



## 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 Clongriffin to City Centre Core Bus Corridor Scheme.

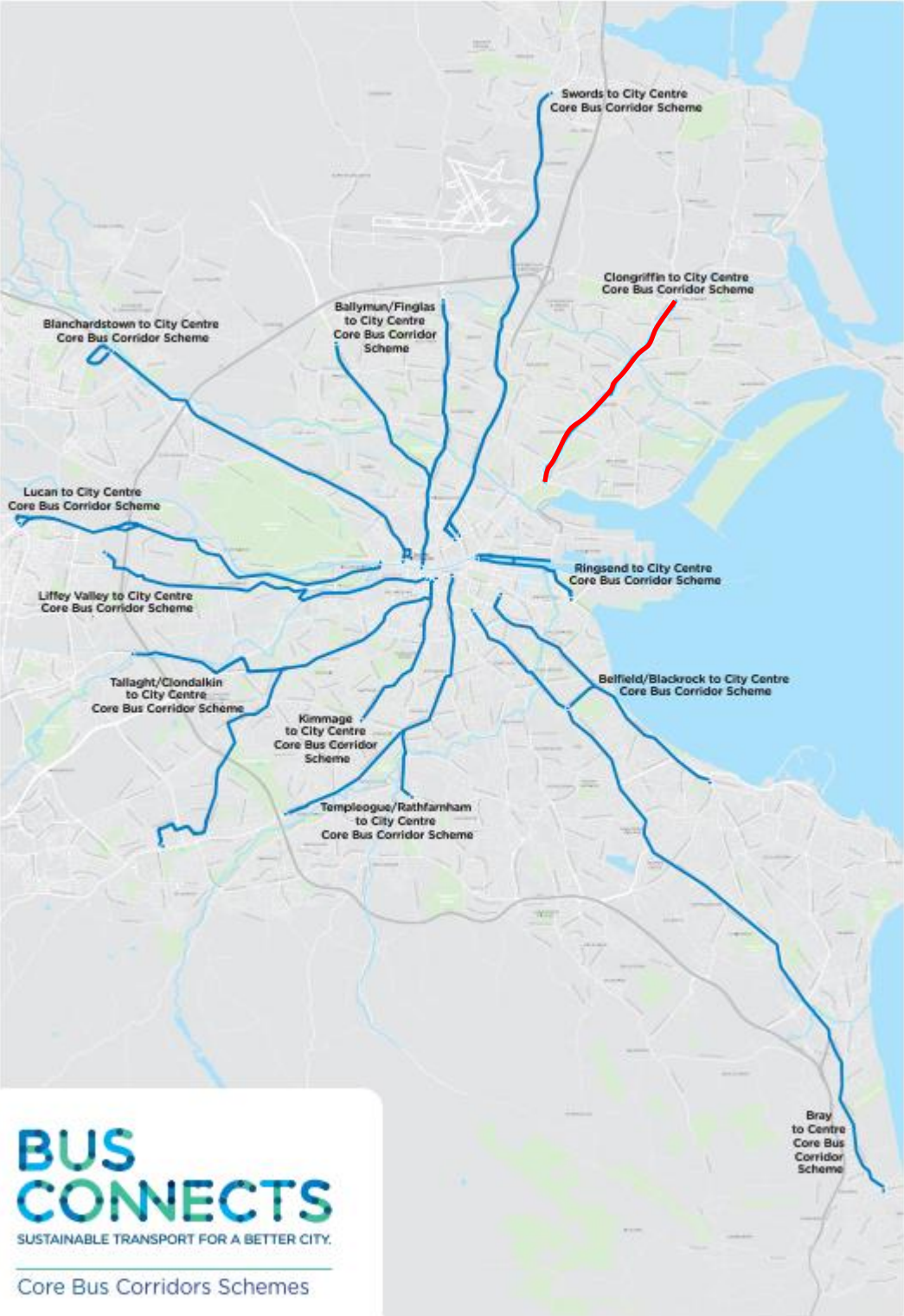
This Stage 1 FRA is a high-level study to identify flood risks to the project and any potential flooding risk arising due to the project. This report will inform the planning process and identify whether a further Stage 2 FRA is required.

The BusConnects Dublin Programme is a plan to transform Dublin's bus system, with the CBC project providing 230km of dedicated bus lanes and 200km of cycle tracks on sixteen of the busiest bus corridors in and out of the city centre. 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 Report was a discussion document outlining proposals for the delivery of a CBC network across Dublin. The aim of the Proposed Project is to transform the bus system to provide better services to more people.

The Clongriffin to City Centre Core Bus Corridor Scheme, hereafter called the Proposed Scheme, is identified as forming part of the radial Core Bus Network is 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**

## 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 due to construction of the proposed development,
- Review of the availability and adequacy of existing information,
- Identification of possible measures which could mitigate the flood risk to acceptable levels, and;
- Areas for further investigation (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](http://www.floodinfo.ie));
- Flood history of the site from the OPW National Flood Hazard Mapping website ([www.floodinfo.ie](http://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,

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

## 1.4 Route Overview

The Proposed Scheme measures approximately 5.7km. The Proposed Scheme is routed along the R107 Malahide Road from Mayne River Avenue – R107 Malahide Road Junction to the junction with Marino Mart - Fairview and also routed via the junction with Malahide Road-Brian Road along Carleton Road, St Aidans Park, Haverty Road and Marglann Marino, all in the County of Dublin. The Clongriffin DART Station to Malahide Road via Clongriffin Main Street section is no longer proposed to be included as part of this project. It is noted that Clongriffin Main Street already has dedicated Bus lanes and the scheme proposed by Dublin City Council, Belmayne Main Street and Belmayne Avenue Scheme, also incorporates dedicated Bus lane and cycle infrastructure. The CBC is routed via Malahide Road to the junction with Marino Mart/Fairview. From Marino Mart/Fairview the CBC ties into a separate project, Clontarf to City Centre Cycle and Bus Priority Project currently proposed by Dublin City Council and is not considered as part of this report.



### 1.4.1 Mayne River Avenue to Gracefield Road

The Proposed Scheme is to be routed along the Malahide Road to the junction with the R105 at Marino Mart/Fairview requiring upgrades of a number of junctions. Between Clarehall Avenue and Blunden Drive, a single bus lane and two general traffic lanes will be maintained in each direction. It is proposed to upgrade the existing roundabout on Blunden Drive to a fully signalised junction. Between Tonlegee Road junction and Gracefield Road junction, it is intended to retain the single bus lane and general traffic lane in each direction. A northbound segregated cycle track will be

provided in the area between the Malahide Road and Brookville Park. It is proposed that southbound cyclists are redirected onto the adjoining St. Brendan's Avenue using a Quiet Street Treatment. Cyclists can then re-join the Malahide Road at Gracefield Road. It is proposed to upgrade the existing roundabout at Gracefield Road to a fully signalised junction.

#### 1.4.2 Gracefield Road and Clontarf Road

Between Gracefield Road and Clontarf Road junctions, it is proposed to upgrade multiple junctions. Between Gracefield Road junction and Killester Avenue, it is proposed to provide a continuous bus lane with a single general traffic lane in each direction. Segregated cycle tracks and facilities will be maintained through this section. Between Killester Avenue junction and Collins Avenue, it is proposed to maintain the road cross-section as described in the previous section. The existing road between these junctions requires widening to accommodate the necessary lane widths and bus stop facilities.

Along the Malahide Road between the Collins Avenue junction and the Griffith Avenue junction, it is proposed to provide a continuous bus lane with a single general traffic lane in each direction. Between the Griffith Avenue junction and the Clontarf Road junction, it is proposed to continue the bus and general traffic lanes in each direction.

It is proposed to provide an alternative cycle route using a Quiet Street Treatment running parallel to the Malahide Road along Brian Road, Carleton Road and Haverty Road. Cyclists will then re-join Marino Mart and connect with the Clontarf to City Centre Cycle Scheme. It is proposed to close Haverty Road for vehicular traffic at the St Aidan's Park end of the street. This proposal will also help to further reduce through-traffic on Brian Road, Carleton Road and Haverty Road.

The proposed bus lane works will tie into the new bus and cycle facilities on Clontarf Road, which are being advanced by Dublin City Council and have received planning approval.



## 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.

Three flood zones are defined in the Guidelines:

**Table 1: Definition of Flood Zone Categories**

Zone Category	Description
<b>Flood Zone A</b>	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).
<b>Flood Zone B</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
<b>Flood Zone C</b>	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. 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 proposed development is to provide primary transport and is considered essential infrastructure. It is therefore classed as Highly Vulnerable Development.

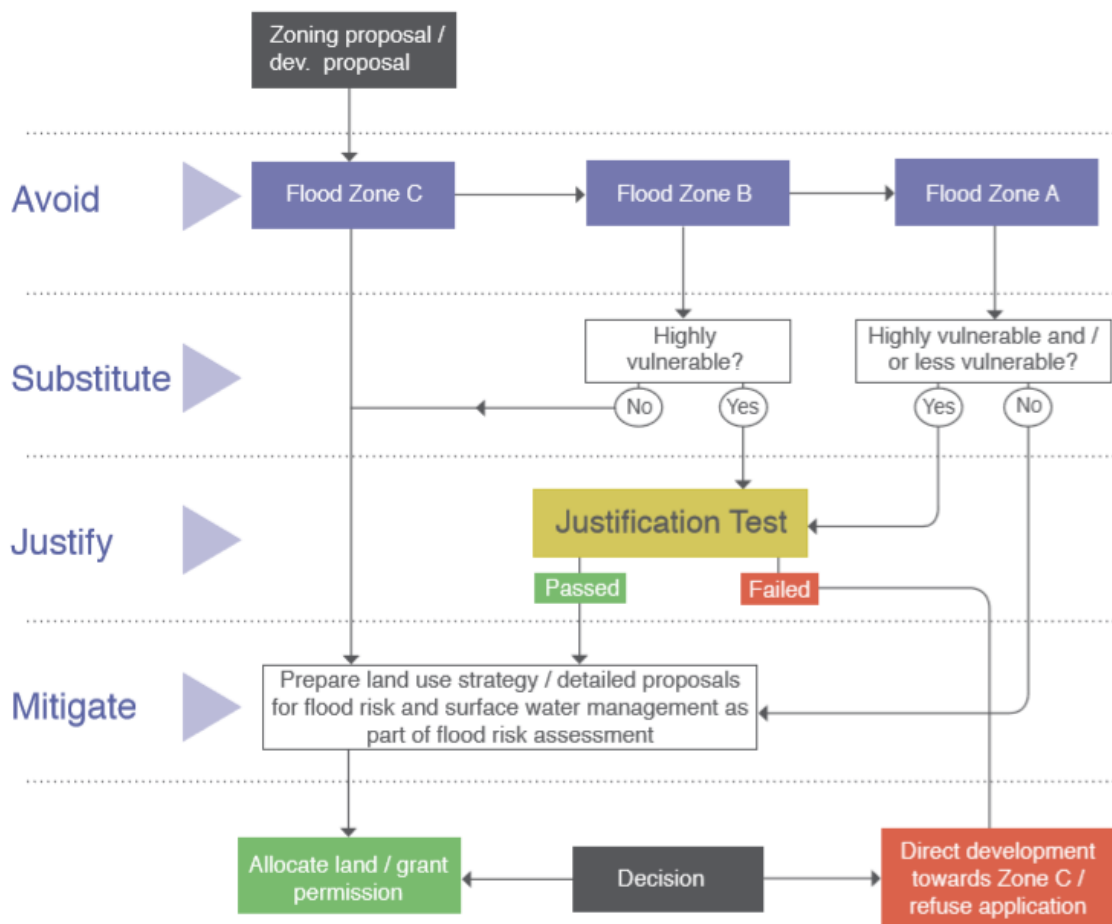
**Table 2: Definition of Vulnerability Classes**

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



### 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. Preferably, development in areas with a high risk of flooding should be avoided.



**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**

	<b>Flood Zone A</b>	<b>Flood Zone B</b>	<b>Flood Zone C</b>
<b>Highly Vulnerable</b>	Justification Test	Justification Test	Appropriate
<b>Less Vulnerable</b>	Justification Test	Appropriate	Appropriate
<b>Water Compatible</b>	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 should take place.

Section 9.5.3 Flood Management outlines the key policies and objectives of Dublin City Council regarding flood risk. The plan presents several Dublin City Council 'Strategic Infrastructure' (SI) policies as follows:

- **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, open space 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:** The 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 as follows:

- **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 (Volume 7 of the Draft Dublin City Development Plan 2016-2022)

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 several 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 occurs when the capacity a river is exceeded during periods of intense rainfall.
- Tidal Flooding is the temporary inundation of low-lying areas, due to tidal events.
- Pluvial Flooding/Urban Drainage occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall and the network is over capacity. Surface 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 Historical Flood Data

Reports and maps from the OPW's Flood Hazard Mapping website ([www.floodinfo.ie](http://www.floodinfo.ie)) have been examined as part of this flood risk assessment. Figure 3 presents the flood record for the site and its immediate vicinity. Several flood events have been recorded on or adjacent to the proposed scheme. The most noteworthy area of historical flooding is at Donnycarney (marked as 1 and 2 on Figure 3) Table 4 provides a summary of the flood events that have occurred along the proposed route.

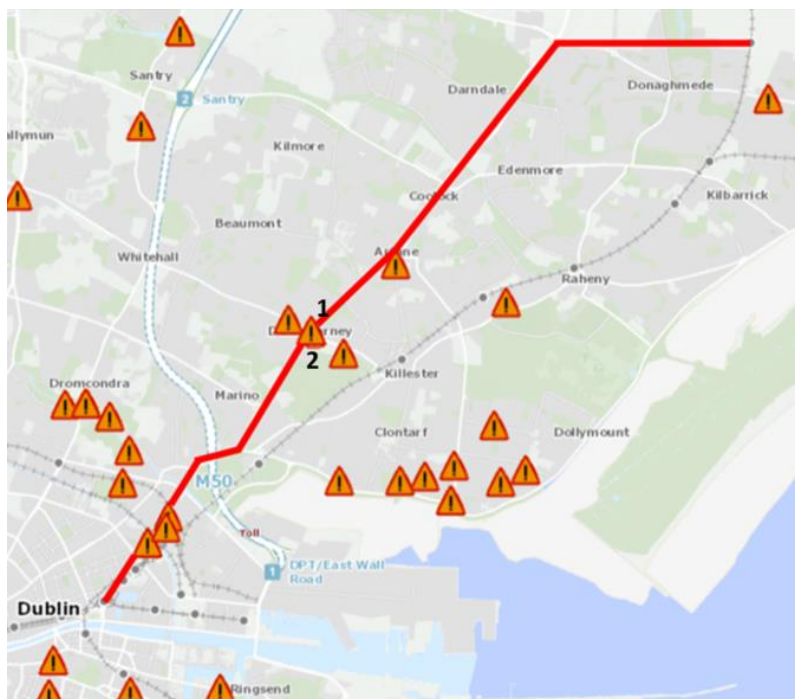


Figure 3: Historic Flood Events

**Table 4: Historic Flood Events: Clongriffin to City Centre Core Bus Corridor Scheme**

Flood Point No.	Date	Catchment	Flood Source	Details
1	10/06/1963	Tolka	River	Flooding here is associated with the Tolka catchment. The flood name is Donnycarney Wad June 1963 and the location is an Exact Point.
2	-	-	-	Recurring Flood. Flooding here is associated with the 'null' catchment. The flood name is Donnycarney Dublin Recurring, and the location is an Approximate Point.







**Figure 5: CFRAM Fluvial Flood Map (River Santry)**

Below are some noteworthy comments extracted from the Dublin City Development Plan SFRA for the area shown in Figure 5:

- The area generally has a low sensitivity to climate change,
- All surface water in this area shall be carefully managed with provisions made for significant rainfall events during periods of increased river flows,
- If development is permitted in this area, surface water runoff shall be limited to current values,
- The flood extents generally indicate flow paths coming from the river channel via over ground routes and then returning in the same way or through the existing drainage network.

As the proposed route is not impacted by any designated flood zones, it is considered that there is no associated fluvial flood risk. However, the Dublin City Development Plan SFRA and the historical flood events suggests that there is a residual flood risk from fluvial sources.

## 4.2 Fluvial Flooding – River Wad

At Donnycarney, located on the junction between the R103 and the R107. The Dublin City Development Plan SFRA suggests that flow paths come directly out of the river culvert through manholes and gullies, and this is compounded with pluvial flooding if heavy rainfall coincides with high river culvert flows.

The culverted section of the Wad River extends from Collins Park, crosses the Malahide Road near the Topaz garage, and onto Collins Avenue East. There is residual flood risk here, should the culvert be compromised by blockages.

There is a significant fluvial flood risk associated with the culverted section of the Wad River which interacts with the BusConnects Corridor. Future works in this area are expected to include a new culvert from Collins Park to connect into the new scheme at Clanmoyle. These future works have not been included as part of any recent planning applications and are not expected to be



completed in the short to medium term. However, when these works are completed the overland flows will be diverted underground at Collins Park, thus reducing the risk of overland flows and flooding within the catchment<sup>1</sup>.

There is flooding at Collins Park, mainly due to capacity issues in the surface water system. Additionally, the alarm at Collins Park (SW) activates during short periods of intense rain. During heavy rainfall events, surface water can overflow from Collins Park, down Collins Avenue East and into the new system at Clanmoyle.

This area of flooding along the River Wad from Collins Avenue East to Collins Park is outside of the CFRAM Flood Mapping Extents. However, below are some noteworthy comments extracted from the Dublin City Development Plan SFRA for this area:

- No flood defences are in this area (however, there is downstream storage in the Clontarf Golf Club),
- The area is sensitive to climate change if the capacity of the culverted section of the Wad River is exceeded more frequently,
- All surface water in this area shall be carefully managed and if development is permitted, provisions shall be made to limit the amount of surface water runoff to current values,
- Surface water and foul sewage flows shall be separated where possible,
- The flood extents for the area generally indicate flow paths coming directly out of the river culvert through manholes and gullies (compounded with pluvial flooding if heavy rainfall coincides with high river culvert flows).

Remedial/ upgrade works at Collins Park are not considered as part of the BusConnects development as the works would be outside the extents of the proposed development area. Run-off from the Bus-Connects corridor will not exacerbate existing flood risk as any additional impermeable area generated within the corridor is to be managed by the provision of Sustainable (Urban) Drainage Systems (SuDS).

### 4.3 Tidal Flood Risk

An extract from the Eastern CFRAM coastal flood extent map is provided in Figure 6, with the proposed route shown in orange. The predicted tidal flood extents for three separate return period events are presented on the map (1 in 10, 200 year and 1000-year tidal flood extents.)

As illustrated in Figure 6, part of the proposed route falls within the 1 in 1000-year tidal extents and is therefore located in Flood Zone B. The modelled water levels for the nodes are displayed below. The closest modelled node to the site is 0914C00001 with water level 3.11m OD during the 1 in 200-year flood event and 3.33m OD during the 1 in 1000-year flood event. The road levels in the area are approx. 3m OD. The Dublin City Development Plan SFRA suggests that the flood extents in this area generally indicate flow paths from the tidal region (by overland routes) which are compounded by rainfall during periods of high tides.

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<sup>1</sup> Dublin City Council.ie. Water/Waste and Environment/Pluvial Flooding/Wad River. Available at: <http://www.dublincity.ie/main-menu-services-water-waste-and-environment-water-projects/pluvial-floodingwad-river>



**Figure 6: Coastal Flood Extents – Fairview**

It is not considered within the scope of this project to significantly increase road levels to mitigate this risk.

It is noted that the above map extract (Figure 6) has a note attached which states 'wave overtopping plays a significant role in this location and is not currently included in the mapping shown here'. Therefore, a review of the Irish Coastal Protection Strategy Study (ICPSS) mapping for this area was carried out.

The ICPSS suggests there is significant coastal flood risk in this area of the proposed development.

A review of the ICPSS mapping levels was completed within the vicinity of the site. Figure 7 below indicates the water depth for the section of the scheme at risk of coastal flooding during a 1 in 200-year event (with the proposed route highlighted in green). The closest ICPSS Node is 22 which is located approx. 3 km from the proposed scheme. This node suggests that the tidal water level for a 1 in 200-year event is 3.07m OD.



**Figure 7: ICPSS Flood Depth Map 0.5% AEP**

It can be seen, moving from north to south along the green line, that the water depth increases from approx. 0.25m to 1.50m and then reduces back to approx. 0.25m. Thus, the central location of the green section highlighted above is considered most critical during a 1 in 200-year event. It should be noted that no past flood events appear to have been recorded in this area.

Below are noteworthy comments extracted from the Dublin City Development Plan SFRA for the areas shown in Figure 6 and Figure 7:

- Sea level rises of between 0.5m and 1.0m for this area would have a significant impact,
- All surface water within this area is to be managed and provisions shall be made for a 1-year high tide event occurring concurrently with a 1 in 100-year rainfall event,
- Flood extents for the area generally indicate flow paths coming out of the tidal region (through quay walls and underground chambers near quay walls).
- Flood defences have been constructed in this area incorporating a 200-year tide level plus 300mm freeboard, plus an allowance for fluvial surcharge at high tide,
- The highest recorded tide (3<sup>rd</sup> January 2014) was contained within the flood defences,
- All surface water within this area is to be managed and provisions shall be made for a 5-year high tide event assuming a 100-year rainfall event,
- The flood extents for the area generally indicate flow paths coming out of the tidal region (compounded with pluvial flooding during periods of high tides and heavy rainfall,
- Inland flood risk includes the culverted Wad River (discussed above),
- Existing sea wall protection along the Clontarf Road with the exception of the last 250m east of Alfie Byrne Road,
- Site is extremely sensitive to climate change,
- All surface water in this area shall be carefully managed and provisions made for a 1-year high tide event occurring during a 100-year rainfall event,
- The flood extents generally indicate flow paths from the tidal region by over ground routes (compounded by rainfall during periods of high tides).

#### 4.4 Pluvial Flooding/ Urban Drainage

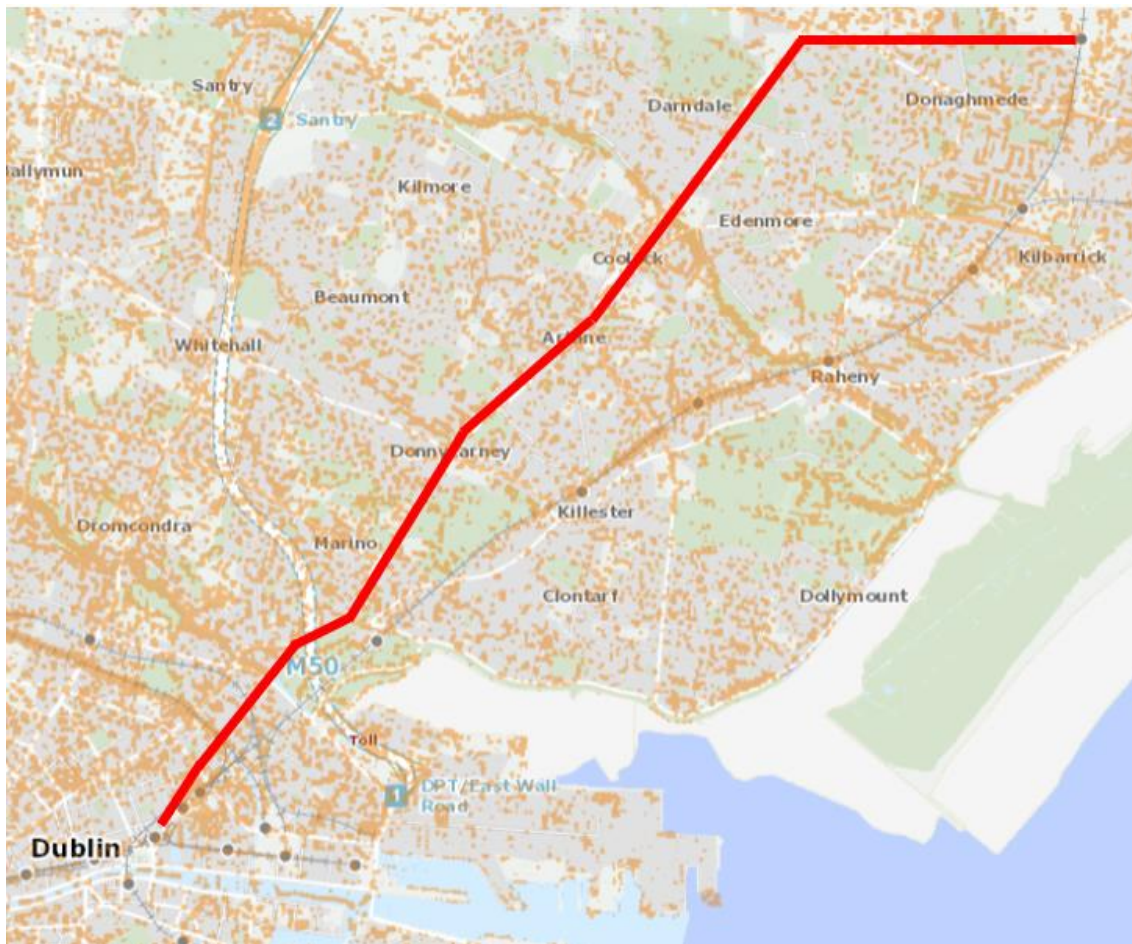
Pluvial flooding occurs when extreme rainfall overwhelms drainage systems or soil infiltration capacity, causing excess rainwater to pond above ground at low points in the topography.

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 8.

The Dublin City Council Flood Resilient City Project was carried out in conjunction with Jacobs in 2012. This study was carried out to detail pluvial flood risk assessment of pilot areas in Dublin City.

A review of this project was carried out to determine the pluvial flood depths the proposed development length. From this study the pluvial flood depth at the location where the proposed scheme passes over the M50 (Port Tunnel) was predicted to be between 0.1m and 0.2m (Dublin North Central Pilot Area), and approx. of 0.2m in other local areas.

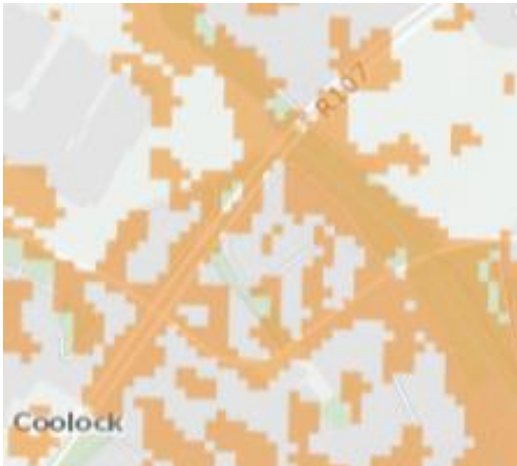

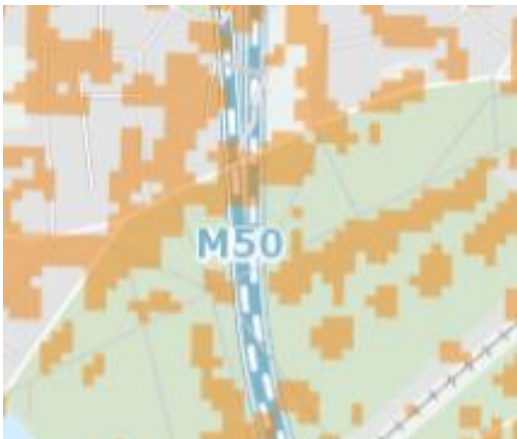




**Figure 8: Extract from OPW PFRA Pluvial Flood Maps - 10% AEP Pluvial Flood Risk**

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. There are multiple locations where there is a continuous section of the scheme which is indicated as being flooded on the OPW Flood Maps. A summary of the noteworthy locations is provided in Table 5.

**Table 5: Noteworthy Pluvial Flood Risk Areas**

Location	Initial Flood Risk Comments
	<p>Pluvial flood risks have been identified on the R107 near the junction with the R104.</p> <p>The flood maps suggest that approx. 500m of the road corridor is flooded at this location during a 10% AEP event.</p>
	<p>Pluvial flood risks have been identified on the R107 near the junction with the R103.</p> <p>The flood maps suggest that approx. 180m of the road corridor is flooded at this location during a 10% AEP event.</p> <p>The Dublin City Development Plan SFRA requires that all surface water in this area shall be carefully managed and if development is permitted, provisions shall be made to limit the amount of surface water runoff to current values.</p> <p>Past flood event noted in this area.</p>
	<p>Pluvial flood risks have been identified at the location where the road corridor crosses over the M50.</p> <p>The flood maps suggest that approx. 370m of the road corridor is flooded at this location during a 10% AEP event.</p> <p>The Dublin City Development Plan SFRA requires that all surface water within this area is to be managed and provisions shall be made for a 5-year high tide event assuming a 100-year rainfall event.</p>

As the scheme does not propose significant level changes, it is beyond the scope of the project to mitigate flooding for the existing road network in its entirety. However, noteworthy areas of pluvial flooding have been identified and will be remediated through the design of the Bus Connects drainage infrastructure where feasible. These areas are:

1. Areas where the PFRA mapping has highlighted pluvial flood risk for continuous lengths of road in excess of 150m – see Table 5,
2. Where historical flood mapping has highlighted a past pluvial flood events, and
3. Where topographical surveys have indicated a local low-point in the road alignment adjacent to or alongside the BusConnects route without drainage inlets (i.e. undrained sag points).

Where a new surface water sewer is being proposed along the development the network shall be designed to provide attenuation for return period of up to 30 years. This would be an improvement of the existing historical drainage network infrastructure and will reduce the overall risk of pluvial flooding.

New drainage infrastructure will be provided including new Sustainable (Urban) Drainage Systems (SuDS) solutions such as rain gardens, swales and tree pits where possible and practical. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

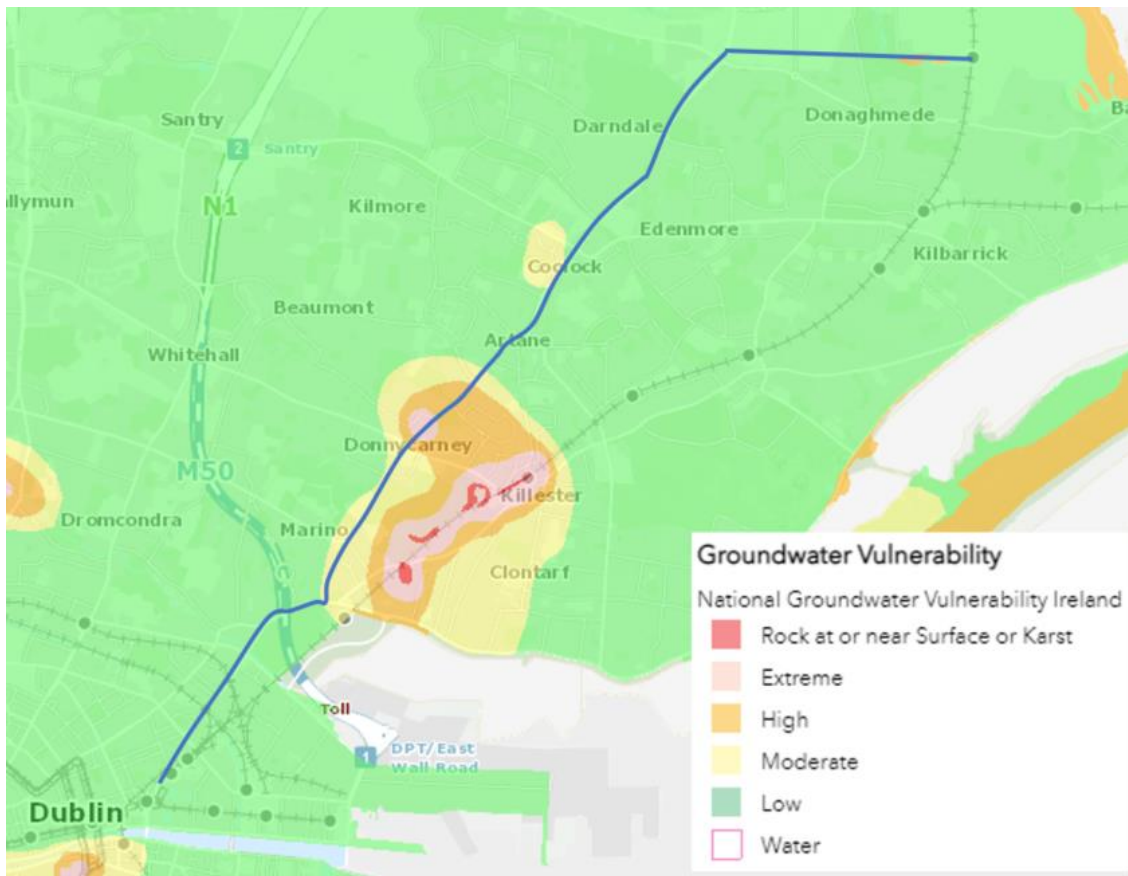
In summary, there is a risk of pluvial flooding along the proposed route, however this risk will be reduced by some local drainage improvements and the provision of Sustainable (Urban) Drainage Systems (SuDS) along the BusConnects project.

#### 4.5 Groundwater Flooding

Groundwater flooding can occur during a 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.

Groundwater vulnerability assessment of the proposed development are presented in Figure 9 (proposed development route shown in blue). The assessments indicate that the groundwater vulnerability varies across the site. Most of the site falls into the “Low” groundwater vulnerability category with a portion of the site around Donnycarney to Fairview is assigned “Extreme”, “High”, and “Moderate” groundwater vulnerability classifications.

The proposed works do not involve any excavations or significant changes in road levels or basement construction. As the scheme is on existing roads with no known groundwater flooding, it is not expected that groundwater risk will change or increase as a result of the proposed development.



**Figure 9:GSI Groundwater Vulnerability Mapping**

#### 4.6 Summary of Existing Flood Risk

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 Scheme has varying levels of flood risk along the route, with low impact on the proposed development.
- Residual fluvial flood risk is present along the proposed development route, at the culverted section of the Wad River, however residual risk is low on the proposed development.
- From Fairview to the City Centre is in the 1 in 200-year flood extent (Flood Zone B – medium risk), however residual risk is low on the proposed development.
- The risk of groundwater flooding impacting the proposed development is low.



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

### 5.1 Flood Zones

The site is located within Flood Zone B from Fairview to the City Centre (1 in 200-year tidal flood extents).

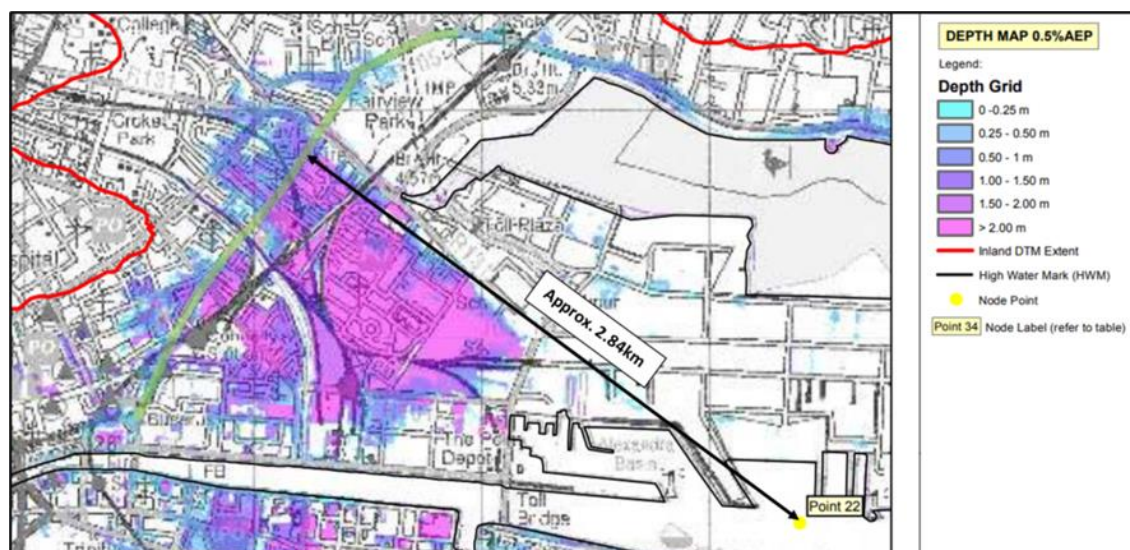


Figure 10: ICPSS Flood Map 0.5% AEP Event

### 5.2 Vulnerability Classification

As defined in Table 2 in Chapter 2, the proposed development is classified as a ‘highly vulnerable development’ thus a Justification Test is required for the 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
  - iv) 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

With regards to Item 1, we consider the criterion has been 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.*

Shown in Figure 11, the site is identified as a Proposed BRT (Bus Rapid Transport) route within zoning map set J of the Dublin City Development Plan 2016 – 2022.



### 5.5.2 Development Management Plan Justification Test – Item 2

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 the 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.*

Any new roads, cycleways or other hard standing 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 possible and practical. This will reduce the risk of ponding and surface water collecting at localised low points.

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 proposed development 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 provide and improve, pedestrian and cyclist movement together with bus services along core routes in Dublin. Measures to address flood risk have been incorporated into the design without compromising the streetscape and functioning of the development. The proposed development will result in a more integrated and functional streetscape with improved facilities for active travel and greater use of public transport.

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

The scheme satisfies the requirements of the Plan Making Justification Test and the requirements of Development Management Justification Test.

## 6 Conclusion

This Flood Risk Assessment (FRA) has been carried out in support of the Planning Application for the proposed route from Proposed Scheme.

Several historical flood events are noted to be in the vicinity of the proposed development. The proposed development is largely on existing roads and will result in minimal increase in paved surfaces, therefore will not increase the existing floods levels and risks.

According to the Dublin City Development Plan 2016-2022 Strategic Flood Risk Assessment Vol 7, there are two areas of the scheme, between Fairview and the end of the route, that are at risk of tidal and coastal flooding. These are:

- At Fairview (junction between R105 and R107) – Flood Zone B,
- On the R105, between the Tolka River and the Royal Canal – Flood Zone A.

The above areas are well outside of the proposed development, the risk is low.

The groundwater vulnerability varies along the proposed development route. As most of the proposed development is on existing roads with no known flooding specifically due to groundwater, it is expected that this risk will not increase as a result of the proposed development. To accurately assess the site-specific risk of groundwater flooding, a pre-construction geotechnical site investigation is recommended in order to confirm groundwater conditions.

The risk of pluvial flooding along most of the proposed route is high in the current scenario. Where new surface water sewers are being proposed along the development, these networks shall be designed to provide attenuation for 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. New drainage infrastructure will be provided including Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales, and tree pits where possible. These SuDS features will provide source control measures and reduce the risk of pluvial flooding.

Donnycarney is located at the junction between regional roads R103 and R107 is at risk of fluvial flooding according to Dublin City Development Plan 2016-2022 Strategic Flood Risk Assessment Vol 7. The area is located within a Flood Zone A, however the proposed BusConnects development is located outside the extents of the area at risk. Run-off from the proposed development corridor will not exacerbate existing flooding conditions as the permeable (grass area) is being increased locally within the corridor with the possibility to provide SuDS solutions.

Finally, proposed development 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.

# Appendices

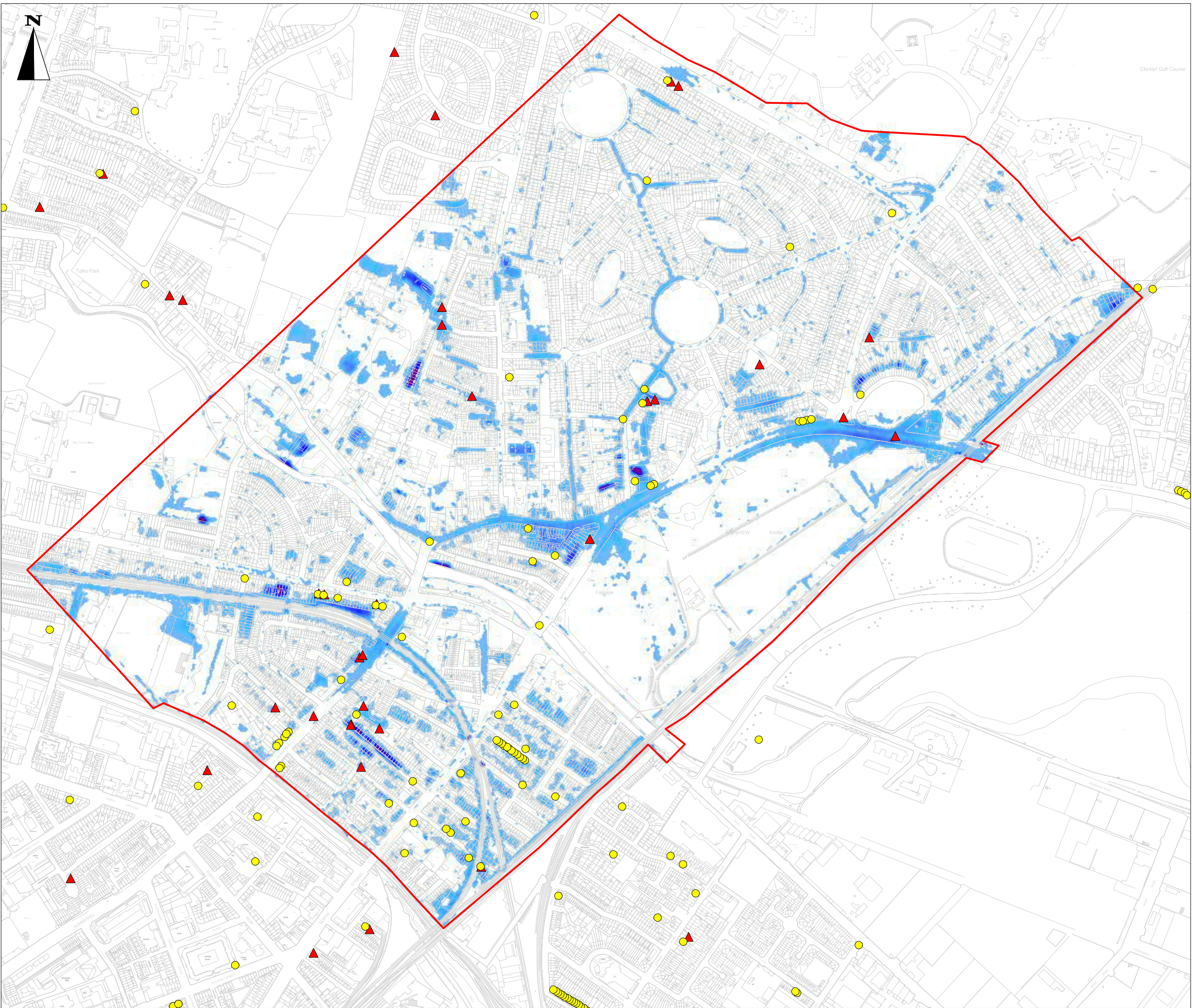
## Drawings

- Clongriffin to City Centre Core Bus Corridor Scheme – General Arrangement Key Plan.
- FloodResilienCity Project – Type 2 Model – Flood Depth Map (2% AEP)
- Tolka River 1000 Flood Event – Draft Floodplain (2 Year Fluvial 200 Year Tidal) Map 3 of 3
- Tolka River 1000 Flood Event – Draft Floodplain (100 Year Fluvial 200 Year Tidal) Map 3 of 3
- CRAM Clontarf Tidal Flood Extents Page 1 of 3
- Dublin City Flood Hazard Maps Type 1 -200 Year Flood Extent Map 14 -East Wall and Tolka#
- Dublin City Flood Hazard Maps Type 2 -200 Year Flood Extent Map 14 -East Wall and Tolka.

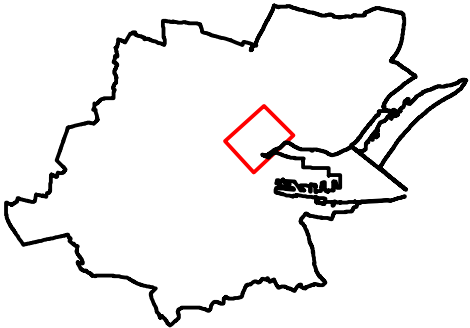








Existing Situation (No - Minimum)  
Flood Depth Map - Dublin North Central



Dublin City Council boundary

Legend

Flood Depth (m)

- 0.1 m to 0.2 m
- 0.2 m to 0.3 m
- 0.3 m to 0.5 m
- 0.5 m to 1.0 m
- 1.0 m to 2.0 m
- > 2.0 m

- Reported Flood Incidents (Aug 2008 & July 2009)
- Reported Flood Incidents<sup>1</sup> (October 2011)

- Type 2 Model Boundary

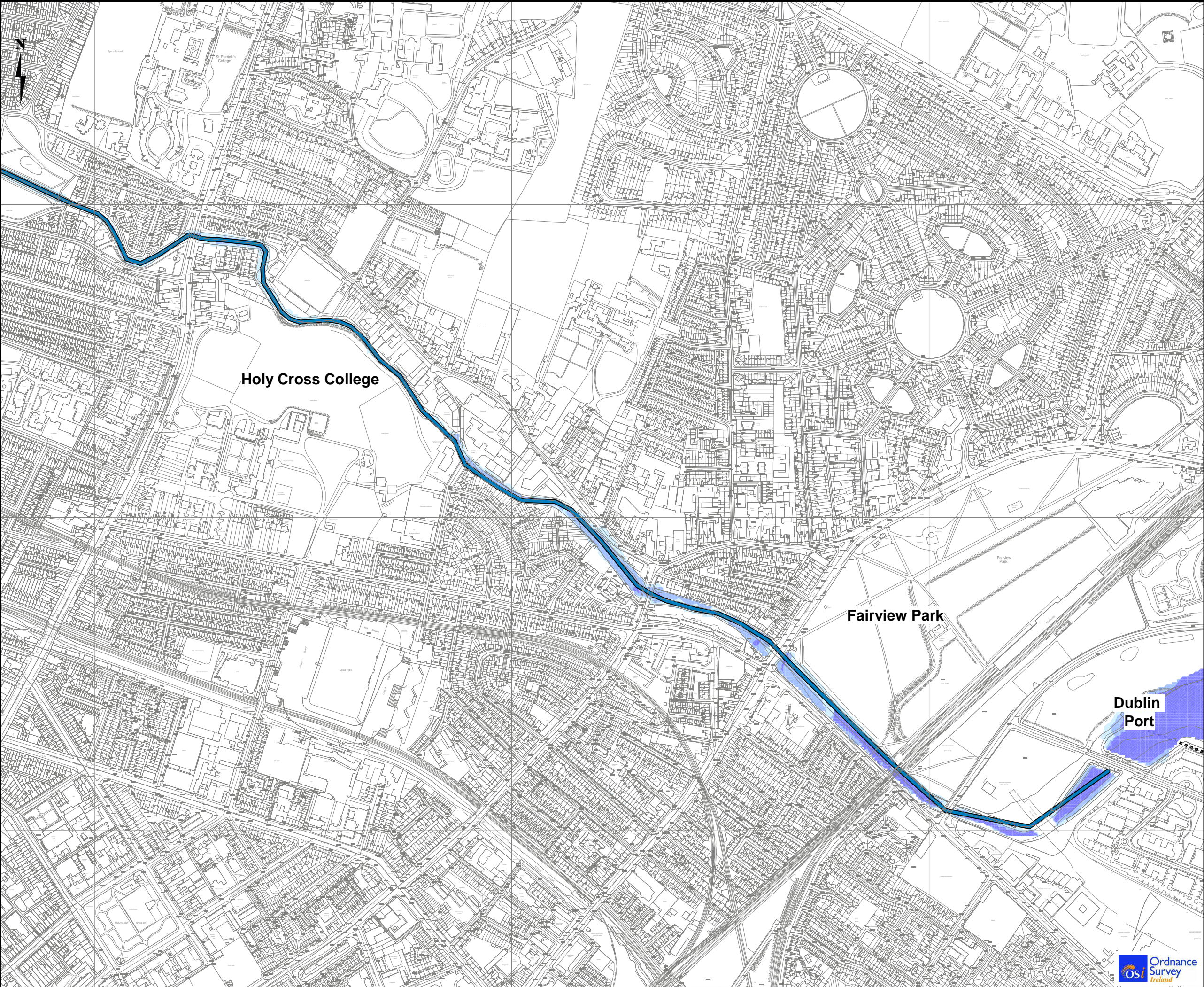
Notes:  
1 - Reported flood incident locations were provided by DCC and are up to date as of 22/06/12.

JACOBS

Client			
Project	FloodResilienCity Project		
Title	Type 2 Model - Flood Depth Map (2% AEP) Dublin North Central Pilot Area		
Drawing Status	FINAL		
Job No.	32102500		
Figure No.	FIGURE B3.4B		Revision
Scale	1:7000		Date : 9/12/11
Drawn		MM	Checker
MV		Review	PS
Approved		KK	

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Legend

River Tolka

County Boundary

Flood Plain Ranges

0 to 1

1.01 to 2

2.01 to 3

3.01 to 4

Client

Dublin City Council  
Comhairle Cathrach Bhaile Átha Cliath

Project

Tolka River 1000 Year Flood Event

Title

Draft Floodplain  
(2 Year Fluvial 200 Year Tidal)  
Map 3 of 3

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Approved by: J. Hobbs

Scale: 1:6,800 @ A3

Date: 01/09/2010

Project No. MDW0400

File Ref. MDW0400Mi0023F01

Drawing No. Mi0023

Rev. F01

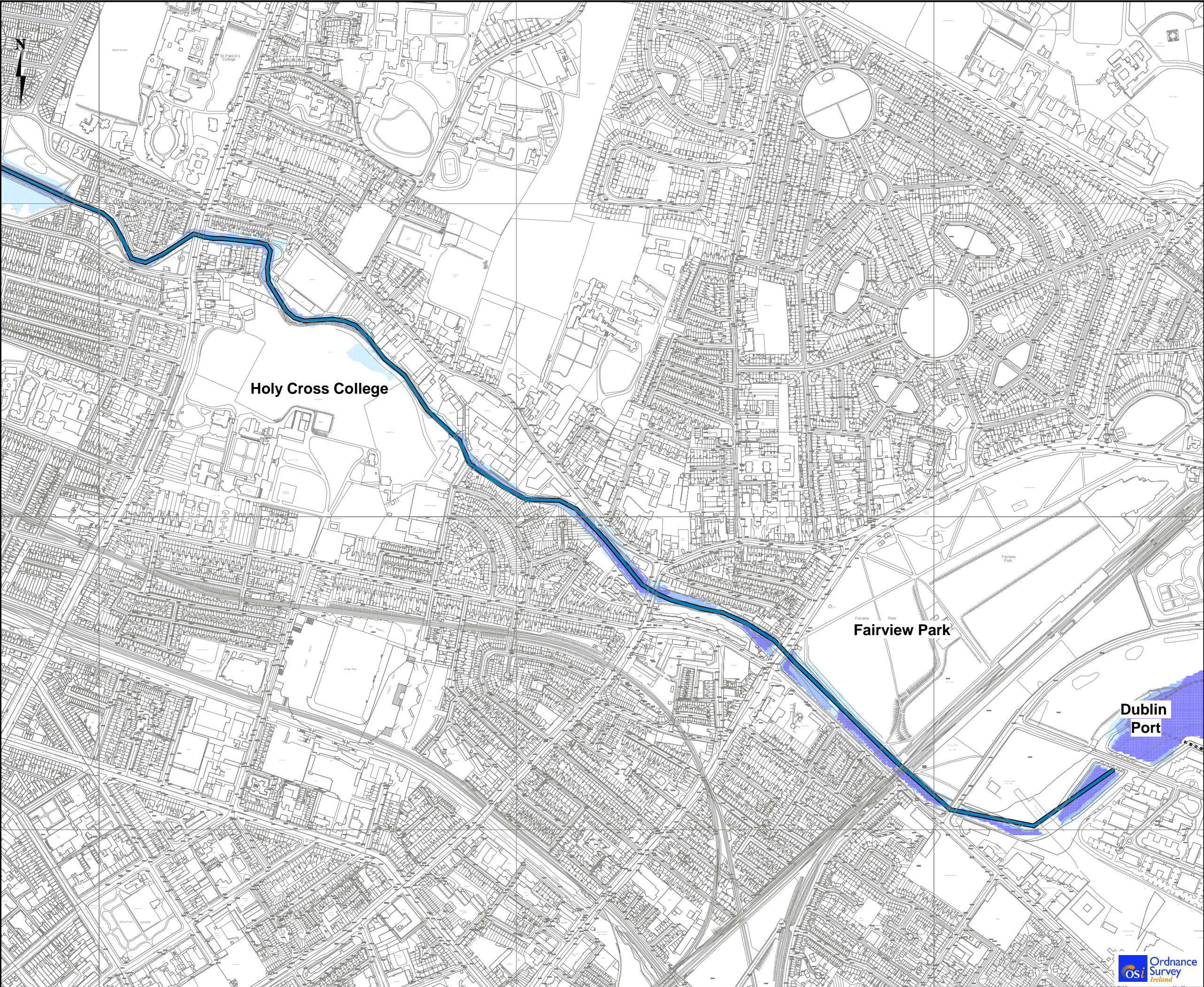
Notes

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Legend

River Tolka

County Boundary

Flood Plain Ranges

0 to 1

1.01 to 2

2.01 to 3

3.01 to 4

Client

Dublin City Council  
Comhairle Cathrach Bhaile Átha Cliath

Project

Tolka River 1000 Year Flood Event

Title

Draft Floodplain  
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Map 3 of 3

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Date: 01/09/2010

Project No. MDW0400

File Ref. MDW0400Mi0008F01

Drawing No. Mi0008

Rev. F01

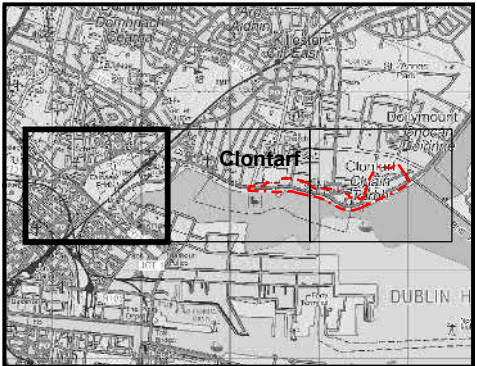
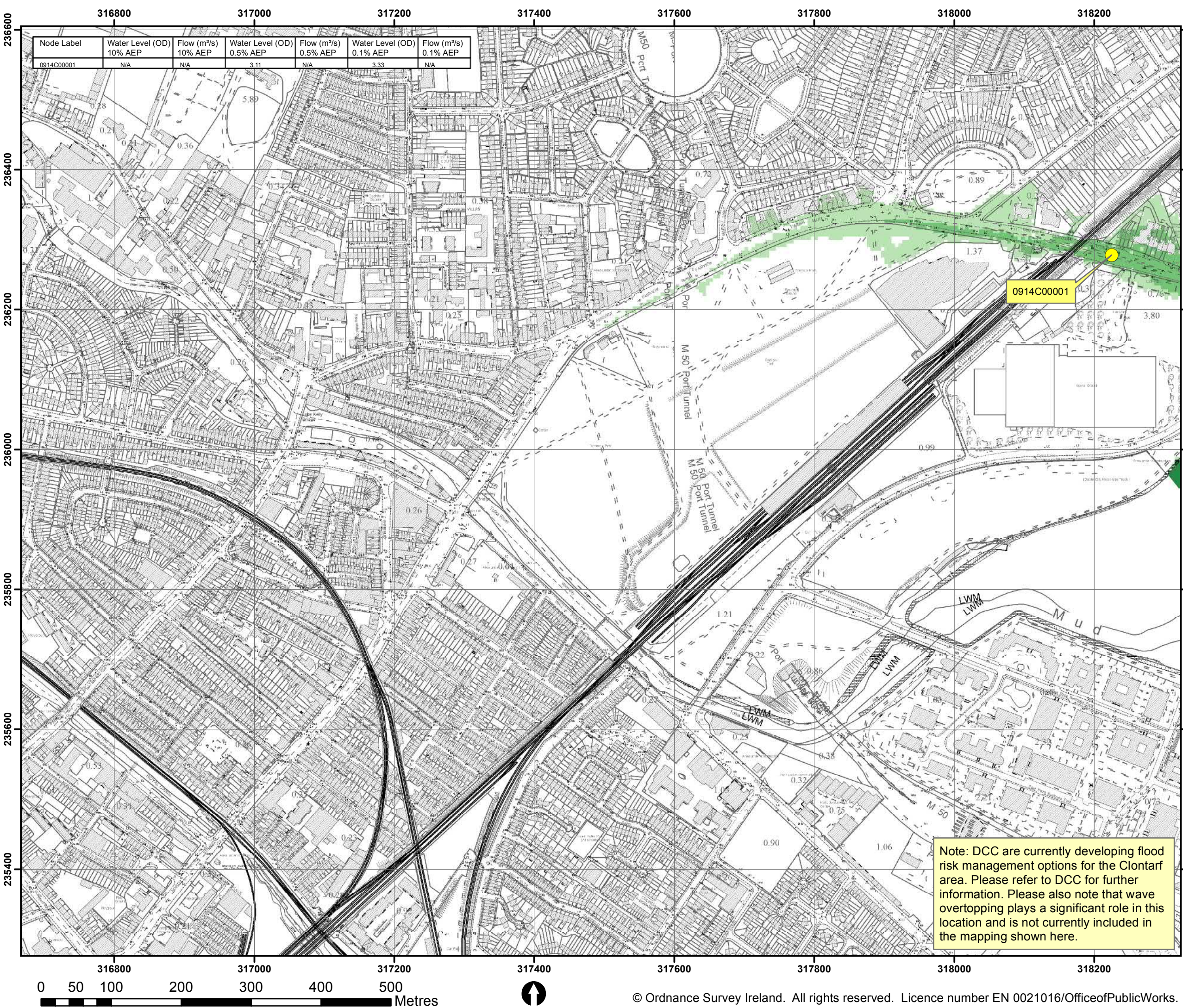
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**Legend**

- 10% Tidal AEP Event
- 0.5% Tidal AEP Event
- 0.1% Tidal AEP Event
- AFA Extents
- Embankment
- Wall
- Defended Area
- Standard of Protection of Flood Defence (Walls / Embankments)
- Node Point
- Node ID

**FINAL**

REV: NOTE: DATE:

**EASTERN CFRAM STUDY**  
Coastal Flood Risk Assessment and Management

**OPW**  
The Office of Public Works

**RPS**

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W www.rpsgroup.com  
E ireland@rpsgroup.com

**Map:**  
**Clontarf Tidal Flood Extents**

**Map Type:** EXTENT

**Source:** TIDAL

**Map Area:** COASTAL

**Scenario:** CURRENT

**Drawn By:** C.McG. **Date:** 26 July 2016

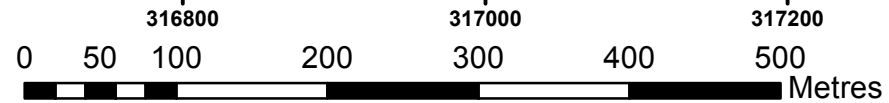
**Checked By:** A.S. **Date:** 26 July 2016

**Approved By:** S.P. **Date:** 26 July 2016

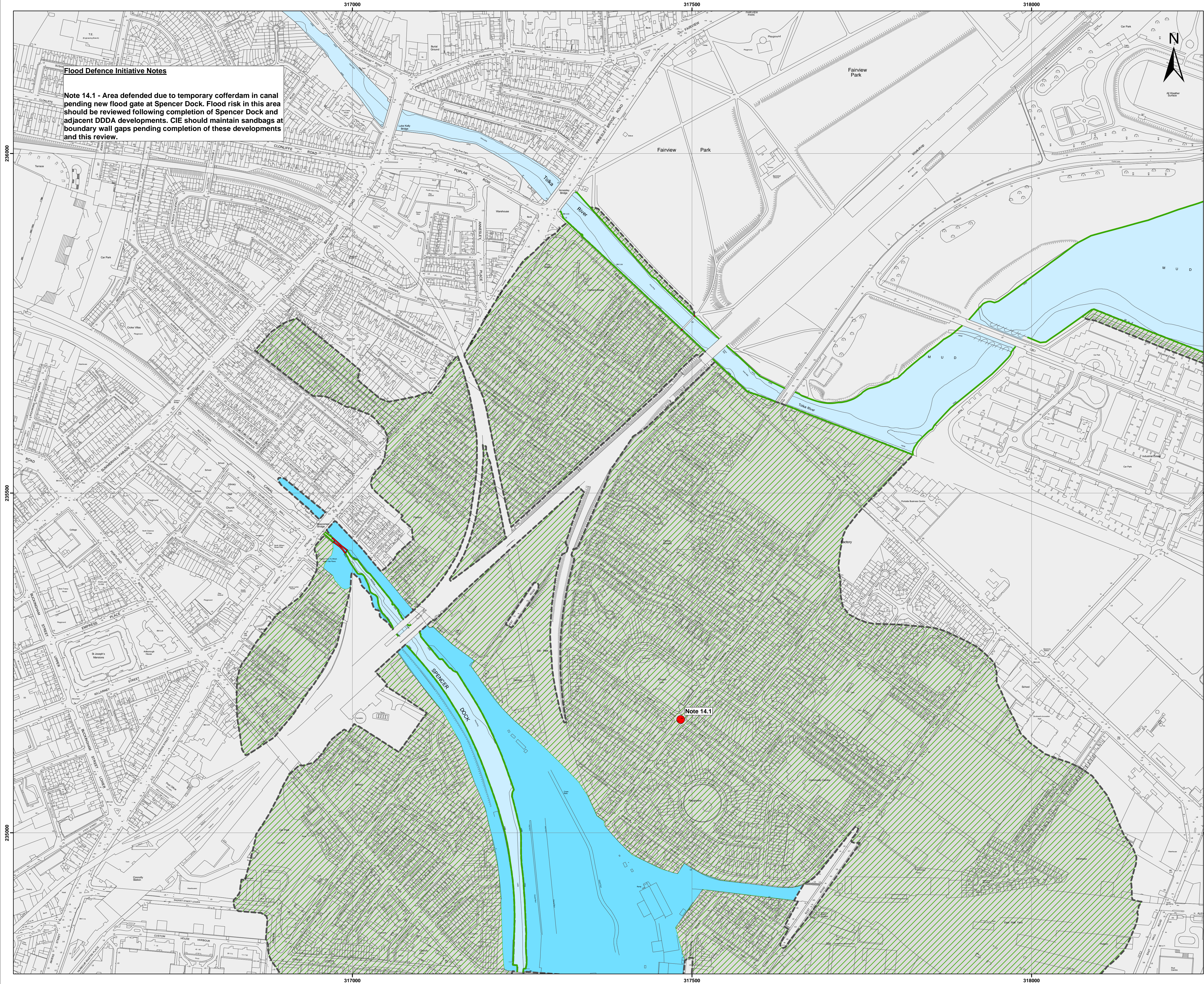
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**Map Series:** Page 1 of 3

**Drawing Scale:** 1:5,000 @ A3

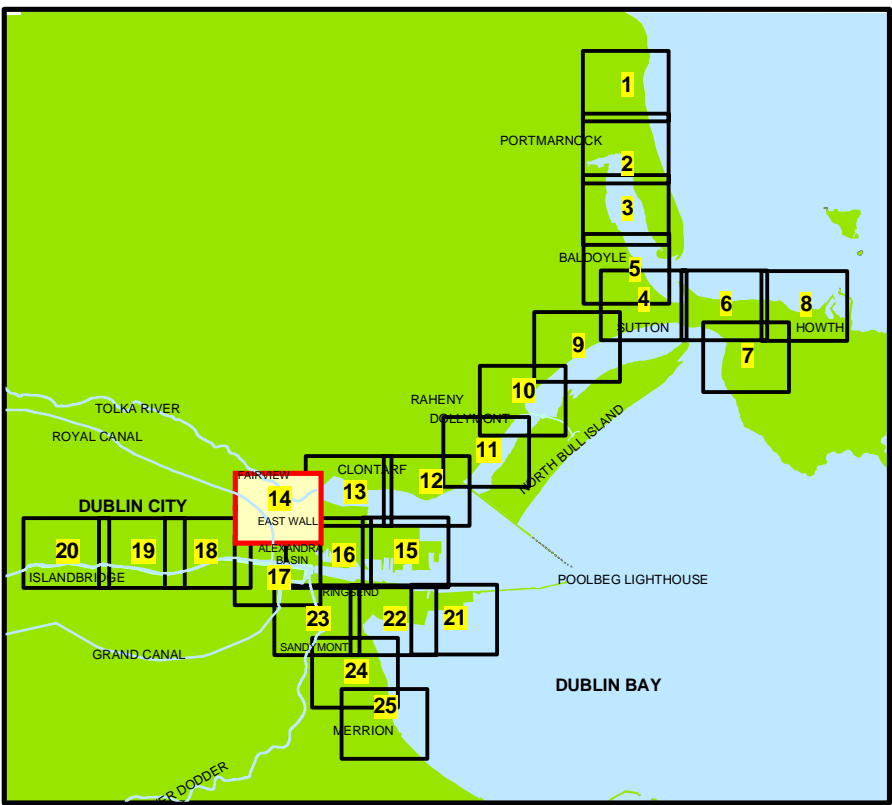






Flood Defence Initiative Notes

Note 14.1 - Area defended due to temporary cofferdam in canal pending new flood gate at Spencer Dock. Flood risk in this area should be reviewed following completion of Spencer Dock and adjacent DDDA developments. CIE should maintain sandbags at boundary wall gaps pending completion of these developments and this review.



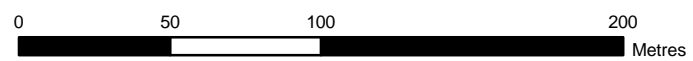
Legend:

- 1/200 Flood Hazard Extent
- 1/200 Flood Hazard Area
- Protected Area (Based on 200 Year Event)
- Flood Defence
- Gap/Demountable Flood Defences
- Coastal Area/Rivers/Canals
- Ongoing Flood Defence Initiatives and Notes

Notes :

- These maps present the indicative tidal flood hazard for a 200 year return period event (shown as flood extent) for the category shown in the legend and as described in the notes below. The justification for these maps and the information presented on them arises through the flood risk assessment work undertaken as part of the Dublin Coastal Flooding Protection Project, completed by Royal Haskoning for Dublin City Council and Fingal County Council in April 2005. Before use is made of these maps the following notes should be read carefully to avoid incorrect interpretation of the information presented. The maps must only be used in conjunction with and in acceptance of the information, exclusions and disclaimers set out in these notes.
  - Tidal flood hazard is taken to mean areas at risk from combinations of:
    - Extreme tide levels with wave action as appropriate along the open coastline
    - Extreme tide levels with a component of fluvial discharge as appropriate within the tidal reaches of the rivers.
  - Definition of flood hazard area and protected area in the context of the information presented on these maps:
    - 1/200 Flood Hazard Area/Extent – Indicative flood hazard extent for a 200 year event taking into consideration the effect of the existing defences and the possibility of plausible failure scenarios of those defences at any given location.
    - Protected Area (Based on 200 Year Event) – The indicative area within the 1/200 Flood Hazard Area that is protected or defended against flooding for a 200 year event as a result of the existence of the current defences, i.e. if the existing defences remain intact then the area shown green hatched with light grey background will be protected against flooding for the 200 year event. The area is a protected flood hazard area.
- Note: The residual blue area within the 1/200 Flood Hazard Area (not overlain with green hatch and light grey background) shows the indicative flood area extent taking into account the effect of the existing defences, i.e. the standard of protection (SoP) of some or all of the defences is less than 200 years. The blue area is not defended to a 200 year event.
- For more detail of the definitions and a description of how the areas have been assessed for the production of these maps, see the definitions presented at the beginning of these maps and also the Flood Hazard Manual produced to accompany these maps.
- A 200 year extreme tide level at Dublin Port has been assessed as 3.13mODM (5.64mLAT).
- The work undertaken and hence the information presented on these maps is relative to the year 2005.
  - As such none of the categories presented make any allowance for climate change.
  - These type 1 maps show the indicative extent of flooding for the categories presented in note 4 and also the legend.
  - The maps do not show indicative flood hazard associated with any of the following:
    - Extreme fluvially dominated combinations within the tidal reaches of the rivers
    - Extreme pluvial events
    - Blocked drains
    - High ground water level conditions
    - Other unforeseen events, e.g. bridge collapse etc.
  - It should be noted that a residual risk remains for the other areas (light grey), located outside those defined as being at risk from tidal flooding on this map, as a result of flooding through the mechanisms identified in note 7 above.
  - For a more detailed description of the information presented on these Flood Hazard maps, see the Flood Hazard Map Manual.
  - All level information presented on these maps relates to ordnance datum Main Head (mODM). For conversion from mODM to mLAT relative to Dublin Bay add 2.51m.
  - These maps are to be used and read in conjunction with the DCFPP final report and the Flood Hazard Map Manual produced to accompany them. The manual presents details of the work undertaken to produce the maps together with the constraints and assumptions as appropriate for given locations.
  - Whilst the utmost care and quality control has been undertaken in the interpretation of level data and modelling results for the production of these maps, the information presented is indicative only and is subject to the normal uncertainties associated with ground level and modelling accuracy. Accordingly, the maps should not be used in isolation for decision making purposes and should be read and interpreted by suitably experienced persons using all associated and additional data available for the area to aid in the decision making process.
  - Dublin City Council makes no representations, warranties or undertakings about any of the information in these maps including, without limitation, their accuracy, their completeness or their quality or fitness for any particular purpose.
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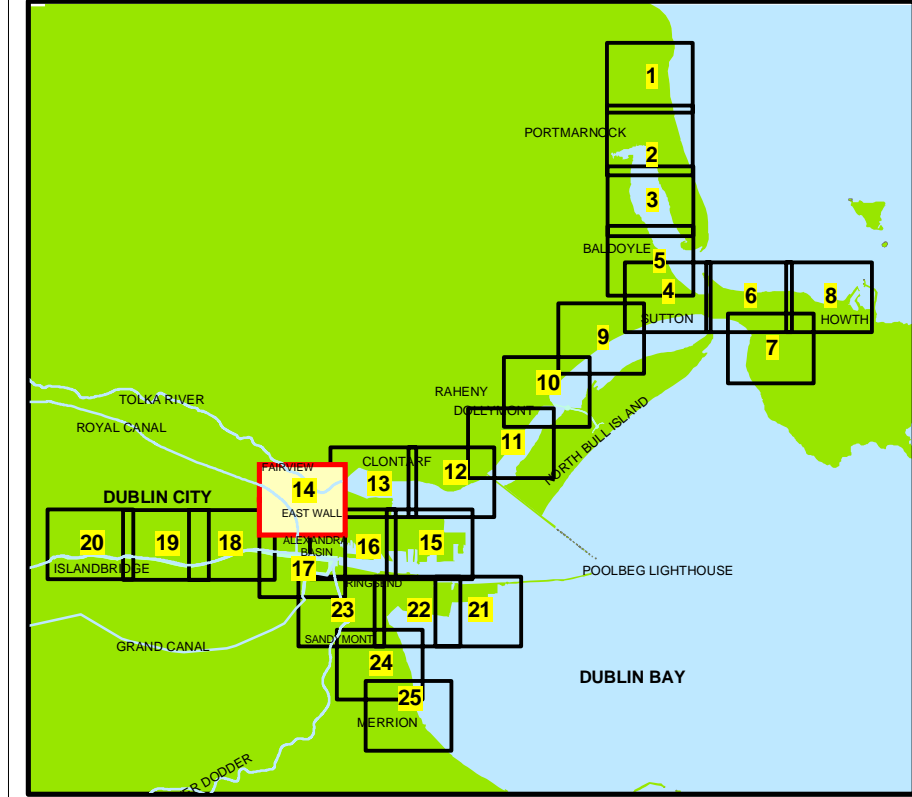
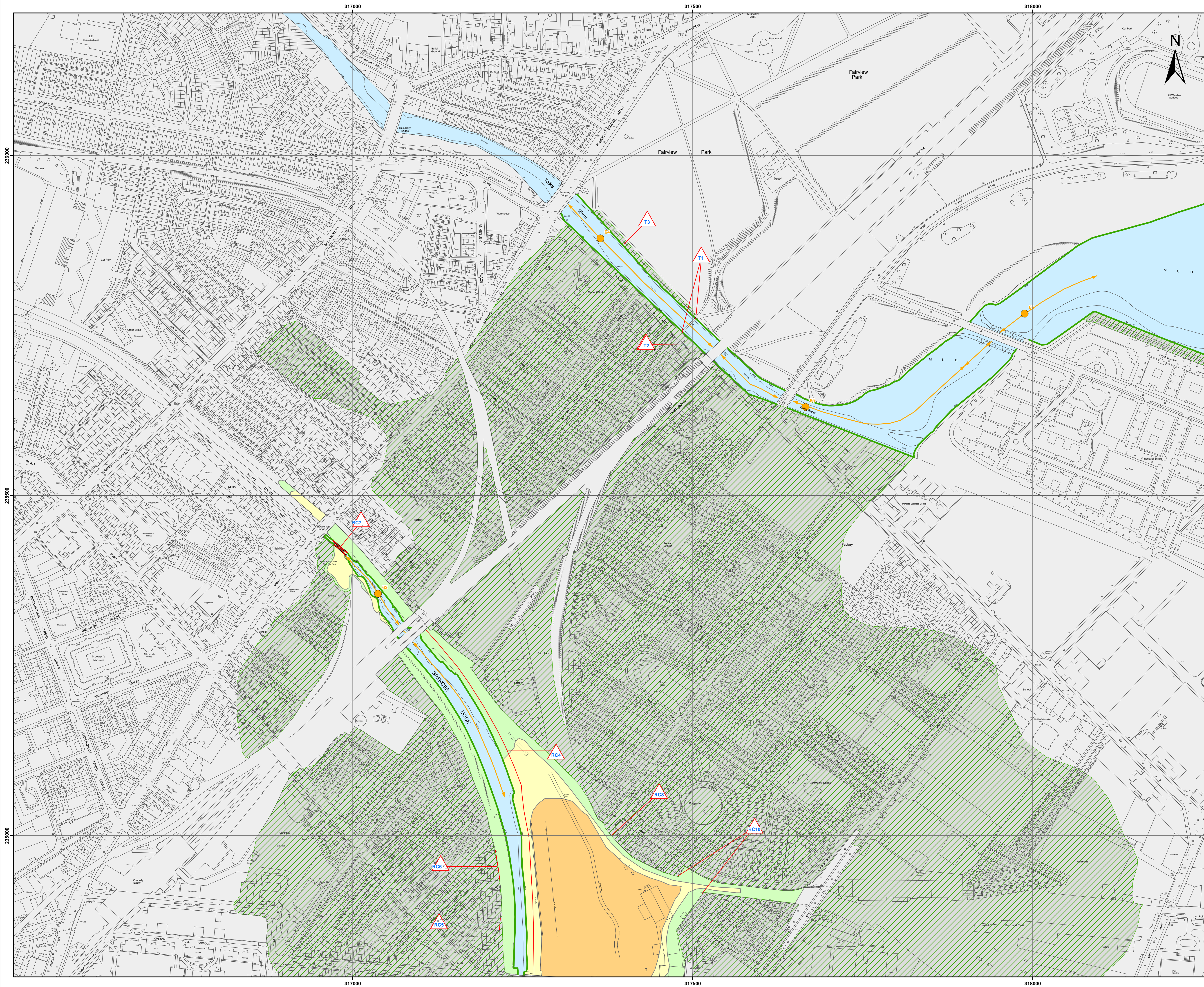


Scale:1:2,500 @ A1

DUBLIN CITY FLOOD HAZARD MAPS  
TYPE 1 - 200 YEAR FLOOD EXTENT  
Map 14 - EAST WALL AND TOLKA





**Legend:****Flood Depth within unprotected 200yr Area:**

0.00m - 0.25m	1.00m - 1.50m
0.25m - 0.50m	1.50m - 2.00m
0.50m - 1.00m	> 2.00m

**Other:**

- Protected Area (Based on 200 Year Event)
- Flood Defence
- Gap/Demountable Flood Defences
- Coastal Area/Rivers/Canals
- Critical Location

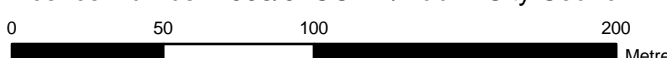
**Triton Warning Points:**

- Coastal
- Tidal Rivers /Canals

**Notes :**

- These maps present the following information:
  - The indicative 1/200 Flood Hazard Area (unprotected and protected). Only the 200 yr unprotected case is broken down to show flood depth. The protected 200 yr area is shown hatched as an extent - the same as on the Type 1 Maps.
  - The location of the Triton Flood Forecasting System (TFFS) warning points and the frontage representative of each.
  - The location and details of critical locations around the frontage, i.e. low spots in defences, gaps etc.
- The justification for these maps and the information presented on them arises through the flood risk assessment work undertaken as part of the Dublin Coastal Flooding Protection Project, completed by Royal Haskoning for Dublin City Council and Fingal County Council in April 2005. Before use is made of these maps the following notes should be read carefully to avoid incorrect interpretation of the information presented. The maps must only be used in conjunction with and in acceptance of the information, exclusions and disclaimers set out in these notes.
- Tidal flood hazard is taken to mean areas at risk from combinations of:
  - Extreme tide levels with wave action as appropriate along the open coastline
  - Extreme tide levels with a component of fluvial discharge as appropriate within the tidal reaches of the rivers.
- Definition of flood hazard area and protected area in the context of the information presented on these maps:
  - 1/200 Flood Hazard Area/Extent – Indicative flood hazard extent for a 200 year event taking into consideration the effect of the existing defences and the possibility of plausible failure scenarios of those defences at any given location.
  - Protected Area (Based on 200 Year Event) – The indicative area within the 1/200 Flood Hazard Area that is protected or defended against flooding for a 200 year event as a result of the existence of the current defences, i.e. if the existing defences remain intact then the area shown green hatched with light grey background will be protected against flooding for the 200 year event. The area is a protected flood hazard area.
- Note:** Only the residual blue area within the 1/200 Flood Hazard Area (not overlain with green hatch and light grey background) as shown on the Type 1 maps, has been evaluated to show flood depth. The protected area is still shown as flood extent only. For more detail of the definitions and a description of how the areas have been assessed for the production of these maps, see the definitions presented at the beginning of these maps and also the Flood Hazard Manual produced to accompany these maps. A 200 year extreme tide level at Dublin Port has been assessed as 3.1mODM (5.6mLAT). The work undertaken and hence the information presented on these maps is relative to the year 2005. As such none of the categories presented make any allowance for climate change.
- These type 2 maps show the indicative depth of flooding within the unprotected 200 year flood extent area only. Only flood extent without depths have been shown for the protected 200 year extent area (shown green hatched).
- The maps do not show indicative flood hazard associated with any of the following:
  - Extreme fluvially dominated combinations within the tidal reaches of the rivers
  - Extreme pluvial events
  - Blocked drains
  - High ground water level conditions
  - Other unforeseen events, e.g. bridge collapse etc.
- It should be noted that a residual risk remains for the other areas (light-grey), located outside those defined as being at risk from tidal flooding on this map, as a result of flooding through the mechanisms identified in note 7 above.
- For a more detailed description of the information presented on these Flood Hazard maps, see the Flood Hazard Map Manual.
- All level information presented on these maps relates to ordnance datum Main Head (mODM). For conversion from mODM to mLAT relative to Dublin Bay add 2.51m.
- These maps are to be used and read in conjunction with the DCFPP final report and the Flood Hazard Map Manual produced to accompany them. The manual presents details of the work undertaken to produce the maps together with the constraints and assumptions as appropriate for given locations.
- Whilst the utmost care and quality control has been undertaken in the interpretation of level data and modelling results for the production of these maps, the information presented is indicative only and is subject to the normal uncertainties associated with ground level and modelling accuracy. Accordingly, the maps should not be used in isolation for decision making purposes and should be read and interpreted by suitably experienced persons using all associated and additional data available for the area to aid in the decision making process.
- Dublin City Council makes no representations, warranties or undertakings about any of the information in these maps including, without limitation, their accuracy, their completeness or their quality or fitness for any particular purpose.
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**Scale: 1:2,500 @ A1****DUBLIN CITY FLOOD HAZARD MAPS  
TYPE 2 - 200YR FLOOD DEPTH****Map 14 - EAST WALL AND TOLKA**