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Appendix A13.2
Site Specific Flood
Risk Assessment

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1 Introduction

1.1 Background

Mott MacDonald/AECOM has been appointed by the National Transport Authority (NTA) to undertake a Stage 1 Flood Risk Assessment (FRA) as part of the planning application process for the Core Bus Corridor (CBC) BusConnects Dublin Programme. This FRA will assess the flood risk for the Tallaght / Clondalkin to City Centre Core Bus Corridor which consists of two sections:

- Tallaght to City Centre Section
- Clondalkin to Drimnagh Section

This Stage 1 FRA is a high-level study of the scheme to identify flood risks to the project and any potential flooding issues arising due to the project. This report will inform the planning process and identify whether a further Stage 2 FRA is required.

BusConnects is the National Transport Authority's (NTA) programme to improve bus and sustainable transport services, with BusConnects Dublin Core Bus Corridor Infrastructure Works delivering approximately 230km of dedicated bus lanes and 200 km of cycle tracks along twelve stand-alone Core Bus Corridor Schemes. This project is fundamental to addressing the congestion issues in the Dublin region with the population due to grow by 25% by 2040, bringing it to almost 1.55million.

In June 2018 the National Transport Authority (NTA) published the Core Bus Corridors Project Report. The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure which will enable and deliver efficient, safe and integrated sustainable transport movement along the corridors.

The Tallaght / Clondalkin to City Centre Core Bus Corridor of the CBC Infrastructure Works forms part of the radial Core Bus Network as shown in Figure 1.

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

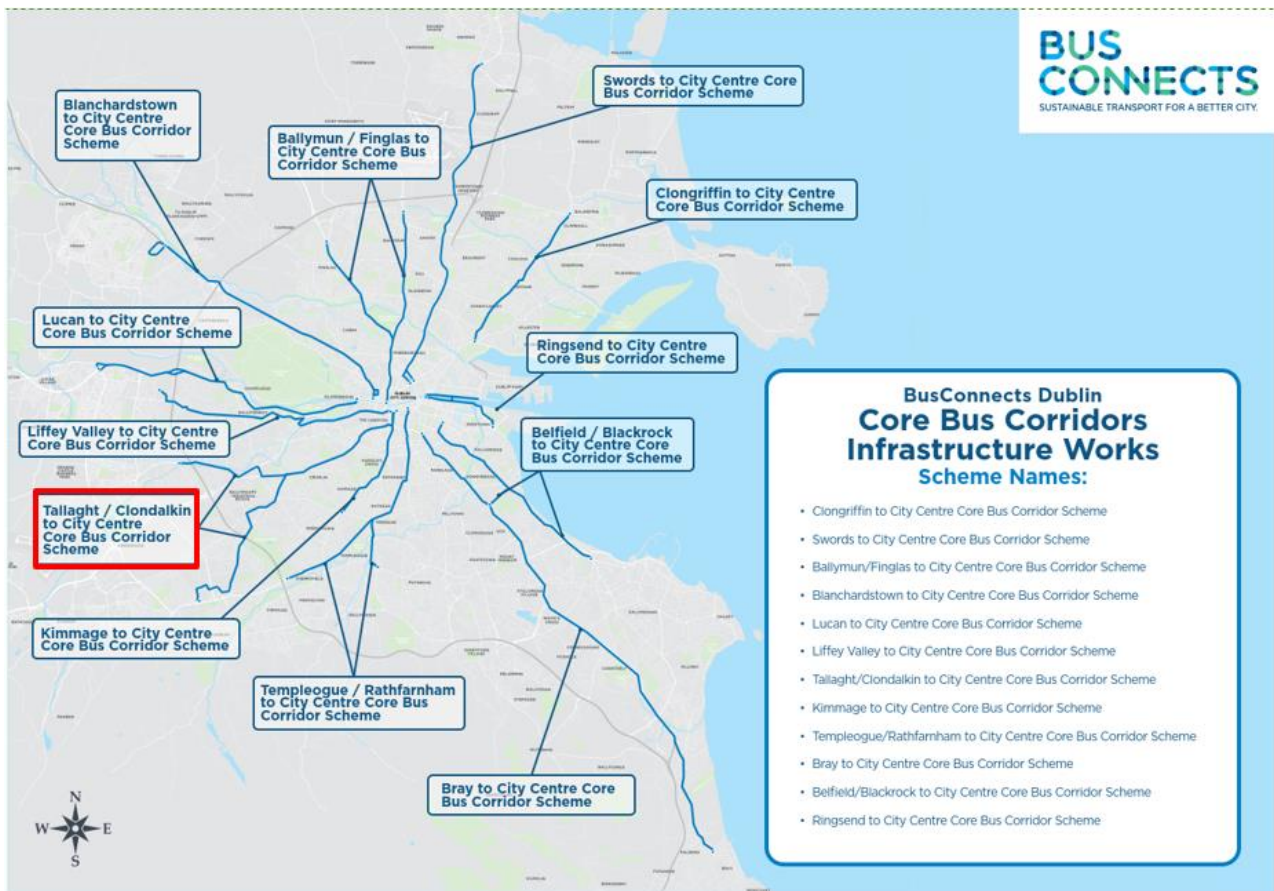


Figure 1: BusConnects CBC Network Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme

1.2 Scope of Assessment

The Flood Risk Assessment (FRA) 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 as a result of 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 (Stage 2 FRA) if required.

1.3 Summary of Data Used

Data regarding flood risk relevant to the proposed development and surrounding area has been obtained from the following sources:

- Review of Dublin City Development Plan (<http://www.dublincity.ie/main-menu-services-planning-city-development-plan/dublin-city-development-plan-2016-2022>)
- Irish Coastal Protection Strategy Study (ICPSS);
- Preliminary Flood Risk Assessment (PFRA) Mapping produced by the OPW (www.floodinfo.ie);

- Flood history of the site from the OPW National Flood Hazard Mapping website (www.floodinfo.ie);
- Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management' published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG);
- Topographical information received for site surveys.
- Dublin City Development Strategic Flood Risk Assessment for Dublin City Development Plan 2016-2022

All Ordnance Datum (OD) levels referred to in this report are to Malin Head Ordnance Datum unless otherwise stated.

1.4 Route Overview

1.4.1 Tallaght to City Centre Section

The Tallaght to City Centre section, described below, is split into four sub-sections:

- i. Tallaght to Ballymount
- ii. Ballymount to Crumlin
- iii. Crumlin to Grand Canal
- iv. Grand Canal to Christchurch

1.4.1.1 Tallaght to Ballymount

The Proposed Scheme commences at the junction of Old Blessington Road/Cookstown Way and is routed along Belgard Square West, Belgard Square North, Belgard Square East, Blessington Road, Main Road, Old Greenhills Road to the junction of Greenhills Road and Bancroft Park. Between the Old Greenhills Road and the junction with Mayberry Road, along the Greenhills Road (R819), it is intended to provide one bus lane, one traffic lane and a cycle track in each direction. Between Mayberry Road and Tymon Lane, it is proposed to reconfigure the local road network with a new approximately 620m long sustainable link road for bus/cycling/pedestrian modes that will run parallel to Birchview Avenue and Treepark Road.

1.4.1.2 Ballymount to Crumlin

The existing M50 bridge crossing will be retained. Two new single span pedestrian/cycle bridges are proposed to be located adjacent to the existing bridge. Two sustainable link roads will be constructed in the Ballymount area due to the existing width constraints within the existing Greenhills Road (R819) to the east of the M50. The existing Ballymount Road Upper connection will be closed to vehicular traffic and a new 220m long link road to the south of Ballymount Avenue will provide a connection to Greenhills Road (R819). It is proposed to widen the existing Ballymount Avenue and Calmount Road for dedicated bus and cycle tracks and connect Calmount Road to Greenhills Road. The existing Greenhills Road (R819) will be detained for local access and cycling facilities with a cul-de-sac treatment to the northern end where a new approximately 250m long sustainable transport link road will be constructed in the green area to the east of Calmount Road. To maintain access for local businesses along the Greenhills Road (R819) in this area a new roundabout will be constructed with a new approximately 90m long link road to connect Greenhills Road with Calmount Avenue. Between Calmount Road and Walkinstown Roundabout, it is proposed to maintain one bus lane, one traffic lane and a cycle track inbound with one traffic lane and a cycle track outbound along the Greenhills Road (R819). The layout of Walkinstown Roundabout has been designed to provide

enhanced cycle and pedestrian connectivity around this busy junction as well as improving safety for pedestrians, cyclists, bus and general traffic.

1.4.1.3 Crumlin to Grand Canal

On Walkinstown Road (R819) between Walkinstown Roundabout and the Long Mile Road (R110), it is proposed to provide one bus lane and one general traffic lane in each direction. City bound cyclists will have an alternative segregated cycle route along Bunting Road and St. Marys Road providing a more direct route linking Walkinstown Roundabout with Kildare Road. On Drimnagh Road (R110) it is proposed to maintain one bus lane, one general traffic lane and one cycle track in each direction. On Crumlin Road (R110) bus priority will be maintained by incorporating Signal Controlled Priority and managing the flow of traffic in both directions along the Crumlin Road (R110). Due to width restrictions in the area of Crumlin Road (R110) there is insufficient space to provide dedicated cycle lanes. Therefore, it is proposed to provide an alternative cycle route along Kildare Road and Clogher Road.

1.4.1.4 Grand Canal to Christchurch

Between Dolphin Road and South Circular Road (R811), it is intended to provide one bus lane, one general traffic lane and one cycle track in each direction along the R110. The proposed South Circular Road junction design takes into account the Dolphins Barn Public Realm improvement plan that is being implemented by DCC. Between South Circular Road (R110) and Ardee Street it is proposed to have one bus lane, one general traffic lane and one cycle track in each direction. The Dean Street/Patrick Street junction will be upgraded to provide enhanced cycling and pedestrian facilities. Between Dean Street and Bride Road it is proposed to have one bus lane, one general traffic lane and one cycle track in each direction, between Bride Road and Christchurch Place it is proposed to have one bus lane and one cycle track in each direction with two traffic lanes inbound and one traffic lane outbound.

1.4.2 Clondalkin to Drimnagh Section

The Clondalkin to Drimnagh section is described below, split into two sub-sections

- i. Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction
- ii. Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh

1.4.2.1 Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction

The junction at Woodford Walk/New Nangor Road (R134) will be upgraded with removal of the existing left turn slip lanes, provision of enhanced cycling and pedestrian facilities and improved connectivity to the existing Grand Canal Greenway. Between Woodford Walk/New Nangor Road (R134) junction and the approach to the M50 overbridge a bus lane, general traffic lane and cycle track will be provided in both directions. It is proposed to widen the existing R134 carriageway at the M50 bridge to provide a three lane arrangement. Between the New Nangor Road (R134) /Riverview Business Park junction and New Nangor Road (R134) /Killeen Road junction it is proposed to widen the existing R134 carriageway to accommodate enhanced bus, cycle and pedestrian facilities along the corridor. At the Killeen Road junction the existing outbound bus bypass facility will be modified to accommodate the revised junction arrangements. Between Killeen Road junction and the Naas Road (R810) junction land acquisition and new retaining walls will be required along the northern boundary to facilitate enhanced Bus, cycle, and pedestrian infrastructure. At the New Nangor Road (R134) /Naas Road (R810) junction a new pedestrian

and cycling bridge with accessible ramps and stairs on all approaches to the junction has been proposed. A continuous inbound bus lane and a new bus lane within the junction will be introduced to improve bus priority.

1.4.2.2 Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh

The Proposed Scheme is routed along the Naas Road (R810) until the junction with Walkinstown Avenue (R112), generally maintaining the existing lane provision of one bus lane and two traffic lanes in each direction with a proposed segregated two way cycle track on the inbound direction and segregated one way cycle track on the outbound direction. The junction of Naas Road (R810)/ Walkinstown Avenue (R112) is being reconfigured to provide enhanced pedestrian and cyclist facilities. From the Naas Road (R810) the Proposed Scheme is routed along the Walkinstown Avenue (R112), with one bus lane, one general traffic lane, cycle track and footpath in each direction. The existing bus and traffic lane provision is generally maintained along the Long Mile Road (R110) until the junction with Slieverbloom Park, at which point the proposed scheme joins the Tallaght section.

2 The Planning Context

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

- The National Planning Guidelines, referred herein as ‘the 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 2.1.
- In terms of planning policy context, the provisions contained in the Dublin City Development 2016 - 2022 are relevant.

2.1 The Planning System and Flood Risk Management Guidelines for Planning Authorities

In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public works jointly published a Guidance Document for Planning Authorities entitled “The Planning System and Flood Risk Management”.

The Guidelines are issued under Section 28 of the Planning and Development Act 2000 and Planning Authorities. Therefore, An Bord Pleanála are required to implement these Guidelines in carrying out their functions under the Planning Acts.

The aim of the guidelines is to ensure that flood risk is neither created nor increased by inappropriate development.

The guidelines require the planning system to avoid development in areas at risk of flooding, unless they can be justified on wider sustainability grounds, where the risk can be reduced or managed to an acceptable level.

They require the adoption of a Sequential Approach to Flood Risk Management following the steps of Avoidance of flood risk, Substitution with less vulnerable uses, Justification and Mitigation of flood risk. The Guidelines require the incorporation of Flood Risk Assessment into the process of making decisions on planning applications and planning appeals.

Fundamental to The Guidelines, is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability to flooding.

The management of flood risk is now a key element of any development proposal in an area of potential flood risk and should therefore be addressed as early as possible in the site master planning stage.

2.1.1 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones defined in the Guidelines as follows:

Table 1: Definition of Flood Zone Categories

Zone Category	Description
Flood Zone A	Probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
Flood Zone B	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 and 0.5% or 1 in 200 for coastal flooding); and
Flood Zone C	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.

2.1.2 Definition of Vulnerability Classification of Flooding

The Guidelines classify different land uses and types of development as highly vulnerable, less vulnerable and water-compatible to flooding. The vulnerability classification is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings.

The following Table 2 summarises the Vulnerability Classes defined in the Guidelines and provides a sample of the most common type of development applicable to each class.

The project will be providing primary transport and is therefore considered essential infrastructure. It is therefore classed as Highly Vulnerable Development.

Table 2: Definition of Vulnerability Classes

Vulnerability Class	Land use and types of development which include:
Highly Vulnerable Development	Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions, essential infrastructure, such as primary transport and utilities distribution and SEVESO and IPPC sites, etc.
Less Vulnerable Development	Includes retail, leisure, warehousing, commercial, industrial and non-residential institutions, etc.
Water Compatible Development	Includes Flood Control Infrastructure, docks, marinas, wharves, navigation facilities, water-based recreation facilities, amenity open spaces and outdoor sport and recreation facilities

2.1.3 Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach.

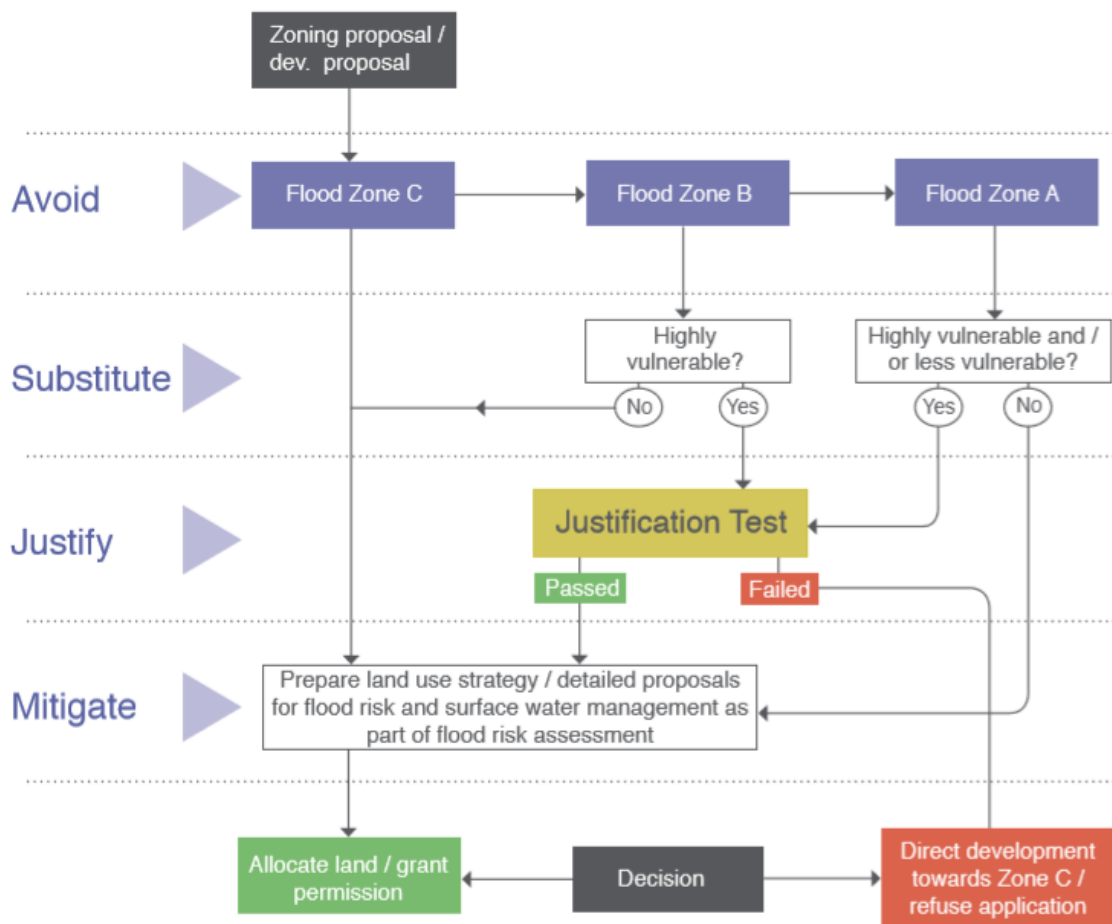


Figure 2: Sequential Approach (reproduced from the Guidelines)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

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

Table 3 illustrates the different types of Vulnerability Class appropriate to each zone and indicates where the Justification Test is required.

Table 3: Vulnerability Class per Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

2.2 Dublin City Development Plan 2016-2022

The Dublin City Development Plan 2016-2022 was adopted by Dublin City Council on 23rd September 2016 and came into effect on 21st October 2016. The Plan sets out policies and objectives to create a sustainable and vibrant city at the heart of the Greater Dublin Region and guides how and where development will take place in the city over the next 6 years.

Section 9.5.3 of the plan deals with Flood Management and outlines the key policies and objectives of Dublin City Council in relation to flood risk. The plan presents a number of Dublin City Council 'Strategic Infrastructure' (SI) policies that state that it is their policy to:

- **SI8:** To mitigate the effects of floods and droughts, subject to Environmental Assessment.
- **SI9:** To assist the Office of Public Works in developing catchment-based Flood Risk Management Plans for rivers, coastlines and estuaries in the Dublin city area and have regard to their provisions/recommendations.
- **SI10:** To have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management and Technical Appendices, November 2009, published by the Department of the Environment, Community, and Local Government as may be revised/updated when assessing planning applications and in the preparation of plans both statutory and non-statutory.
- **SI11:** To put in place adequate measures to protect the integrity of the existing Flood Defence Infrastructure in Dublin City Council's ownership and identified in the Strategic Flood Risk Assessment and to ensure that the new developments do not have the effect of reducing the effectiveness or integrity of any existing or new flood defence infrastructure and that flood defence infrastructure has regard also to nature conservation and amenity issues.
- **SI12:** To implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Dublin City Development Plan.
- **SI13:** Development of basements or any above ground buildings for residential use below the estimated flood levels for Zone A or Zone B will not be permitted.
- **SI14:** To protect the Dublin City coastline from flooding as far as reasonably practicable, by implementing the recommendations of the Dublin Coastal Flood Protection Project and the Dublin Safer Project.
- **SI15:** To minimise the risk of pluvial (intense rainfall) flooding in the city as far as is reasonably practicable and not to allow any development which would increase this risk.

- **SI16:** To minimise the flood risk in Dublin City from all other sources of flooding, including fluvial, reservoirs and dams and the piped water system.
- **SI17:** To require an environmental assessment of all proposed flood protection or flood alleviation works.

Section 9.5.3 of the development plan also outlines the following objectives in relation to Flood Risk Management. The plan presents a number of Dublin City Council 'Strategic Infrastructure Objectives' (SIO) objectives that state that it is there objectives for:

- **SIO8:** All development proposals shall carry out, to an appropriate level of detail, a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with:
 - The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Department of the Environment, Community and Local Government, November 2009, as may be revised/updated and the Strategic Flood Risk Assessment (SFRA) as prepared by this Development Plan.
 - The site-specific flood risk assessment (SSFRA) shall pay particular emphasis to residual flood risks, site-specific mitigation measures, flood-resilient design and construction, and any necessary management measures (the SFRA and Appendix B4 of the above-mentioned national guidelines refer). Attention shall be given in the site-specific flood risk assessment to building design and creating a successful interface with the public realm through good design that addresses flood concerns but also maintains appealing functional streetscapes. All potential sources of flood risk must be addressed in the SSFRA.
- **SIO9:** Proposals which may be classed as 'minor development', for example small-scale infill, small extensions to houses or the rebuilding of houses or paving of front gardens to existing houses, most changes of use and small-scale extensions to existing commercial and industrial enterprises in Flood Zone A or B, should be assessed in accordance with the Guidelines for Planning Authorities on the Planning System and Flood Risk Management & Technical Appendices, November 2009 as may be revised/updated, with specific reference to Section 5.28 and in relation to the specific requirements of the Strategic Flood Risk Assessment. The policy shall be not to increase the risk of flooding and to ensure risk to the development is managed.
- **SIO10:** That recommendations and flood maps arising from the Fingal-East Meath CFRAM Study, the Dodder CFRAM Study and the Eastern CFRAM Study are taken into account in relation to the preparation of statutory plans and development proposals. This will include undertaking a review of the Strategic Flood Risk Assessment for Dublin city following the publication of the Final Eastern CFRAM Study, currently being produced by the OPW.
- **SIO11:** To work with neighbouring Local Authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.
- **SIO12:** To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the

Dublin City Council climate change adaption policy and in the OPW Climate Change Sectorial Adaptation Plan Flood Risk Management applicable at the time.

2.3 Dublin Strategic Flood Risk Assessment

A Regional Flood Risk Assessment (RFRA) was carried out for the Regional Planning Guidelines (RPG) for the Greater Dublin Area 2010-2022. Chapter 9 of the RFRA sets out the key policy with regards to avoiding and managing flood risk within the Greater Dublin Area (GDA). The Guidelines set out a number of strategic recommendations including:

- **FR1:** New development should be avoided in areas at risk of significant flooding. Alongside this, the Regional Flood Risk Appraisal recognises the need for continuing investment and development within the urban centres of flood vulnerable designated growth towns and the City and for this to take place in tandem with the completion of CFRAM Studies and investment in comprehensive flood protection and management.
- **FR2:** Development and Local Area Plans should include a Strategic Flood Risk Assessment and all future zoning of land for development in areas at risk of flooding should follow the sequential approach set out in the Departmental Guidance on Flood Risk Management. All Flood Risk Assessments and CFRAM studies should take place in coordination and consultation with adjoining local authorities and regions and in coordination with the relevant River Basin Management Plans.
- **FR3:** Local authorities should take the opportunities presented to optimise improvements in biodiversity and amenity when including policies and actions in development plans/local area plans (such as flood plain protection and SuDS) for existing and future developments.
- **FR4:** Plans and projects associated with flood risk management that have the potential to negatively impact on Natura 2000 sites will be subject to a Habitats Directive Assessment (HDA) according to Article 6 of the habitats directive and in accordance with best practice and guidance.

3 Flood Mechanisms and Historic Flooding at the Site

3.1 Potential Flood Risk Sources to the Site

The potential sources of flooding to the subject site can be categorised as follows:

- Fluvial (river) Flooding a of watercourse occurs when the capacity a river is exceeded during periods of intense rainfall.
- Tidal Flooding is the temporary inundation of low-lying areas, during exceptionally high tide events.
- Pluvial Flooding/ Urban Drainage occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding.
- Groundwater Flooding can occur during lengthy periods of heavy rainfall, typically during late 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 long periods of flooding.

3.2 Historic Flood Data

Reports and maps from the OPW's Flood Hazard Mapping website (www.floodinfo.ie) have been examined as part of this flood risk assessment.

3.2.1 Tallaght to City Centre Section

Figure 4 presents the flood record for the site and its immediate vicinity. A number of historic flood events have occurred adjacent to the Proposed Scheme. However, no past flood events have occurred along, or impacted upon, the Proposed Scheme.

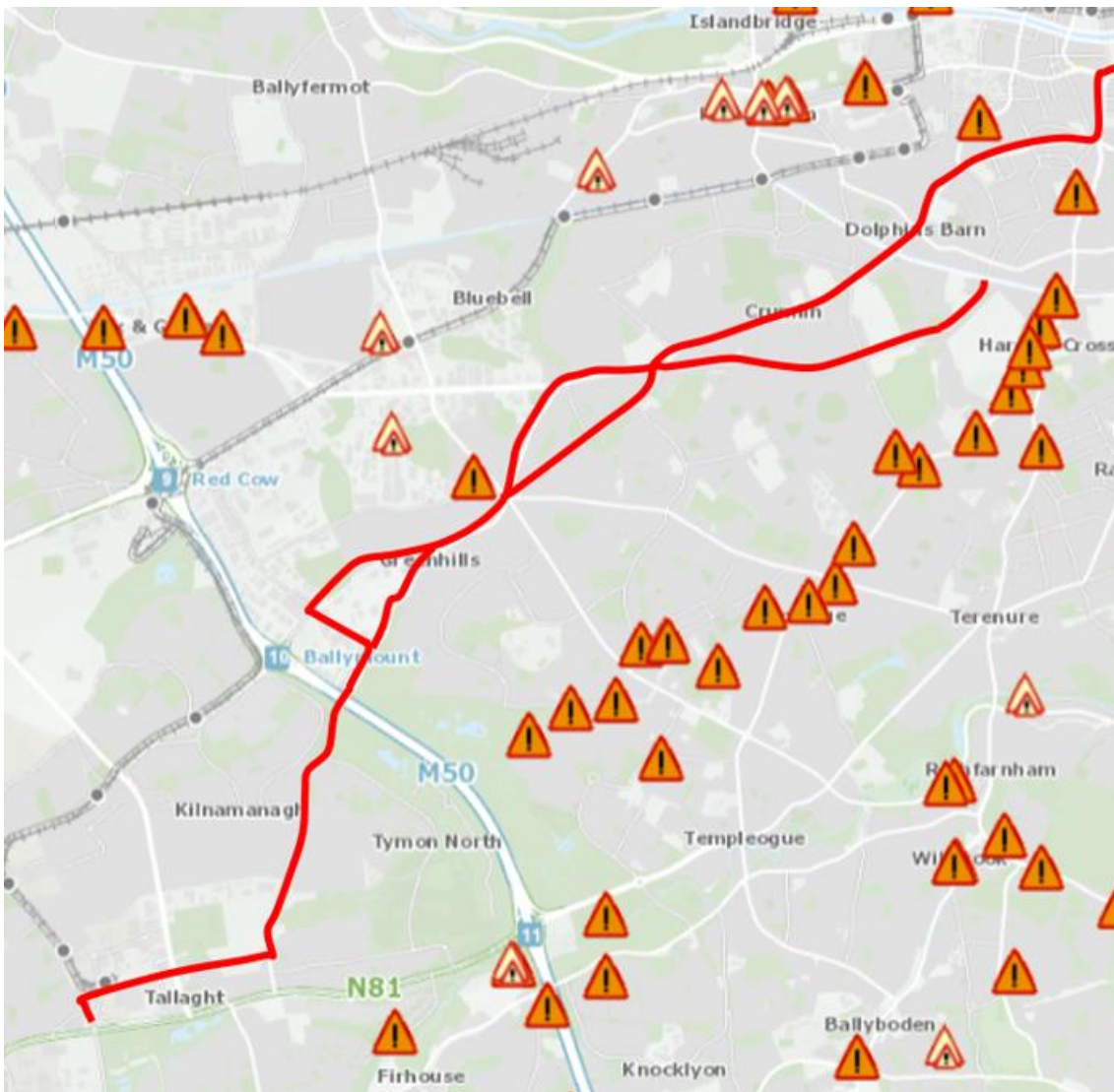


Figure 4: Location of Historic Flood Events (Tallaght to City Centre Section)

3.2.2 Clondalkin to Drimnagh Section

Figure 3 presents the flood record for the site and its immediate vicinity. A number of recorded flood events have occurred adjacent to the Proposed Scheme. The most noteworthy is the past flood event along the River Camac (located to the north of the R134) which has impacted upon the Proposed Scheme. Table 4 provide a summary of this event.



Figure 3: Location of Historic Flood Events (Clondalkin to Drimnagh Section)

Table 4: Historic Flood Events: Clondalkin to Drimnagh Section

Flood Point No.	Date	Catchment	Flood Source	Details
1	05/11/2000	Liffey	River Camac	Flooding here is associated with the Liffey catchment. The flood name is Camac November 2000, and the location is an <u>approximate point</u> .

4 Existing Flood Risk

4.1 Fluvial Flooding

4.1.1 Tallaght to City Centre Section

Fluvial flood extent maps from the Eastern CFRAMS are displayed in Figure 9, Figure 10, Figure 11, Figure 12, Figure 13, and Figure 14. The predicted fluvial flood extents for three return period events are presented on the map (for the 1 in 10, 200 and 1000-year fluvial flood extents).

It can be seen in Figure 9, Figure 10, Figure 11, and Figure 12 that the Proposed Scheme is not located within any designated flood zones.

In Figure 13 and Figure 14 the Proposed Scheme is located within the 1 in 100-year and 1 in 1000-year fluvial flood extents, and is therefore located within Flood Zone A.

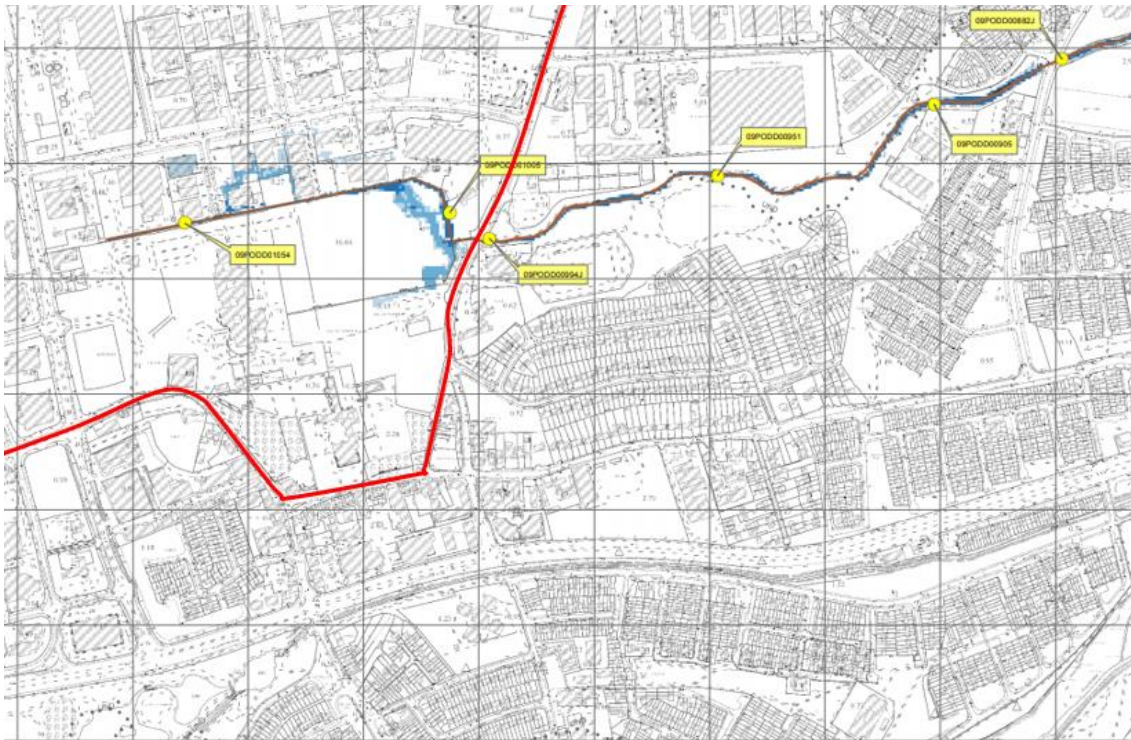


Figure 9: CRFAM Fluvial Flood Maps (Tallaght)

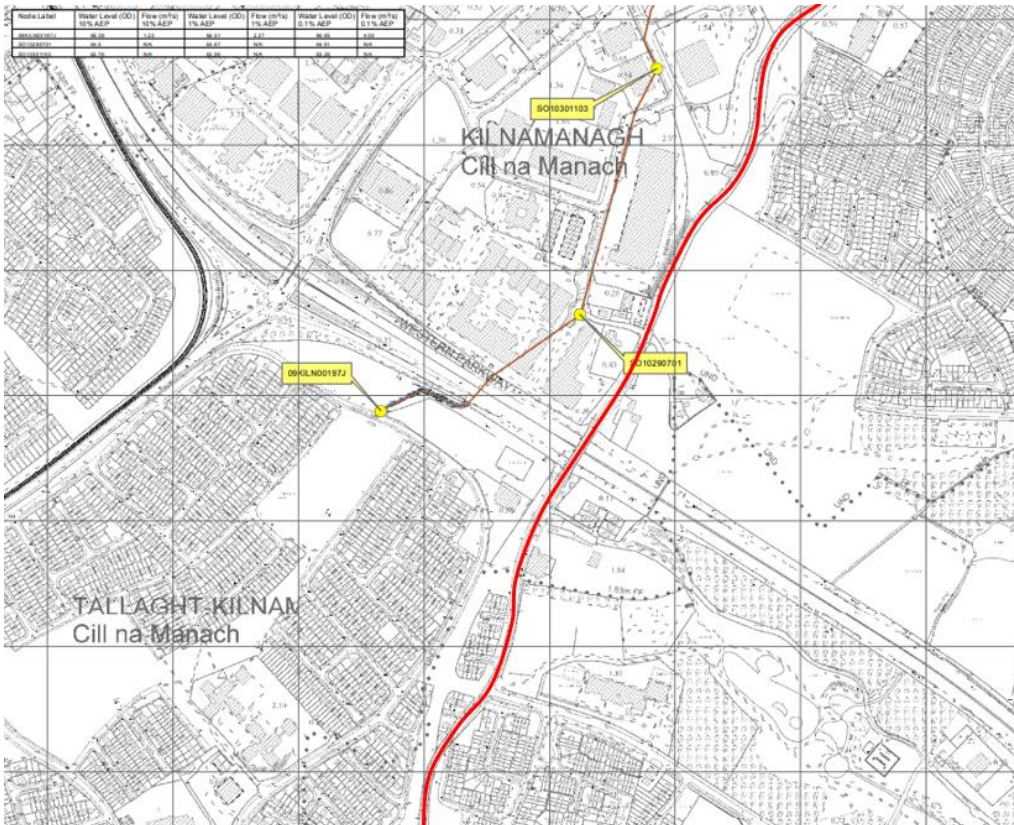


Figure 10: CRFAM Fluvial Flood Maps (Kilnamagh)

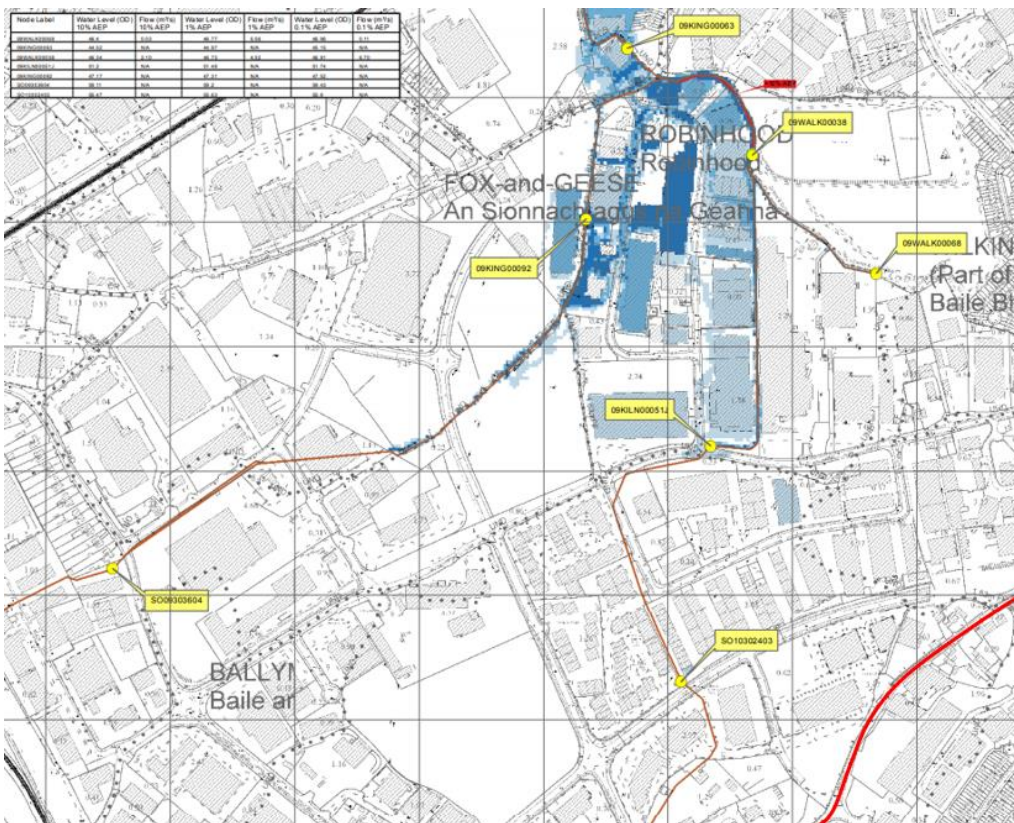


Figure 11: CRFAM Fluvial Flood Maps (Fox-and-Geese)

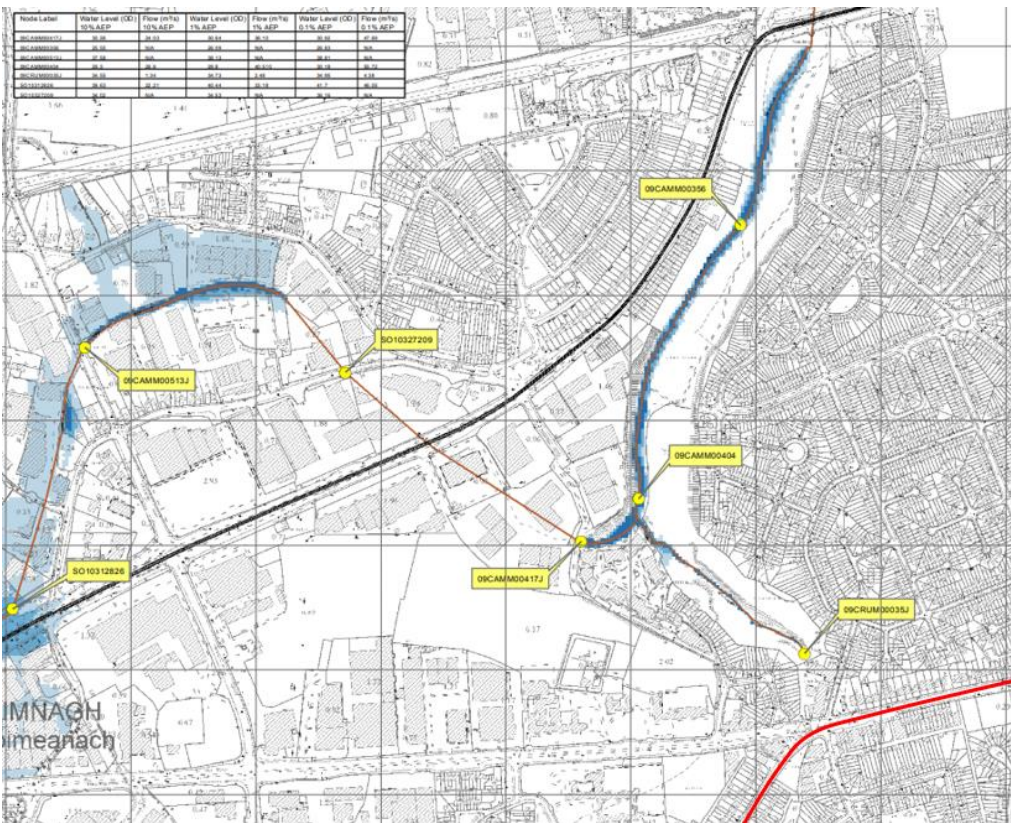


Figure 12: CRFAM Fluvial Flood Maps (Bluebell)

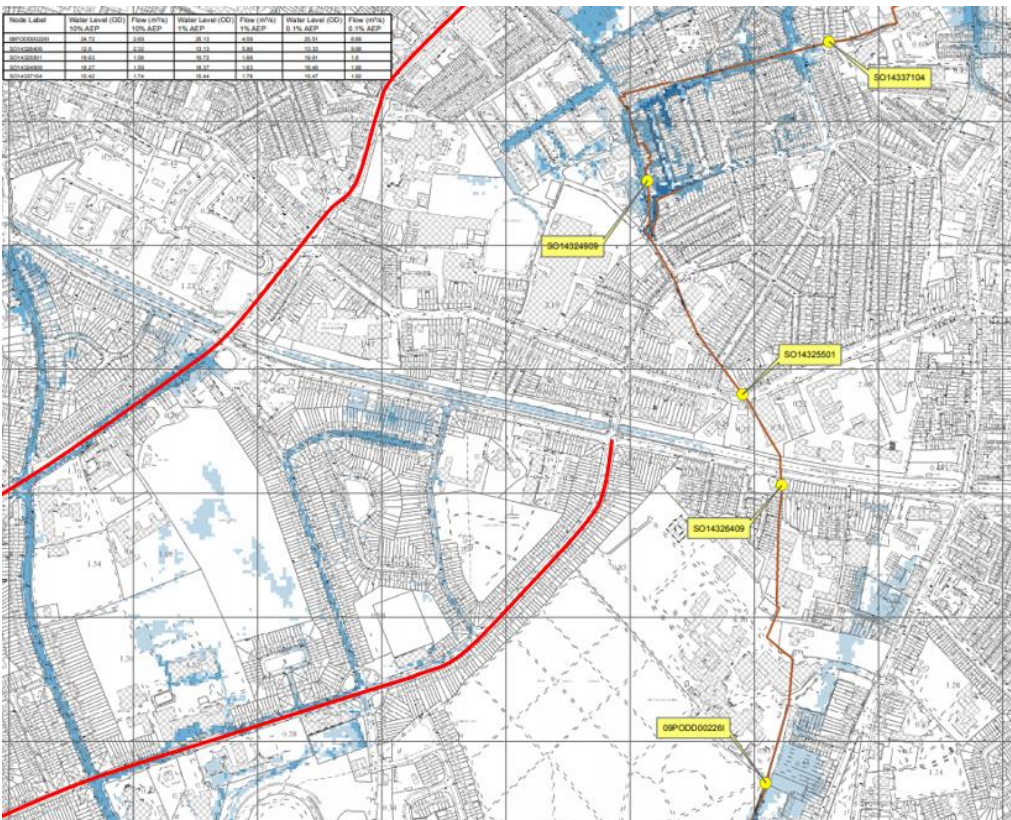


Figure 13: CRFAM Fluvial Flood Maps (Dolphins Barn)

Below are some noteworthy comments from the Dublin City Development Strategic Flood Risk Assessment for Dublin City Development Plan 2016 – 2022 for flooding shown in Figure 13:

- There are no existing defences at present, but residual risks arising from blockage of the culverts is possible and should be assessed to determine how flow paths and water depths may be changed.
- An increase of 20% flow on top of the estimated 100-year culvert flow will cause more flooding in this area.
- All surface water within this area is to be managed and provisions made for significant rainfall events during high river flows.
- The flood extents indicate flow paths generally coming directly out of the river culvert through manholes and gully grids as well as some overland flows from the river itself upstream.

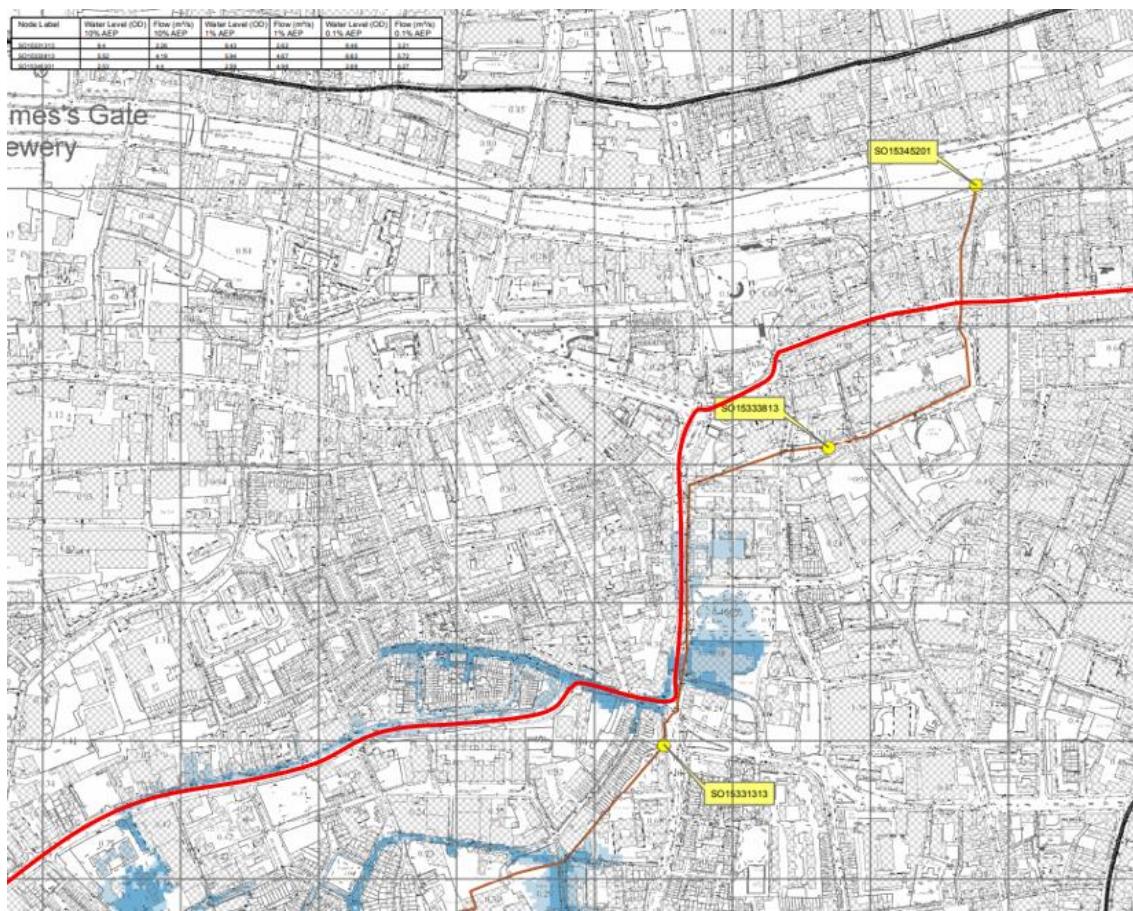


Figure 14: CRFAM Fluvial Flood Maps (The Coombe)

Below are some noteworthy comments from the Dublin City Development Strategic Flood Risk Assessment for Dublin City Development Plan 2016 – 2022 for flooding shown in Figure 14:

- A 20% increase of estimated climate change on top of the estimated 100-year river flow will cause extra flooding in this area.
- All surface water in this area needs to be carefully managed and provision made for significant rainfall events during high river flows.
- Separation of surface water and foul sewage flows should be carried out where possible.

- Flood extents for the area generally indicate flow paths coming directly out of the river culvert through manholes and gully grids.

The fluvial flood risk is associated with the Poddle River. This risk has been identified along the culverted section of this river which is located at the downstream end. This culverted section of the Poddle River outfalls into the River Liffey at Wellington Quay, and therefore the fluvial flood risk is compounded by tidal events.

There is an upstream overflow in the River Poddle which discharges into the Grand Canal, and there are multiple culvert sections with trash screens. There is a residual fluvial flood risk due to the potential for blockage of these screens and overflow.

The River Poddle flows from near the Institute of Technology in Tallaght to the River outfall at Wellington Quay. Much of the lower section of the River Poddle, which is within the surrounding area of the Proposed Scheme, is culverted.

The Eastern CFRAM Study Hydraulics Report of the Poddle Model¹ was reviewed to assess this fluvial flood risk that this source presents along the Proposed Scheme. The report indicates that the River Poddle has multiple discharges from the urban drainage network within its catchment. Figure 15 indicates the route of the River Poddle from the IT in Tallaght to the outfall to the River Liffey. The figure also indicates the route of the Proposed Scheme in red. It can be seen the lower end of the River Poddle (which is culverted) and the Proposed Scheme, interact significantly.

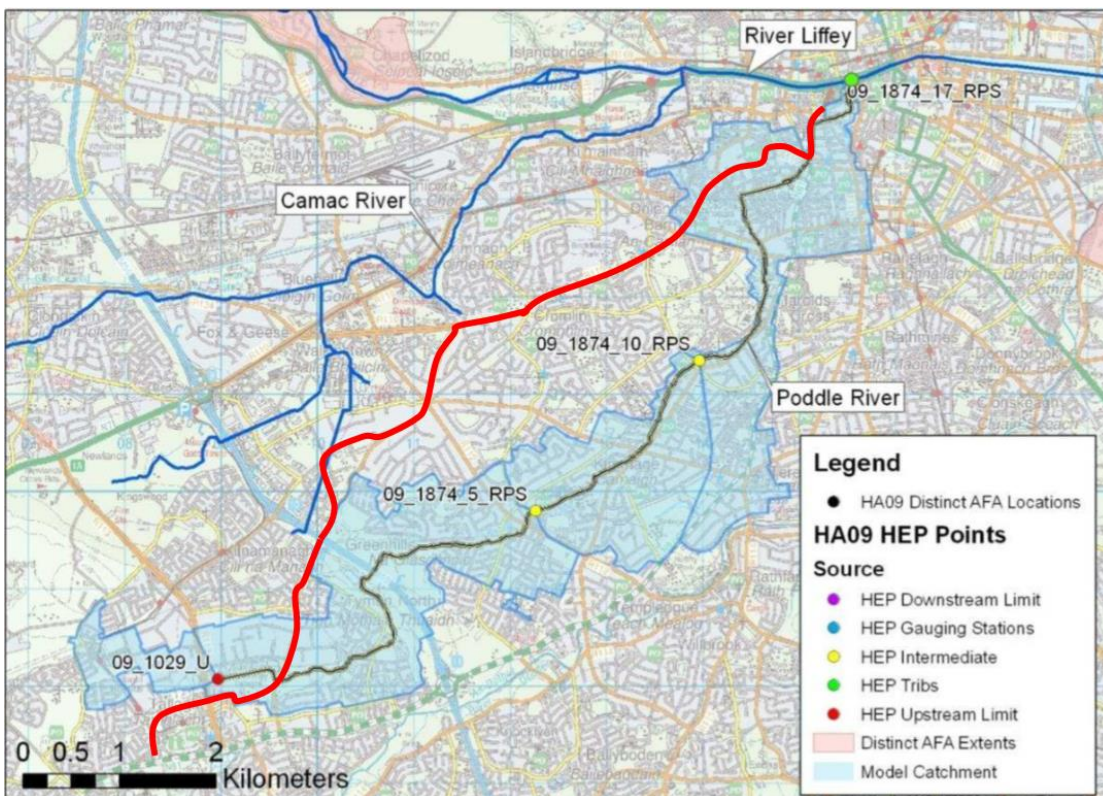


Figure 15: Map of the River Poddle Catchment and the Proposed Scheme

Reference: (1) Map of Model Extents. Eastern CFRAM Study HA09 Hydraulics Report Poddle Model. RPS. September 2014.

¹ Eastern CFRAM Study HA09 Hydraulics Report Poddle Model. RPS. September 2014. Available at: http://eastcfam.irish-surge-forecast.ie/wp-content/uploads/2011/10/RpRef_4_8_0027_HA09HydraulicReport_Poddle_F05.pdf

Figure 16 shows the outfall location of the River Poddle (where it discharges to the River Liffey). The potential for tidal influence on the lower section of the River Poddle can clearly be seen by the high-water marks on the quay walls.



Figure 16: River Poddle Outfall to the River Liffey

Reference: Google Street View

It appears from Figure 16 that there is no flap valve located on the River Poddle outfall to the River Liffey. As a result, there is a residual risk that flood waters from the River Liffey could prevent free discharge of stormwater, leading to surcharge and flooding of the storm drainage network which discharges to the River Poddle.

4.1.2 Clondalkin to Drimnagh Section

Fluvial flood extent maps from the Eastern CFRAMS are displayed in Figure 5, Figure 6, and Figure 7. The predicted fluvial flood extents for three return period events are presented on the map (for the 1 in 10, 200 and 1000-year fluvial flood extents).

As shown in Figure 5, the proposed route (in red) falls within the 1 in 1000-year and 1 in 100-year fluvial flood extents and is therefore located in Flood Zone A.

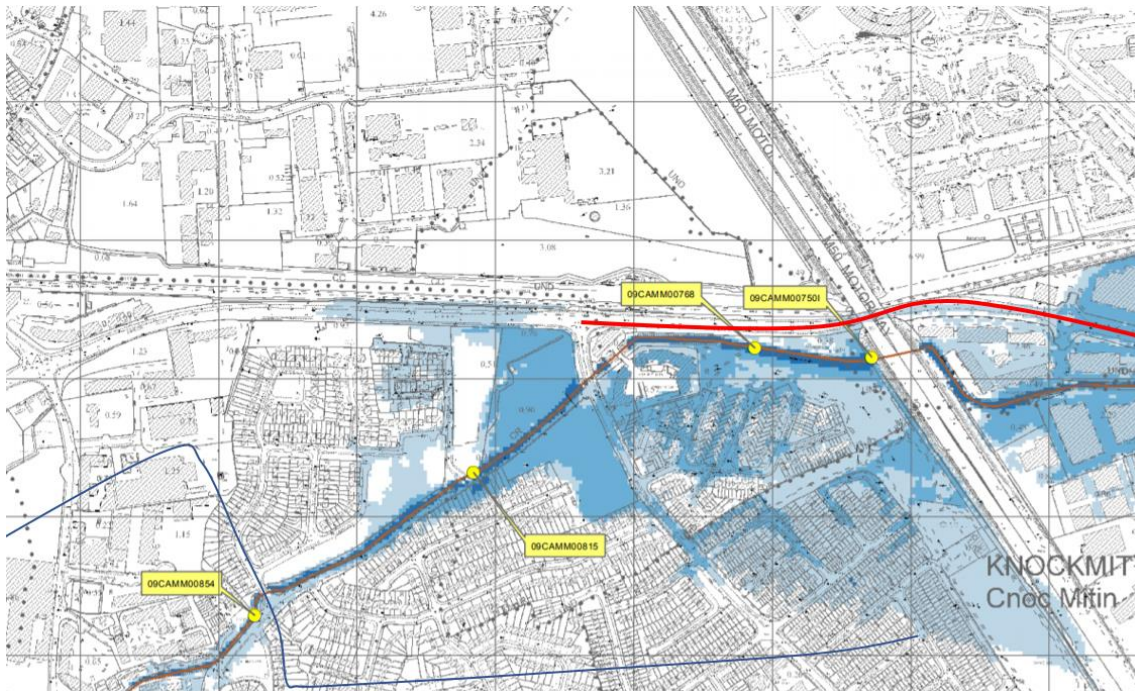


Figure 5: CRFAM Fluvial Flood Maps (near Clondalkin)

As shown in Figure 6, there are flood protection measures adjacent to the proposed route in places. However, the proposed route (in red) still falls within the 1 in 1000-year and 1 in 100-year fluvial flood extents and is therefore located in Flood Zone A.

As shown in Figure 7, the proposed route (in red) falls within the 1 in 100-year fluvial flood extents and is therefore located in Flood Zone A.

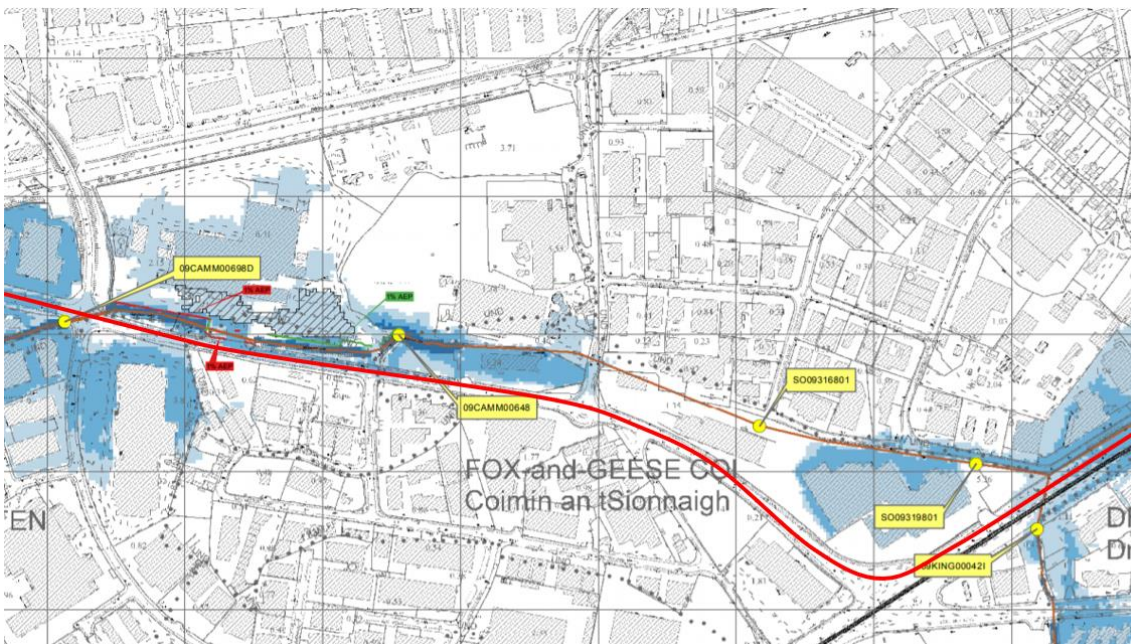


Figure 6: CRFAM Fluvial Flood Maps (Fox-and-Geese)

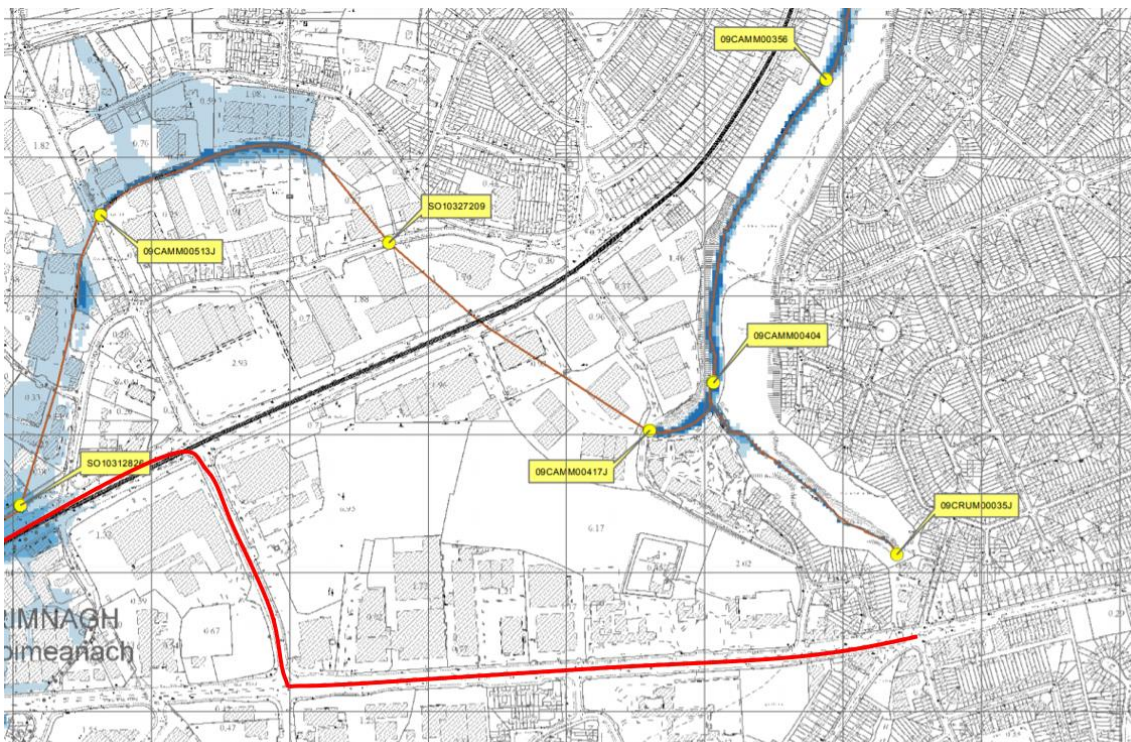


Figure 7: CRFAM Fluvial Flood Maps (near Drimnagh)

A review of reports from past flood events was carried out to determine the contributing factors of fluvial flooding along the Proposed Scheme. There is a hydrometric station located adjacent to the R134 (near the Toyota/ Diageo complex). An EPA Report² (linked to past flood events) presents hydrometric data for historic flooding at this location and states that there is a trash

² EPA. Flooding in the Cammock, Dodder, Liffey, and Tolka Catchments. March 2002. Available at: https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/030%20South%20Dublin%20County%20Council/002%20Reports/sdc_re_if_0000001249.pdf

screen located downstream of this hydrometric station in which debris is caught in during server floods. The report states that the screen was blocked during floods in April 1998 and November 2000.

There is a residual risk at this location due to the potential for the trash screen to become blocked during storm events.

The Proposed Scheme is located parallel to the River Cammock for a significant percentage of the route (along the R134). As a result, this section of the Proposed Scheme is vulnerable to flooding from this source (bursting of riverbanks).

The Eastern CFRAM Study Hydraulics Report of the Camac Model³ was reviewed to assess the fluvial flood risk that this source presents along the Proposed Scheme. The report states that flooding in the mid catchment reaches in the vicinity of the M50 crossing and Nangor Road has been attributed to bridge and culvert blockages. While flooding in the downstream reaches of the catchment are reportedly due to under capacity of the drainage network.

Figure 8 indicates the route of the Camac River (shown in red) and the route of the Proposed Scheme (shown in yellow). The interaction between these two elements is clear near the M50 crossing and along the New Nangor Road. Hydraulic model calibration data from the Eastern CFRAM Report indicates flood levels from the storm event on the 24th October 2011. One of the recorded flood levels was along the R110 (Long Mile Road) and suggests a recorded flood depth of up to 200mm.

Details of the bridge and culvert (incl. trash screen) blockages are unknown and have not been included as part of this flood risk assessment. It is therefore assumed that there is potential for these blockages to continue, causing future flooding.



Figure 8: Map of the Camac River and the Proposed Scheme

Reference: (1) Map of Model Extents. Eastern CFRAM Study HA09 Hydraulics Report Camac Model. RPS. September 2016.

³ Eastern CFRAM Study HA09 Hydraulics Report Camac Model. RPS. September 2016. Available at: <http://eastcfрам.irish-surge-forecast.ie/wp-content/uploads/2011/10/Camac.pdf>

4.2 Tidal Flood Risk

4.2.1 Tallaght to City Centre Section

The proposed route is outside the extents of the Eastern CFRAM coastal flood extent mapping and is removed from any coastal boundary. Therefore, there is no tidal flood risk along the proposed route.

4.2.2 Clondalkin to Drimnagh Section

The proposed route is outside the extents of the Eastern CFRAM coastal flood extent mapping and is removed from any coastal boundary. Therefore, there is no tidal flood risk along the proposed route.

4.3 Pluvial Flooding/ Urban Drainage

Pluvial flooding occurs when extreme rainfall overwhelms drainage systems or soil infiltration capacity, causing excess rainwater to pond above ground at low point in the topography.

4.3.1 Tallaght to City Centre Section

The risk of pluvial flooding has been assessed by the flood maps produced as part of the Preliminary Flood Risk Assessment (PRFA) by Office of Public Works (OPW) as shown in Figure 19.

The initial 3.7km (approx.) of the Proposed Scheme is located outside of the rainfall flood extents mapping. Therefore, the pluvial flood risk for this section of the scheme was not assessed.

There are multiple sections of the scheme which are impacted upon during a 1 in 10-year rainfall event. However, the sections of scheme impacted upon are generally not continuous and are scattered along the route.

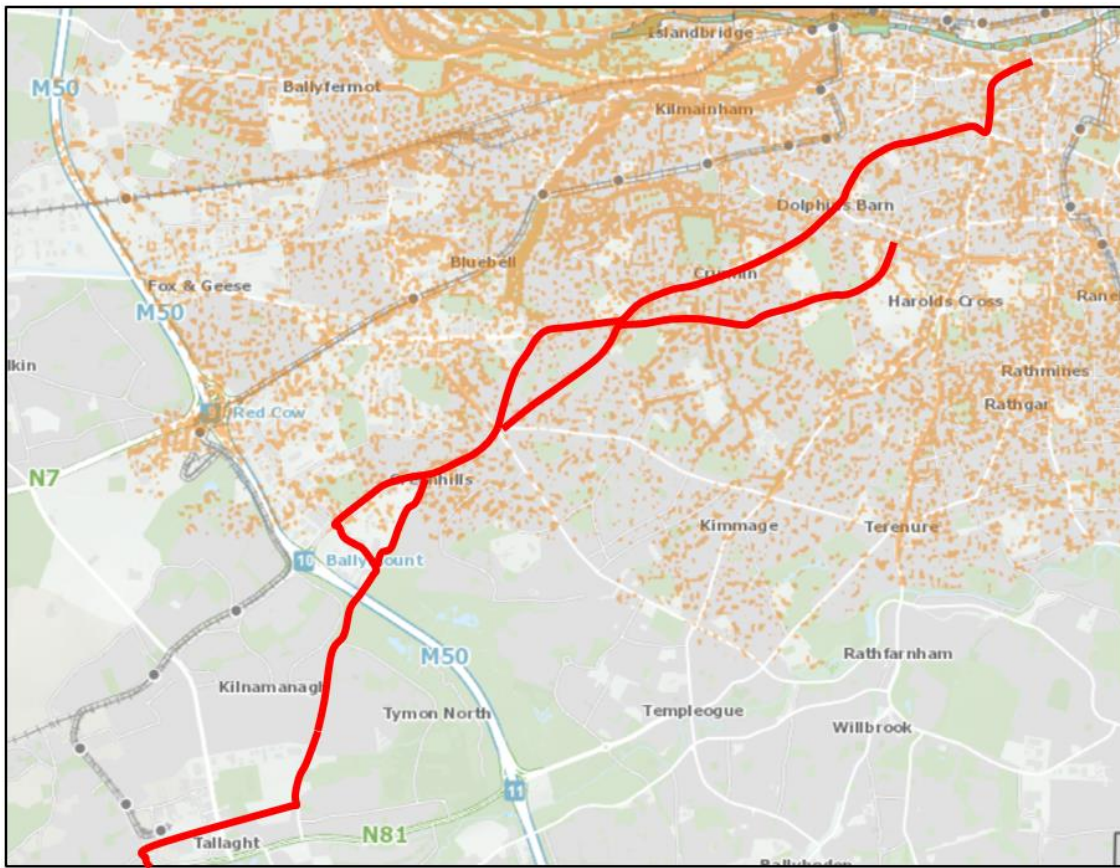
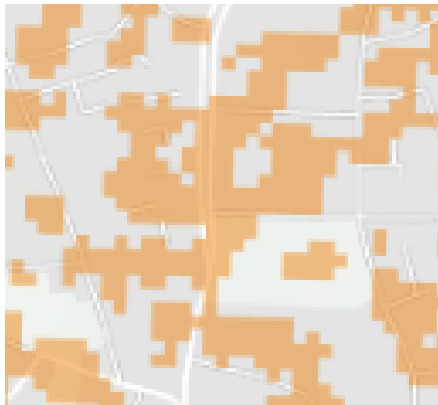


Figure 19: Extract from OPW PFRA Pluvial Flood Maps – 10% AEP Pluvial Flood Risk

There is a significant percentage of the scheme which is identified as being at risk of flooding following a 1 in 10-year rainfall event. There are multiple locations where there is a continuous section of the scheme which is indicated as being flooded on the OPW Pluvial Flood Maps. A summary of noteworthy pluvial flood risk areas, where there is a continuous flooded section of road greater than 150m, is provided in Table 6.

Table 6: Noteworthy Pluvial Flood Risk Areas

Location	Initial Flood Risk Comments
	<p>Pluvial flood risks have been identified along the R137 Patrick Street, near St. Patrick's Park.</p> <p>The flood maps suggest that approx. 150m of the road corridor is flooded at this location during a 1 in 10-year event.</p>

The pluvial flood depth map along the Proposed Scheme was reviewed. From these maps it was determined that while there is potential for pluvial flooding along the Proposed Scheme, the

overall risk associated is minimal. Generally, the pluvial flooding is scattered with spot flood depths of less than 0.3m.

The above pluvial flooding areas will be mitigated through provision of additional drainage inlets, upsizing of the pipe network and/or localised regrading of the existing road alignment. This will reduce the risk of ponding and surface water collecting at localised low points.

All new surface water sewers provided as part of the scheme shall be designed so that no flooding will occur for a return period up to 30 years. This is an improvement when compared to some of the existing historical drainage infrastructure to be replaced and will reduce the risk of pluvial flooding.

Also, as part of the scheme new drainage infrastructure will be provided which will include new Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales and tree pits. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

In summary, there is a risk of pluvial flooding along the proposed route however this risk will be reduced as a result of the drainage improvements of the BusConnects project.

4.3.2 Clondalkin to Drimnagh Section

The risk of pluvial flooding has been assessed by the flood maps produced as part of the Preliminary Flood Risk Assessment (PRFA) by Office of Public Works (OPW) as shown in Figure 17.

The 10% AEP Pluvial Flood Risk Map indicates that there is a significant percentage of the route which is identified as being at risk of flooding following a 1 in 10-year rainfall event. However, the sections of scheme impacted upon are generally not continuous and are scattered along the route. A summary of noteworthy pluvial flood risk areas, where there is a continuous flooded section of road greater than 150m, is provided in Table 5.

It is noted that the initial 0.4km (approx.) of the Proposed Scheme is located outside of the rainfall flood extents mapping. Therefore, the pluvial flood risk for this section of the scheme was not assessed.

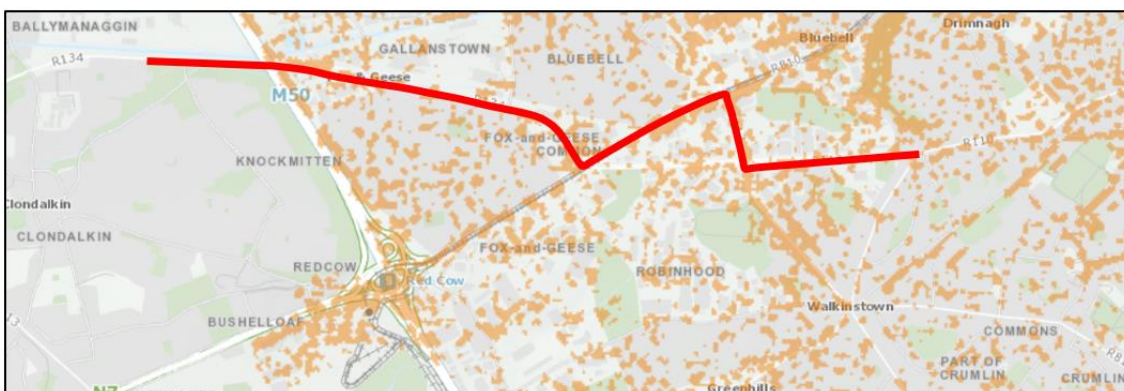
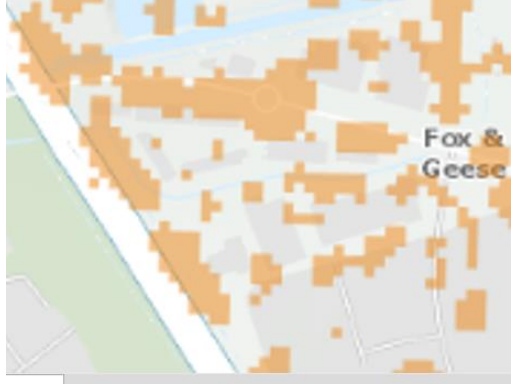


Figure 17: Pluvial Flood Extents

Table 5: Noteworthy Pluvial Flood Risk Areas

Location	Initial Flood Risk Comments
	<p>Pluvial flood risks have been identified on the R134 from the M50 underpass to just before the junction with the Oak Road.</p> <p>The flood maps suggest that approx. 240m of the road corridor is flooded at this location during a 1 in 10-year event.</p>

The pluvial flood depth map along the Proposed Scheme was reviewed. These maps are available in PDF from the floodinfo.ie website⁴. These maps estimate the flood depth for a flood event of a particular probability. The depths are mapped over square grids of 25m or 12.5m. The depths across these grids is mapped as constant, however, the depths within the grid square may vary.

Figure 18 shows the proposed route (in red) overlaid on the pluvial flood depth map for the area for a 10% AEP event. Generally, there is no continuous section of flooded road. The ‘patches’ of flooding vary from a depth of 0.1 - 0.25m to 0.5 – 1m.

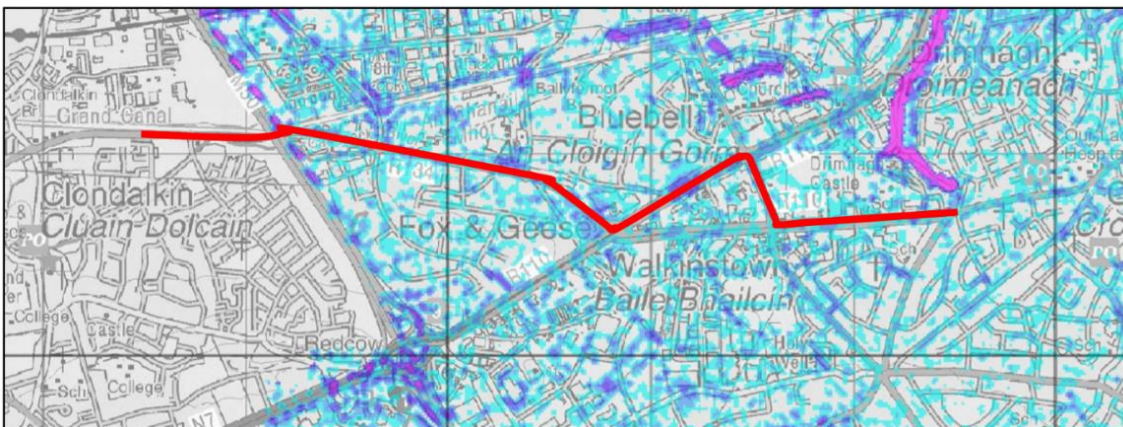


Figure 18: Pluvial Flood Depth Map

⁴ Flood Maps. Available at: <https://www.floodinfo.ie/map/floodmaps/>

4.4 Groundwater Flooding

Groundwater flooding can occur during lengthy period 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.

4.4.1 Tallaght to City Centre Section

The groundwater vulnerability for the proposed route is presented in Figure 21 (route shown in blue). It indicates that the groundwater vulnerability varies across the site. Most of the site falls into the “Moderate” or “Low” groundwater vulnerability categories with a portion of the site around Greenhills and Crumlin assigned “Extreme” or “High” groundwater vulnerability classification.

The proposed works do not involve any excavations, significant changes in levels or basement construction. As scheme is on existing roads 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.

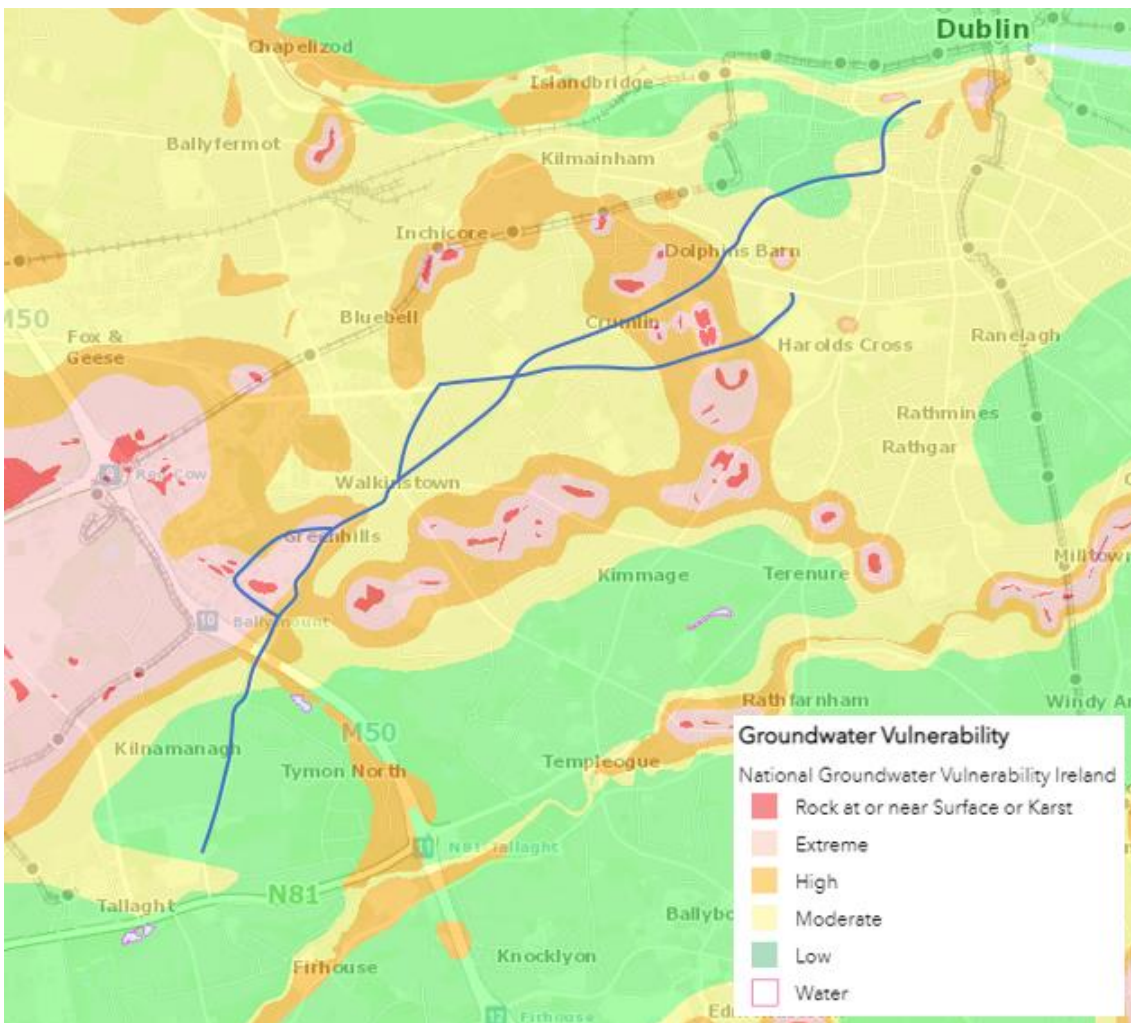


Figure 21: GSI Groundwater Vulnerability Mapping

4.4.2 Clondalkin to Drimnagh Section

The groundwater vulnerability for the proposed route is presented in Figure 20 (route shown in blue). It indicates that the groundwater vulnerability varies across the site. Most of the site falls into the “High” or “Moderate” groundwater vulnerability categories with a portion of the site around Fox-and-Geese assigned “Extreme” groundwater vulnerability classification.

The proposed works do not involve any excavations, significant changes in levels or basement construction. As scheme is on existing roads 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.

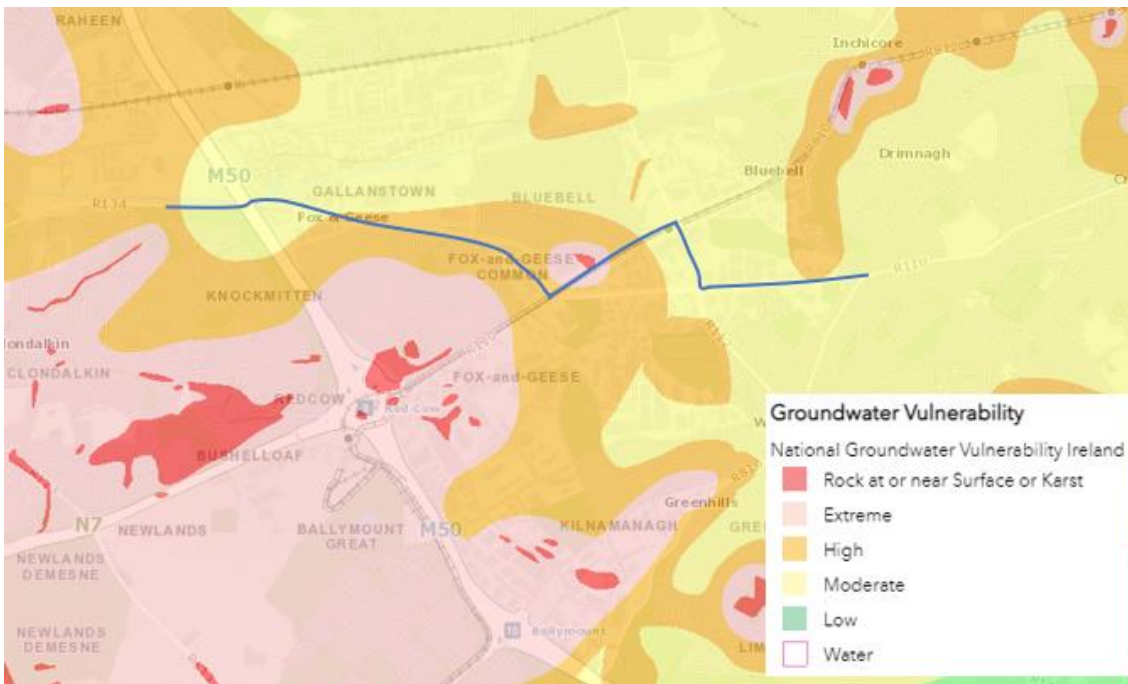


Figure 20: GSI Groundwater Vulnerability Mapping

4.5 Summary of Existing Flood Risk

4.5.1 Tallaght to City Centre Section

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

- The proposed route from Tallaght to City Centre Section has varying levels of flood risk along the route. There are multiple section of the route which are located within the 1 in 10-year fluvial flood extents, and therefore located within Flood Zone A. These are:
 - At Dolphins Barn on the R110,
 - On Clogher Road near St. Kevin's College,
 - At the junction between R110 and R137 (near St. Patrick's Cathedral).
- The risk of pluvial flooding to the site is low.
- The risk of groundwater flooding is considered moderate.

4.5.2 Clondalkin to Drimnagh Section

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

- The proposed route from Clondalkin to Drimnagh Section has varying levels of flood risk along the route. The section of the route at Fox-and-Geese and Drimnagh is within the 1 in 100-year Fluvial Flood Extents and is therefore within Flood Zone A.
- There is no tidal flood risk along the proposed route.
- The risk of pluvial flooding to the site is low.
- The risk of groundwater flooding is considered high.

5 Application of “The Planning System and Flood Risk Management” Guideline

5.1 Flood Zones

There are a number of flood zones identified along both of the proposed routes.

Tallaght to City Centre Section:

- Area 1: Section at Dolphins Barn on the R110 lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 2: Section on Clogher Road near St. Kevin’s College lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 3: Section at the junction between R110 and R137 (near St. Patrick’s Cathedral lies within Flood Zone A (1 in 100-year fluvial flood extents),
- The rest of the route is at low risk of flooding from rivers and the coast and is therefore located within Flood Zone C.
- The risk of pluvial along the route is considered to be medium and this risk will be reduced further as a result of the scheme.

Clondalkin to Drimnagh Section:

- Area 1: Section at the Fox-and-Geese lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 2: Section at Drimnagh lies within Flood Zone A (1 in 100-year fluvial flood extents),
- The rest of the route is at low risk of flooding from rivers and the coast and is therefore located within Flood Zone C.
- The risk of pluvial along the route is considered to be medium and this risk will be reduced further as a result of the scheme.

5.2 Vulnerability Classification

As per Table 2, it is considered the proposed development is classified as a ‘highly vulnerable development’ as per the vulnerability classification.

As the proposed development is a “highly vulnerable development” a Justification Test is required for those sections of the route which are within Flood Zone A and Flood Zone B.

5.3 Justification Test

The Justification Test is comprised of two processes:

1. The first is the Plan-making Justification Test (described in Chapter 4 of ‘The Planning System and Flood Risk Management’ guidelines) 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.
2. The second is the Development Management Justification Test (described in Chapter 5 of ‘The Planning System and Flood Risk Management’ guidelines) 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.

5.4 Plan-making Justification Test

A Plan-Making Justification test forms part of the Strategic Flood Risk Assessment. The Strategic Development Zone (SDZ) Planning Scheme as approved notes that all proposed developments must include a site-specific flood risk assessment (SSFRA). It is further confirmed that the SSFRA is not required to carry out a justification test, given that this exercise has already been carried out as part of the adopted SDZ Planning Scheme.

5.5 Development Management Plan Justification Test

Box 5.1 of the Justification Test in the Planning Guidelines requires two criteria to be met:

- The subject lands have been zoned or otherwise designated for the particular use of form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.
- The proposal has been subject to an appropriate flood risk assessment that demonstrates:
 - i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
 - ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
 - iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and

The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

5.5.1 Development Management Plan Justification Test – Item 1

5.5.1.1 Tallaght to City Centre Section

With regards to Item 1, we consider that this criterion has been met as follows:

- The subject lands have been zoned or otherwise designated for the particular use of form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.

As shown in Figure 23 and Figure 24, the proposed route site is located in a number of GZT zones, predominantly in R2 – Existing residential (yellow). The proposed route is located in O1 Strategic Reserve white land. Strategic Reserve, white land (O1) is to cater for those cases where land is zoned for development at some time in the future, but no objectives or specific controls are indicated. The site is currently used as a main road and therefore there is no change in the form of development.

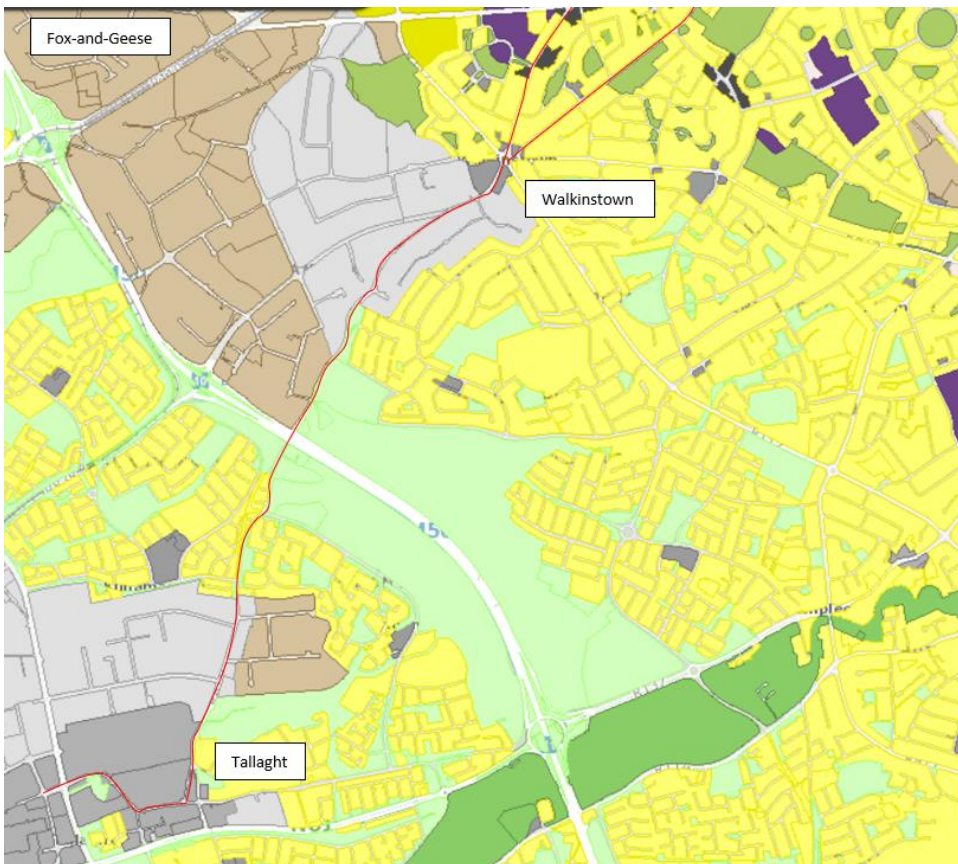


Figure 23: Generalised Zone Types – Tallaght to City Centre Section
Ref: Myplan.ie; Department of Housing, Local Government and Heritage.

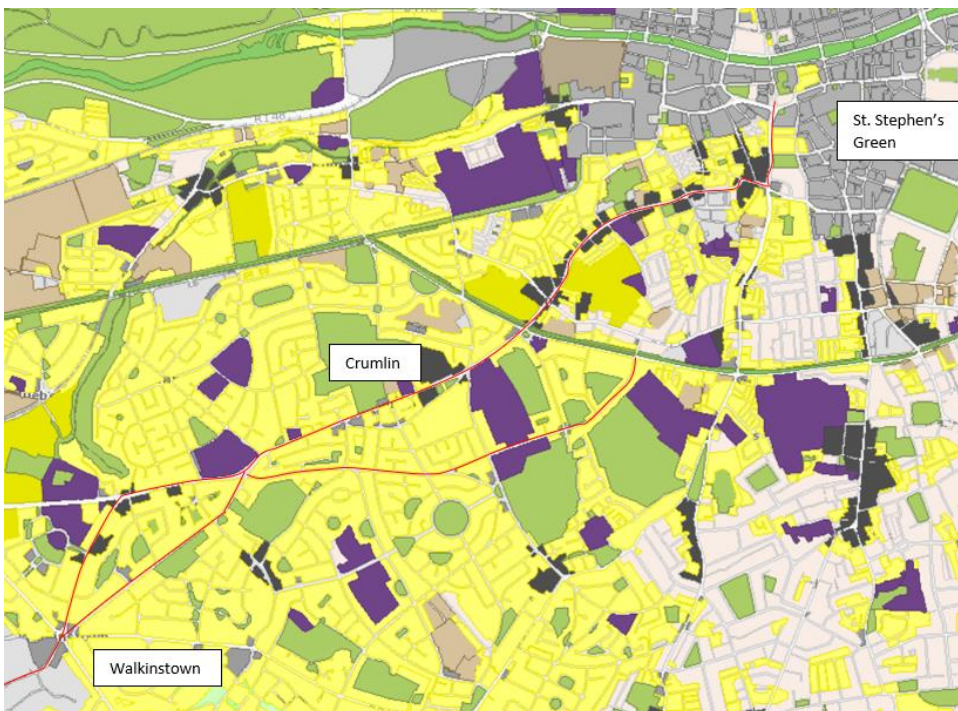


Figure 24: Generalised Zone Types – Tallaght to City Centre Section
Ref: Myplan.ie; Department of Housing, Local Government and Heritage.

5.5.1.2 Clondalkin to Drimmagh Section

With regards to Item 1, we consider that this criterion has been met as follows:

- The subject lands have been zoned or otherwise designated for the particular use of form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.

As shown in Figure 22, the proposed route site is located in a number of GZT zones, predominantly in C2.1 – Industrial, enterprise (brown) and employment and R2 – Existing residential (yellow). The proposed route is located in O1 Strategic Reserve white land. Strategic Reserve, white land (O1) is to cater for those cases where land is zoned for development at some time in the future, but no objectives or specific controls are indicated. The site is currently used as a main road and therefore there is no change in the form of development.

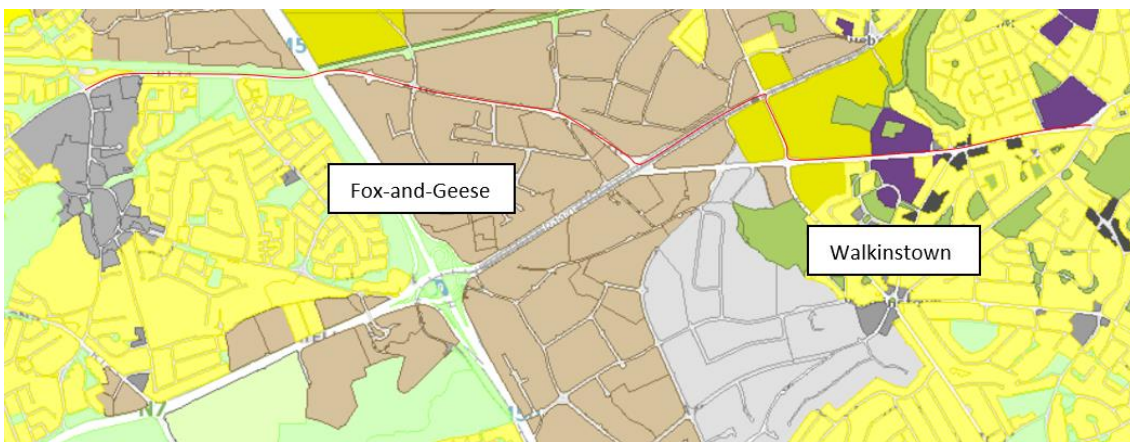


Figure 22: Generalised Zone Types – Clondalkin to Drimmagh Section

Ref: Myplan.ie; Department of Housing, Local Government and Heritage.

5.5.2 Development Management Plan Justification Test – Item 2

5.5.2.1 Tallaght to City Centre Section

With regards to Item 2, we consider that these criteria have been met as follows:

- The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.

As flood areas identified are existing roadways, it is not proposed to alter the extents of hardstanding area or raise the road level in these areas. Therefore, development of the Bus Connects route in this area will not increase flood risk elsewhere. This area meets the criteria for Part 2(i).

- The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonable possible.

Many areas along the route which are within a predicted flood extents zone are existing roads and will not increase flood risk compared to the existing scenario.

Any new roads, cycleways etc. constructed as part of the scheme will include appropriate mitigation measures to reduce the risk of flooding included at detailed design stage. As outlined in Section 4.3 pluvial flood risk will be mitigated by the incorporation of SuDS features into the

drainage system where necessary. This will reduce the risk of ponding and surface water collecting at localised low points.

The mitigation measures proposed will minimise the flood risk to people, property, the economy, and the environment.

It is therefore considered that the proposed development satisfies the criteria of Part 2(ii) of the Development Management Justification Test.

- The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.

The measures ensure that residual risks to the area and/or development will be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures.

Therefore, it is considered that the proposed development satisfies the criteria of Part 2(iii) of the development management Justification Test.

- The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The scheme has been designed to the highest standards and creates a connection of Bus services along core routes of Dublin. Measures to address the flood risk have been incorporated into the design without compromising the streetscape and functioning of the development.

Therefore, it is considered that the proposed development satisfies the criteria of Part 2 (iv) of the development management Justification Test.

5.5.2.2 Clondalkin to Drimnagh Section

With regards to Item 2, we consider that these criteria have been met as follows:

- The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.

As flood areas identified are existing roadways, it is not proposed to alter the extents of hardstanding area or raise the road level in these areas. Therefore, development of the Bus Connects route in this area will not increase flood risk elsewhere. This area meets the criteria for Part 2(i).

- The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonable possible.

Many areas along the route which are within a predicted flood extents zone are existing roads and will not increase flood risk compared to the existing scenario.

Any new roads, cycleways or other standing areas constructed as part of the scheme will include appropriate mitigation measures to reduce the risk of flooding included at detailed design stage. As outlined in Section 4.3 pluvial flood risk will be mitigated by the incorporation of SuDS features into the drainage system where necessary. This will reduce the risk of ponding and surface water collecting at localised low points.

The mitigation measures proposed will minimise the flood risk to people, property, the economy, and the environment.

It is therefore considered that the proposed development satisfies the criteria of Part 2(ii) of the Development Management Justification Test.

- The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.

The measures ensure that residual risks to the area and/or development will be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures.

Therefore, it is considered that the proposed development satisfies the criteria of Part 2(iii) of the development management Justification Test.

- The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The scheme has been designed to the highest standards and creates a connection of Bus services along core routes of Dublin. Measures to address the flood risk have been incorporated into the design without compromising the streetscape and functioning of the development.

Therefore, it is considered that the proposed development satisfies the criteria of Part 2 (iv) of the development management Justification Test.

5.6 Justification Test Conclusion

Tallaght to City Centre Section and Clondalkin to Drimnagh Section satisfy the requirements of the Plan Making Justification Test and the requirements of Development Management Justification Test.

6 Conclusion

This site-specific flood risk assessment for the Proposed Scheme has been undertaken in accordance with the requirements of “The Planning System and Flood Risk Management Guidelines for Planning Authorities”.

Several historic flood events are noted to be in the vicinity of the Proposed Schemes. The schemes are largely on existing roads and will result in minimal increase in paved surfaces, therefore will not increase the existing floods levels and risks.

There is no tidal flood risk to either of the Proposed Schemes. Therefore, there is no risk of coastal flooding to the site in the present, or future climate change scenario.

The risk of pluvial flooding along most of the Proposed Scheme is low. However, this risk exists in the current scenario and will be reduced as a result of the Proposed Scheme development.

All proposed surface water sewers provided as part of the CBC shall be designed to provide attenuation for a return period of up to 30 years where possible. This would be an improvement on the existing historical drainage network infrastructure and will reduce the overall risk of pluvial flooding. Proposed drainage infrastructure will be provided which will include new Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales and tree pits. These SuDS features will provide source control measures and reduce the risk of pluvial flooding.

The groundwater vulnerability varies along both routes. As most of the proposed development is on existing roads with no known flooding specifically due to groundwater, it is not expected that this risk will not increase with the construction of the scheme. To accurately assess the site-specific risk of groundwater flooding, a pre-construction geotechnical site investigation will be carried out as part of the final design in order to confirm groundwater conditions along the Proposed Scheme.

There are sections of the Proposed Schemes where there is a risk of fluvial flooding. These are:

Tallaght to City Centre Section:

- Area 1: Section at Dolphins Barn on the R110 lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 2: Section on Clogher Road near St. Kevin’s College lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 3: Section at the junction between R110 and R137 (near St. Patrick’s Cathedral lies within Flood Zone A (1 in 100-year fluvial flood extents),
- The rest of the route is at low risk of flooding from rivers and the coast and is therefore located within Flood Zone C.
- The risk of pluvial along the route is considered to be medium and this risk will be reduced further as a result of the scheme.

Clondalkin to Drimnagh Section:

- Area 1: Section at the Fox-and-Geese lies within Flood Zone A (1 in 100-year fluvial flood extents),
- Area 2: Section at Drimnagh lies within Flood Zone A (1 in 100-year fluvial flood extents),
- The rest of the route is at low risk of flooding from rivers and the coast and is therefore located within Flood Zone C.

- The risk of pluvial along the route is considered to be medium and this risk will be reduced further as a result of the scheme.

Finally, the Proposed Scheme is categorised by the Guidelines as a 'highly vulnerable development' and is required to pass the justification test if any part of the development is located within Flood Zone A or Flood Zone B. The Plan Making Justification Test and Development Management Justification have been assessed and passed in Chapter 5 of this report and further investigation of the flood risk in the form of a Stage 2 FRA is not required.