northern portion of the site which is at risk to flooding. It is also recommended to provide a fence at the boundary of the site to prevent any access to the watercourse. The fence shall not be solid to allow flood waters to dissipate into the green open space provided in the event of a flood.

### 5.3 Impact of the proposed development on the existing flood regime of the area

To prevent any increased flooding at the downstream reach of the River Bride from the proposed development, it is proposed to implement SuDS measures, as discussed in detail in the Services Infrastructure Report, in order to limit the discharge from the site to the greenfield discharge rates. The implementation of these SuDS measures will ensure that there will be no increase in the risk of flooding elsewhere as a result of the development. It is therefore considered that the proposed development will have a negligible impact on the existing flood regime of the area.

# Appendix 1:

Flood Map Reports

**Prepared by:**

Engineer, OPW, South West Region Maintenance.

**Report date:**

July 4<sup>th</sup> 2012. Amended July 10<sup>th</sup> 2012.

**Summary.**

This report relates to flooding of a number of locations in the River Bride catchment. I visited Blackpool Village, the Commons Road, & Watercourse Road and observed the aftermath of flooding in those locations, and spoke to a number of people affected by flooding there, on the morning of June 28<sup>th</sup>. Flooding was also reported to me by personnel in Cork City Council as having occurred in Kilnap & Ballyvolane. A person I spoke to in Blackpool village reported the flooding of a number of houses in Dublin Street.

About 155 properties were affected by flooding in all of these flood events.

Further information came to my attention on July 6<sup>th</sup> relating to the events recorded in this report. A further site visit was carried out on July 9<sup>th</sup> and this led to the revision of this report

**Location of flood event.**

There are eight locations referred to in this report. All of these locations were flooded by or are located in the catchment of the Bride River (or its tributaries), to the north of Cork city. The location listed below for Balyvolane is merely intended to indicate the Ballyvolane area in general and not a specific location where flooding occurred as this is not known to me at this time. Approximate indications of the locations are as listed on the following table, using ING references.

Location Name	Easting	Northing
Commons Road (North Point Business Park Area and Kilnap Viaduct)	166,265	74,750
Commons Road (Commons Inn to Sunbeam Site)	166,550	74,400
Blackpool Village	167,450	73,250
Watercourse Road (South of O Connell Street)	167,400	72,850
Dublin Street	167,700	73,700
Ballyvolane	168,540	73,525
Spring Lane	167,700	73,520
Lower Killeens Rd. (west of Mallow Rd)	166,035	74,690

## ***Date of Flooding.***

Flooding occurred in the early hours of the morning on June 28<sup>th</sup> 2012.

## ***Sources and Causes of Flooding.***

- **Commons Road (North Point Business Park Area and Kilnap Viaduct).** Watercourse, known as the Glenamought River. The cause of flooding is believed to be the large volume of flood water being significantly in excess of the capacity of the watercourse, resulting from intense rainfall. This was exacerbated by old and new culverts on this water course which are both inadequate for the volume of water in this flood event.

Flooding of the Killeens Road (under and to the north of the N20) and the new business park to the north of the N20 (but west of the North Point Business park) may have been contributed to by the Glenamought River, as well as from a stream flowing into the area from the Rathpeacon & Killeens areas.

In the North Point Business park, flood waters entered the park as a result of over flowing upstream of the culvert under the entrance to the park (see photo later 7BR1\_0). Some flow may have entered the park from the public road outside the entrance which might have been a combination of pluvial run off and run off from the Glenamought River which overflowed its banks upstream of the next culvert upstream from the entrance to the park (see further photo later 7BR1\_91). It is clear from flood debris on the boundary fence between the park and the Bride River that flow was from the park to the river and not vice versa.

- **Commons Road. (Commons Inn to Sunbeam Site).** Primarily from the River Bride, possibly with some contribution from surface water run off, or overflow from storm water retention tanks from Fair Hill (as labelled on OSI Discovery scale mapping). The cause of flooding is believed to be the large volume of flood water being significantly in excess of the capacity of a small two arched bridge under Fitz's Boreen, possibly with some contribution from surface water run off from Fair Hill to the west. This caused the flooding of one large commercial premises (a hotel). Downstream of that, the Commons Road itself flooded, and it was the overflowing of the footpaths on the road, possibly worsened by traffic on the road, that caused flooding of residential properties. I was advised by occupiers of the residential properties that The Bride river did overflow its banks adjacent to the properties, but it did not flood as far as the buildings on the properties themselves.

However, closer to the city in the flood extent here, persons advised that commercial properties were flooded both from the road and from the river. It is clear from debris marks on the ground that the River Bride overflowed its banks in this area, commencing at a point about 260m downstream from Fitz's Boreen

- **Blackpool Village.** Flooding was from the River Bride. The cause of flooding is considered to be culverts both at Orchard Court and south of Blackpool Church that were not capable of conveying the flood waters in the Bride River. It is not considered that there were any blockages in these culverts during the flood. This opinion is based on video footage of the flood at both culverts that was made available to me by a member of the public as well as a discussion with senior engineer who witnessed the floods at these locations at what is believed to be about the time of the peak flood level. The video footage was recorded about 5.00am to 5.20 am while the engineer witnessed the flooding at about 4.00am to 4.30am. (It is possible that flooding here could have been contributed to by the flow from Spring Lane along Thomas Davis Street.)

- **Watercourse Rd (South of O Connell street)**. There were two separate flooding incidents here. Firstly there was a surface water run off flood from the North Monastery Road area, and later, there was flooding of Watercourse Rd. from the Bride River that over flowed its walls and banks further north in Blackpool Village. Photographs of the Surface Water run off flood were made available to me by a member of the public and these were taken between about 1.40 am and 2.15 am. Flooding of the Watercourse road extending on to the Blackpool Bypass (North Link Road) at Brewery Corner was reported to me as having been observed at 5.30am to 5.45am.
- **Dublin Street**. Surface water runoff.
- **Ballyvolane**. Flooding was from the Glen River. The cause was reported to be pipes (Culverts) which were inadequate to convey the flow in the watercourse.
- **Spring Lane**. Flooding was observed flowing out of a commercial coal, sand & gravel yard on Spring Lane. On inspection, (believed to be about 8.00am to 9.00am) water was seen flowing from The Glen stream (also labelled as “Back Water Course” on OSI 1:5000 mapping), through a stone wall underneath a concrete capping of the wall. Given report of times of flooding elsewhere in the area, flooding could have been at a higher level earlier in the morning. Flow in this yard was described as flowing out the gate when yard staff arrived for work in the morning. It was noted that there were sandbags at doors of houses across from the entrance to this yard on Spring Lane

### ***Flood data.***

Has flooding occurred at these locations before? Where I asked this question, the answers I obtained were as follows.

**Blackpool Village**. This occasion, (June 2012) is the third or fourth time that such a flood has occurred in the past 8 to 10 years. At least one of the previous floods was exacerbated by a blockage in the culvert at Orchard Court. The church was flooded on this occasion and was flooded to a similar but slightly lower level about 10 years ago.

It was pointed out to me that on this occasion both the culverts at Orchard Court and adjacent to the church were clearly overwhelmed by the flood, but that on a previous occasion in about 2001, the culvert at the church clearly had spare capacity while the culvert at Orchard Court was overwhelmed. (It may have been the case there was a blockage in the Orchard Court culvert on the previous occasion.)

**Commons Road**. Two people I spoke to separately advised me that this was the worst flooding they had experienced at their properties in 25 years. I understood this to mean that they were occupying their properties for 25 years and this was the worst flooding they experienced in that period, rather than that they had experienced worse flooding about 25 years ago.

At the city end of the flood extent on the Commons Road personnel I spoke to there advised that flooding of the yards adjacent to the buildings had been observed before but that they had never observed flooding entering the buildings before. Peoples' period of knowledge of these properties varied from 2 years to 20 years to 30 years.

At Lower Killeens Rd, I was advised that a property there floods on average every 3 to 4 years. Generally the flood affects storage or shed type buildings on the lower part of the site, but the flood has in the past gone into the residence on the site on one occasion. A comment was made that if you can see the top of the pipe (conveying the Bride River under the Mallow road) things are ok, but if

the flood level exceeds that of the top of the pipe, the flood will be into the property.

## ***Impacts of Flooding.***

### **Property.**

Impacts on numbers of properties are estimated as listed in the following table.

<b><i>Location Name</i></b>	<b><i>Number of Properties flooded (Approximate estimate)</i></b>
Commons Road (North Point Business Park Area and Kilnap Viaduct).	2 residential and 6 Commercial
Commons Road (Commons Inn to Sunbeam Site)	12 Commercial plus about 8 Residential
Blackpool Village	About 90 total, including church.
Watercourse Road (South of O Connell Street)	About 8 total, plus an Underground car park.
Dublin Street	3 residential.
Ballyvolane	25-30 residential.
Spring Lane	1 Commercial.
Lower Killeens Rd (west of Mallow Rd.)	1 property.

### **Roads.**

Lengths of a National route (N20) and local roads or streets were flooded as apparent on the flood extents later in this report.

## ***Photographs.***

### ***Watercourse Road and O Connell Street.***

The following photographs were made available to me by a member of the public and were taken between 1.40 am and 2.15am approximately. These photographs show flooding from Surface Water run off from the North Monastery road area to O Connell Street and Watercourse Road.





View looking east towards Watercourse Rd, on O Connell Street.



View from front door of property, looking across footpath to parked cars on O Connell Street



View looking south on Watercourse Rd from junction with O Connell Street.



View looking down footpath on O Connell Street towards Watercourse Road.



View looking up O Connell Street.

### ***Blackpool Village***

The photographs below which were taken during the flood were made available to me by a member of the public and they were taken between 4.00am and 5.00am. I took the photographs showing the aftermath of the flood on the morning of June 28<sup>th</sup>.



View showing depth of flooding in a house in Thomas Davis Street, (just over 0.5m).



View showing depth of flood debris caught in railing along River Bride in Orchard Court (about 0.6m)



View showing debris indicating depth of flood at exit from Orchard Court car park to Thomas Davis Street.



Flooding on Great William O Brien Street at about 5.00am



Flooding on Great William O Brien Street at about 4.15am



Entrance to Culvert adjacent to Blackpool Church. This view is a still from a video taken about 5.00 am. I was advised by a Senior Engineer from Cork City Council that the flood at this location was observed earlier at the level of the graffiti on the headwall of the culvert (ringed in red). This would be about 1.2m above the soffit level of the culvert, or at a level of about 8.7m O.D. Malin, based on Lee CFRAMS Channel & Cross Section Survey (7BRI\_0). See following photo for clarification.



View of culvert at Blackpool Church with flood level reduced. Note staff in right of photos used to give estimation of height of Graffiti mark above soffit.



Entrance to culvert at Orchard Court. This view is a still from a video recorded at shortly after 5.00am. As with the culvert at the Church, I was advised that the flood had been observed earlier at a level of 10 blocks down from the top of the wall. See following photo.



View of entrance to Orchard Court cuvlert after flood level reduced. Red line indicates level described as observed earlier. Based on Lee CFRAMS (7BRI\_93) survey drawing this approximates to a level of about 9.4m OD Malin, and it is about 1.1m higher than the soffit level of the culvert entrance.

***Commons Road. (Commons Inn to Sunbeam Site)***

I took the following photographs late in the morning and in the afternoon of June 28<sup>th</sup>. Some photos were given to me by members of the public and this is indicated for each photo.





Photo showing tide line at about 0.27m on staff on inside of wall at exit from hotel grounds near north end of flood extent



Photo showing flood debris on far side of security fence. This is located just north of Topaz filling station. The Bride River is just the other side of the yard inside the fence, but this side of the yard with the cars.



Large culvert on River Bride to east of Topaz filling station and Mc Donalds. Note tide line in left foreground and debris gathered on right bank.



Photo showing small two arched bridge downstream of large culvert in previous photo. Note debris gathered on pipes. Based on the Lee CFRAMS Channel & Cross Section Survey (7BRI\_1425), the flood level indicated by this debris would be about 18.1m to 18.2m OD Malin, but this would be a rough estimate and would need to be surveyed before being relied on.



View along Bride River downstream from the two arched bridge on Fitz's Boreen. There were no signs of flooding visible from this bridge looking downstream.

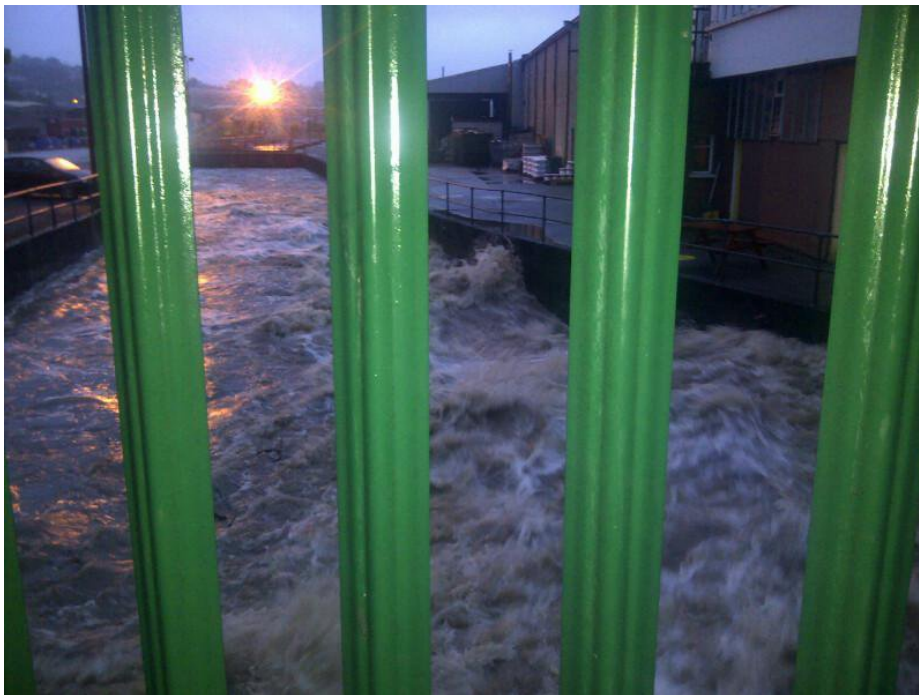


Photo given to me by a member of the public taken from the same location as the previous photo at about 4.30am or so.

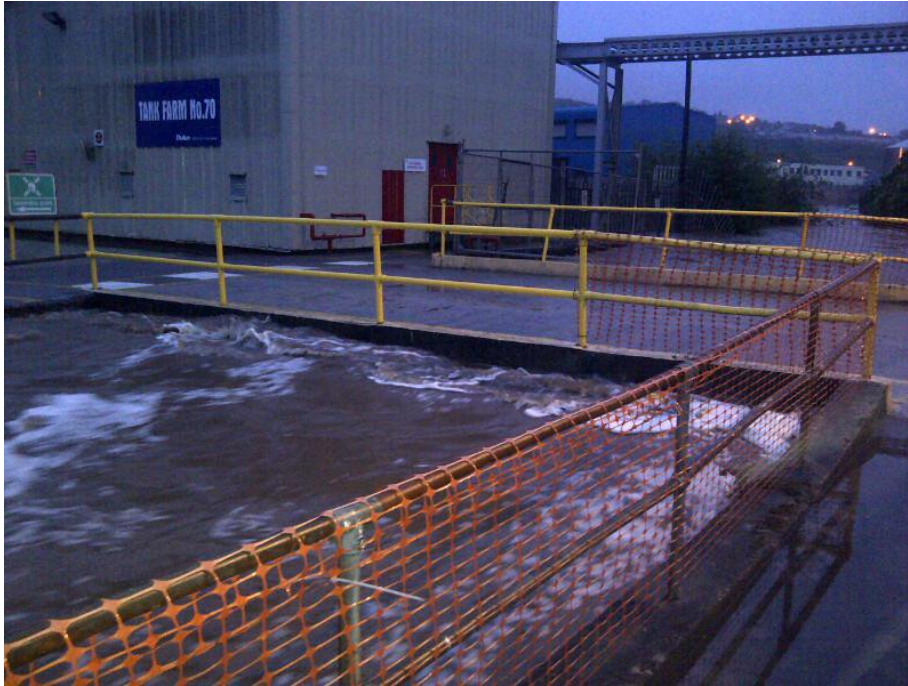


Photo given to me by a member of the public showing flood level shortly after 4.30 am. This bridge is located about 260m downstream from Fitz's Boreen. Based on the Lee CFRAMS Channel and Cross Section Survey (7BRI\_1175), the flood level here at this time is about 15.85m OD Malin

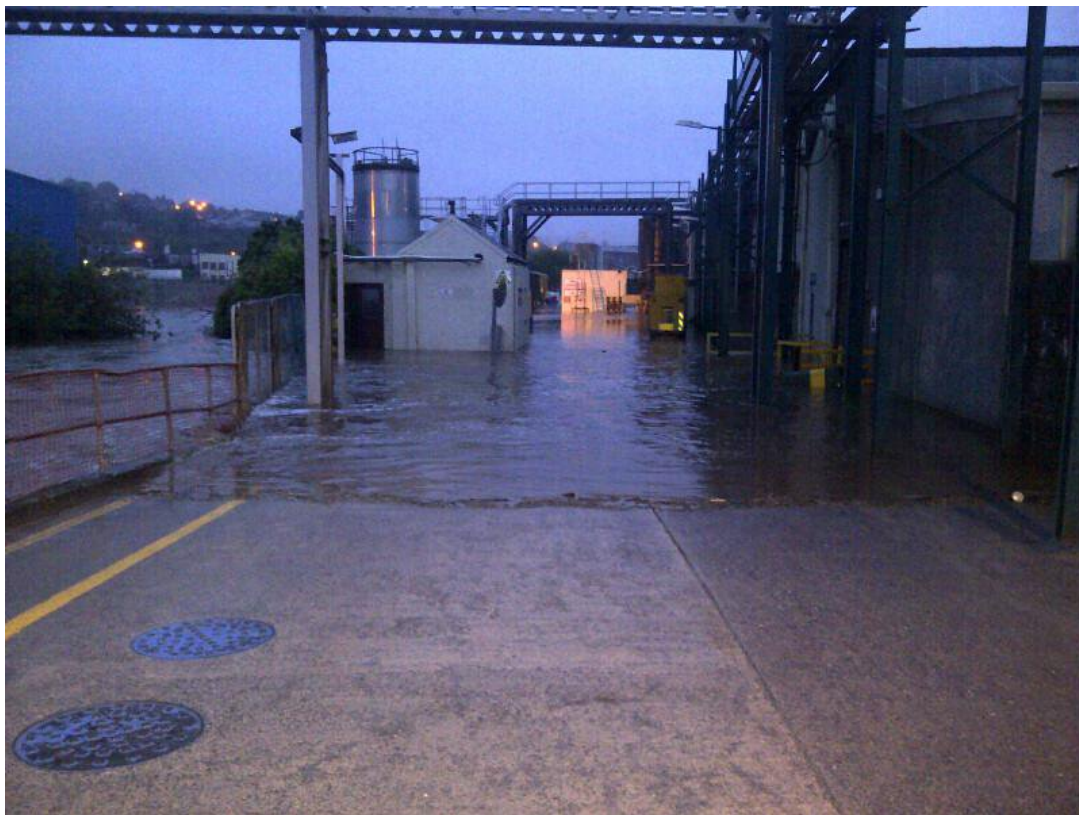


Photo given to me by a member of the public showing flood inundation on property about 10m or so downstream of bridge in previous photos.



Photo Given to me by member of the Public. Based on the Debris level in this photo & the Lee CFRAMS Channel & Cross Section Survey (7BRI\_1072), the flood level upstream of this footbridge would have been about 15.6m OD Malin. This should be regarded as a rough estimate, needing to be confirmed by survey, as the whole structure is not recorded in the Survey.



Photo looking downstream toward entrance to Culvert at Rear of Millfield Industrial Estate. Lee CFRAMS channel cross section 7BRI\_991 is just upstream of the culvert entrance beyond the trees in the photo. Estimated level of flood here about 15.7m OD Malin. Again, this to be taken as a rough estimate only.



This photo is of the bridge at the entrance to the Blackpool Shopping Centre from the Commons Road. Based on the debris mark in the photo and the Lee CFRAMS Channel Cross section and Structure Survey (7BRI\_548) the flood level here would appear to have been about 12.3m OD Malin or so.

***Commons Road (North Point Business Park Area and Kilnap Viaduct).***



Photo showing upstream side of culvert at entrance to North Point Business Park on Glenamought River. Estimated flood level, based on debris marks, shown by Red line in photo. Based on lee CFRAMS survey of this structure (7BR1\_0), flood level would have been about 24.3m OD Malin. It seems likely that flow into the North Point Business park would have been through the railing to the left of the photo.



Photo showing upstream side of culvert on private access road on Glenamought River. Based on debris observed in the area and the Lee CFRAM Structure survey (7BR1\_91), the estimated flood level, indicated by the red line is about 25.3m OD Malin. This may be conservative, (low) as there was considerable debris evident upstream along the road to the left of the picture

## ***Flood Extents.***

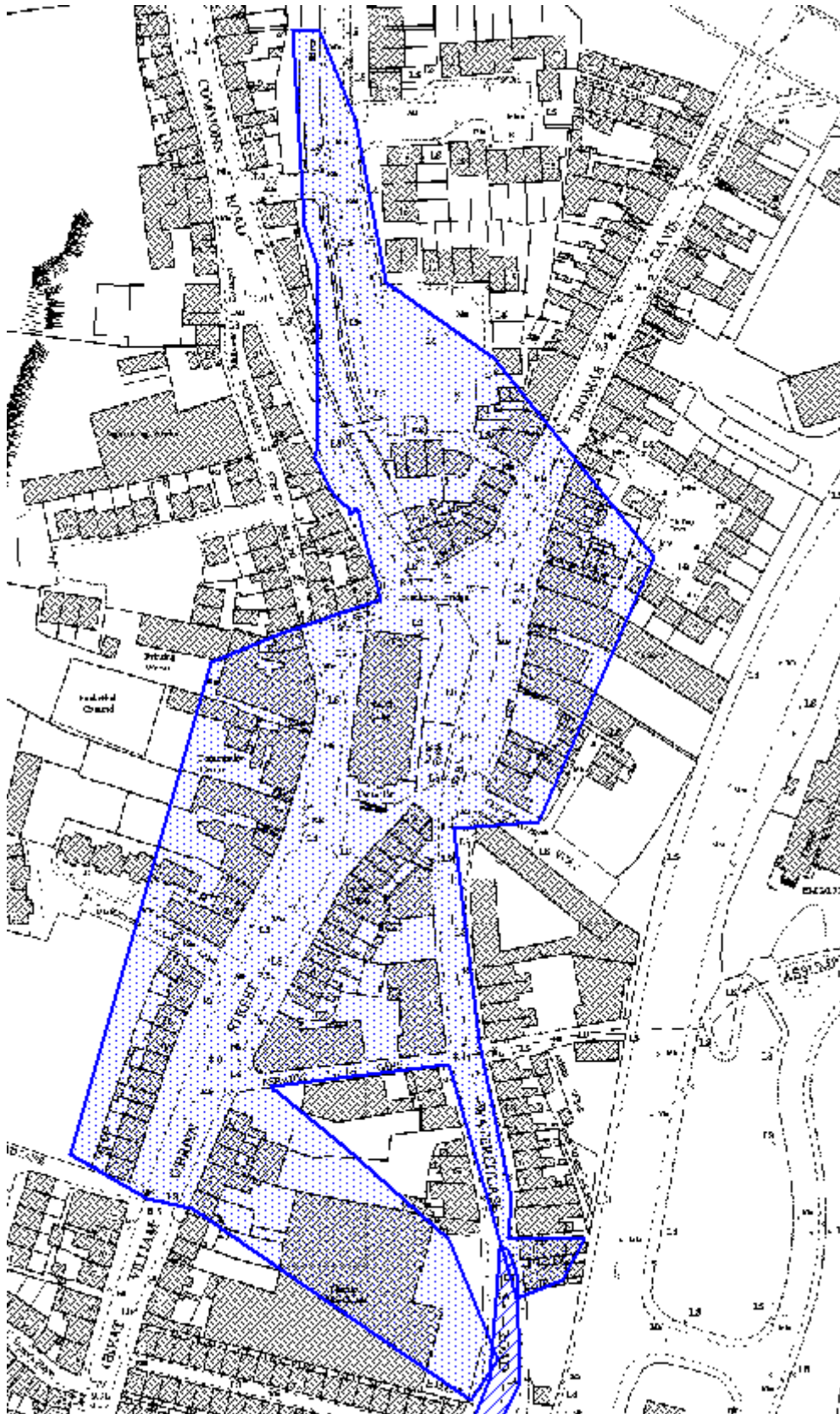
The following flood extents are intended to be indicative and merely to indicate the general broad extent of where the floods impacted on properties and roads. They are not intended to be precise indications of the extents and should not be used for surveying levels or any other similar purpose.

It should be noted that these flood extents would not be expected to be replicable by flood modelling in subsequent studies, because of their indicative nature. In most cases the actual flood outlines were not evident at the time of the site visits carried out.

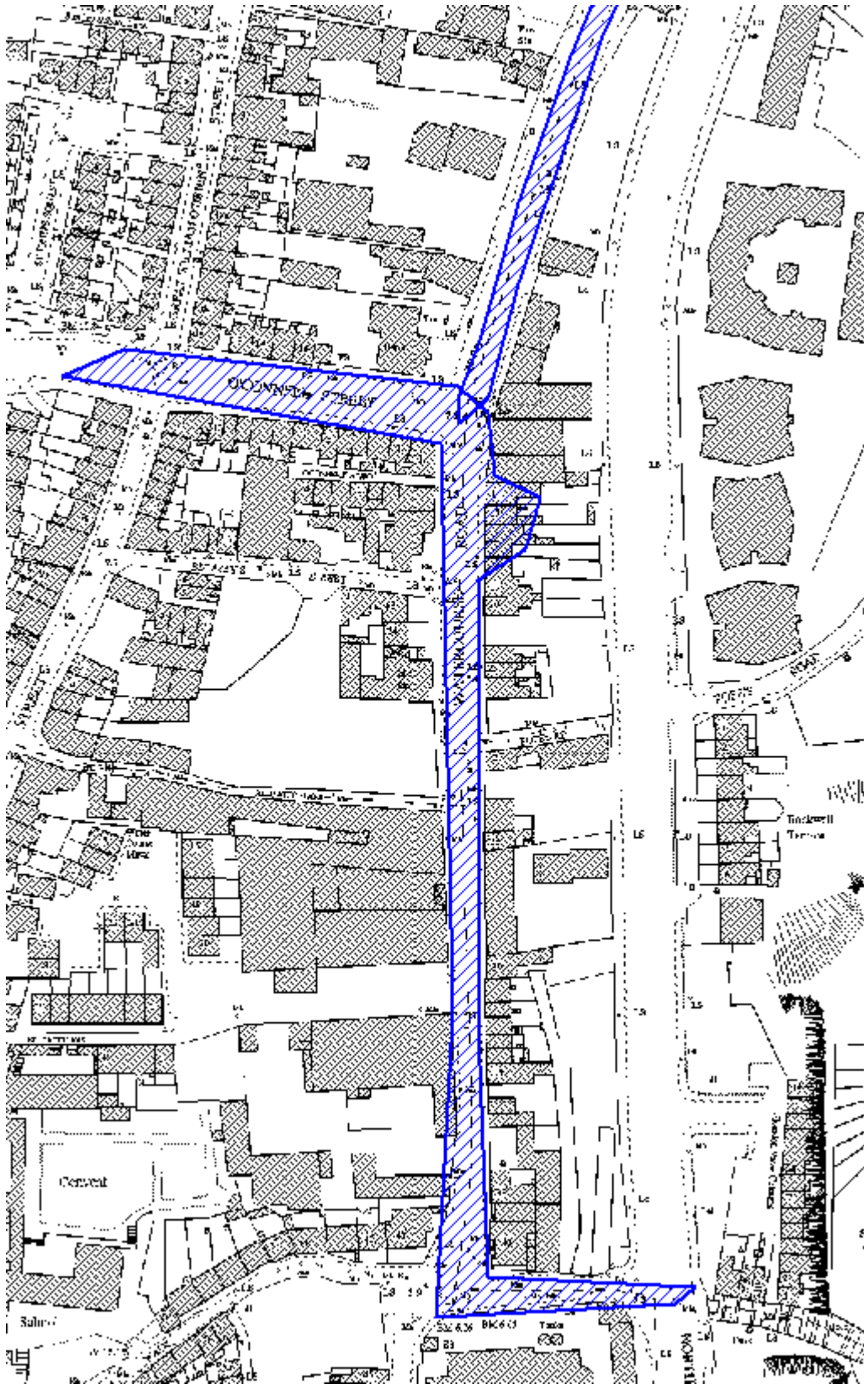
In some cases an actual extent mark was noted or pointed out during the site visits and this may be indicated in the following mapped extracts

All are indicated on OSI 1:5000 scale mapping and North is towards the top of the page.

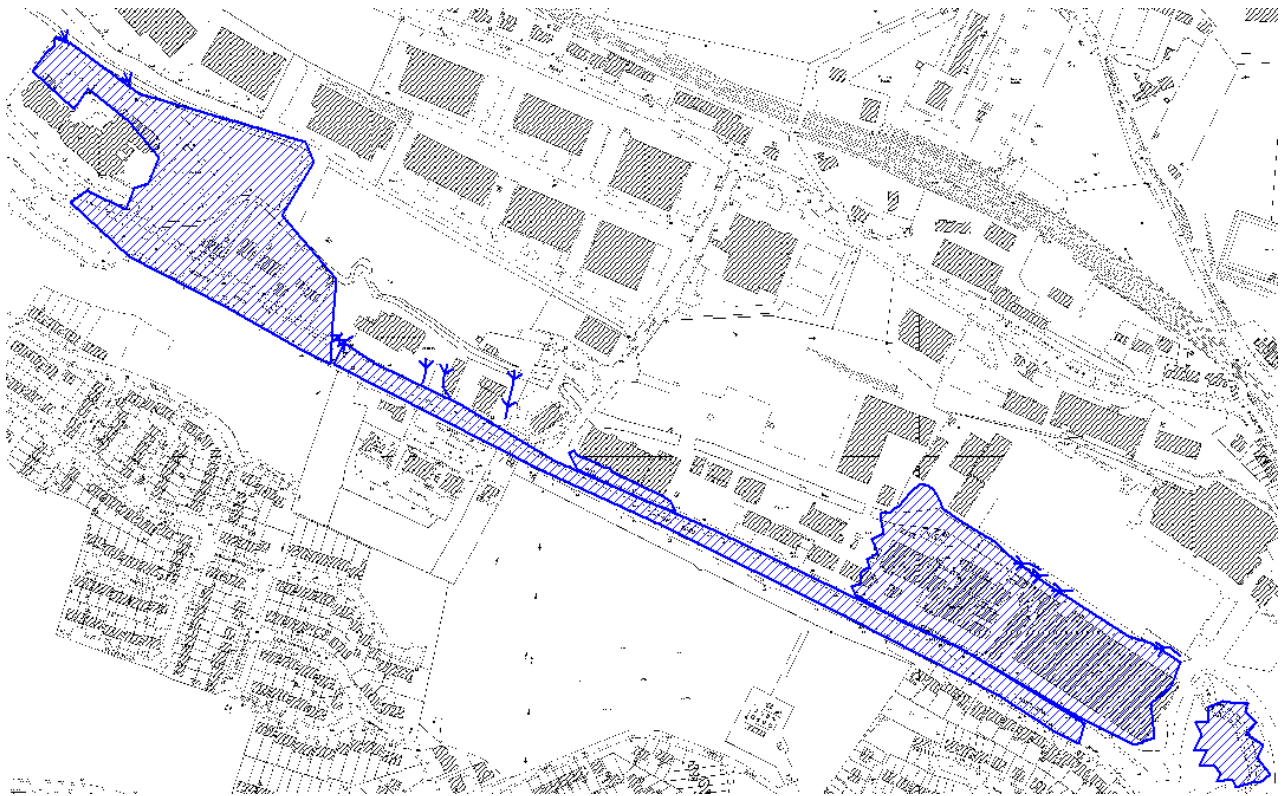




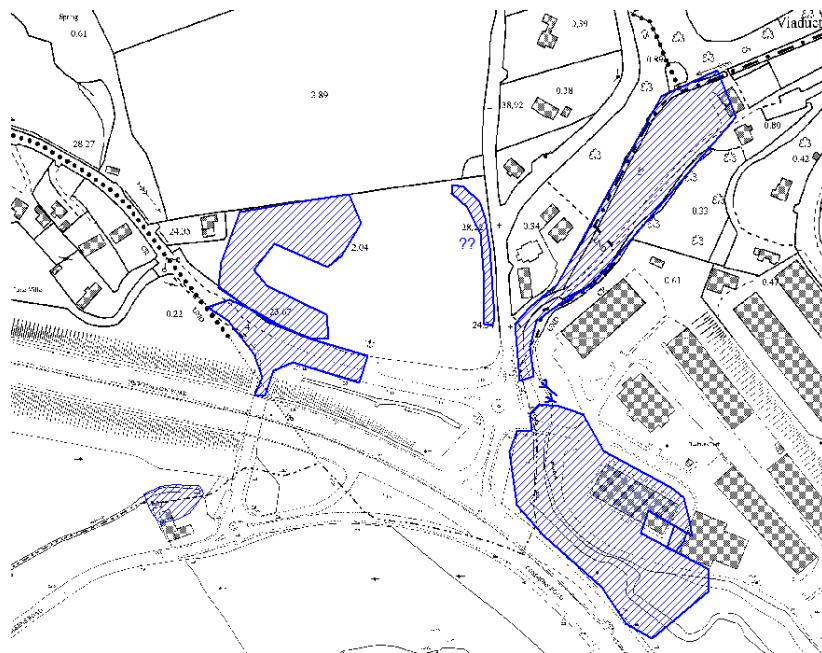
***Backpool Village. (note Extent pointed out on Great William O'Brien St. At southern end of extent as drawn)***



***Watercourse Road.***



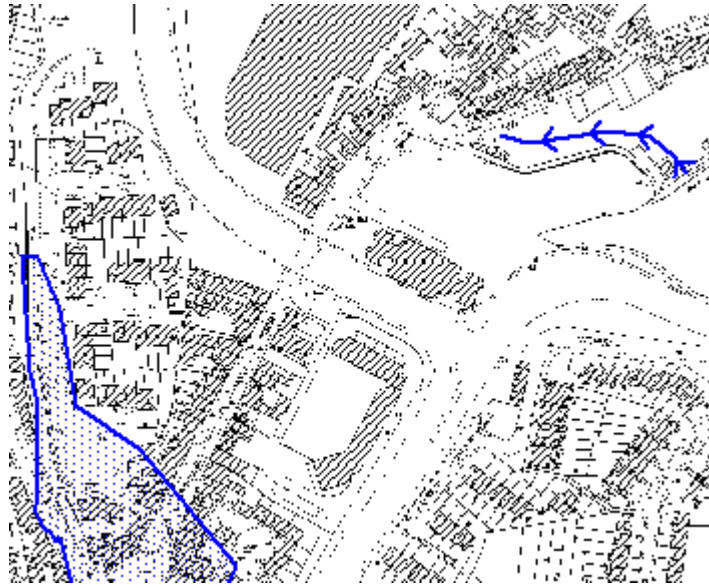
***Commons Road. (Commons Inn to Sunbeam Site)***



***Lower Killeens Road (west of Mallow road) AND***

***Commons Road (North Point Business Park Area and Kilnap Viaduct).***

**Note.** The 'C' shaped flood extent mark outline on the left, is to indicate that the flood here surrounded a building in this business park but the fluvial flood did not enter the building. The pair of question marks adjacent to the extent mark is because there was some flooding reported in this site, in the parking areas, that did not enter buildings, but no further information on the extent or location has been reported.



***Spring Lane.***

*Note: Flood route described shown by line with arrows in upper right part of extract. Extent marked in bottom left of extract is part of that shown already for Blackpool Village.*

# Flooding at Commercial Premises, Old Mallow Road, Cork 28<sup>th</sup> June 2012

The information contained in this report has been gathered by an OPW engineer who visited the affected area on April 23<sup>rd</sup> 2015.

- **Location and date of flood event:**

Location: Commercial/Industrial Premises, Old Mallow Road, Cork.

National Grid Reference:

Irish Grid Co-ordinates – 166925, 75125

The flooding event occurred on June 28<sup>th</sup> 2012

- **Source and cause:**

The source of the flood waters was a water course adjacent to the property on the north side.

- **Flood data:**

The following flood information was provided:

The member of staff who reported the flooding described the depth of flooding in the larger and most downstream premises on the site as being about 0.3m above floor level. This flood was from the river.

A wall alongside the river was undermined and collapsed and had to be rebuilt following the flood.

There have been flood events that occurred on the site previously, but these were from road surface water run off

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)	0.3m		Approx, above floor level of larger premises
Flood Flow (m <sup>3</sup> /s)			
Flood Velocity (m/s)			

- **Impacts of flooding event:**

It was recorded that this flooding event had the following impacts.

**Impacts to property:**

Residential – *None*

Community – *None*

Commercial – *One commercial/industrial premises (workshop) flooded*

**Impacts to transport infrastructure:**

Road – *n/a*

**Impacts to communications infrastructure:**

**Impacts to electrical infrastructure:**

**Impacts to gas infrastructure:**

**Impacts to water/wastewater infrastructure:**

Water supply –

Wastewater –

**Impacts to water quality and heritage:**

Water quality –

Heritage –

**Impacts to agriculture and forestry:**

- **Additional information:**

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