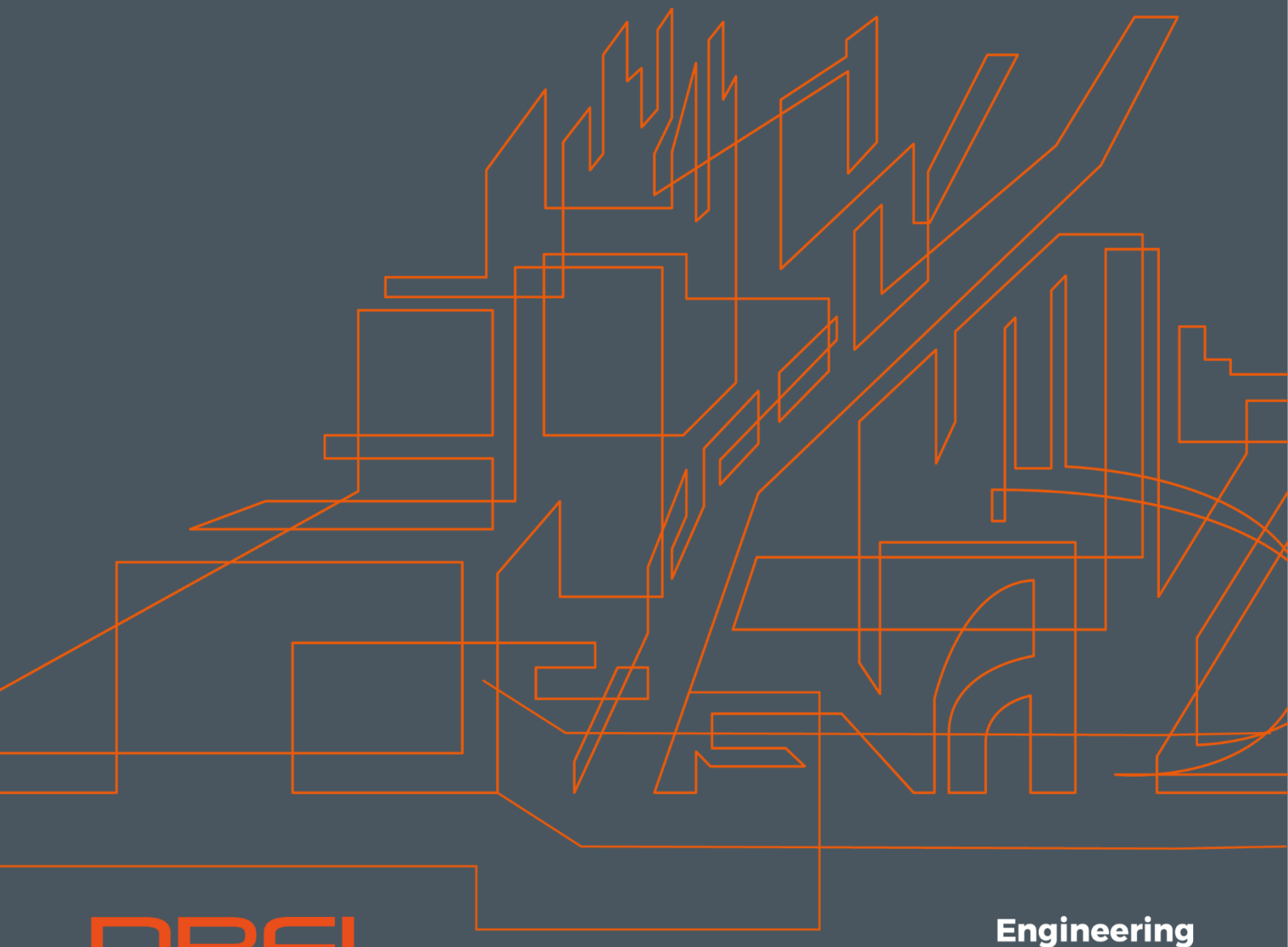
Royal Canal Urban Greenway

Site Specific Flood Risk Assessment Report

170239-X-X-XXX-RP-DBFL-CE-0002

Sept 2026



DBFL CONSULTING ENGINEERS

Engineering Sustainable Futures

Project Title:	**Royal Canal Urban Greenway**		
Document Title:	**Site Specific Flood Risk Assessment Report**		
File Ref:	**170239-X-X-XXX-RP-DBFL-CE-0002**		
Status:	**S4 Suitable for Stage Approval**	Rev:	**0**

Rev.	Date	Description	Prepared	Reviewed	Approved
0	30/09/26	Planning Issue	Multiple	Declan Haugh	Robert Kelly

Disclaimer

This document has been prepared for the exclusive use of our Client and unless otherwise agreed in writing with DBFL Consulting Engineers no other party may use, make use of or rely on the contents of this document. The document has been compiled using the resources agreed with the Client and in accordance with the agreed scope of work. DBFL Consulting Engineers accepts no responsibility or liability for any use that is made of this document other than for the purposes for which it was originally commissioned and prepared, including by any third party or use by others of opinions or data contained in this document. DBFL Consulting Engineers accepts no liability for any documents or information supplied by others and contained within this report. It is expressly stated that no independent verification of any documents or information supplied by others for this document has been made. DBFL Consulting Engineers has used reasonable skill, care and diligence in compiling this document and no warranty is provided as to the report's accuracy.

Copyright

The contents and format of this report are subject to copyright owned by DBFL Consulting Engineers unless that copyright has been legally assigned by us to another party or is used by DBFL Consulting Engineers under licence. This report may not be copied or used for any purpose other than the intended purpose.

Contents

1 Introduction 1
1.1 Background 1
1.2 Objectives and Scope of Assessment 1
1.3 The Proposed Scheme 1
2 Proposed Works 4
3 Planning Context 5
3.1 Planning System Flood Risk Management Guidelines 5
3.1.1 General 5
3.1.2 Sequential Approach and Justification Test 5
3.1.3 Flood Zones 7
3.1.4 Vulnerability 7
3.1.5 Flood Zone and Vulnerability 7
3.1.6 Flood Risk Assessment Stages 8
3.2 Fingal County Development Plan 2023-2029 8
4 Stage 1 Flood Risk Identification 10
4.1 General 10
4.2 Available Flood Risk Information 10
4.3 Initial Findings & Flood Zone Determination 11
4.3.1 Fluvial 11
4.3.2 Coastal 16
4.3.3 Pluvial 17
4.3.4 Groundwater 17
4.3.5 Summary of Existing Flood Risk 19
4.4 Vulnerability Classification 19
4.5 Source-Pathway-Receptor Model 20

4.6 Source-Pathway-Receptor Model Results 21

5 Stage 2 Initial Flood Risk Assessment 23

5.1 Initial Fluvial Flood Risk Assessment 23

5.2 Initial Pluvial Flood Risk Assessment 24

6 Conclusion 25

Appendix A : Fingal Strategic Flood Risk Maps 2023-2029 ..... A

Appendix B : CFRAM Leixlip Fluvial Flood Extents ..... B

Appendix C : CFRAM Liffey Tidal Flood Extents C

Appendix D : Past Flood Summary Report ..... D

Figure

Figure 1-1 Proposed Scheme Route Overview 2

Figure 1-2 Proposed Scheme within existing water networks (Source: EPA Maps) 3

Figure 3-1 Extract from FRM Guidelines: (Fig. 3.2 Sequential Approach Mechanism in the Planning Process) 6

Figure 3-2 Extract from FRM Guidelines: (Table 3.2 -Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test) 7

Figure 4-1 Extract from Leixlip Fluvial Flood Extents maps (no. E09LEI_EXFCD_F2_08) showing the Proposed Scheme 11

Figure 4-2 NIFM flooding extents associated with the Rusk River (Source: www.floodinfo.ie) 12

Figure 4-3 Extract from Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029 Map 23 showing the Proposed Scheme 13

Figure 4-4 Extract from Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029 Map 24 showing the Proposed Scheme 14

Figure 4-5 Figure 5-1 Extracted from Variation 2 – Fingal Development Plan 2023-2029, Appendix 3 Strategic Flood Risk Assessment 15

Figure 4-6 Groundwater Vulnerability (Source: GSI Groundwater Mapping) 18

Figure 4-7 Extract from 'The Planning System and Flood Risk Management Guidelines' 20

Figure 5-1: Rusk River Flood Zone B water levels 23

Table

Table 4-1 Source-Pathway-Receptor Analysis 21

1 Introduction

1.1 Background

DBFL Consulting Engineers were appointed by Fingal County Council (FCC) to prepare designs for a section of the Royal Canal Urban Greenway (hereafter referred to as the 'Proposed Scheme') which is to be constructed along / adjacent to the Royal Canal from the Kildare / Dublin county boundary to the Old Navan Road (near the 12th Lock), where it connects with a previously constructed section of the Greenway.

As part of the preliminary design of the Proposed Scheme, DBFL have prepared this Site-Specific Flood Risk Assessment (SSFRA) report to accompany the planning application.

1.2 Objectives and Scope of Assessment

The objective of this report is to inform the planning authority regarding flood risk for the Proposed Scheme. The report assesses the proposed greenway route in accordance with the requirements of "The Planning System and Flood Risk Management Guidelines for Planning Authorities" determining the Flood Zone category along the route and presents information which would facilitate an informed decision of the planning application in the context of flood risk and level of vulnerability.

This SSFRA will include the following:

- Confirmation of the sources of flooding which may affect the site;
- A qualitative assessment of the risk of flooding to the site and to adjacent sites due to construction of the proposed development;
- Review of the availability and adequacy of existing information;
- Identification of possible measures which could mitigate the flood risk to acceptable levels; and
- Areas for further investigation if required.

1.3 The Proposed Scheme

As noted above, this flood risk assessment report will focus attention on the extents of the Proposed Scheme, from the Kildare / Dublin county boundary to the Old Navan Road (near the 12th Lock). The Proposed Scheme comprises three main sections.

The Proposed Scheme is approximately 8.1km in length and is divided into three sections as follows:

- Section 1 – Kildare County Border to Hansfield Railway Bridge (Ch. 0000 – 3200)
- Section 2 – Hansfield Railway Bridge to Kennan Bridge (Ch. 3200 – 5300)
- Section 3 – Kennan Bridge to Talbot Bridge (Chainage 5300 – 8100)

Section 1 extends from Kildare/Dublin County boundary line to Hansfield Railway Bridge.

Section 2 extends from Hansfield rail bridge, through Clonsilla under Callaghan bridge to Kennan bridge at Porterstown Road. In Section 2, the character of the area changes from rural to predominantly suburban in nature. This section is predominately residential on the northern side of the canal with farmlands on the southern side.

Section 3 runs from Kennan bridge (Porterstown Road) to Talbot Bridge (Old Navan Road). This section is predominately urban with extensive residential catchments on both sides of the Canal.

An overview of the route of the Proposed Scheme and its sections is included in Figure 1-1.

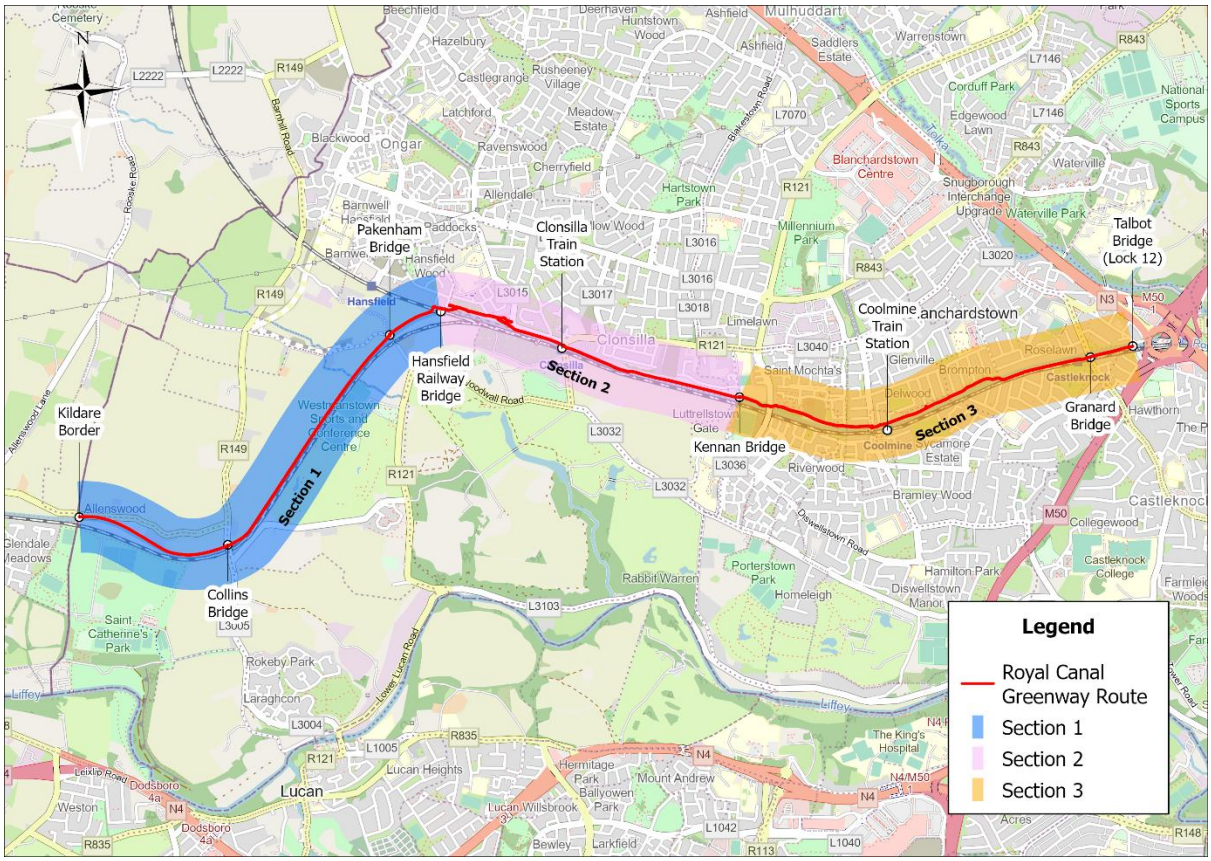


Figure 1-1 Proposed Scheme Route Overview

The Proposed Scheme extents in the context of the existing water network is also shown in Figure 1-2.

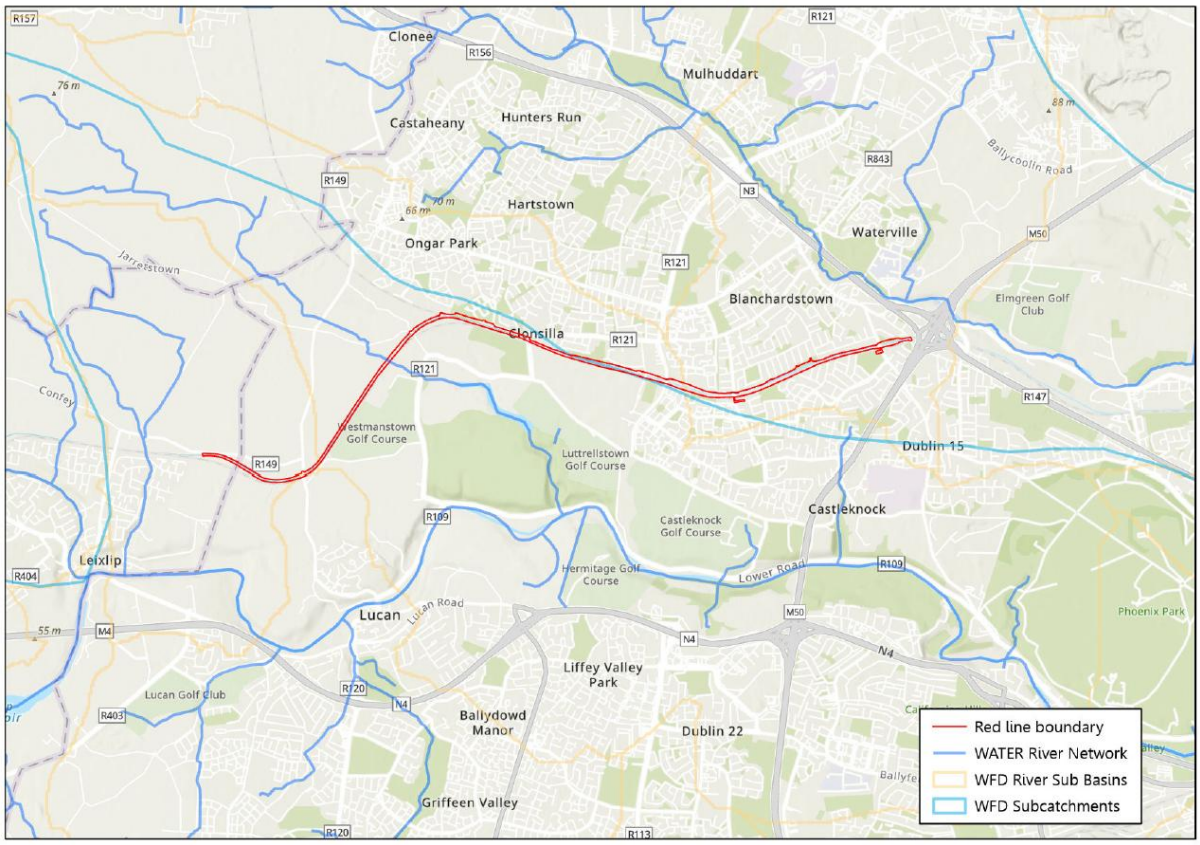


Figure 1-2 Proposed Scheme within existing water networks (Source: EPA Maps)

2 Proposed Works

The Proposed Scheme, is to be made up of a number of fundamental construction forms depending on location:

- Section 1 (within the rural setting) will largely follow the existing canal tow path and will be constructed to reflect the existing unbound gravel surfacing, with widening of the tow path where necessary.
- Section 2 (moving into the more urban setting) will in part follow the existing canal tow path and yet will be reconstructed as a bituminous pavement build-up, with widening of the tow path where necessary. The route will also deviate from the existing tow path in parts to construct a new bituminous route further north away from the canal. A section of this will be ramped onto an embankment approximately 4m above the existing tow path.
- In addition to the bituminous pavement, Section 2 also includes a portion of 4m wide cantilevered boardwalk with pre-cast concrete surfacing on a piled steel structure raised above the existing surface.
- Section 3 (moving into the more urban setting) will largely comprise a newly constructed route to the north of the canal, constructed as a bituminous pavement build-up, ranging from approximately 5m to 10m above the existing canal banks.
- Section 3 includes a portion of existing roadway along Sheepmoor Lane.
- In addition to the general greenway route in Section 3, the works include the construction of two bridge structures, one crossing an existing quarry along the northern banks (referred to as the 'Quarry Bridge'), and the other traversing the canal itself (referred to as the 'Landmark Bridge').
- On approach to the Quarry Bridge, the proposed construction consists of new concrete surfacing with portions of raised boardwalk via a piled steel structure.
- Section 3 also comprises a new underpass to be constructed beneath Castleknock Road on the southern side of the Granard Bridge.

Each of the above construction forms is outlined further as part of the Construction Methodology Report (170239-DBFL-XX-XX-RP-C-0003) which also forms part of the submission.

3 Planning Context

The following policy documents are relevant to the assessment of the proposed development:

- The National Planning Guidelines published by the OPW, and the Department of the Environment, Heritage and Local Government in November 2009 entitled 'The Planning System and Flood Risk Management: Guidelines for Planning Authorities' are particularly pertinent and are discussed in Section 3.1.
- In terms of planning policy context, the provisions contained in the Fingal County Development 2017 - 2023 are relevant.

3.1 Planning System Flood Risk Management Guidelines

3.1.1 General

"The Planning System and Flood Risk Management, Guidelines for Planning Authorities" (referred to as 'the FRM Guidelines') and its Technical Appendices outline the requirements for a Flood Risk Assessment.

The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways), and the people and assets affected by it (the receptors).

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from development locally and beyond.

3.1.2 Sequential Approach and Justification Test

This SSFRA applies the sequential approach to flood risk assessment as outlined in the aforementioned guidelines. The process begins by establishing the Flood Zone category of the site or location. The next stage is to determine the vulnerability classification for the proposed development. Using these determinations, the development is either considered appropriate or will require that a justification test be conducted (see Figure 3-1).

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.

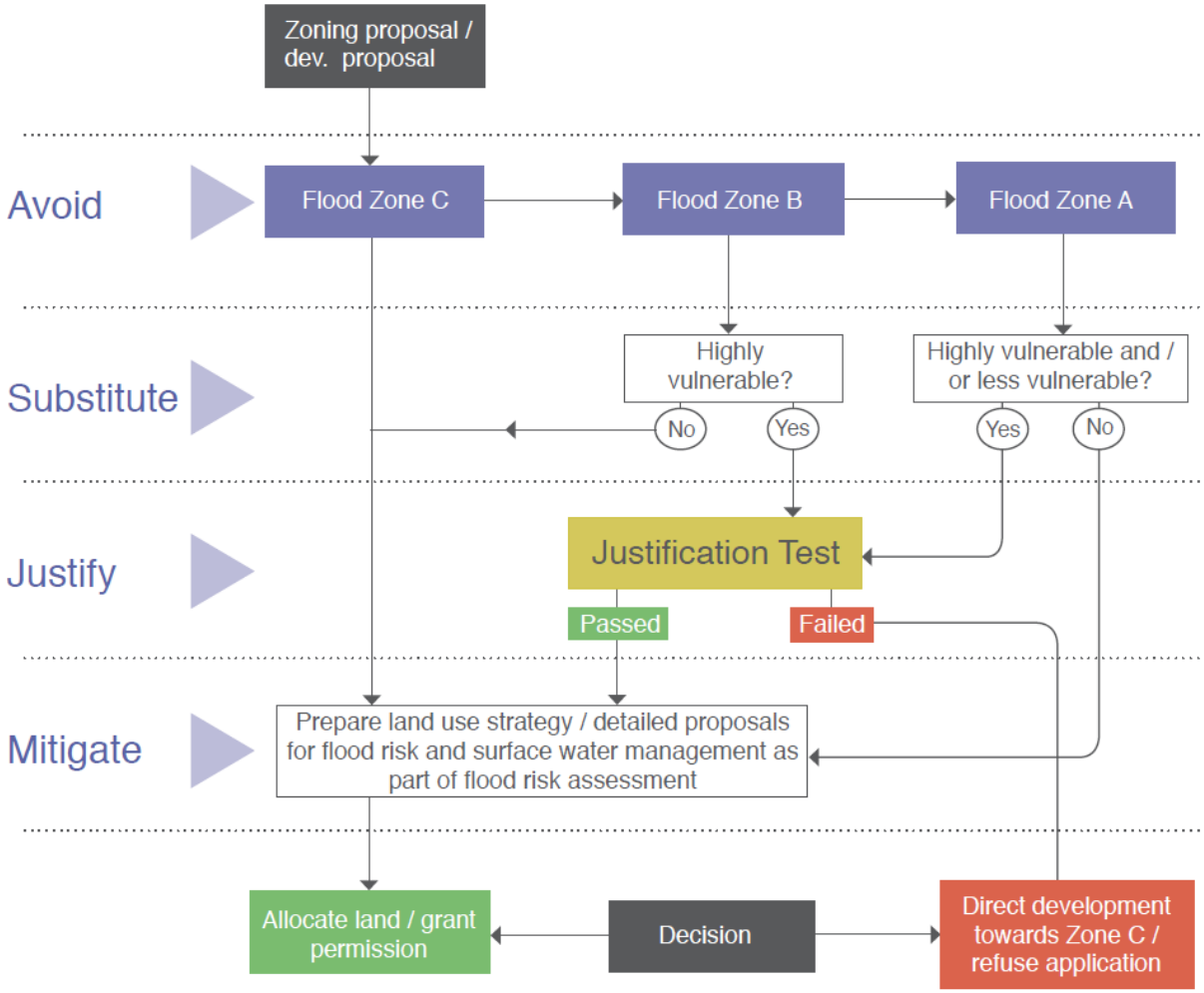


Figure 3-1 Extract from FRM Guidelines: (Fig. 3.2 Sequential Approach Mechanism in the Planning Process)

3.1.3 Flood Zones

The FRM Guidelines uses Flood Zones to determine the likelihood of flooding and for flood risk management as part of the planning process. There are three Flood Zones identified.

Flood Zone A – where the probability of flooding from rivers and the sea is highest (i.e., greater than 1% AEP for river flooding and 0.5% for coastal flooding)

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (i.e., between 0.1% and 1% for river flooding and between 0.1% and 0.5% for coastal flooding).

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

3.1.4 Vulnerability

The FRM Guidelines, in Table 3.1 therein, also categorises types of development as either:

- Highly Vulnerable e.g., dwellings, hospitals, fire stations, essential infrastructure, etc.;
- Vulnerable e.g., retail, commercial or industrial buildings, local transport infrastructure, etc.; and
- Water Compatible e.g., flood infrastructure, docks, amenity open space, etc.

3.1.5 Flood Zone and Vulnerability

The aim of the FRM Guidelines, using the Sequential Approach, is to ensure that development is best positioned on land that is at the lowest risk of flooding appropriate to the level of vulnerability assigned. Where the form of development is not considered appropriate a Justification Test can be undertaken (refer to Figure 7 below).

	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

Figure 3-2 Extract from FRM Guidelines: (Table 3.2 -Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test)

3.1.6 Flood Risk Assessment Stages

The FRM Guidelines also outlines that a staged approach should be adopted when carrying out a flood risk appraisal or assessment. The stages of appraisal and assessment are:

- Stage 1 *Flood risk identification* – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;
- Stage 2 *Initial flood risk assessment* – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative Flood Zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and
- Stage 3 *Detailed flood risk assessment* – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

This SSFRA considers Stages 1, 2 and 3 involving identification, initial assessment and more detailed assessment (where necessary) of flood risks and surface water management related to the planned development site.

3.2 Fingal County Development Plan 2023-2029

A Strategic Flood Risk Assessment (SFRA) was carried out for the Fingal County Council area, in support of the Fingal County Development Plan, 2023-2029. Section 7 'Flood Risk Management Policies and Objectives' of that SFRA outlines the key policies and objectives of Fingal County Council regarding flood risk. The plan presents several objectives as follows:

- **IU016** Have regard to the OPW Flood Risk Management Guidelines 2009, as revised by Circular PL 2/2014, when assessing planning applications and in the preparation of statutory and non-statutory plans and to require site specific flood risk assessments to be considered for all new developments within the County. All development must prepare a Stage 1 Flood Risk Analysis and if the flooding risk is not screened out, they must prepare a Site-Specific Flood Risk Assessment (SSFRA) for the development, where appropriate.

- **IUO17** Implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Fingal Development Plan 2023–2029.
- **IUO18** All Flood Risk Assessments must comply with the recommendations from the SFRA report.
- **IUO19** Surface water designs must include 'Medium Range Future Scenario Climate Change Predictions'.
- **IUO20** Require all developments in the County to be designed and constructed in accordance with the 'Precautionary Principle' as detailed in the OPW Guidelines and to minimise the flood risk in Fingal from all potential sources of flooding as far as is practicable, including coastal, pluvial, fluvial, reservoirs and dams, and the piped water system.
- **IUO21** Encourage the use of Green Roofs on apartment, commercial, leisure and educational buildings.
- **IUO22** Support and facilitate the provision of new or upgrading of existing flood alleviation measures where appropriate.
- **IUO23** Ensure that where flood protection or alleviation works take place that the natural and cultural heritage of rivers, streams and watercourses are protected and enhanced to the greatest extent possible.
- **IUO24** Work with neighbouring Local Authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.

4 Stage 1 Flood Risk Identification

4.1 General

The initial flood risk identification stage uses existing information to identify and confirm whether there may be flooding or surface water management issues for the subject site which may warrant further investigation.

4.2 Available Flood Risk Information

The following sources are considered relevant to the greenway route and have been researched in order to identify initial flood risks.

Information Source	Comments
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at www.floodinfo.ie;	Information obtained (and reviewed) from www.floodinfo.ie (OPW website).
Predictive flood maps produced under CFRAM Studies; https://www.floodinfo.ie/map/floodmaps/	Floodinfo.ie providing access to Eastern CFRAM study Flood Maps – Fluvial Flood Extents and Fluvial Flood Depth Maps consulted.
Predictive flood maps produced under National Indicative Fluvial Mapping (NIFM) data; https://www.floodinfo.ie/map/floodmaps/	It is noted that the NIFM are described as not being the best achievable representation of flood extents and they are not as accurate as the Flood Maps produced under the CFRAM programme.
Information on flood defence condition and performance;	No flood defences identified in the Eastern CFRAM Study in the immediate vicinity of the site.
'Liable to flood' markings on the old '6 Inch' maps;	Historic OSI maps consulted.
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at www.floods.ie;	Information obtained (and reviewed) from www.floods.ie (OPW website).
Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029	Proposed Scheme extents covered within Appendix A – Fluvial Flood Zone Mapping Maps 23 and 24

4.3 Initial Findings & Flood Zone Determination

4.3.1 Fluvial

Eastern Catchment Flood Risk Assessment and Management

As part of the desktop study, historic and predicted flood risk mapping published by the OPW on the Flood Hazard Mapping Website http://www.floodinfo.ie/ was reviewed. The Eastern Catchment Flood Risk Assessment and Management (CFRAM) study details the predicted risk for a variety of fluvial and coastal flood scenarios. The mapping does not include the watercourse reaches traversing the proposed scheme.

There is flooding indicated on the Leixlip Fluvial Flood Extents maps (no. E09LEI_EXFCD_F2_08) which appears to relate to a tributary of the River Liffey with flooding of adjacent fields approximately 0.5km northwest of the of the western extent of the Proposed Scheme. While the current map is under review by the OPPW Refer to Appendix B herein and in Figure 4-1 for a historic version of same.

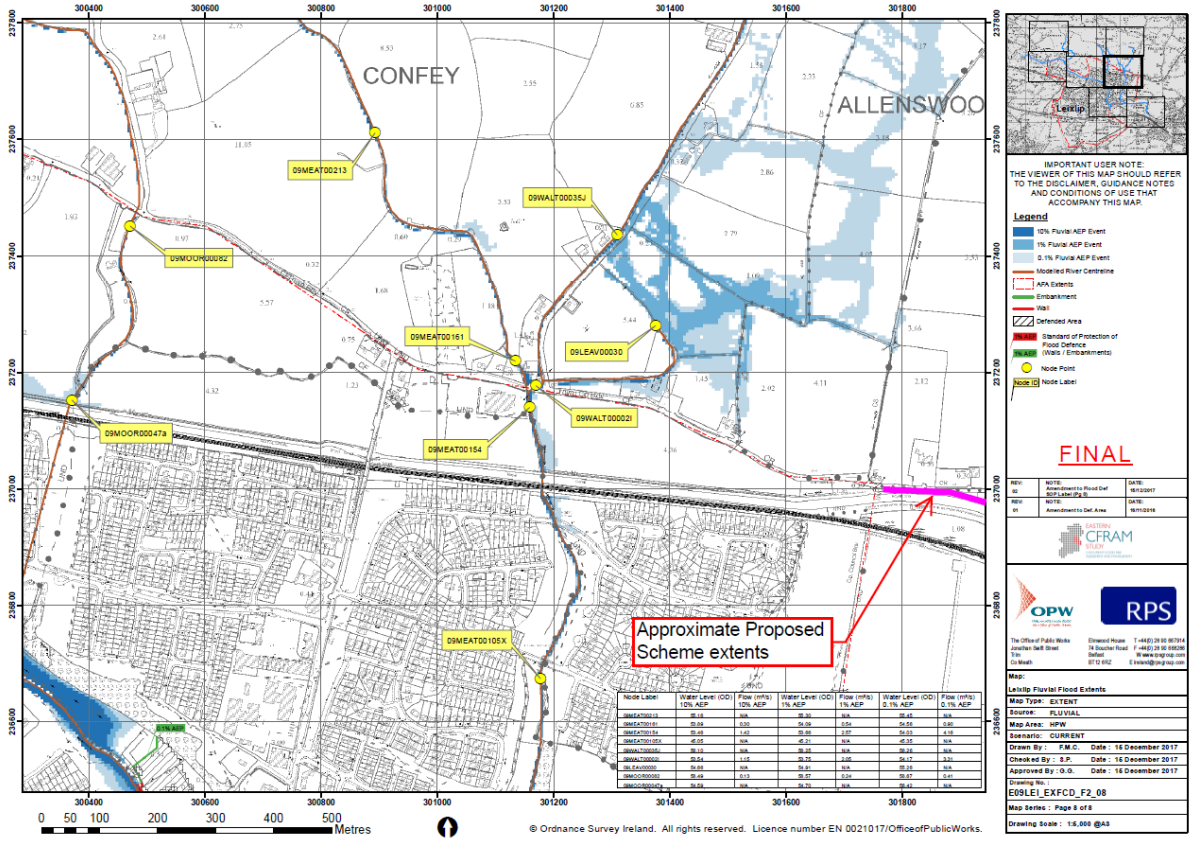


Figure 4-1 Extract from Leixlip Fluvial Flood Extents maps (no. E09LEI_EXFCD_F2_08) showing the Proposed Scheme

National Indicative Fluvial Mapping

There is however National Indicative Fluvial Mapping (NIFM) data which indicates Medium Probability and Low Probability flooding associated with the Rusk River in the vicinity of the Proposed Scheme. Refer to Figure 4-2 for an extract from the OPW mapping at www.floodinfo.ie showing the NIFM flooding extents.

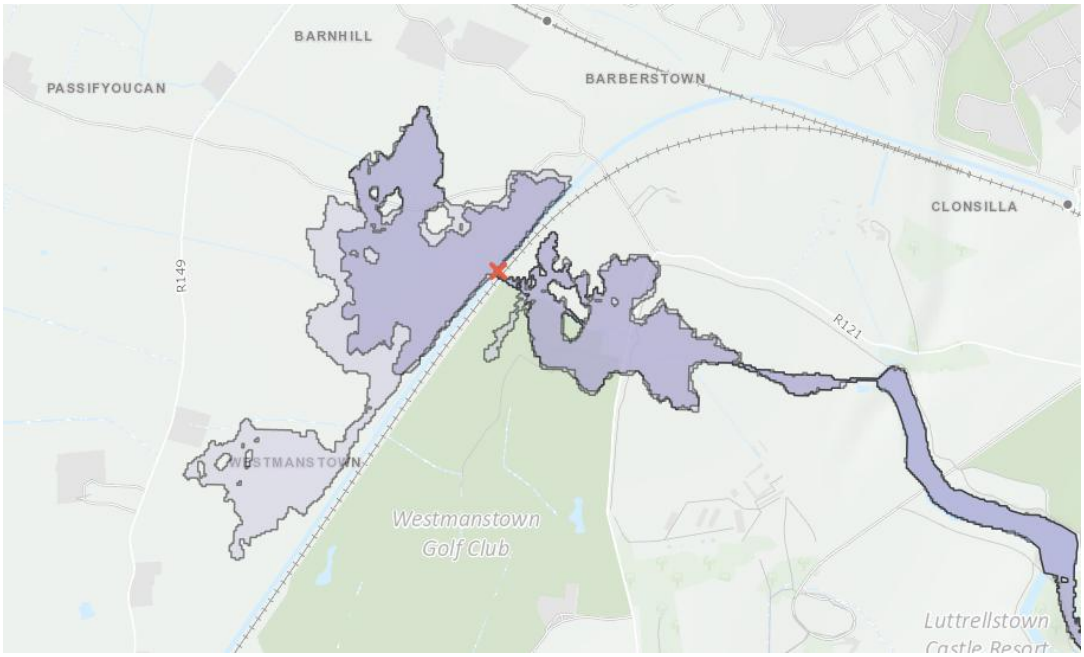


Figure 4-2 NIFM flooding extents associated with the Rusk River (Source: www.floodinfo.ie)

However, it is noted that the NIFM are described as not being the best achievable representation of flood extents and they are not as accurate as the Flood Maps produced under the CFRAM programme. The guidance notes associated with the data note that the maps should not be used to assess the flood risk associated with individual properties or point locations, or to replace a detailed site-specific flood risk assessment.

Historical Flood Data

Historical flood maps/data indicate there is one recorded flood event within the immediate vicinity of the Proposed Scheme extents, however the associated report indicated it was not as a result of fluvial flooding – refer to Section 4.3.3 herein.

Strategic Flood Risk Assessment

The Strategic Flood Risk Assessment for the Fingal Development Plan 2017-2023 (FDP SFRA) provides an assessment of all types of flood risk within the County and assisted FCC to make informed strategic land-use planning decisions and formulate flood risk policies. A review of available flood risk information was undertaken to identify any flooding or surface water management issues related to the County that warranted further investigation.

There are several sources of relevant flood risk information presented therein for Fingal and this information was used to generate the fluvial flood zone maps as shown in Appendix A of the FDP SFRA. Relevant maps showing the Proposed Scheme extents (no. 23 and 24) have been extracted and are presented in Appendix D herein, as well as in Figure 4-4 and Figure 4-4, respectively. As indicated on the mapping, the proposed scheme falls outside the extents of both Flood Zone A and B.

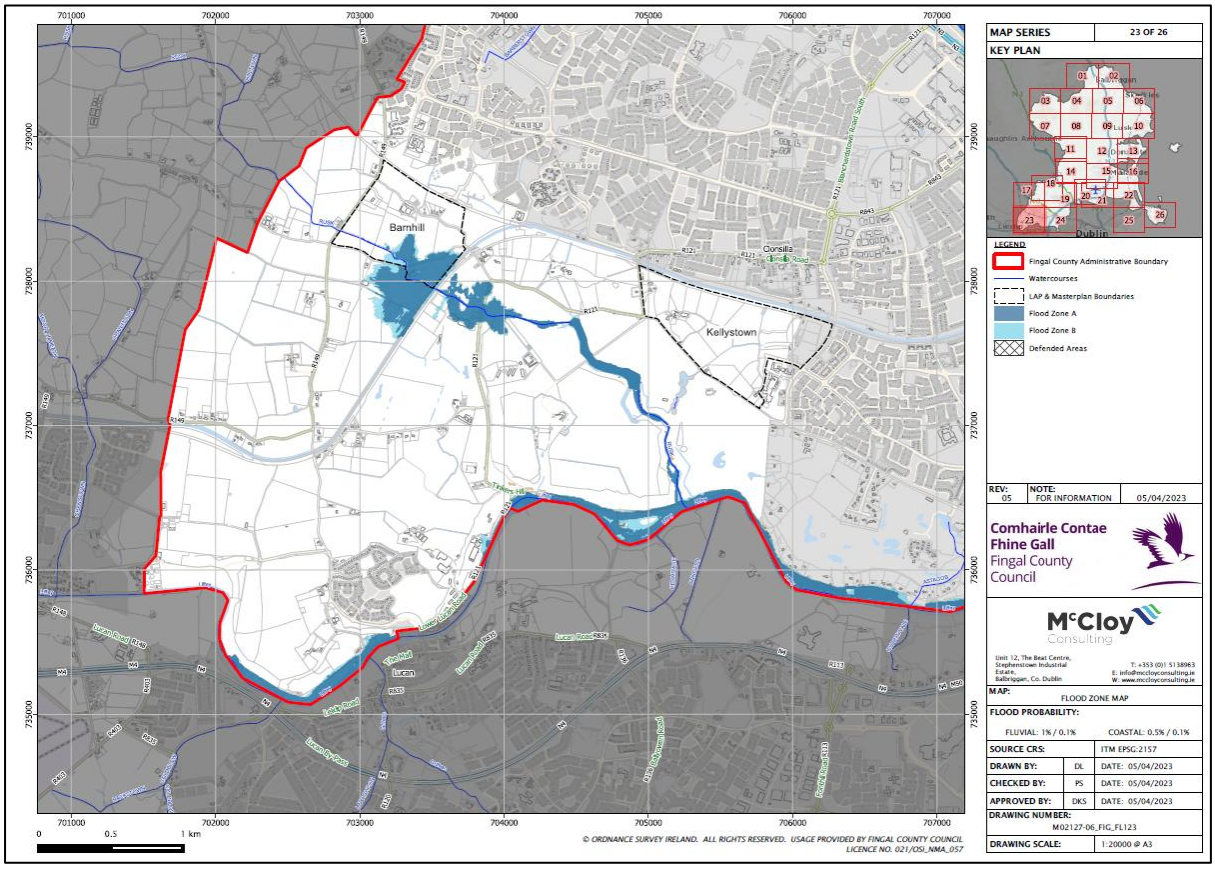


Figure 4-3 Extract from Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029 Map 23 showing the Proposed Scheme

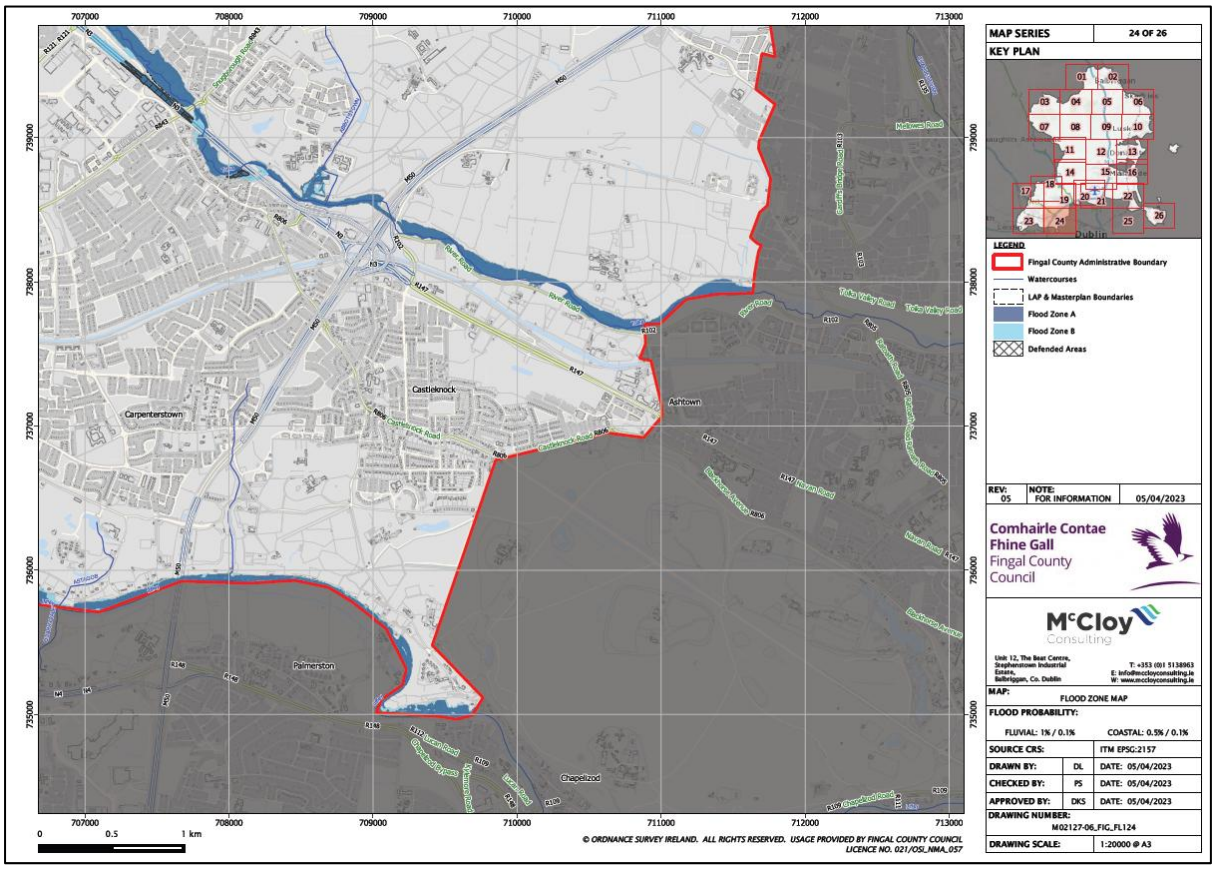


Figure 4-4 Extract from Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029 Map 24 showing the Proposed Scheme

As of 30th March 2026, Variation 2 of the Fingal County Development Plan took effect. The variation includes for development of lands within Barnhill, south of Barberstown Road. The variation included a detailed flood risk assessment, evaluating flood risk for the Áras Mhuire Field development. The report assesses previous flood risk assessments and establishes the model informing same as the most recent and detailed assessment of flooding in the area.

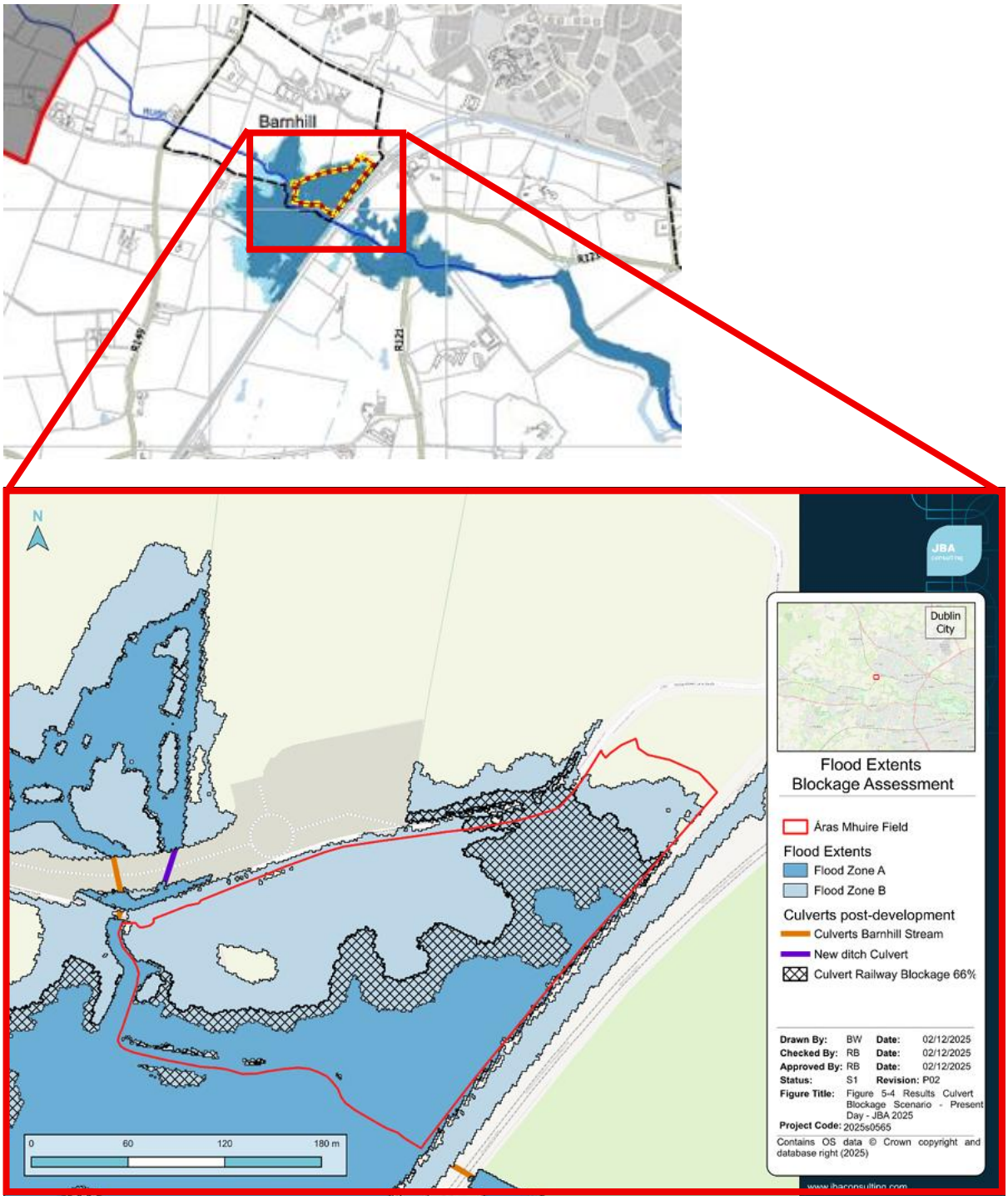


Figure 4-5 Figure 5-1 Extracted from Variation 2 – Fingal Development Plan 2023-2029, Appendix 3 Strategic Flood Risk Assessment

Figure 4-5 shows flood extents for the 1% AEP and 0.1% AEP, outlining Flood Zones A and B respectively. The flood model shows that a portion of the Royal Canal and so the existing towpath at the Barnhill Site potentially falls within Flood Zone B.

Royal Canal

To consider the potential flooding risk from fluvial events as a result of river waters (or other sources) discharging into the Royal Canal, the current regime has been assessed. The main water supply for the canal is Lough Owel near Mullingar which feeds the highest (or summit) level (approximately 70km from the Proposed Scheme). The canal levels then descend in both directions, east to Dublin and the Proposed Scheme, and west to the Shannon, in accordance with the topography of the countryside. There are total of 46 locks (including the sea lock at the river Liffey in Dublin), as well as four major aqueducts which were built to carry the canal over the rivers Ryewater, Boyne and Inny.

Based on a review of river water bodies along the canal, it does not appear that there are any significant feeder rivers or streams discharging into the canal between the Proposed Scheme and the canal's source.

Along the length of the scheme, the measured water level (taken in May 2018) ranged from +56.51mAOD at the western extent, falling gradually to +56.48mAOD at the eastern extent. Where the Proposed Scheme runs directly along the canal banks, the existing levels are generally a minimum of 0.3m above the canal levels, and the proposed works shall raise levels locally along the greenway.

As such it is considered that the canal water levels are managed appropriately through the network of locks, and there is minimal or negligible risk of flooding as a result of rising levels.

Stage 1 Flood Zone Determination

At Stage 1 Flood Risk Identified some areas of the Proposed Scheme extents are therefore considered to potentially be within Flood Zone B – requiring further assessment at Stage 2.

4.3.2 Coastal

Eastern Catchment Flood Risk Assessment and Management

As part of the desktop study, historic and predicted flood risk mapping published by the OPW on the Flood Hazard Mapping Website http://www.floodinfo.ie/ was reviewed.

The CFRAM study details the predicted risk for a variety of fluvial and coastal flood scenarios. The Proposed Scheme is located over 8km from the nearest indicated coastal flooding extents – shown on map E09LIF_EXCCD_F1_01 associated with the Liffey Tidal Flood Extents (Appendix C herein).

The 1-in-200 year tidal water level at this location is approximately 3.54mAOD. Due to the site location, and its relative elevation of circa 55m-65mOD the subject site is not considered to be at risk from coastal flooding.

4.3.3 Pluvial

Pluvial flooding occurs when overland flow cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high water level in the receiving watercourse.

With the exception of road crossings, there is limited existing piped surface water drainage networks within the extents of the Proposed Scheme, and the proposed drainage strategy largely comprises over the edge drainage.

Surface water runoff from the proposed unbound and bituminous flexible pavement and concrete surfaced sections of the greenway (including boardwalks) will generally run over the edge and soak naturally to the underlying soil or to a filter drain for treatment and storage if practicable. Even where an unbound surface is proposed, the cycle track will be constructed so that surface water is shed to the sides, notwithstanding the fact that the surface is permeable. This is to prevent the sub-surface from becoming saturated. While the raised section of bridges will drain off to the underlying soil or canal.

Drawings 170239-X-05-X-XXX-DR-DBFL-CE-1301 to 1305 included within the planning drawings demonstrate the proposed surface water drainage regime, showing locations and directions of over-the-edge drainage, as well as proposed locations of filter drains.

Historical Flood Data

Historical flood maps/data indicate there is one recorded flood event within the immediate vicinity of the Proposed Scheme extents – refer to Appendix A herein. The recorded report relates to a flood event in 2000 in the Clonsilla area approximately halfway along the Proposed Scheme to the north of the Royal Canal. The flood event at this location was attributed to surcharging in the combined sewerage system in the area on low lying properties, with no relation to the Royal Canal indicated. The report also notes that remedial works were since carried out and no properties were flooding in a later flood event in 2002 as a result.

4.3.4 Groundwater

Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during later winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

Groundwater Vulnerability Mapping

Groundwater vulnerability is varied across the entire Proposed Scheme extents and in the vicinity – as shown in Figure 4-6 – ranging from Moderate to Extreme. In addition, there are areas of Rock at or near the surface. Areas of highest vulnerability correspond to these areas of near surface bedrock and thin soil depths. It is noted that the aquifer vulnerability classification does not consider the nature of the underlying 'receiving' aquifer with respect to resource value or significance of pollution occurring and is only a reflection on the protection afforded to the aquifer by overlying deposits.

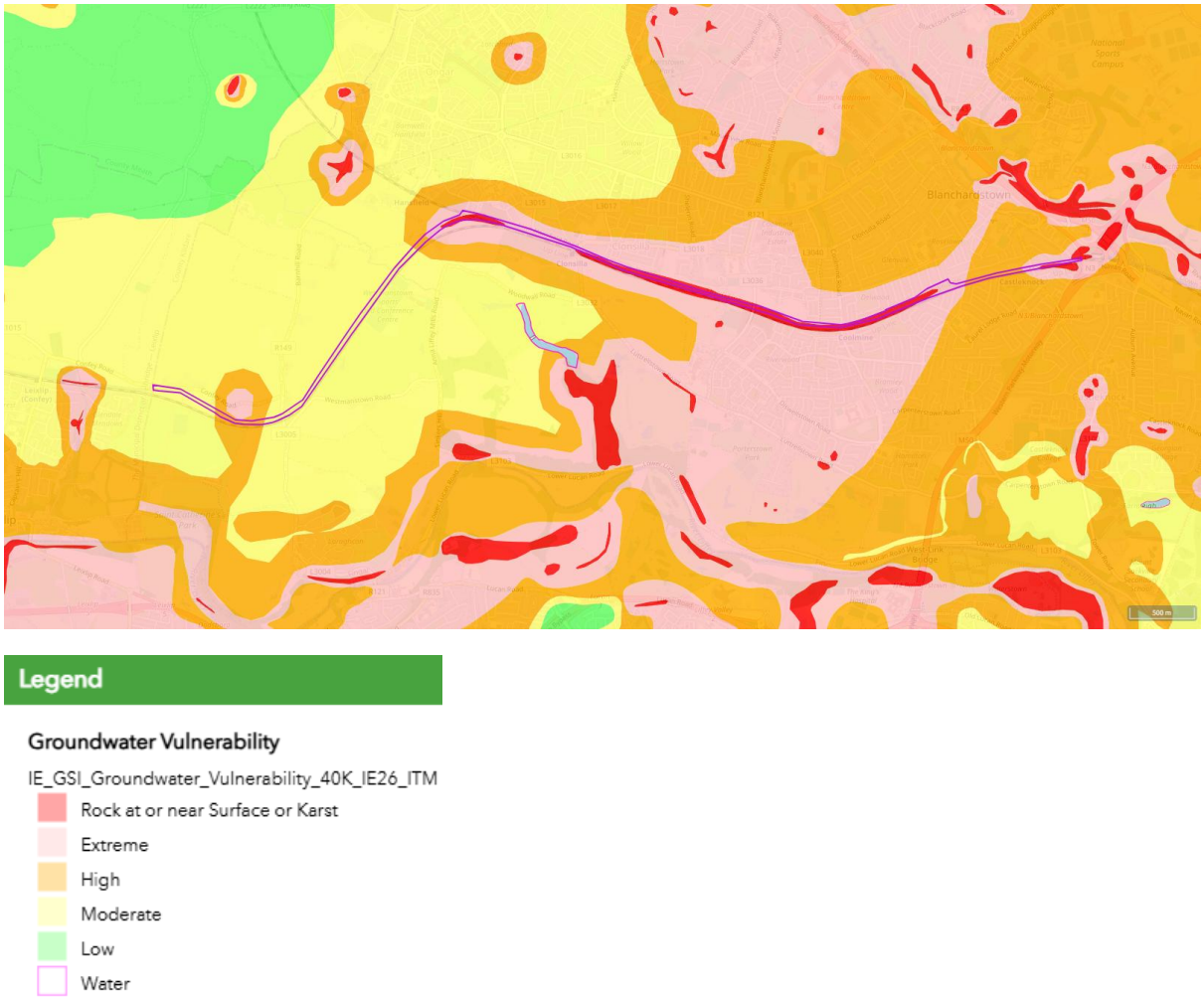


Figure 4-6 Groundwater Vulnerability (Source: GSI Groundwater Mapping)

Site investigation was carried out as part of the Proposed Scheme design development. A number of slit trenches were carried out with ground water strikes at depths generally ranging from 1.2mBGL to 1.5mBGL or greater. At one location west of Kennan Bridge there was a ground water strike at 0.9mBGL however it is noted that at this location the proposed greenway will be higher on the embankment to where this slit trench was carried out.

Generally, the proposed works do not involve any significant deep excavations (with the exception of the Hansfield and Delwood areas), significant changes in levels or basement construction. As the scheme is on existing paved or vegetated routes with no known flooding specifically due to groundwater, it is not expected that this risk will increase to the site or surrounding areas due to the construction of the scheme.

4.3.5 Summary of Existing Flood Risk

The risk of flooding to the existing site from fluvial, coastal, pluvial and groundwater sources has been assessed and is summarised as follows:

- Fluvial – The Proposed Scheme is classified as being primarily within Flood Zone C, with some areas potentially sitting within Flood Zone B.
- Coastal – The Proposed Scheme is classified as being within Flood Zone C.
- The risk of pluvial flooding to the site is currently considered low.
- The risk of groundwater flooding to the site is considered low.

4.4 Vulnerability Classification

The assignment of a vulnerability class for the proposed scheme is a key decision in the level of flood risk that is appropriate. The route will predominantly be used as a leisure route based on the objectives of the proposed scheme. The route will also offer a sustainable transport link along the Royal Canal with integration with water-based recreation activities. Therefore, the greenway could be classified as either local transport infrastructure (less vulnerable), or amenity open space (both water compatible development) (see Figure 4-7 below).

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).

Figure 4-7 Extract from 'The Planning System and Flood Risk Management Guidelines'

Therefore, with reference back to Figure 3-1 and Figure 3-2, it is considered that a Justification Test is not required, and the development associated with the Proposed Scheme is appropriate due to being within Flood Zone C and not being considered a highly vulnerable development.

4.5 Source-Pathway-Receptor Model

A Source-Pathway-Receptor model has been produced to summarize the possible sources of floodwater, the pathways by which flood water could reach receptors and the receptors that could be affected by potential flooding, see Table 4-1.

It outlines effects of various potential sources, the performance and response of pathways and the consequences to the receptors in the context of the proposed development.

These sources, pathways and receptors will be assessed further by the initial flood risk assessment stage.

Table 4-1 Source-Pathway-Receptor Analysis

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Coastal	Tidal flooding from coast 13km away, with the site at 55m – 65m AOD and the 200-year tide plus climate change at 3.54m AOD at nearest flooding extents.	-	Rare	-	-
Fluvial	Flooding local water courses (Adjacent to River Liffey and oversailing Rusk River)	People / cycle route	Possible	Very Low	Minor
Surface Water (Pluvial)	Blockage and / or surcharging of the existing surface water drainage network.	People / cycle route	Unlikely	Low	Minor
Groundwater	Rising groundwater levels within the extents of the route	People / cycle route	Unlikely	Low	Minor
Infrastructural - Human or Mechanical Error	Blockage of new drainage network (in the case of new filter drains and/or outfall pipes)	People / cycle route	Possible	Low	Moderate

		Impact				
		Very Low	Low	Medium	High	Very High
		2	3	4	5	6
Likelihood	Highly Probable	Moderate	Significant	Significant	Severe	Severe
	Probable	Moderate	Moderate	Significant	Significant	Severe
	Possible	Minor	Moderate	Moderate	Significant	Significant
	Unlikely	Minor	Minor	Moderate	Moderate	Significant
	Rare	Minor	Minor	Minor	Moderate	Moderate

4.6 Source-Pathway-Receptor Model Results

The initial flood risks identified above are summarised below:

- Negligible or no risk of coastal flooding.
- Minor risk of fluvial flooding, largely due to the crossing of the Rusk Risk potentially causing a localised event.
- Minor risk of pluvial flooding (existing surface water network).
- Minor risk of groundwater flooding.
- Moderate risk of pluvial flooding associated with new pipework in filter drains and outlets.

It is clear from the above flooding analysis that the proposed site is not at significant risk from fluvial, tidal, pluvial or groundwater flooding due to its geographic location and topography. There is particularly negligible or no predicted coastal flooding risk, which therefore will not require any further assessment in the Stage 2 Initial Flood Risk Assessment.

5 Stage 2 Initial Flood Risk Assessment

The main sources of flooding identified from Stage 1 are:

- Fluvial flood risk from the Rusk River, a River Liffey tributary.
- Pluvial flood risk associated with the proposed scheme's new drainage network – confined only to where pipework is proposed in filter drains and outlets.

5.1 Initial Fluvial Flood Risk Assessment

As indicated, the main potential indicator of fluvial flood risk is the updated Flood modelling carried out for Variation 2 of the Fingal County Development Plan 2023-2029. It indicates Low Probability flooding associated with the Rusk River in the vicinity of the Proposed Development. Information regarding the 0.1% AEP flood levels was requested and Figure 5-1 was issued in response.

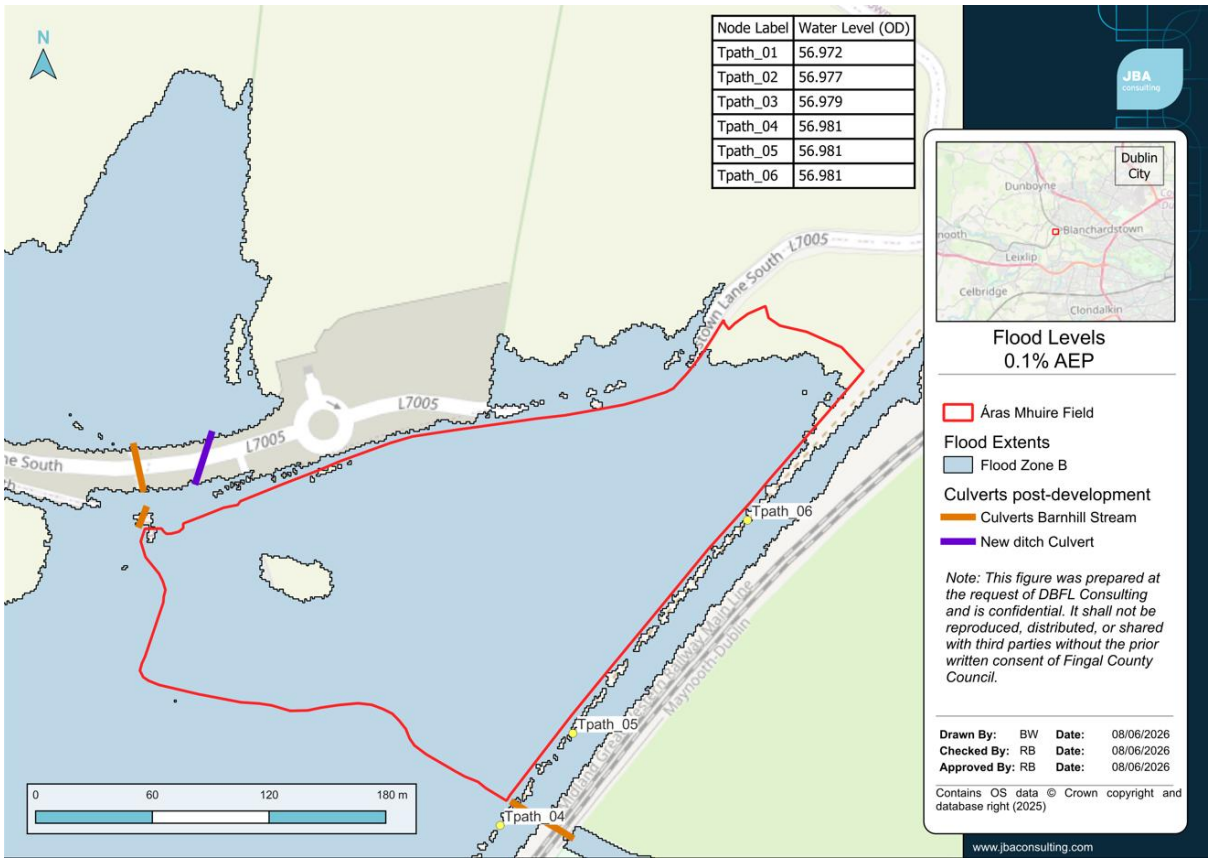


Figure 5-1: Rusk River Flood Zone B water levels

With water level modelled at +56.981mAOD along the towpath, and the existing levels of the Royal Canal towpath in the order of +57.25mAOD at this location – along with an edge embankment to a level in the order of +57.65mAOD, it can be concluded that the Proposed Development falls

outside the Flood Zone B despite flood extents suggesting it potentially sat within it. Differences in levels recorded could be attributed to varying accuracies in the use of LiDAR information as opposed to more accurate topographical survey information.

Regarding the flooding to the west of the Proposed Scheme shown on the CFRAM Flood Maps. The 1-in-100 year water level at the nearest node is indicated as 55.26mAOD. The existing level within the extents of the Proposed Scheme at the nearest location is approximately 56.8m – 57.8mAOD, and the R149 runs at a lower level than the canal towpath separating the Proposed Scheme from the flood extents.

It is concluded that the site is within Flood Zone C i.e., low risk of flooding from fluvial sources.

5.2 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a moderate risk of pluvial flooding specifically relating to the proposed surface water drainage network and human / mechanical error. The greenway will be largely drained naturally to the underlying soil along the entire route. This will be primarily in the form of over the edge to grass verge for the greenway construction alongside the road and will pass through or off the surface in the case of boardwalks or bridges. As such this pluvial flooding risk relates to the piped section of the greenway where filter drains are provided and/or where the Proposed Scheme impacts the existing road drainage network.

The risk of the greenway impacting on the existing road drainage network will be confined to the 5 no. above ground road crossings and will be mitigated by ensuring that the run-off from any additional hard standing is directed to soakage areas away from the road drainage network. The existing kerb lines and road extents are largely being retained as part of the proposed works.

The risk of pluvial flooding affecting the operation of the greenway itself will be mitigated by ensuring the filter drains and associated pipe networks are sized accordingly for the area being drained, designed based on recommendations made in the Greater Dublin Strategic Drainage Strategy (GDSDS), taking account of flood exceedance e.g., for storms return periods over 1% AEP and incorporating 20% climate change.

A detailed risk assessment of the pluvial risk is therefore not considered necessary.

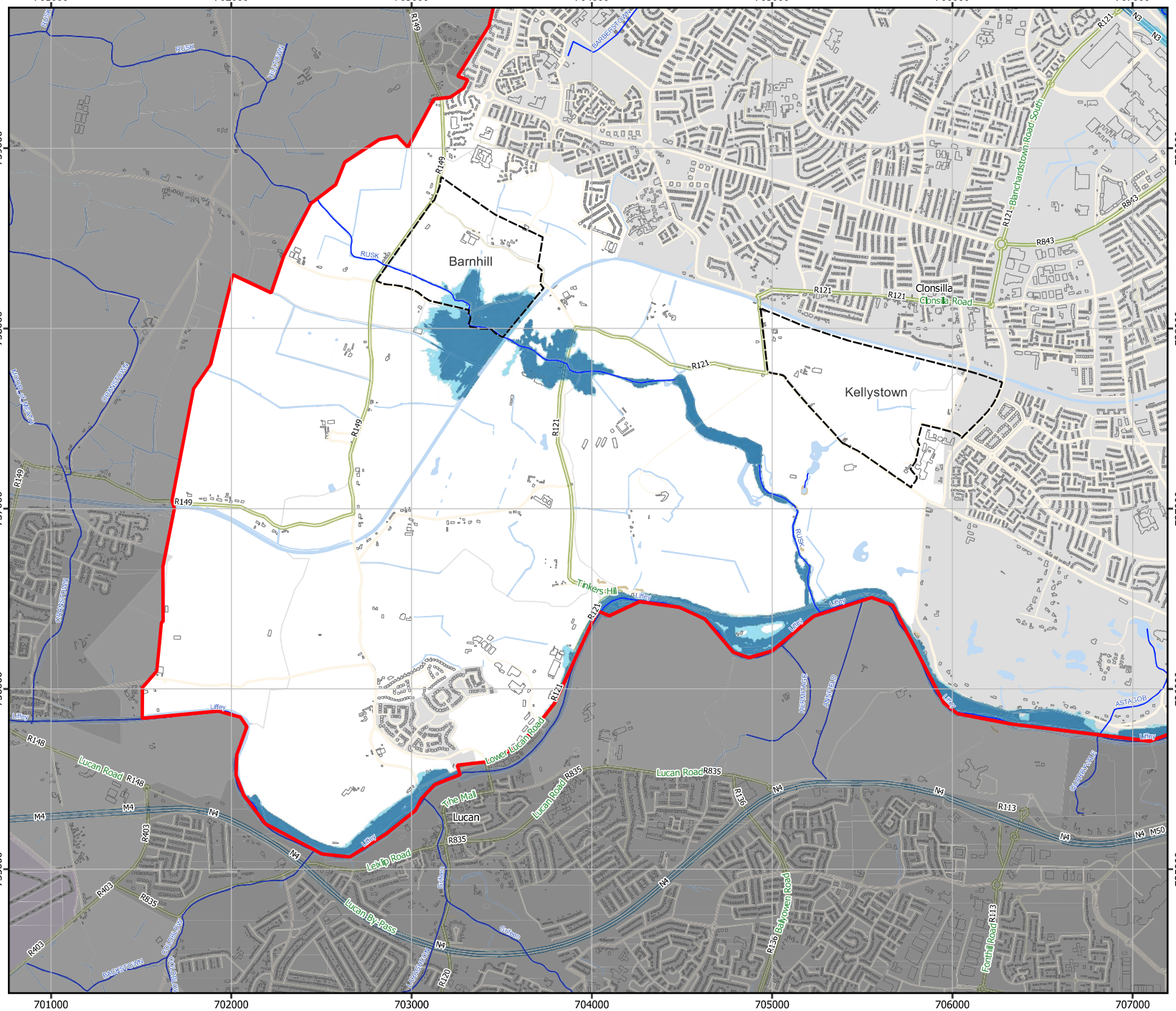
6 Conclusion

Based on a thorough review and assessment of the flood risks associated with the proposed scheme the following conclusions can be drawn:

- The proposed greenway can be classified both as less vulnerable when considered as a local transport link and water compatible when considered as a leisure-based amenity. It is considered that a Justification Test is not required, and the development associated with the Proposed Scheme is appropriate due to being within Flood Zone C and not being considered a highly vulnerable development.
- It is clear from the above flooding analysis that the proposed site is not at significant risk from fluvial, tidal, pluvial or groundwater flooding due to its geographic location and topography. There is particularly negligible or no predicted coastal flooding risk
- The most prominent flood risk associated with the greenway route is the section of the Proposed Development apparently across the 0.1% AEP flood zone at Barnhill within Flood zone B, in the vicinity of the Rusk River Crossing. A level analysis revealed that existing towpath levels (+57.25m OD) and constructed greenway levels (+57.65m OD) were above the modelled flood levels (+56.981m OD), putting the proposed development in Flood Zone C.
- Pluvial flooding associated with proposed piped drainage networks will be managed to reduce the potential impact on the greenway. Design measures will be put in place based on recommendations made in the GDSDS and taking direction from CIRIA 753 'The SuDs Manual'.
- The construction forms, irrespective of location, will be robust and resilient requiring limited maintenance following a flood event. This ensures that the 'Mitigation principle' has been applied in accordance with The Planning System and Flood Risk Management Guidelines Sequential Approach. Further detail on the construction forms is provided in the Construction Methodology Report submitted as part of this application.
- The Planning System and Flood Risk Management Guideline's Sequential Approach has been followed through this assessment in the preparation of the Proposed Scheme design. No further detailed assessment is required.

In conclusion, the proposed scheme is considered to be in compliance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, and a further detailed Site-Specific Flood Risk Assessment is not required.

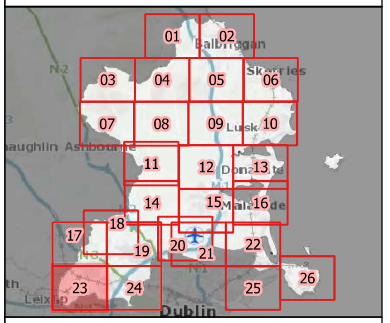
Appendix A : Fingal Strategic Flood Risk Maps 2023-2029



© ORDNANCE SURVEY IRELAND. ALL RIGHTS RESERVED. USAGE PROVIDED BY FINGAL COUNTY COUNCIL LICENCE NO. 021/OSi_NMA_057

MAP SERIES	23 OF 26

KEY PLAN



LEGEND

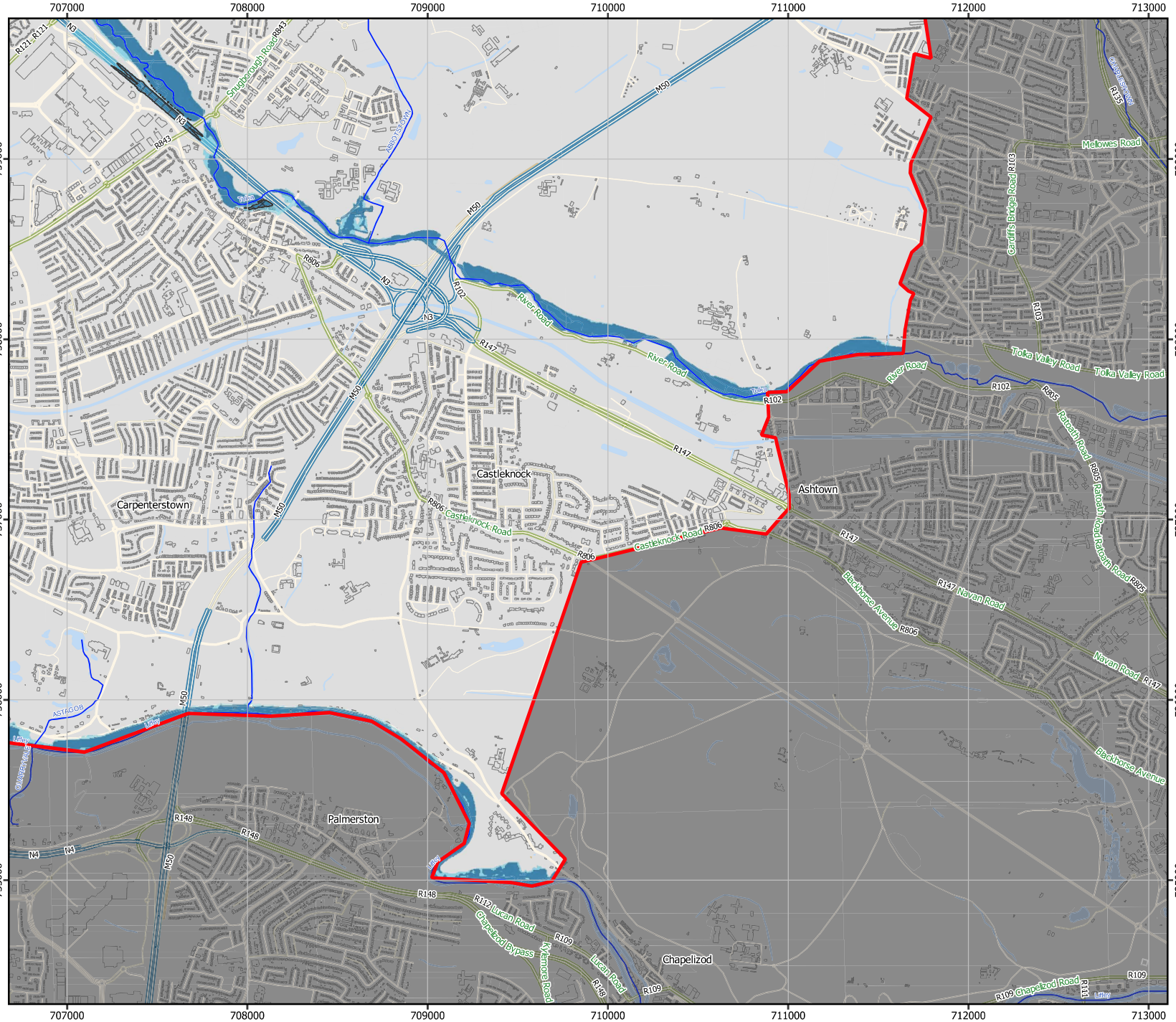
- Fingal County Administrative Boundary
- Watercourses
- LAP & Masterplan Boundaries
- Flood Zone A
- Flood Zone B
- Defended Areas

REV:	NOTE:	
05	FOR INFORMATION	05/04/2023

Comhairle Contae Fhine Gall
Fingal County Council

McCloy Consulting
Unit 12, The Beat Centre, Stephenstown Industrial Estate, Balbriggan, Co. Dublin
T: +353 (0)1 5138963
E: info@mccloyconsulting.ie
W: www.mccloyconsulting.ie

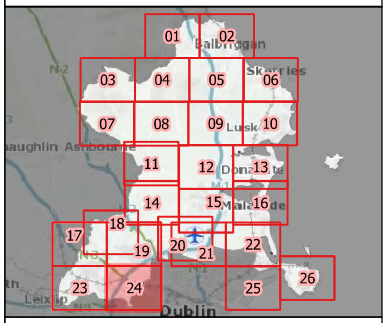
MAP:	FLOOD ZONE MAP	
FLOOD PROBABILITY:	FLUVIAL: 1% / 0.1%	COASTAL: 0.5% / 0.1%
SOURCE CRS:		ITM EPSG:2157
DRAWN BY:	DL	DATE: 05/04/2023
CHECKED BY:	PS	DATE: 05/04/2023
APPROVED BY:	DKS	DATE: 05/04/2023
DRAWING NUMBER:	M02127-06_FIG_FL123	
DRAWING SCALE:	1:20000 @ A3	



© ORDNANCE SURVEY IRELAND. ALL RIGHTS RESERVED. USAGE PROVIDED BY FINGAL COUNTY COUNCIL LICENCE NO. 021/OSi_NMA_057

MAP SERIES	24 OF 26

KEY PLAN



LEGEND

- Fingal County Administrative Boundary
- Watercourses
- LAP & Masterplan Boundaries
- Flood Zone A
- Flood Zone B
- Defended Areas

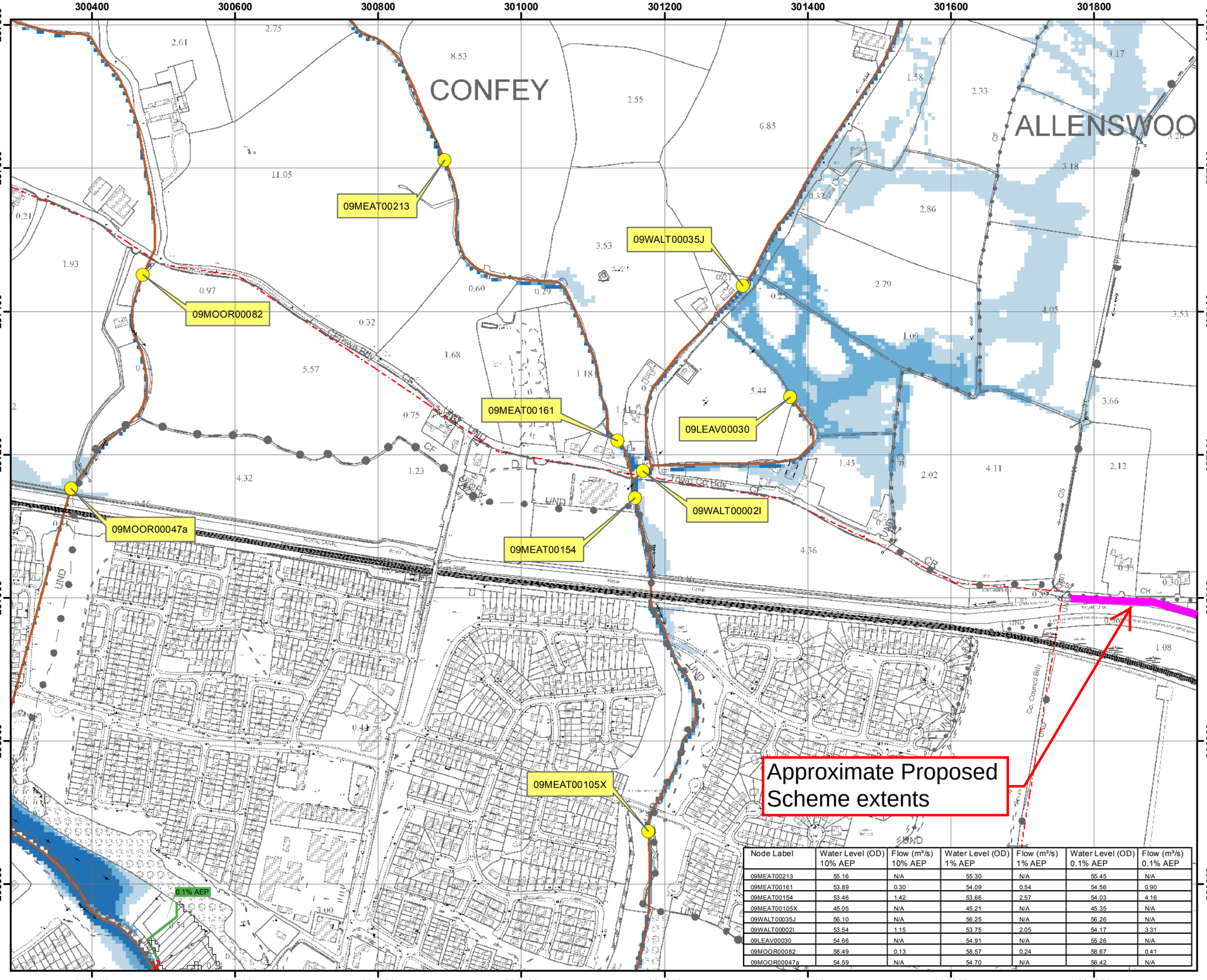
REV:	NOTE:	
05	FOR INFORMATION	05/04/2023

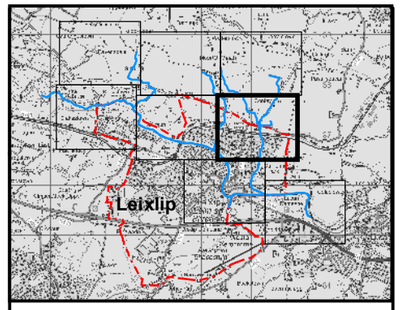
Comhairle Contae Fhine Gall
Fingal County Council

McCloy Consulting
Unit 12, The Beat Centre, Stephenstown Industrial Estate, Balbriggan, Co. Dublin
T: +353 (0)1 5138963
E: info@mccloyconsulting.ie
W: www.mccloyconsulting.ie

MAP:	FLOOD ZONE MAP	
FLOOD PROBABILITY:	FLUVIAL: 1% / 0.1%	COASTAL: 0.5% / 0.1%
SOURCE CRS:		ITM EPSG:2157
DRAWN BY:	DL	DATE: 05/04/2023
CHECKED BY:	PS	DATE: 05/04/2023
APPROVED BY:	DKS	DATE: 05/04/2023
DRAWING NUMBER:	M02127-06_FIG_FL124	
DRAWING SCALE:	1:20000 @ A3	

Appendix B : CFRAM Leixlip Fluvial Flood Extents





IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Embankment
- Wall
- Defended Area
- 1% AEP Standard of Protection of Flood Defence
- 1% AEP (Walls / Embankments)
- Node Point
- Node ID Node Label

Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09MEAT00213	55.16	N/A	55.30	N/A	55.45	N/A
09MEAT00161	53.89	0.30	54.09	0.54	54.56	0.90
09MEAT00154	53.46	1.42	53.66	2.57	54.03	4.16
09MEAT00105X	45.05	N/A	45.21	N/A	45.35	N/A
09WALT00035J	56.10	N/A	56.25	N/A	56.26	N/A
09WALT00002I	53.54	1.15	53.75	2.05	54.17	3.31
09LEAV00030	54.66	N/A	54.91	N/A	55.26	N/A
09MOOR00082	58.49	0.13	58.57	0.24	58.67	0.41
09MOOR00047a	54.59	N/A	54.70	N/A	56.42	N/A

FINAL

REV:	NOTE:	DATE:
02	Amendment to Flood Def SOP Label (Pg 8)	15/12/2017
01	Amendment to Def. Area	16/11/2016

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
An Oifig um Oibreacha Poiblí
The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

RPS
Elmwood House
74 Boucher Road
Belfast
BT12 6RZ
T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map: Leixlip Fluvial Flood Extents

Map Type: EXTENT
Source: FLUVIAL
Map Area: HPW
Scenario: CURRENT
Drawn By : F.M.C. **Date :** 15 December 2017
Checked By : S.P. **Date :** 15 December 2017
Approved By : G.G. **Date :** 15 December 2017
Drawing No. : E09LEI_EXFCD_F2_08
Map Series : Page 8 of 8
Drawing Scale : 1:5,000 @A3

© Ordnance Survey Ireland. All rights reserved. Licence number EN 0021017/OfficeofPublicWorks.

Appendix C : CFRAM Liffey Tidal Flood Extents

Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 0.5% AEP	Flow (m³/s) 0.5% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF00695	3.51	N/A	3.54	N/A	3.64	N/A
09LIFF00682	3.50	107.59	3.52	107.59	3.63	107.59
09BELL00033!	3.52	N/A	3.55	N/A	3.66	N/A
09LIFF00650	3.06	N/A	3.42	N/A	3.61	N/A
09BELL00009	3.36	N/A	3.48	N/A	3.63	N/A
09LIFF00621	3.01	103.57	3.38	103.80	3.58	105.46
09LIFF00612	2.99	N/A	3.36	N/A	3.56	N/A
09LIFF00559!	2.92	N/A	3.31	N/A	3.51	N/A

311800 312000 312200 312400 312600 312800 313000 313200

235000 234800 234600 234400 234200 234000 233800

Phoenix Park

09LIFF00695

09LIFF00682

09BELL00033!

09LIFF00650

09BELL00009

09LIFF00621

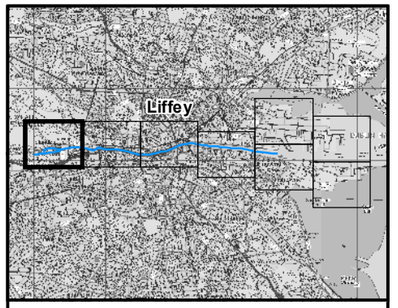
09LIFF00612

09LIFF00559!

Lucan to Chapelizod model upstream of this point.

Proposed Scheme approximately 10km west

0 50 100 200 300 400 500 Metres



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Tidal AEP Event
- 0.5% Tidal AEP Event
- 0.1% Tidal AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:
01	Amendments to Flood Extents.	05/12/16

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Liffey Tidal Flood Extents

Map Type:	EXTENT
Source:	TIDAL
Map Area:	COASTAL
Scenario:	CURRENT
Drawn By : C.C.	Date : 9 May 2017
Checked By : A.S.	Date : 9 May 2017
Approved By : S.P.	Date : 9 May 2017

Drawing No. :
E09LIF_EXCCD_F1_01

Map Series : Page 1 of 8

Drawing Scale : 1:5,000 @ A3

© Ordnance Survey Ireland. All rights reserved. Licence number EN 0021017/OfficeofPublicWorks.

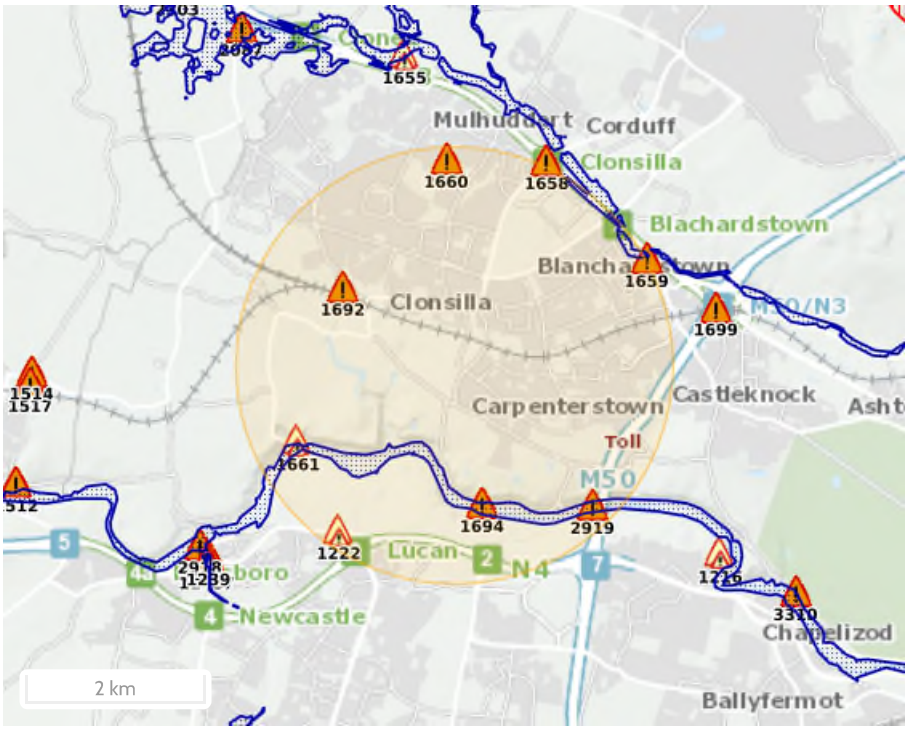
Appendix D : Past Flood Summary Report

Past Flood Event Local Area Summary Report

Report Produced: **12/5/2022 15:57**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

10 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Tolka River Pinebrook Hartstown Nov 2002 (ID-1660)	13/11/2002	Exact Point
	Additional Information: Reports (4) Press Archive (0)		
2.	Tolka November 2002 (ID-5)	13/11/2002	Area
	Additional Information: Reports (143) Press Archive (13)		
3.	Lucan St Edmonsbury Road Recurring (ID-1222)	n/a	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		
4.	Liffey Lr Lucan Rd R109 Strawberry Beds Recurring (ID-1661)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
5.	Liffey R109 at the Strawberry Beds Nov 2002 (ID-1694)	13/11/2002	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		
6.	Pinebrook Hartstown Nov 2000 (ID-2185)	05/11/2000	Exact Point
	Additional Information: Reports (1) Press Archive (2)		

	Name (Flood_ID)	Start Date	Event Location
7.	 Liffey Sommerton Rd Luttrellstown Golf C Oct 2004 (ID-2190)	26/10/2004	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
8.	 Liffey Lower - Dec 1954 (ID-241)	08/12/1954	Area
	Additional Information: Reports (5) Press Archive (2)		
9.	 Portersgate Clonsilla Nov 2000 (ID-1692)	05/11/2000	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
10.	 Liffey Strawberry Beds June 1993 (ID-2919)	10/06/1993	Approximate Point
	Additional Information: Reports (2) Press Archive (1)		

ENVIRONMENT
ISO 14001:2015
NSAI Certified

HEALTH
& SAFETY
ISO 45001:2018
NSAI Certified

QUALITY
I.S. EN ISO 9001:2015
NSAI Certified

Engineering
Sustainable
Futures

DBFL
CONSULTING ENGINEERS

Dublin Office

Ormond House
Upper Ormond Quay
Dublin 7, Ireland
D07 W704

+ 353 1 400 4000
info@dbfl.ie
www.dbfl.ie

Cork Office

14 South Mall
Cork, Ireland
T12 CT91

+ 353 21 202 4538
info@dbfl.ie
www.dbfl.ie

Galway Office

Odeon House
7 Eyre Square
Galway, Ireland
H91 YNC8

+ 353 91 33 55 99
info@dbfl.ie
www.dbfl.ie

Waterford Office

Suite 8b The Atrium
Maritana Gate, Canada St
Waterford, Ireland
X91 W028

+ 353 51 309 500
info@dbfl.ie
www.dbfl.ie