

CORK CITY TO VIADUCT GREENWAY - TRAMORE ROAD TO EAGLE VALLEY (PHASE 1)

Flood Risk Assessment



IE000205_RPS-00-RP-
C-RP00019
A1 C02
21 April 2023

Flood Risk Assessment

Document status					
Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
A1 C02	Issue for Planning	ND	GMcC	RG	05/04/2023

Approval for issue	
RG	21 April 2023

© Copyright RPS Group Limited. All rights reserved.

The report has been prepared for the exclusive use of our client and unless otherwise agreed in writing by RPS Group Limited no other party may use, make use of or rely on the contents of this report.

The report has been compiled using the resources agreed with the client and in accordance with the scope of work agreed with the client. No liability is accepted by RPS Group Limited for any use of this report, other than the purpose for which it was prepared.

RPS Group Limited accepts no responsibility for any documents or information supplied to RPS Group Limited by others and no legal liability arising from the use by others of opinions or data contained in this report. It is expressly stated that no independent verification of any documents or information supplied by others has been made.

RPS Group Limited has used reasonable skill, care and diligence in compiling this report and no warranty is provided as to the report’s accuracy.

No part of this report may be copied or reproduced, by any means, without the written permission of RPS Group Limited.

Prepared by:

RPS

Prepared for:

Cork City Council

Dublin | Cork | Galway | Sligo
 rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
 RPS Consulting Engineers Limited, registered in Ireland No. 161581
 RPS Planning & Environment Limited, registered in Ireland No. 160191
 RPS Engineering Services Limited, registered in Ireland No. 99795
 The Registered office of each of the above companies is West Pier
 Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7



Contents

1	INTRODUCTION	1
1.1	Flood Risk Assessment Approach	1
1.2	Types of Flooding.....	1
1.3	Flood Zones	1
2	PROJECT DESCRIPTION.....	3
2.1	Proposed Development.....	3
2.2	Existing Topography	3
2.3	Local Hydrology	4
2.4	Proposed Greenway Route Corridor.....	5
3	STAGE 1 – FLOOD RISK IDENTIFICATION.....	7
3.1	Overview	7
3.2	Flood Risk & Flood Studies Information.....	7
3.3	Flood History	7
3.3.1	OPW Flood Hazard Mapping.....	7
3.4	OPW / EPA / Local Authority Hydrometric Data	8
3.5	PFRA, CFRAM & Lee, Cork Harbour and Youghal Bay FRMP.....	8
3.6	Cork City Council Development Plan 2022-2028	11
3.7	Conclusion of Stage 1 FRA.....	12
4	STAGE 2 – INITIAL FLOOD RISK ASSESSMENT	13
4.1	Overview	13
4.2	Source-Pathway-Receptor Model	13
4.3	Fluvial Flooding.....	14
4.3.1	Fluvial Flood Risk	14
4.3.2	Fluvial Flood Risk Assessment.....	15
4.4	Impact on Flooding Elsewhere.....	15
4.4.1	Risk Associated with Flooding	15
4.4.2	Mitigation Against Flooding.....	15
4.5	Justification Test	16
4.5.1	Justification Test Requirement	16
4.6	Zoning	17
4.7	Conclusion of Stage 2 – Initial Flood Risk Assessment.....	19
5	CONCLUSION	20

Tables

Table 3-1: Past Flood Event Records provided on the OPW Flood Map Website.....	8
Table 4-1: Possible Flooding Mechanisms.....	13

Figures

Figure 2-1: Location of Proposed Greenway.....	3
Figure 2-2: Surface Water within the Vicinity of Proposed Development.....	4
Figure 2-3: Hydro Catchment Extent within the Vicinity of the Proposed Development	5
Figure 3-1: Past Flood Events (Source: https://www.floodinfo.ie/map/floodmaps/)	7
Figure 3-2: OPW PFRA Map for the Study Area.....	9
Figure 3-3: CFRAM Flood Extents for the Study Area	10
Figure 3-4: CFRAMS Flood Extent Map for the Lee Catchment (Togher, Tile 13).....	11
Figure 3-5: Cork City Development Plan 2022-2028 Indicative Flood Zones (source: www.corkcity.ie).....	12

Flood Risk Assessment

Figure 4-1: Sequential Approach Mechanism to Flood Risk Management as Presented in the Planning System and Flood Risk Management Guidelines (2009 DEHLG/OPW)16

Figure 4-2: Sequential Approach Principles in Flood Risk Management (2009 DEHLG/OPW)17

Figure 4-3: Extract from Cork City Development Plan 2022-2028 Zoning Map 1518

Figure 4-4: Extract from Cork City Development Plan Zoning Map 818

Figure 4-5: Extract from Cork City Development Plan 2022-2028 Zoning Map 718

1 INTRODUCTION

RPS has been appointed by Cork City Council as consultants for the development of the Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road.

As part of this appointment, a Flood Risk Assessment (FRA) has been prepared to identify if there are any flooding or surface water management issues related to the proposed project and the associated greenway improvement works area. The FRA has been completed in accordance with OPW 'Guidelines for Planning Authorities, The Planning System and Flood Risk Management' for inclusion in the Planning Application.

1.1 Flood Risk Assessment Approach

The OPW Guidelines recommend that FRAs be carried out to identify the risk of flooding to land, property and people. FRAs should use the Source-Pathway-Receptor (S-P-R) Model to identify the sources of flooding, the flow paths of the floodwaters and the people and assets impacted by the flooding.

The stages of appraisal for assessment are as follows:

- **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.
- **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.

1.2 Types of Flooding

There are two main sources of flooding: inland and coastal. Inland flooding is caused by prolonged and/or intense rainfall. This results in fluvial, pluvial or ground water flooding acting independently or in combination. Coastal flooding is as a result of tidal actions and is not a concern for the proposed greenway. Due to its inland location, the watercourses adjacent to the proposed works will not experience any tidal influence from the sea.

With regards to inland types of flooding:

- Fluvial flooding occurs when a river overtops its banks due to a blockage in the channel or the channel capacity is exceeded.
- Pluvial flooding occurs when overland flow cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high-water level in the receiving watercourse.
- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it.

1.3 Flood Zones

The Guidelines recommend identifying flood zones which show the extent of flooding for a range flood event probabilities. The Guidelines identify three levels of flood zones:

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

Flood Risk Assessment

- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

2 PROJECT DESCRIPTION

2.1 Proposed Development

The proposed development is located along the section of the former West Cork Railway corridor between Chetwynd Reservoir and Kinsale Road Roundabout.

The route of the former railway corridor is largely unoccupied and free of development. There is Traveller's accommodation units and working yard located on the former railway alignment at Hazelwood Grove to the west of the houses. Parts of the route are currently accessible to the public and have footpaths and tracks of various types and standards. Other areas are overgrown and inaccessible with thick vegetation of briars, gorse and scrub restricting access to some sections, in particular the bridges and the site of a former Travellers' accommodation units at Forge Hill.

The route crosses under the public road at three locations (Spur Hill, Lehenaghmore and Forge Hill) with the roads carried on stone bridges originally constructed to facilitate the roads crossing over the railway line. At Togher Road (L-2454) the greenway will cross at grade via a toucan crossing.

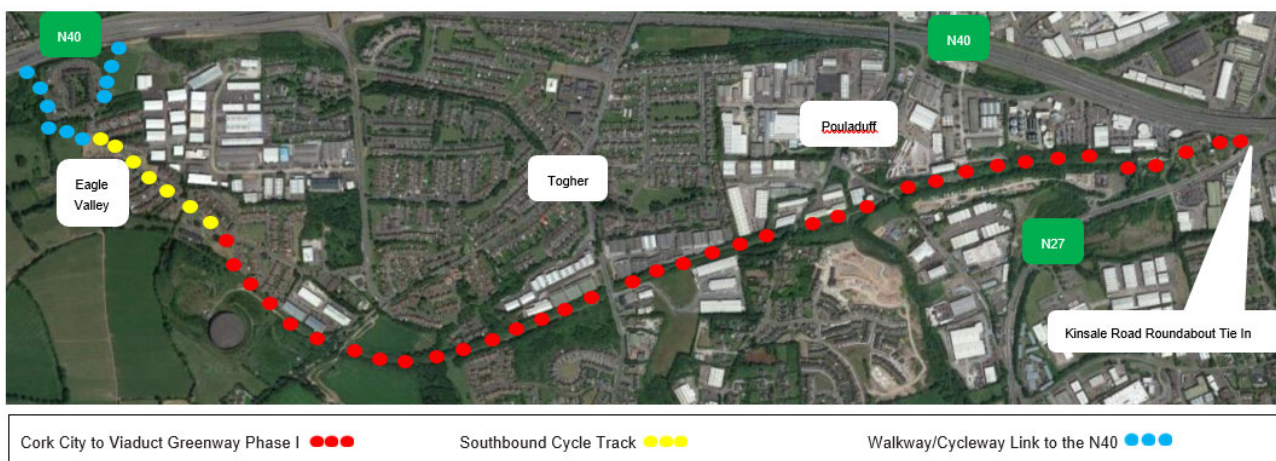
The main elements of the proposed greenway development comprise a 2.9km greenway, 4m in width, with a paved surface and adjacent carpark, circa 2,300m² in area (depicted in red in **Figure 2-1**). New public lighting will be provided along the greenway along with landscaping, to create enhanced amenity areas. The total site area for all associated works is 4.27ha.

Three short sections of new infrastructure for cyclists / pedestrians will provide links to the Greenway; two walkway/cycleway sections will connect to Eagle Valley from the N40 and there will be an onroad southbound cycleway along the spine road in Eagle Valley.

The total site area for all associated works is 5.68ha.

The location of the greenway route is shown in **Figure 2-1** below. The main elements of the proposed greenway development are depicted in red; the on-road cycle way is depicted in yellow and the two walkway/cycleway sections connecting Eagle valley from the N40 are in blue.

Figure 2-1: Location of Proposed Greenway



2.2 Existing Topography

The existing ground within the proposed route corridor typically slopes from south to north towards the Douglas River. The ground elevation ranges from approximately 15m AOD in the vicinity of Garrane Darra, rising to approximately 50m near Chetwynd Reservoir before falling again to approximately 20m AOD at Kinsale Road Roundabout.

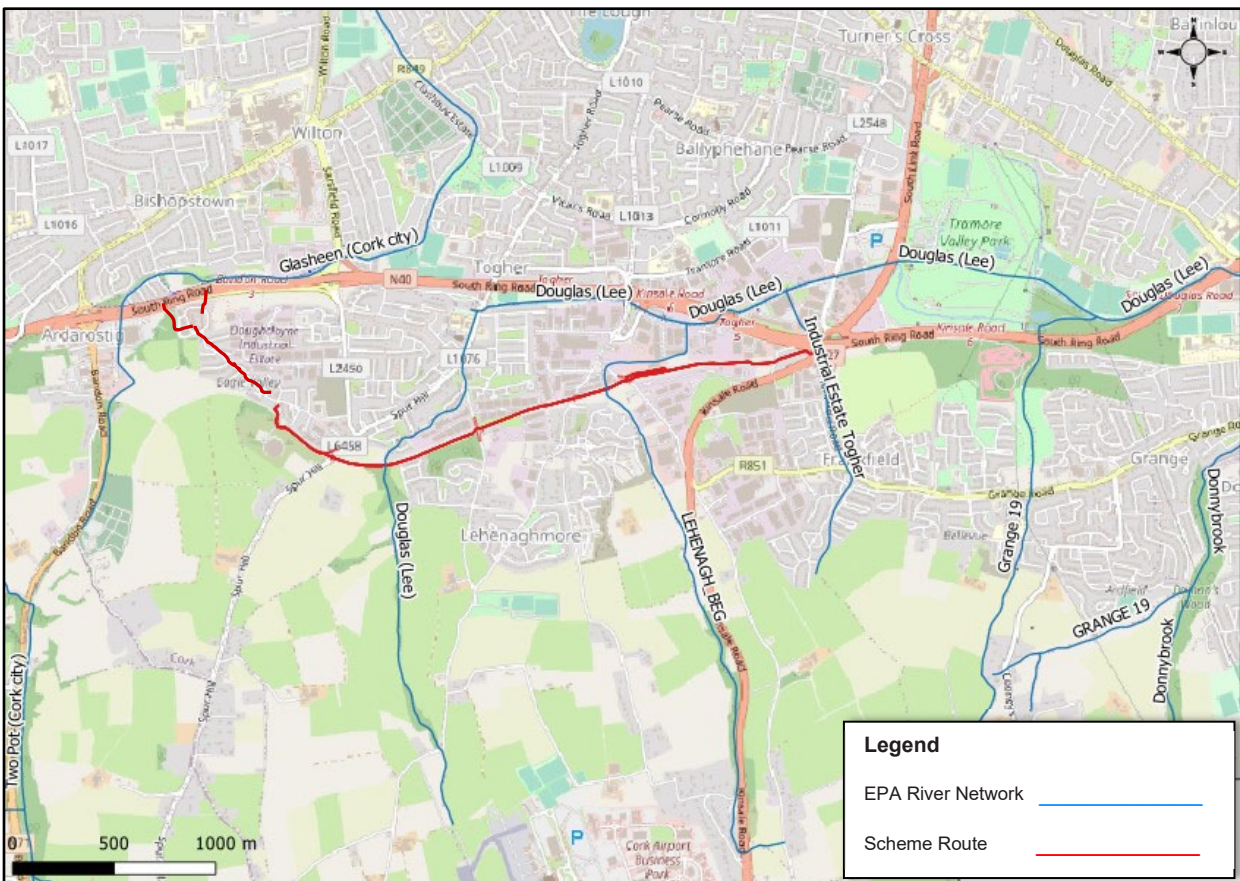
Flood Risk Assessment

2.3 Local Hydrology

The proposed development is located within the WFD Catchment 19 of Lee, Cork Harbour and Youghal Bay. This catchment includes the area drained by the River Lee and all streams entering tidal water in Cork Harbour and Youghal Bay and those streams entering tidal waters between Knockaverry and Templebreedy Battery, Co. Cork, draining a total area of 2,153km². The largest urban centre in the catchment is Cork City. The other main urban centres in this catchment are Ballincollig, Macroom, Carrigaline, Crosshaven, Blarney, Glanmire, Middleton, Carrigtwohill, Cobh, Passage West and Belvelly. The Douglas River, Hop Island Stream and Rochestown Stream (located within the Moneygurney 010 River Waterbody) drain into Lough Mahon Transitional Waterbody (TWB). Lough Mahon TWB is an estuary that stretches from Douglas/Blackrock to Monkstown in Upper Cork Harbour

There is one river waterbody which the proposed greenway crosses, namely that of the Moneygurney_010 (WFD Name) or Douglas (Lee). The Douglas River and its tributary, the Lehenagh Beg Stream (located within the Moneygurney 010 River Waterbody) drain into Lough Mahon TWB. The Glasheen (Cork City)_010 (WFD Name) River Waterbody is present just north of the proposed greenway, flowing from east to west parallel with the Bandon Road (South Ring Road) north of Garrane Darra. **Figure 2-2**, below, illustrates the hydrological features within the vicinity of the proposed greenway.

Figure 2-2: Surface Water within the Vicinity of Proposed Development



The catchment upstream of the proposed greenway is circa 6km² and consists largely of cultivated and pasture lands with commercial land with industrial units in the vicinity of Cork Airport. The extent of the entire catchment area, which is 7.34km² is shown below in **Figure 2-3**.

Flood Risk Assessment

Figure 2-3: Hydro Catchment Extent within the Vicinity of the Proposed Development



2.4 Proposed Greenway Route Corridor

The proposed greenway route is to utilise existing infrastructure in as much as possible, with the works typically consisting of an enhancement of a section of the former West Cork Railway corridor. The proposed greenway crosses the Douglas (Lee) stream over an existing culvert to the east of Spur Hill. The Douglas (Lee) stream is a 1st order stream at this location, originating west of Cork Airport and flowing from south to north towards Toghier, where it changes direction and becomes a 2nd order stream. The Douglas (Lee) then flows into the Transitional Waterbody of Lough Mahon c.5.5km downstream. The proposed greenway

Flood Risk Assessment

crosses the Lehenagh Beg 1st order stream over an existing culvert to the west of Forge Hill; this watercourse flows into Lough Mahon via the Douglas Lee c.4.1km downstream.

No new culverts or bridge works are required as part of the proposed Greenway proper; a minor channel connected to field drainage will be crossed by way of simple single span bridge or other suitable arrangement to facilitate one of the links between the N40 and the Greenway.

Accordingly, the development will not impact on existing water courses running within or in the vicinity of the proposed development.

The proposed drainage will be over the edge drainage, where the design level crossfall will result in all surface water running off into the adjacent verges. There will a gully and carrier pipe drainage at the new car park to the east of Forge Hill. Surface water run-off from the new car park will pass through a bypass interceptor before discharge to the existing surface water network at Forge Hill.

3 STAGE 1 – FLOOD RISK IDENTIFICATION

3.1 Overview

The purpose of this section is to establish the level of flood risk for the study area and to collate and assess existing current and historical information and data which may indicate the level and/or extent of any flood risk. The following sections detail information and data collated as part of the Stage 1 Flood Risk Identification carried out for the study area.

3.2 Flood Risk & Flood Studies Information

Relevant information was reviewed and collated from the following sources:

- Office of Public Works National Flood Hazard Mapping Website (www.floodinfo.ie)
- Lee Catchment Flood Risk Assessment and Management Study Predicted Flood Extent Maps
- Cork City Strategic Flood Risk Assessment, July 2021
- Groundwater Flooding Data from the Geological Survey of Ireland.

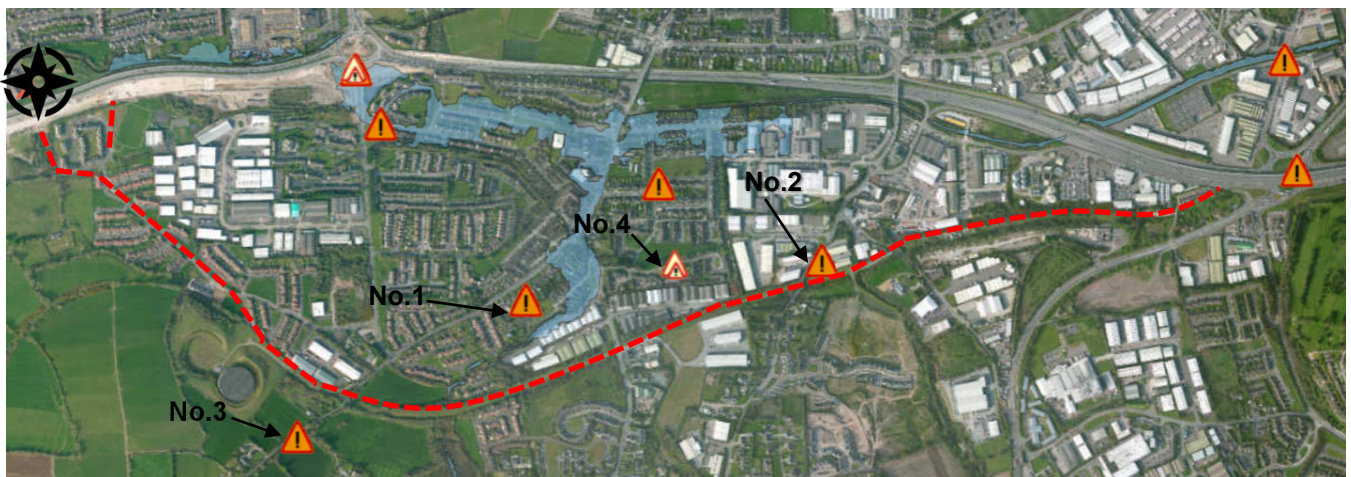
3.3 Flood History

As part of the overall exercise to establish the potential flood risk to the proposed works, a review of the available and recorded information on flooding in the area surrounding the project site was carried out. The following sources were used for the data.

3.3.1 OPW Flood Hazard Mapping

A review of the Office of Public Works (OPW) Flood Maps (www.floodinfo.ie), extract seen in **Figure 3-1** reveals no past flood events are recorded along the route of the proposed development. However, there were previous flooding incidents in the vicinity of the proposed route. A description of these nearby past flood events is presented below in **Table 3-1**.

Figure 3-1: Past Flood Events (Source: <https://www.floodinfo.ie/map/floodmaps/>)



Flood Risk Assessment

Table 3-1: Past Flood Event Records provided on the OPW Flood Map Website

Ref.	Waterbody	Flood Location	Date	Distance from Proposed Development	Source of Flooding
1.	Moneygureny_010 (Douglas (Lee))	North of Lehenaghmore Industrial Estate	05/11/2002	95m from the section of the Proposed Greenway between Togher Road and Spur Hill.	Heavy rainfall caused stream to overtop where it enters the culvert.
2.	Moneygureny_010 (Lehenagh_Beg)	Pouladuff Road	20/11/2002	100m south of the Proposed development at Forge Hill.	Land and road flooding due to blockage in stream caused by cable drums.
3.	n/a Pluvial	Spur Hill LP2454	27/11/2002	Adjacent to the Proposed development. Spur Hill Bridge on Spur Hill and road to the south.	Downpours caused surface water to flow along the road. Records of potholes and loose gravel on the Spur Hill road.
4.	n/a Pluvial	Palmbury Estate Togher	Reoccurring (20/21/27/11/2002)	Located 150m to the south of the Proposed development.	Surface water drainage is affected through soakaways, heavy rainfall caused localised flooding in estate.

3.4 OPW / EPA / Local Authority Hydrometric Data

The OPW, EPA and local authority hydrometric data were investigated. This investigation has determined that there are no existing active permanent or historic hydrometric gauging stations located within the Moneygurney Waterbody.

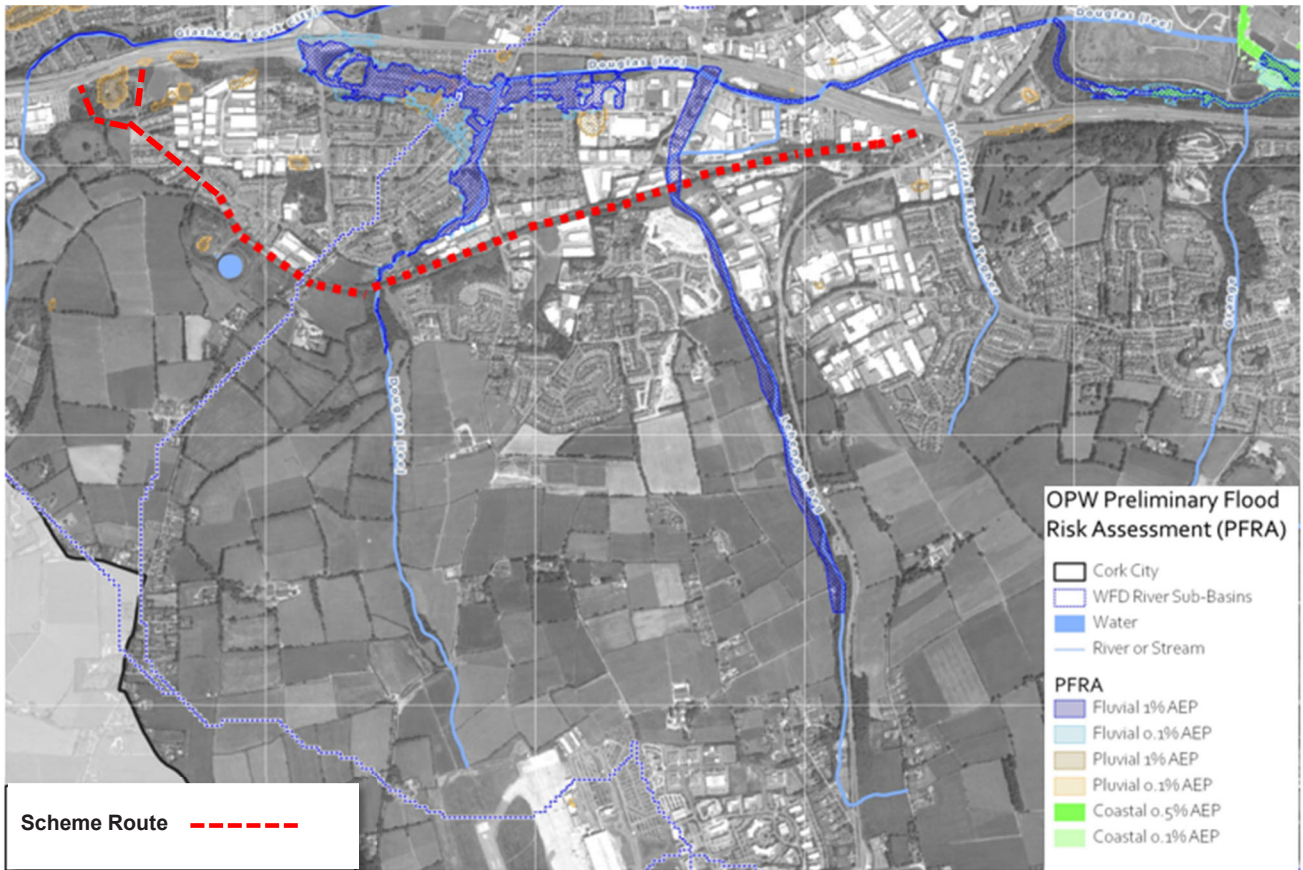
3.5 PFRA, CFRAM & Lee, Cork Harbour and Youghal Bay FRMP

The OPW lead the development of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The proposed greenway and surrounding area fall within the Lee CFRAM Study area.

The Preliminary Flood Risk Assessment was a national screening exercise to identify areas where they may be a significant risk of flooding. This exercise was completed in 2011 and Draft Preliminary Flood Risk Assessment (PFRA) maps were produced for the whole country by the OPW. **Figure 3-2** is an extract of the PFRA for the study area. The PFRA Map indicates that the proposed greenway is at risk from potential fluvial flooding where the Douglas (Lee) and the Leghanbeg Streams cross the proposed development. The PFRA Map also indicates a risk from pluvial flooding at Garrane Darra where the proposed greenway is to be linked via a walkway/cycleway link with the N40. However, the predicted extent of the flooding shown in the PFRA are intended to be indicative only.

Flood Risk Assessment

Figure 3-2: OPW PFRA Map for the Study Area



As a result of PFRA process, certain areas were identified as Areas for Further Assessment (AFAs). The Catchment Flood Risk Assessment and Management (CFRAM) Study provided a detailed assessment of the extent and degree of flood risk for the AFA’s identified from the flood hazard mapping referred to above. The flood hazard areas had been identified as being potentially at risk from significant flooding, including areas that have experienced significant flooding in the past.

The Flood Risk Management Plan (FRMP) for the Lee Catchment was published by the OPW as an output from the South Western CFRAMS. A number of AFAs were determined to be potentially significant in one or more communities within the area covered by the Lee, Cork Harbour & Youghal Bay River Basin Plan. The FRMP for the Lee, Cork Harbour & Youghal Bay River Basin addresses fluvial and coastal flooding in these and other AFA’s within the Lee Catchment. The AFA’s addressed in the Lee, Cork Harbour and Youghal Bay FRMP relevant to the proposed Greenway are Cork City and Togher. Detailed CFRAM flood maps were produced for these AFA’s which lie along the extents of the greenway, which is the subject of this assessment, namely Cork City (Tile 12), Togher (Tile 13) and Togher (Tile 14) - see **Figure 3-3**.

Flood Risk Assessment

Figure 3-3: CFRAM Flood Extents for the Study Area

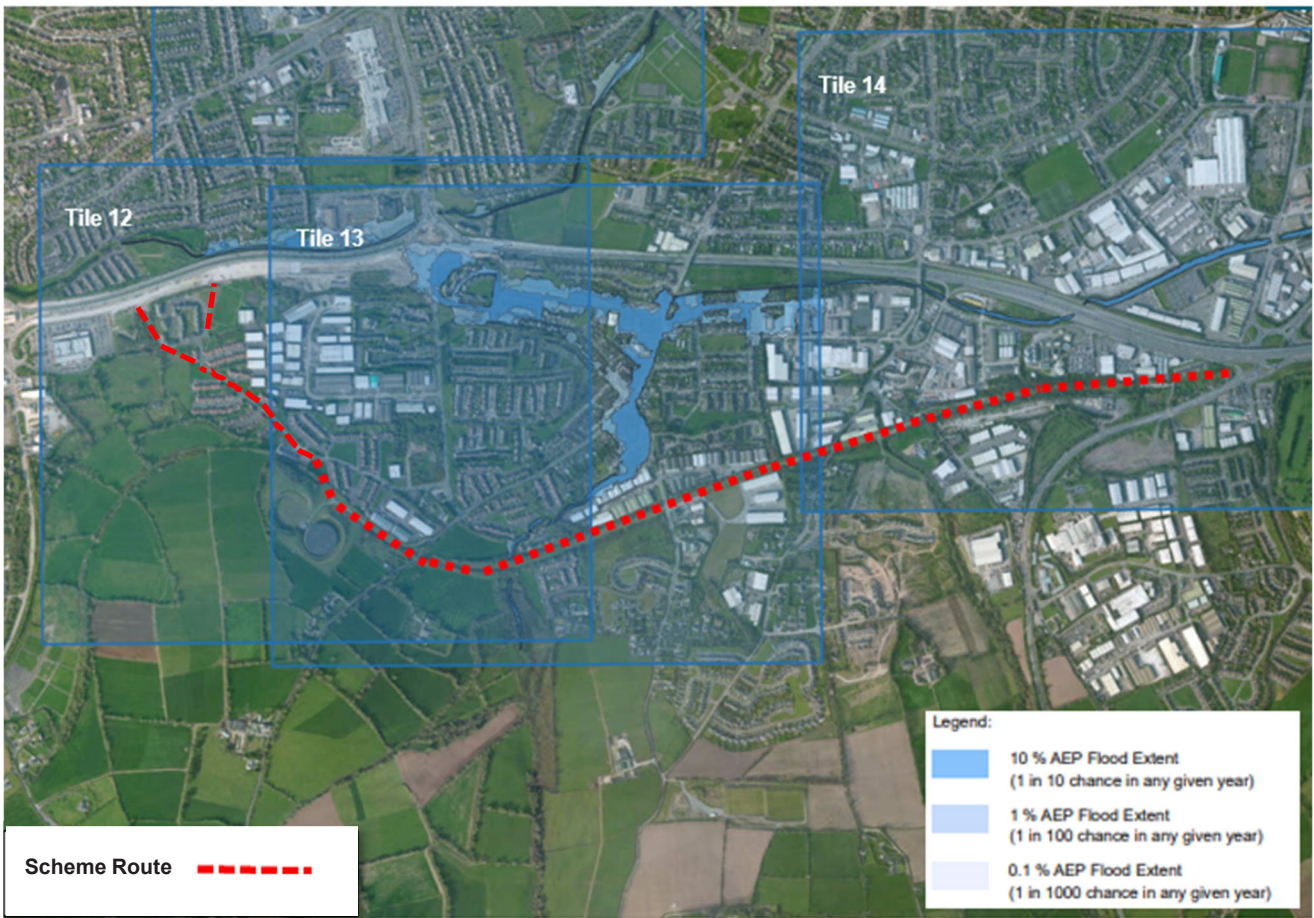
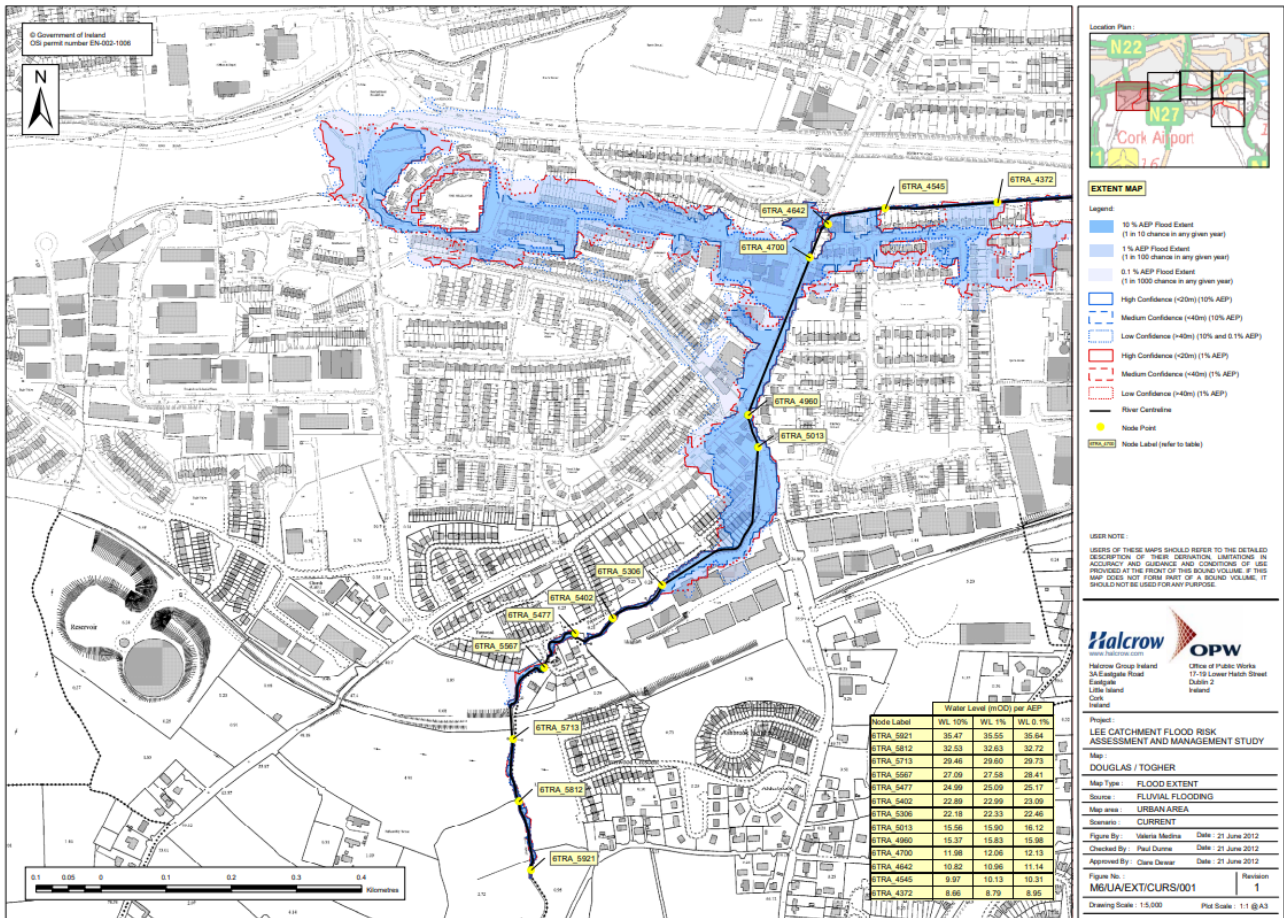


Figure 3-4 below shows the detailed CFRAM map for Togher (Tile 13). From this figure, it can be seen that Togher Village to the north of the proposed greenway is identified as being at risk of flooding. The mapping also indicates that small green areas along the Douglas (Lee) north and south of the culvert over which the proposed development passes are mapped within the River Flood extents for High (AEP 10%), Medium (AEP 1%) and Low (AEP 0.1%) Probability Flood Events.

Flood Risk Assessment

Figure 3-4: CFRAMS Flood Extent Map for the Lee Catchment (Togher, Tile 13)



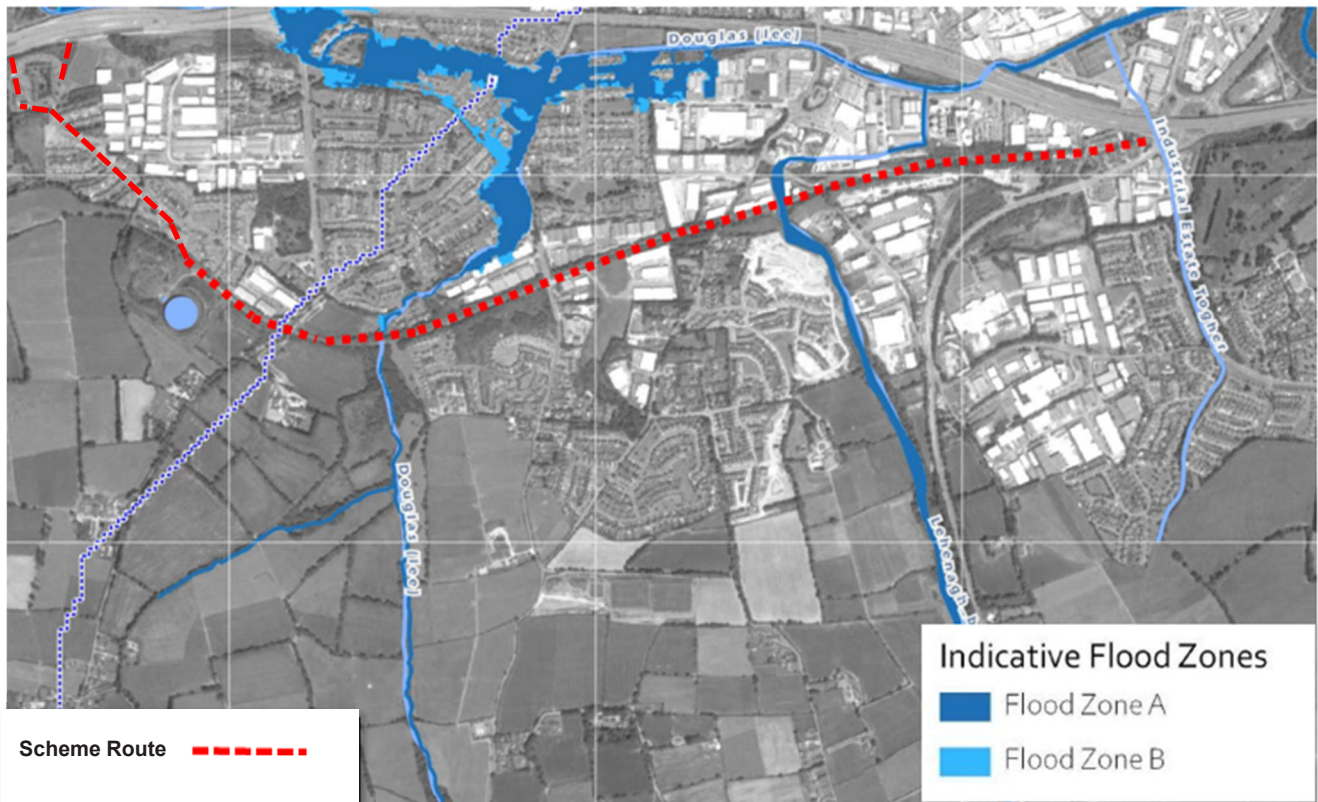
3.6 Cork City Council Development Plan 2022-2028

The proposed study area is contained within the Cork City Council settlement boundary area. A Strategic Flood Risk Assessment (SFRA) for the Cork City Development Plan 2022-2028 was undertaken in accordance with the requirements of the OPW planning guidelines, 'Guidelines for Planning Authorities, The Planning System and Flood Risk management'. This plan provides details of flood mapping proposed to be included within the Cork City Development Plan 2022-2028.

This flood mapping provides information on the Flood Zone A and Flood Zone B areas associated with the waterbodies in the vicinity of proposed Greenway. From a review of these maps, flood extents are indicated in the study area that are associated with the Douglas River and Lehenagh Beg Stream. This flood mapping provides information on the Flood Zone A and Flood Zone B areas associated with these waterbodies. An extract from the flood mapping indicating the Indicative Flood Zones is shown as **Figure 3-5** below.

Flood Risk Assessment

Figure 3-5: Cork City Development Plan 2022-2028 Indicative Flood Zones (source: www.corkcity.ie)



Flooding associated with the Douglas River, which flows into Lough Mahon from lands to the south of the proposed greenway, is indicated on the flood mapping. The proposed route of the greenway is noted to utilise an existing culvert to cross over the Douglas River. An area of indicated flood risk is noted adjacent to the greenway to the north of the culvert, over which the proposed greenway crosses.

Flooding is also indicated associated with the Lehenabeg Stream, which flows into the Douglas River from lands to the south of the proposed greenway. The proposed route of the greenway is noted to cross through a 20m length of this area of indicated fluvial flood risk, representing 0.7% of the overall length of the proposed greenway. This section of the proposed greenway will be accommodated along the route of an existing paved service access road.

3.7 Conclusion of Stage 1 FRA

The purpose of Stage 1 is to establish whether a flood risk exists or may exist in the future. If there is a potential flood risk, then a Stage 2 Assessment is required.

The Lee CFRAM predicted flood extents typically indicate that the proposed greenway improvement scheme works area is adjacent to the indicated flood extents associated with fluvial flooding from the Douglas River. While these maps indicate flood extents associated with the adjacent Douglas River, the flood extents do not extend as far as the proposed route of the greenway. This would indicate that the proposed greenway route is at low risk from flooding.

However, the predicted fluvial flood extents as included within the Cork City Development Plan 2022-2028 would appear to indicate that a small section of the proposed greenway passes through an area of predicted fluvial flood extents associated with the Lehenagh Beg Stream (i.e. Flood Zone A).

The proposed development is potentially at risk from pluvial flooding based on PFRA mapping and historical pluvial flooding adjacent to the proposed Greenway, as identified in **Section 3.3 and Section 3.5**.

Therefore, on the basis that the Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road. corridor passes through an area of predicted fluvial flood extents, the FRA has progressed to Stage 2 – Initial Flood Risk Assessment.

4 STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

4.1 Overview

The purpose of the Initial Flood Risk Assessment is to appraise the availability and adequacy of the identified flood risk information, to qualitatively appraise the flood risk posed to the site and potential impacts on flood risk elsewhere and recommend possible mitigation measures to reduce the risk to acceptable level. A Source-Pathway-Receptor model is used to summarise the possible sources of floodwater, the pathway and the receptors that could be affected by potential flooding.

4.2 Source-Pathway-Receptor Model

In the first instance, an identification and assessment of the probability, magnitude, response of pathways and consequences of a flood event in the proposed development site were appraised. This analysis was aimed at identifying high risk elements as summarised in **Table 4-1** below.

Table 4-1: Possible Flooding Mechanisms

Source	Pathway	Receptor	Likelihood	Consequences	Risk	Comment / Reason
			Remote, possible, likely	Low, medium, high	Low, medium high	
Tidal /Coastal	Increased levels in Lough Mahon encroaching on Greenway	Proposed Greenway	Remote	Low	Low	The study area is located inland and outside the extents of potential coastal flooding from Cork Harbour.
Fluvial	Increased stream levels overtopping banks	Proposed Greenway	Possible	Low	Medium	The proposed greenway crosses the Lehenagh Beg Stream over an existing culvert and passes through a minor section of its mapped Flood Zone A extents.
Fluvial	Increased Douglas River levels overtopping riverbanks	Proposed Greenway	Possible	Low	Low	The route corridor crosses the Douglas River over an existing culvert. CFRAM fluvial extent mapping indicates that the proposed greenway is adjacent to small areas mapped within the Douglas River Flood extents, however as the flood extents do not reach the proposed greenway no new flood risks are associated with the proposed greenway.

Flood Risk Assessment

Source	Pathway	Receptor	Likelihood	Consequences	Risk	Comment / Reason
Pluvial	Overland Flow from Elevated Lands or Water logging	Proposed Greenway	Possible	Low	Low	Pluvial flooding is indicated in PFRA mapping at Garrane Darra & has occurred in the past at Spur Hill, however the subsoil in the area is well draining with existing drainage infrastructure in place so waterlogging potential is unlikely.
Blockage	Culvert blockage	Proposed Greenway	Possible	Low	Low	The proposed greenway overlies 2 no. culverts east of Spur Hill and west of Forge Hill. Regular maintenance and checks should avoid any issues of this nature.
Groundwater	Rising Ground Water Level	Proposed Greenway	Remote	Low	Low	Consultation with the GSI Groundwater Flooding Data Viewer indicates that the proposed greenway is not in area defined as being at risk of groundwater flooding.

The primary source of flood risk to the proposed development may be attributed to fluvial flooding from the Lehenagh Beg Stream, as per the flood extents mapping as produced as part of the Cork City Development Plan 2022-2028.

4.3 Fluvial Flooding

4.3.1 Fluvial Flood Risk

Section 3.3 outlines a brief history of the previous flood events from the waterbodies in the vicinity of the proposed works.

Detailed CFRAM flood maps produced for the Flood Risk Management Plan (FRMP) for the Lee, Cork Harbour & Youghal Bay River Basin show a small portion of green lands to the north of greenway to intersect with flooding from the Douglas River.

The Lehenagh Stream was not modelled as part of the detailed CFRAM flood maps, however the predicted flood extent included within the Cork City Development Plan 2022-2028 mapping show a small section of the greenway corridor to intersect with potential flooding extents from the Lehenagh Beg Stream at Forge Hill.

Flood Risk Assessment

4.3.1.1 Douglas (Lee)

The existing greenway route passes through an existing dirt track that is largely overgrown between Spur Hill and the Togher Road (L-2454). It is proposed to clear and upgrade this track to create a new 4m wide greenway.

The detailed flood extent CFRAM maps produced for the Togher AFA indicate that small areas along the Douglas (Lee) River north and south of the culvert (at Fernwood) over which the proposed development passes have been mapped within the flood extents for Low, Medium and High Probability Flood Events.

The proposed 4m wide greenway between Spur Hill and Togher will be accommodated along the route of the former railway line. The proposed works for this area will comprise reprofiling and the creation of landscaped verges with wildflowers and ornamental planting.

4.3.1.2 Lehenagh Beg

The existing greenway route passes through a paved service access road at the western half of the Lehenaghmore Road to Forge Hill Road Section. It is proposed that the route of the proposed greenway will be accommodated along this access road. The predicated Flood Zone A for the Lehenagh Beg Stream, as produced for the Cork City Development Plan 2022-2028, is noted to overlap with this area.

The proposed new 4m wide greenway will be accommodated by the existing paved area and the proposed works for this area will consist of landscaping only; generally, there will be 0.75 to 1.0m landscaped verges with wildflowers and ornamental planting, which will tie in with the existing trees and shrubbery on the periphery of the former West Cork Railway corridor.

4.3.2 Fluvial Flood Risk Assessment

Both of the above areas can also be described as amenity open spaces, for use as outdoor sports and recreation. The Planning System and Flood Risk Management Guidelines for Planning Authorities describe such works as water compatible development. Therefore such works are considered appropriate for this location.

Should a flood event occur in either of these areas, the outcome would be surface water flooding to an area that is fully compatible with such an event. Such an event would result in only limited negative impacts on the proposed facilities. Typically, in the occurrence of such as flood event, pedestrian and cyclists would not be using the facilities due to the inclement weather conditions associated with the occurrence of the flooding. Once the storm event abates, the flood waters would recede, allowing the facility to return to a condition whereby it can be used as intended. Over the edge drainage will allow surface water runoff to infiltrate back to ground.

Therefore, while the risk of flooding to the amenity area is considered as medium, based on the Cork City Development Plan 2022-2028 mapping, the consequence of any such event is considered to be low.

4.4 Impact on Flooding Elsewhere

4.4.1 Risk Associated with Flooding

During a flood event, as per the extents indicated in the Cork City Development Plan 2022-2028, flood waters are predicted to inundate the proposed amenity area to be constructed as part of the proposed greenway, resulting in flooding of the area.

There is a risk associated that the development of this section of lands as an amenity area could increase the risk of flooding elsewhere, either upstream or downstream of the site location.

4.4.2 Mitigation Against Flooding

During a flood event, as per the extents indicated in the Cork City Development Plan 2022-2028, flood waters would inundate the amenity area proposed to be constructed as part of the proposed greenway. It is not proposed to significantly alter the topography of this area as part of the greenway project. Therefore any future flood events would still be allowed to be contained within the footprint of the lands used as the amenity

Flood Risk Assessment

area. Once the storm event abates and the associated flood waters recede, the flood waters would return to the Douglas Lee River and Lehenagh beg Stream and the area would return to normal operations.

The 2010 Draft Catchment Flood Risk Management Plan (FRMP) for the Lee Catchment, published in February 2010, originally recommended flood relief measures for the Togher area. The Lee, Cork Harbour & Youghal Bay FRMP was adopted by Cork City Council in July 2018, and they have committed to implementing the recommendations from the FRMP and are working in conjunction with the OPW to progress the proposed flood relief scheme for Douglas which includes the Togher area.

Currently Cork City Council are carrying out such works as part of the Togher Flood Relief and Public Realm Enhancement Works. The scheme comprises conveyance improvement, culvert removal and replacement, flood defence walls and a trash screen. To date, a new culvert has been installed between Togher Community Centre and Lehenaghmore Industrial Estate. Other flood alleviation works include the addition of a trash screen at the rear of Lehenaghmore Industrial Estate which has been recently installed. These works will alleviate the risk of flooding within the village.

This scheme will provide protection to existing residential and commercial properties at risk from fluvial flooding against the 1% AEP event standard of protection (roughly equivalent to a 1 in 100-year storm).

Therefore, the risk of any impact of flooding elsewhere is considered low.

4.5 Justification Test

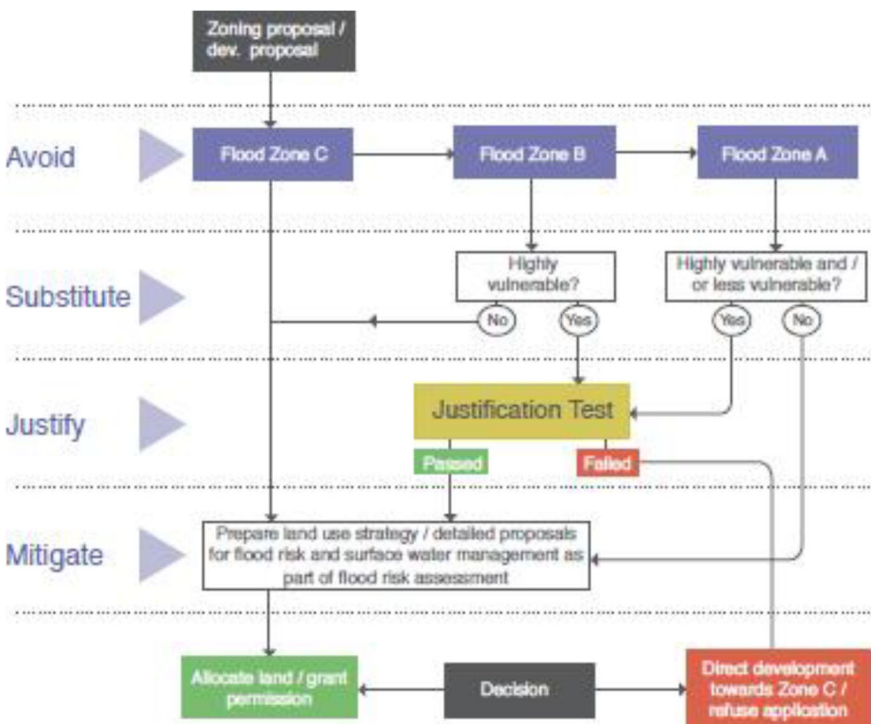
4.5.1 Justification Test Requirement

The requirement for a Justification Test for the proposed upgrade works was reviewed in accordance with the OPW guidelines “*The Planning System and Flood Risk Management – Guidelines for Planning Authorities*”.

The results of the Initial Flood Risk Assessment determine that one small section of the proposed Cork City to Viaduct Greenway works will be at risk of flooding during the 1% AEP event associated with the Leghenagh Beg Stream.

Justification Tests are required under the sequential approach to flood risk management recommended as current Best Practice by the OPW. The sequential approach mechanism to flood risk management in the planning process is shown in **Figure 4-1**.

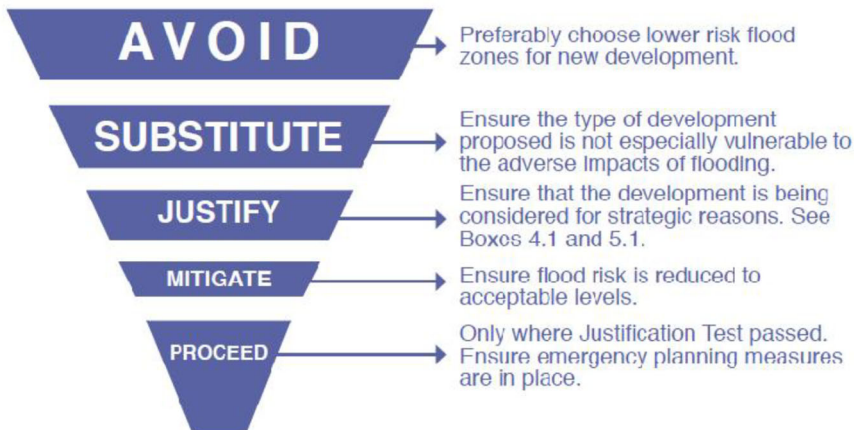
Figure 4-1: Sequential Approach Mechanism to Flood Risk Management as Presented in the Planning System and Flood Risk Management Guidelines (2009 DEHLG/OPW)



Flood Risk Assessment

The sequential approach principals in flood risk management is shown on the flow chart in **Figure 4-2**.

Figure 4-2: Sequential Approach Principles in Flood Risk Management (2009 DEHLG/OPW)



Section 4.3 above describes the works that are required to be located within an area of Flood Zone A and Flood Zone B. The Flood Zone A and Flood Zone B extents are noted to consist of a small section of lands along the Douglas Lee at Fernwood between the junction of Spur Hill and the Togher Road and along the Lehenagh Beg Stream at Farm Lane and Lehenagh Beg Industrial Estate. The flood zones impacts on a proposed amenity area to be provide with the upgraded greenway.

The proposed greenway works comprises of “*Water-compatible development*” under the Guidelines. This infrastructure may be located within areas of Flood Zone A and Flood Zone B, without the requirement to undertake a Development Management Justification Test.

Therefore, in accordance with the sequential approach mechanism as illustrated in **Figure 4-1** and **Figure 4-2**, a Justification Test is not required to be undertaken.

4.6 Zoning

The site falls within the Cork City settlement boundary and is appropriately zoned within the Cork City Development Plan 2022-2028. The greenway route is typically zoned as “Walkways and Cycleways” along the general route of the greenway, with the proposed route located within areas zoned as ‘ZO 01 Sustainable Res Neighbourhoods’ with the zoning objective for this zoning “to protect and provide for residential amenities, local services and community, institutional, educational and civic uses” and “ZO 21 City Hinterland” with the zoning objective ‘to protect and improve rural amenity and provide for the development of agriculture and “ZO 09 Light Industry and Related Uses” for which the objective is to “*to provide for new residential development in tandem with the provision of the necessary social and physical infrastructure*” (see **Figures 4-3** to **4-5** below). The proposed greenway infrastructure is deemed acceptable in principle within such zonings.

Flood Risk Assessment

Figure 4-3: Extract from Cork City Development Plan 2022-2028 Zoning Map 15



Figure 4-4: Extract from Cork City Development Plan Zoning Map 8



Figure 4-5: Extract from Cork City Development Plan 2022-2028 Zoning Map 7



4.7 Conclusion of Stage 2 – Initial Flood Risk Assessment

From the above assessment, it can be determined that the overall risk of flooding to the proposed Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road is low. While it is noted that the risk of flooding to the amenity area would be Medium, the consequence of such an event is deemed low as the proposed amenity area is classed as a water-compatible development.

As the proposed works will not significantly impact on the topography of the existing lands within the predicted flood plain area, the proposed works was not found to increase flood risk elsewhere. Therefore, the risk of flooding elsewhere due to the works is considered to be low.

As the present risk of flooding to the proposed greenway works is low, there is no requirement to progress to a Stage 3 Flood Risk Assessment.

5 CONCLUSION

A Flood Risk Assessment has been carried out to establish the potential flood risk to the proposed Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road project. Based on the results of the Flood Risk Assessment, the conclusions and recommendations for the project are summarised below:

- The vast majority of the Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road is located outside of the predicted flood plains for both the 1.0% AEP (1 in 100 Year/Flood Zone A) and the 0.1% to 1.0% AEP (between 1 in 100 and 1 in 1000 year/Flood Zone B) events for fluvial flooding. Therefore, the risk of fluvial flooding to the proposed greenway scheme is considered to be low,
- The Cork City to Viaduct Greenway - Phase I from Eagle Valley to Tramore Road is located outside of the predicted flood plains for both the 0.5% AEP (1 in 200 Year/Flood Zone A) and the 0.1% to 1.0% AEP (between 1 in 100 and 1 in 1000 year/Flood Zone B) events for coastal flooding. Therefore, the risk of coastal flooding to the proposed scheme is considered to be low.
- Small sections of the green land to the north and south of the culvert over which the proposed development passes are noted to be located in an area at risk from the 10% AEP (1 in 10 Year) and 1.0% AEP (1 in 100 Year) and the 0.1% to 1% AEP (between 1 in 100 and 1 in 1000 year) fluvial flood events from the Douglas River. The development within this area consists of the clearance and upgrade of the existing dirt track comprising reprofiling and the creation of landscaped verges with wildflowers and ornamental planting. These works are considered to be water-compatible development, in line with the requirements of Table 3-1 of the Planning System and Flood Risk Management Guidelines for Planning Authorities. Therefore, the consequence of flooding to this area is considered to be low.
- A small section, representing 0.7% of the total length of the proposed greenway is noted to be located in an area at risk from the 1.0% AEP (1 in 100 Year- Flood Zone A) fluvial flood events from the Lehenagh Beg Stream. The development within this area consists of the upgrade to the existing paved surface with landscaping. These works are water-compatible development, in line with the requirements of Table 3-1 of the Planning System and Flood Risk Management Guidelines for Planning Authorities. Therefore, the consequence of flooding to this area is considered to be low.
- The works in the area of Flood Zone A do not propose to significantly impact on the topography of the area. This will result in the flood plain area post completion of the greenway works resembling that prior to the works and will still allow for the containment of any waters associated with a flood event. Therefore, the risk of flooding elsewhere due to the greenway project is considered to be low.
- The works are considered to be water-compatible, and accordingly there is no requirement to undertake a Justification Test for the section of works within the areas of Flood Zone A.