Appendices

Lissenhall East

Local Area Plan

January 2023

Appendix 3: Strategic Flood Risk Assessment

Prepared by RPS Group Ltd.

Appendices

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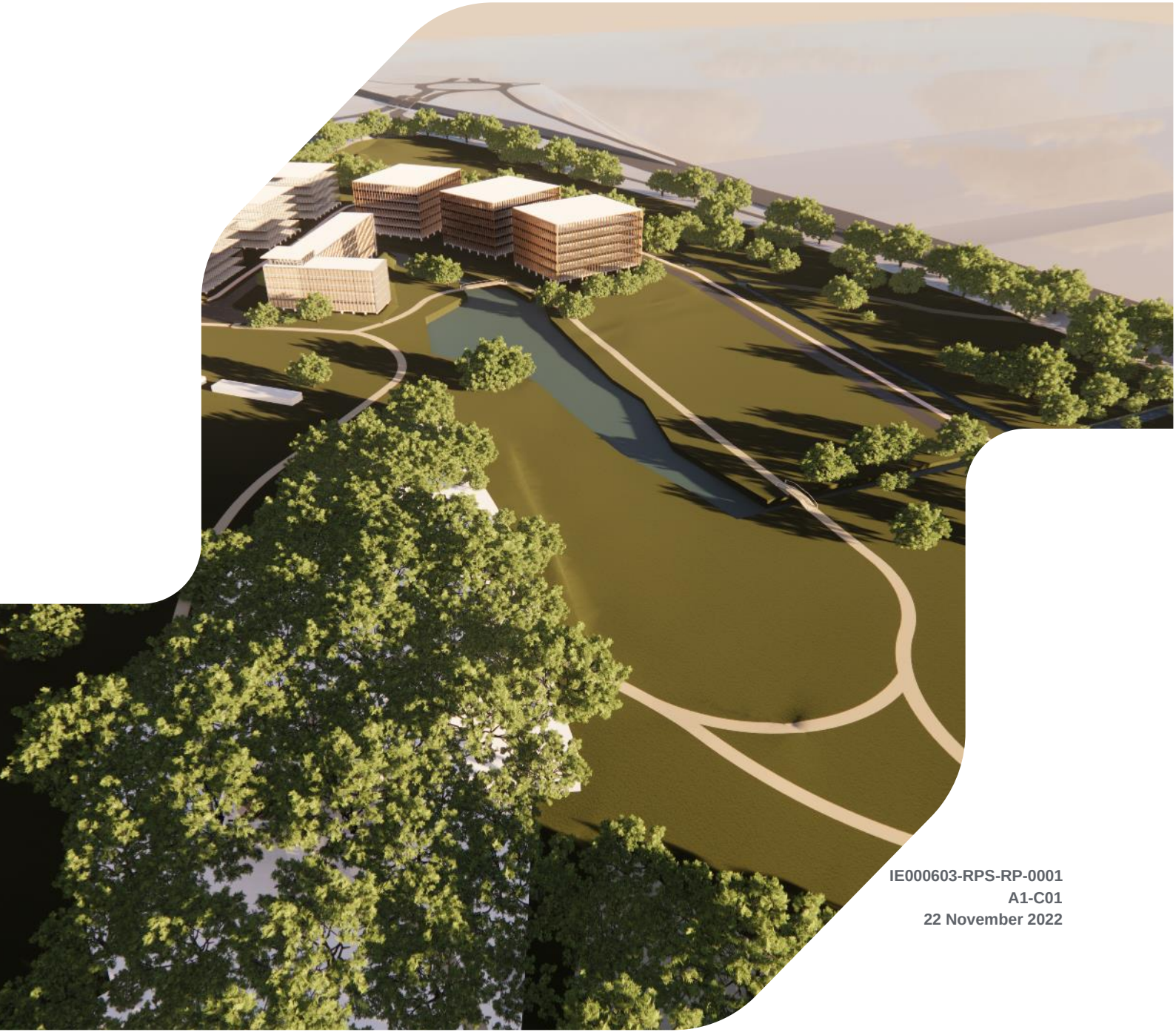
DRAFT LISSENHALL EAST LAP

Strategic Flood Risk Assessment



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Fingal County Council

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1 INTRODUCTION

1.1 Background

Fingal County Council (FCC) has prepared a Draft Local Area Plan (LAP) for lands at Lissenhall East , Swords. FCC commissioned RPS Consulting Engineers to carry out a Strategic Flood Risk Assessment (SFRA) to support the preparation of the Draft LAP. The SFRA has been prepared in accordance with the requirements of The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014) referred to hereafter as 'The Guidelines'.

The SFRA has used information from the following studies:

- Fingal East Meath Catchment Flood Risk Assessment and Management Study Reports and Mapping, Office of Public Works (OPW) 2014;
- Preliminary Flood Risk Assessment Indicative Fluvial Flood Maps, OPW 2011;
- 1289-1 WP/RG Flood Risk Assessment for Lands at Lissenhall Swords, Molony Millar June 2017;
- Irish Coastal Protection Strategy Study Phase 3 - North East Coast, OPW 2010;
- Irish Coastal Wave and Water Level Modelling Study, OPW 2018;
- National Coastal Flood Hazard Mapping Project, OPW 2021;
- FCC County Development Plan 2017-2023 Strategic Flood Risk Assessment; and
- FCC Draft County Development Plan 2023-2029 Strategic Flood Risk Assessment;

1.1 Report Objectives

The objective of this report is to prepare a SFRA for the Draft Lissenhall East LAP. This SFRA Report contains an assessment of all sources of flooding at the development site to assist FCC in making informed strategic land-use planning decisions and formulate flood risk policies. A review of existing flood risk information was undertaken to identify any potential future flooding or surface water management issues related to the development site. Areas at risk of flooding and flood zones for the lands at Lissenhall East were identified and incorporated into this SFRA in order to supplement the LAP. The report is strategic in nature. Where Site Specific Flood Risk Assessments (SSFRA) are required, additional topographical surveys and drainage assessments may be required.

1.2 Report Structure

The extent of the Lissenhall East LAP land and its primary catchment area is detailed in **Section 2**. **Section 3** outlines a summary of the Guidelines as they apply to this SFRA and the requirements for SFRAs as specified in the FCC SFRA for the County Development Plan 2017-2023. **Section 4** details the Flood Risk Identification. **Section 5** outlines the Initial Flood Assessment and lastly **Section 6** provides a summary.

2 STUDY AREA

2.1 Location

The Lissenhall East LAP is located in North County Dublin immediately adjacent to the town of Swords in the administrative county of Fingal. The study area is strategically located between the R132 Regional Belfast Road and the M1 Motorway connection at Exit 4. The extents and location of the study area lands, approximately 0.29 km^2, are shown in **Figure 2-1** and **Figure 2-2**.

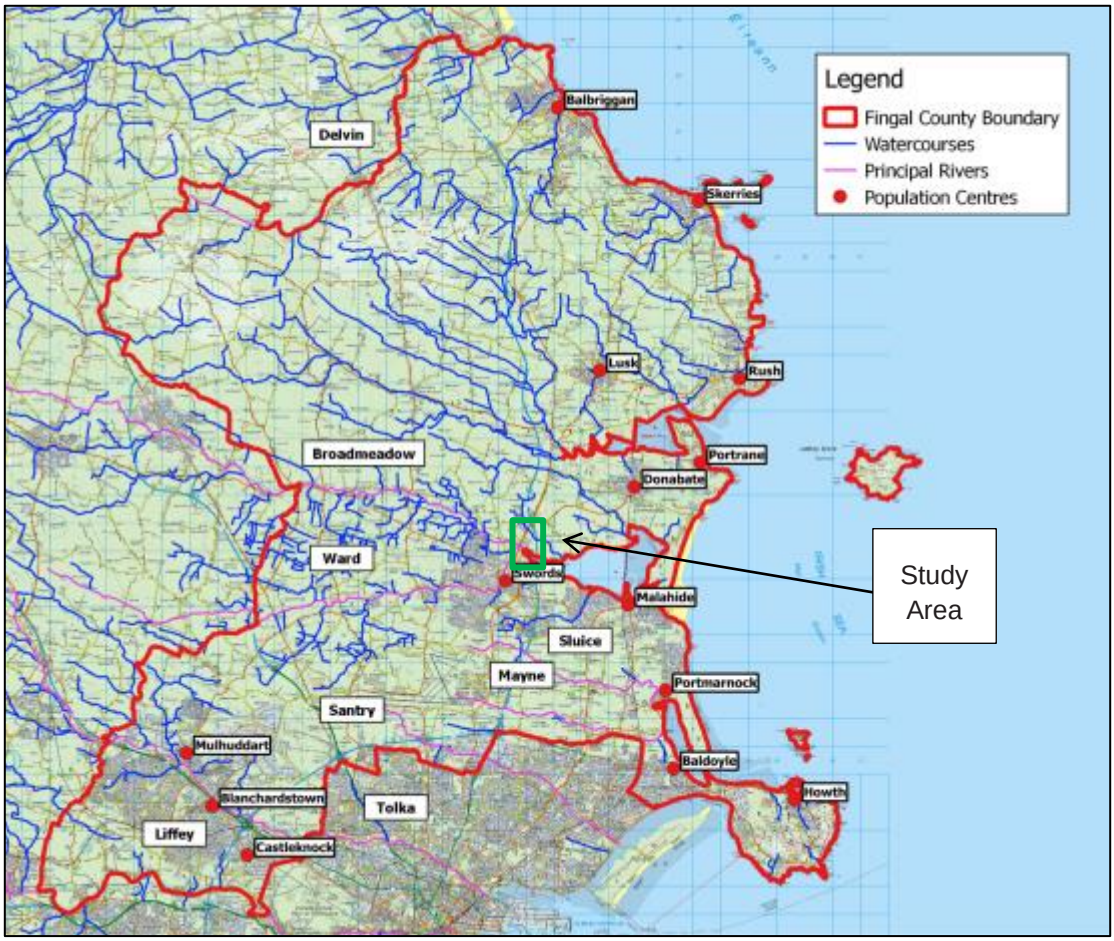


Figure 2-1 FCC Extent and Watercourses

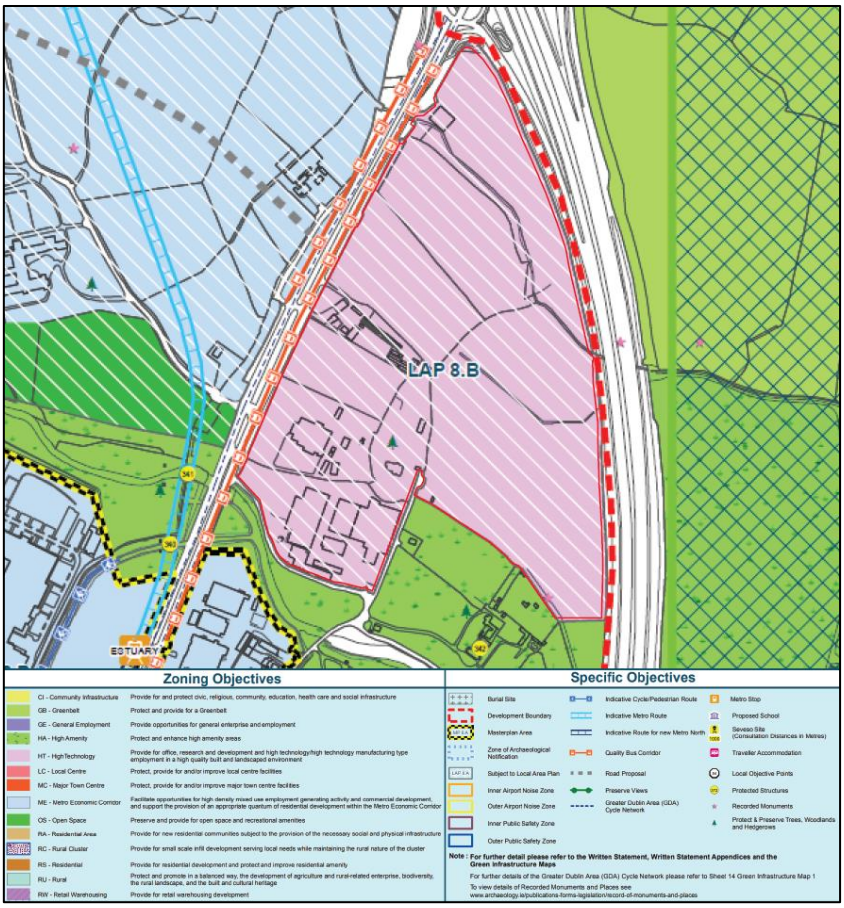


Figure 2-2 Lissenhall East Land Use Zoning (*Fingal Development Plan 2017 – 2023)*

2.2 Existing Site

The land is currently a mixture of agricultural land and commercial development (approximately 25%), as shown in **Figure 2-3**. The primary watercourse in the LAP is the Lissenhall stream which flows in a south-easterly direction through the site before discharging into the Broadmeadow Estuary. The catchment area of this stream is approximately 3.5 km^2. The Lissenhall Stream has its source south of Belinstown near Lissenhall Little. The Broadmeadow River flows in an easterly direction along the southern boundary of the study area before discharging to the Broadmeadow Estuary. A review of historical Ordnance Survey Ireland (OSI) mapping and topographical mapping indicates that the majority of the site drains towards the Lissenhall stream with minor areas of the site draining south to the Broadmeadow. The Lissenhall Stream is flapped at the outfall to the Broadmeadow Estuary. There is no gauging station on the Lissenhall Stream.

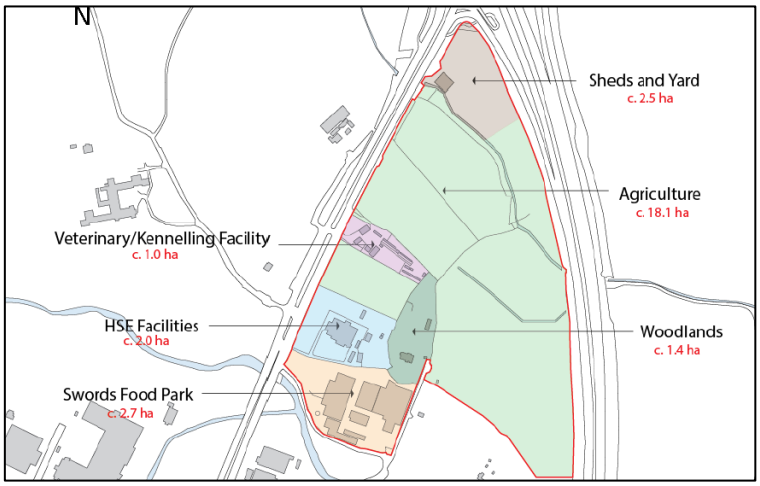


Figure 2-3 Existing Land Uses

2.3 Proposed Development

The LAP lands are zoned in the Fingal County Development Plan 2017-2023 for High Technology which provides for enterprise and employment development. The development (**Figure 2-4**) will focus on the western boundary and central area and comprise hotel and office use. The development includes a central open space and attenuation pond / water feature and other necessary infrastructure.

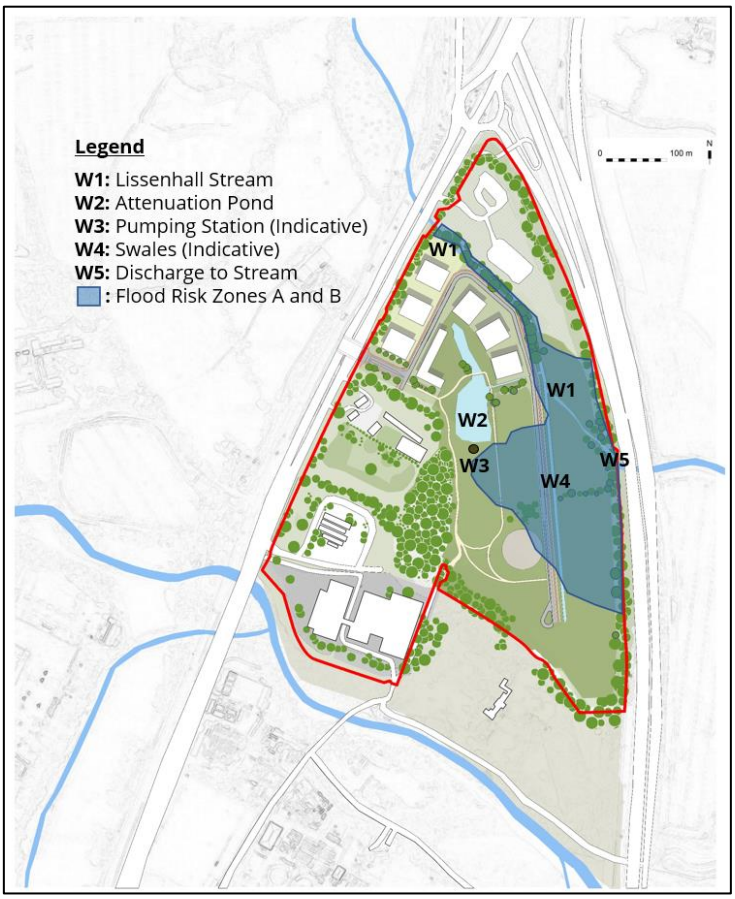


Figure 2-4 Lissenhall East LAP Development Framework

2.4 Subsequent Development Areas

A LAP is valid for six years from the date of adoption by the Council. Its validity may be extended, in year 5 of the LAP for a further 5 years, if deemed appropriate by a resolution of the Council. This LAP's focus for new development during its' duration will be on the western boundary and central area of the overall LAP lands. This area is considered best placed to bring forward new development, establish the location for strategic employment, and is logical in terms of initial servicing and the extension of same.

However, the LAP also provides policy context for potential future development within the site in anticipation of the development of the MetroLink Project (anticipated in 2035). It is acknowledged that any future additional development on the Lissenhall East LAP lands beyond what is currently specified in the Development Framework is indicative only and that any such potential future development will only occur having regard to all relevant environmental, transport, flood risk and planning assessment requirements. Any proposals for future development within a flood zone shall include an appropriately detailed site-specific flood risk assessment (SSFRA).

3 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

3.1 Introduction

In 2009 the Department of Environment, Heritage and Local Government in conjunction with the OPW published The Planning System and Flood Risk Management: Guidelines for Planning Authorities. The Guidelines recommend that Flood Risk Assessments (FRA) be carried out to identify the risk of flood to land, property and people. FRAs should be carried out at different scales by government organisations, local authorities and for proposed developments appropriate to the level of information required. The applicable scale of FRA for this project is a **Strategic Flood Risk Assessment (SFRA)**. This involves an assessment of all types of flood risk informing land use planning decisions. This will enable the FCC to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. The SFRA will include flood risk identification, an initial flood risk assessment, based on the identification of Flood Zones and where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a SSFRA will be recommended, which will necessitate a more detailed flood risk assessment.

3.2 Flood Risk Assessment

3.2.1 Flood Risk Assessment Approach

The Guidelines recommend that FRAs should be carried out using the following staged approach;

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

3.2.2 Flood Risk

The Guidelines state flood risk is a combination of the likelihood of flooding and the potential consequences arising. The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude as occurring or being exceeded in any given year. A 1% probability indicates the severity of a flood that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 (1%) chance of occurring in any one year. **Table 3-1** shows flood event probabilities used in flood risk management.

Table 3-1 Flood Event Probabilities

Annual Exceedance Probability (%)	Return Period (Years)
50	2
10	1
1	100
0.5	200
0.1	1000

3.3 Flood Zones

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

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

The flood zones are generated without the inclusion of climate change factors. The flood zones only account for inland and coastal flooding. They should not be used to suggest that any areas are free from flood risk as they do not account for potential flooding from pluvial and groundwater flooding. Similarly flood defences should be ignored in determining flood zones as defended areas still carry a residual risk of flooding from overtopping, failure of the defences and deterioration due to lack of maintenance.

3.4 Strategic Flood Risk Assessment

The purpose of this report is to carry out a SFRA at development site scale for the LAP lands. The Guidelines recommend a series of outputs for a SFRA. These outputs in broad terms include:

- Identifying principal rivers, sources of flooding and produce flood zone maps for across the local authority area and in key development areas;
- Appraising the availability and adequacy of the existing information;
- Assessing potential impacts of climate change to demonstrate the sensitivity of an area to increased flows or sea levels. Where mathematical models are not available climate change flood extents can be assessed by using the Flood Zone B outline as a surrogate for Flood Zone A with allowance for the possible impacts of climate change;
- Identifying the location of any flood risk management infrastructure and the areas protected by it and the coverage of flood-warning systems;
- Consider, where additional development in Flood Zone A and B is planned within or adjacent to an existing community at risk, the implications of flood risk on critical infrastructure and services across a wider community-based area and how the emergency planning needs of existing and new development will be managed;
- Identifying areas of natural floodplain, which could merit protection to maintain their flood risk management function as well as for reasons of amenity and biodiversity;
- Assessing the current condition of flood-defence infrastructure and of likely future policy with regard to its maintenance and upgrade;
- Assessing the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change;
- Assessing, in broad terms, the potential impact of additional development on flood risk elsewhere and how any loss of floodplain could be compensated for;
- Assessing the risks to the proposed development and its occupants using a range of extreme flood or tidal events;
- Identifying areas where site-specific FRA will be required for new development or redevelopment;
- Identifying drainage catchments where surface water or pluvial flooding could be exacerbated by new development and develop strategies for its management in areas of significant change;
- Identifying where an integrated and area based provision of SUDS and green infrastructure are appropriate in order to avoid reliance on individual site by site solutions; and,

- Providing guidance on appropriate development management criteria for zones and sites.

3.5 Sequential Approach And Justification Test

3.5.1 Overview

The Guidelines recommend using a sequential approach to planning to avoid development in flood risks areas. If the proposed development cannot be avoided or substituted, a Justification Test must be applied and appropriate sustainable flood risk management proposals should be incorporated into the development proposal. **Figure 3-1** shows the sequential approach principles in flood risk management.

Table 3-2 outline recommendations from the Guidelines for the types of development that would be appropriate to each flood zone and those that would be required to meet the Justification Test.

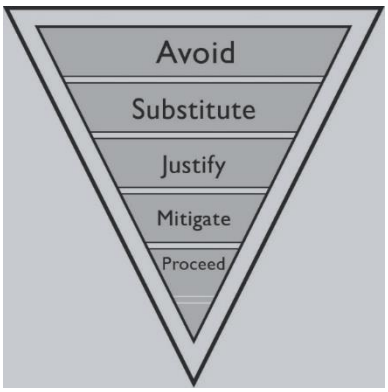


Figure 3-1 Sequential approach principles in flood risk management

Table 3-2 Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water compatible development	Appropriate	Appropriate	Appropriate

The Justification Test is used to assess the appropriateness of developments in flood risk areas. The test is comprised of two processes. The first is the Development Plan Justification Test and is used by Local Authorities 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.

3.5.2 Development Management Justification Test

All development in flood risk areas should be supported by an appropriately detailed Flood Risk Assessment (FRA). The level of detail within the FRA will depend on the risks identified and the proposed land use. Applications should demonstrate the use of the sequential approach in terms of the site layout and design and, in satisfying the Justification Test (where required), the proposal will demonstrate that appropriate mitigation and management measures are put in place. For any development areas that meet the Development Plan Justification Test, a Development Management Justification Test must then be applied. Development must satisfy all of the criteria of the Development Management Justification Test as per **Table 3-3** below.

Table 3-3 Justification Test for Development Management

Justification Test for Development Management
1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. 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 iv. 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 acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

3.5.3 Development Plan Justification Test

The Development Plan Justification Test (or Plan–making Justification Test) should be carried out as part of County Development Plan SFRAs using mapped flood zones. It applies where land zonings have been reviewed with respect to the need for development of areas at a high or moderate risk of flooding for uses which are vulnerable to flooding and which would generally be inappropriate, as set out in

Table 3-2, and where avoidance or substitution is not appropriate. Where land use zoning objectives are being proposed in flood risk areas they must satisfy all of the following criteria as per **Table 3-4**.

Table 3-4 Justification Test for Development Plans

Justification Test for Development Plans
1. The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.
2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular: i. Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement; ii. Comprises significant previously developed and/or under-utilised lands; iii. Is within or adjoining the core[3] of an established or designated urban settlement; iv. Will be essential in achieving compact and sustainable urban growth; and v. There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.
3. A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere. N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

3.6 FCC CDP SFRA 2017-2023

FCC undertook an SFRA as part of the County Development Plan (CDP) 2017-2023. The SFRA identified flood zones on the development site using the flood extent information from the Fingal East Meath Catchment Flood Risk Assessment and Management (FEM FRAM) Study (see **section 4.2.2**) for more information on this study). The SFRA undertook and passed a Development Plan Justification Test for the zonings and development lands in the Lissenhall East area. The Justification outlined that "a further FRA will also take place as part of the LAP process" and that a site-specific FRA should be undertaken for development lands in the Lissenhall East area.

The FRAs should address the following:

- A sequential approach should be applied through site planning and should avoid encroachment onto, or loss of, the flood plain.
- Highly Vulnerable Development shall not be permitted in Flood Zone A or B.
- Development in Flood Zone A should be either open space or water compatible.
- FRA should address residual risk of culvert blockage (where applicable), increased flood extents under climate change scenarios and pluvial risk which should be aimed at setting finished floor levels.
- Compensatory storage for development that results in a loss of floodplain must be provided on a level for level basis.

The Lissenhall East LAP is zoned for industrial development which in accordance the Guidelines would be classified as Less Vulnerable Development. Therefore Section 4.4.4 of the County Development Plan 2017-2023 SFRA applies and it states "Less Vulnerable Development proposals should not be considered in Flood Zone A area unless supplemented by an appropriately detailed FRA and meets the criteria of the Development Management Justification Test. The minimum finished floor level for less vulnerable development should be above the Flood Zone A level plus suitable freeboard." (Recommended levels of freeboard include 500 mm for fluvial flood levels and 750mm for coastal flood levels).

3.7 FCC Draft CDP SFRA 2023-2029

The Draft Fingal Development Plan 2023 – 2029 was published in February 2022. While it is not expected that the Draft Plan will be adopted before the adoption of this LAP. All future planning permissions must satisfy any updated Development Management and Flood Risk Management policies and objectives from the FCC CDP 2023-2029 following its final adoption by FFC.

4 FLOOD RISK IDENTIFICATION

This section identifies any flooding issues related to the LAPs lands by assessing available flood risk information.

4.1 Historical Flooding

Figure 4-1 below shows historical flooding locations from https://www.floodinfo.ie/map/floodmaps/ in the vicinity of the development. The data does not show any historical flooding within the planning application boundary but it does show flooding locations in the surrounding area of the of the development site. The main sources of flooding are fluvial and tidal along the Broadmeadow River.

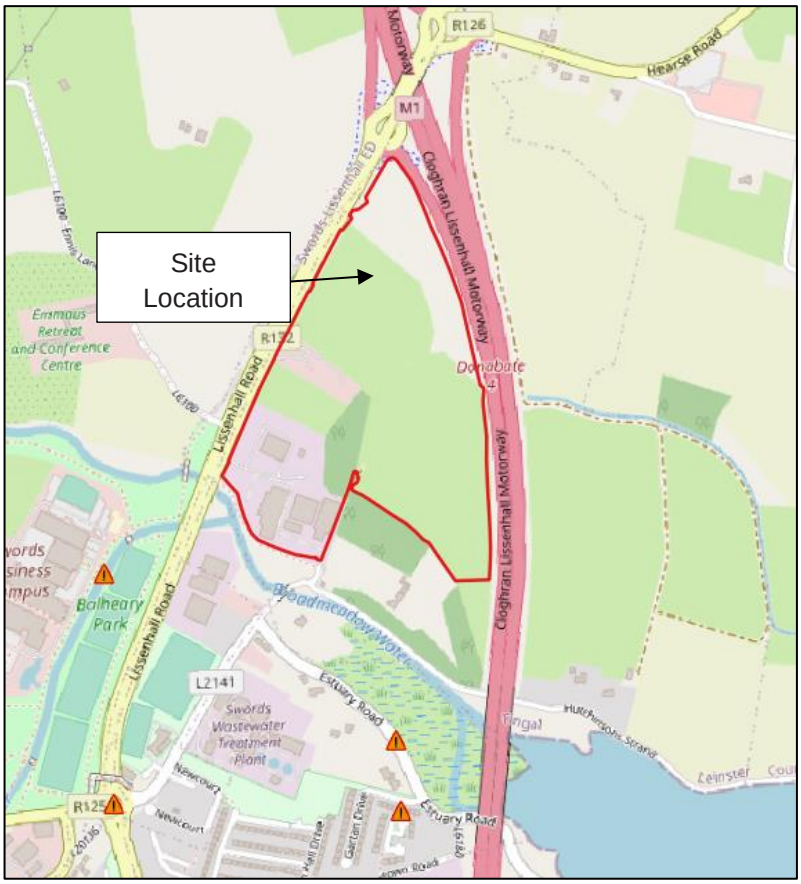


Figure 4-1 - Historical flooding in the surrounding area

4.2 Flood Studies Information

4.2.1 Preliminary Flood Risk Assessment Indicative Fluvial Flood Maps

The Preliminary Flood Risk Assessment (PFRA) is a national screening exercise completed by the OPW in 2012 based on available and readily-deliverable information. The PFRA aimed at identifying areas where there may be a significant risk associated with flooding. ~~Indicative fluvial flood maps were produced to help identify these areas. The mapping did not account for flood defences, channel structures or channel works. Areas where the risks associated with flooding might be significant were identified and are referred to as Areas for Further Assessment, or "AFAs". The PFRA flood zone map indicates that within the site boundary is affected by fluvial and coastal flooding. Due to the indicative nature of the PFRA mapping the flood extents in these areas should be treated with caution.~~ The purpose of the PFRA flood zone mapping is to be provided for the information purposes to help identify areas where flood risk should be explored in greater detail. **Figure 4-2** shows the PFRA mapping for the areas around the Lissenhall East LAP development area. ***Fluvial flood mapping from the PFRA is superseded by the more detailed Fingal East Meath***

Catchment Flood Risk Assessment and Management Study, but still provides relevant indicative flood mapping from pluvial and groundwater flood sources.

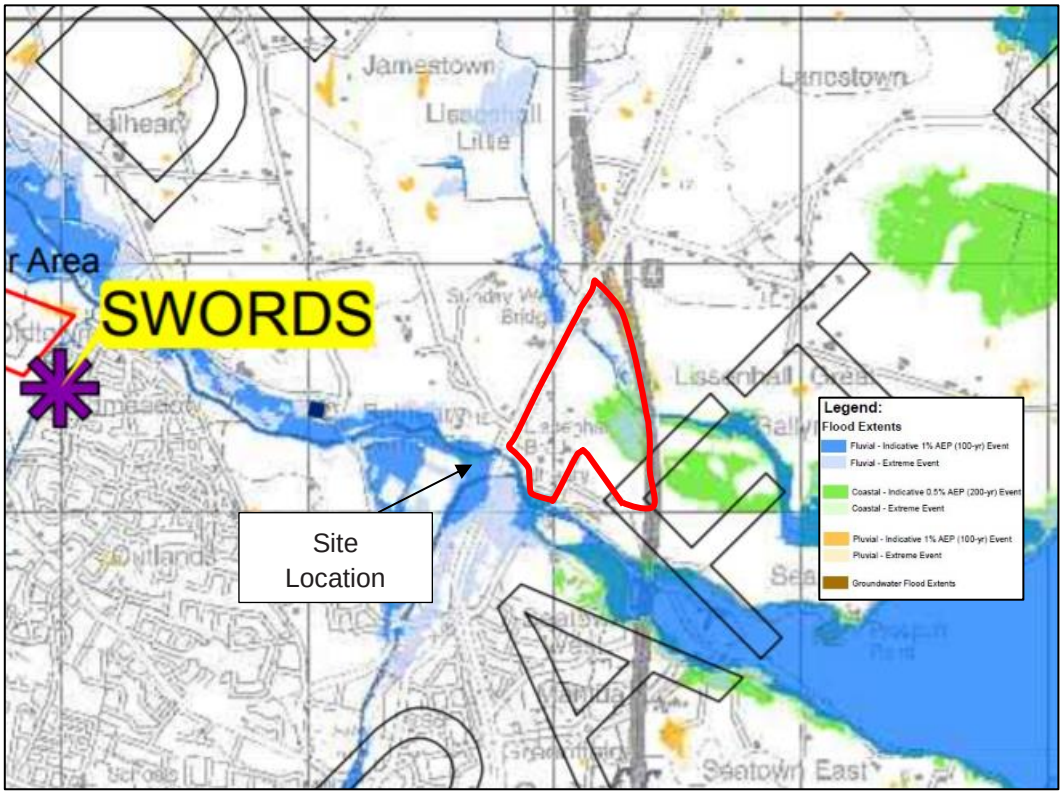
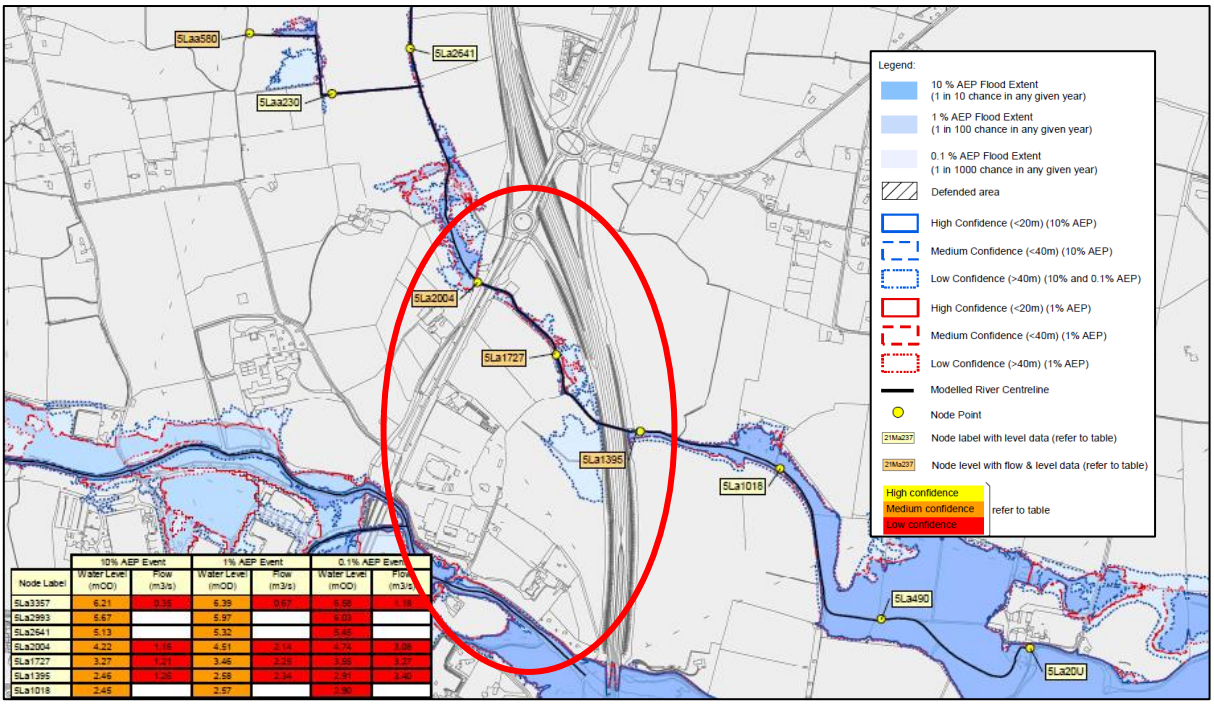


Figure 4-2 - PFRA Flood Extents Mapping Broadmeadow Estuary

4.2.2 Fingal East Meath Catchment Flood Risk Assessment and Management Study

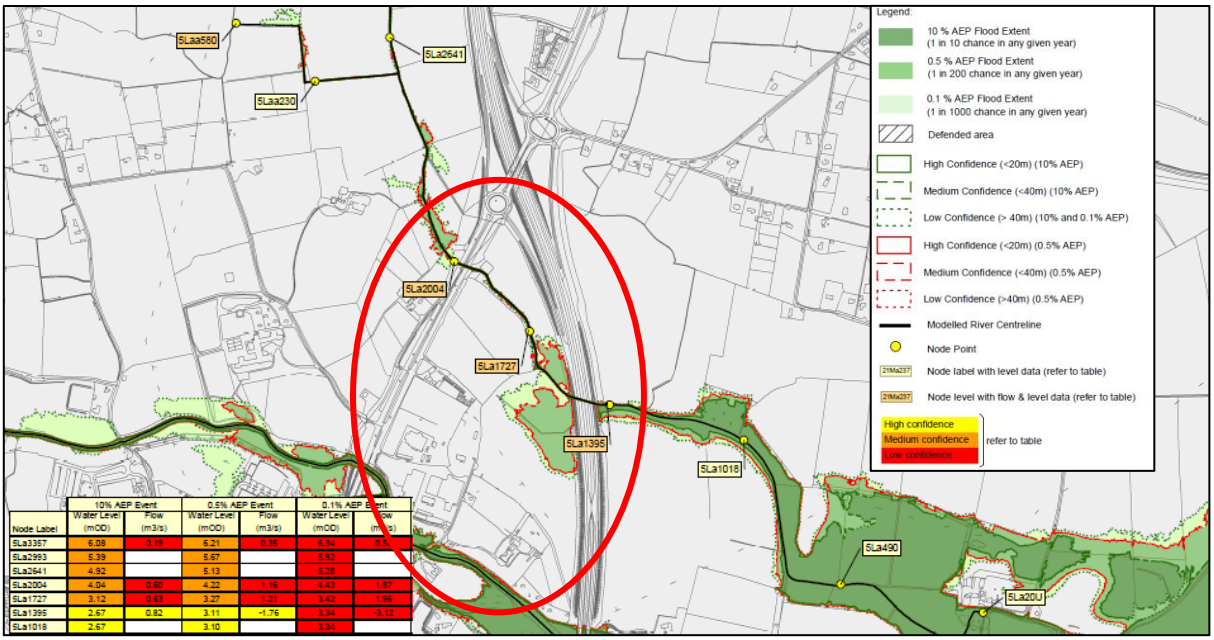
More detailed assessment of the AFA's identified in the PFRA Study were undertaken through the Catchment Flood Risk Assessment and Management (CFRAM) Studies to more accurately assess the extent and degree of flood risk and where the risk is significant, to develop where possible measures to manage and reduce the risk. The flood hazard areas had been identified as being potentially at risk from significant flooding, including areas that have experienced significant flooding in the past. They also take into account issues such as climate change, land use practices and future development. These studies were developed to meet the requirements of the EU directive on the assessment and management of flood risks (the Floods Directive). The Floods Directive was transposed into Irish law by SI 112 of 2010 "European Communities (assessment and Management of Flood Risks) Regulations 2010". The Lissenhall East LAP falls within the Fingal East Meath Catchment Flood Risk Assessment and Management (FEM FRAM) Study.

This study produced fluvial and coastal flood maps which are shown in **Figure 4-3** and **Figure 4-4** respectively. The maps indicate modelled flood extents for flood events for a range of annual exceedance probabilities (AEP). **Figure 4-3** indicates that the Lissenhall Stream has out of bank flooding in the LAP area for the 1% and 0.1% AEP events. **Figure 4-4** indicates that development area is affected by both the 0.5% and 0.1 % AEP tidal flood event stemming from the Irish Sea to the east of the site.



Node Label	10% AEP Event		1% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
5La3357	6.21	0.58	6.39	0.67	6.58	1.19
5La2993	5.67		5.97		6.03	
5La2641	5.13		5.32		5.45	
5La2004	4.22	1.16	4.51	2.14	4.74	3.08
5La1727	3.27	1.21	3.46	2.25	3.55	3.27
5La1395	2.46	1.26	2.68	2.34	2.91	3.40
5La1018	2.45		2.67		2.90	

Figure 4-3 Fluvial Flood Extents



Node Label	10% AEP Event		0.5% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
5La3357	6.08	0.19	6.21	0.35	6.34	0.5
5La2993	5.39		5.67		5.92	
5La2641	4.92		5.13		5.28	
5La2004	4.04	0.60	4.22	1.16	4.43	1.87
5La1727	3.12	0.63	3.27	1.21	3.42	1.98
5La1395	2.67	0.82	3.11	-1.76	3.34	-3.12
5La1018	2.67		3.10		3.34	

Figure 4-4 Coastal Flood Extents

4.2.3 National Coastal Flood Hazard Mapping 2021

This report was prepared by the OPW Coastal and Flood Risk with the aim of the project is to produce national scale coastal flood extent and depth maps for a series of Exceedance Probabilities (AEPs) for the present day and climate change scenarios. It was an update to the Irish Coastal Protection Strategy Study Phase 3 - North East Coast 2010 and utilised data from the Irish Coastal Wave and Water Level Modelling Study 2018. **Figure 4-5** shows the flooding extents for the existing scenario within the Study Area.

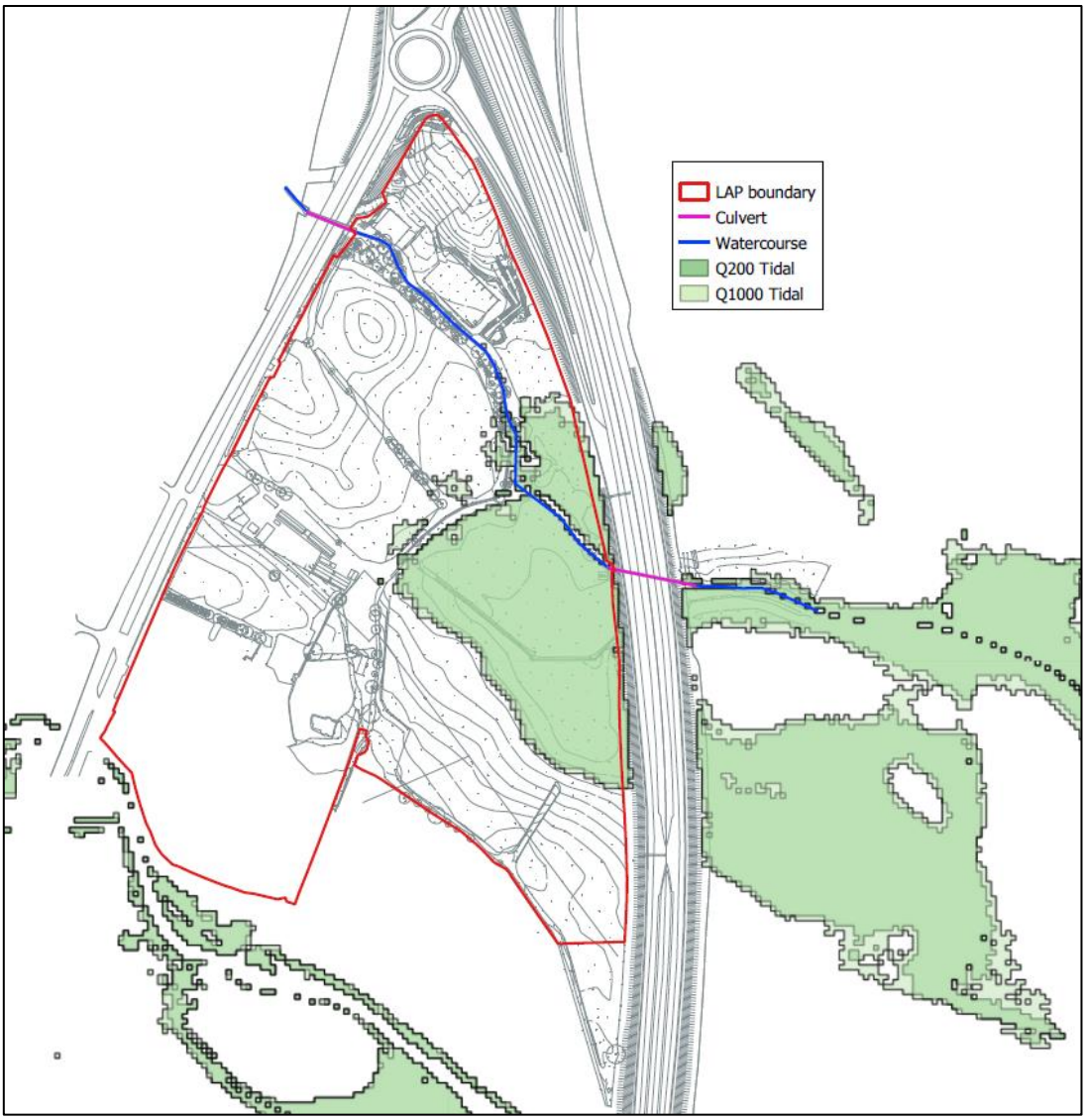


Figure 4-5 Flood Extents for Existing Scenario National Coastal Flood Hazard Mapping 2021

4.2.4 Climate Change Sensitivity

A review of the SFRA for the Fingal Development Plan 2017-2023 states that the Lissenhall stream is susceptible to increased flooding from climate change scenarios. The most significant increase in water levels is at the downstream extent of the river at Ballymadrough and Seapoint where the river bed slope is flatter. However there is also increased flooding just upstream from the M1 culvert, where the constriction of the structure creates a significant head loss and backwater effect. The National Coastal Flood Hazard Mapping 2021 also generated climate change scenario mapping with **Figure 4-6** and **Figure 4-7** showing the predicted flood extents within the Study Area for the Mid-Range Future Scenario and High End Future Scenario respectively.

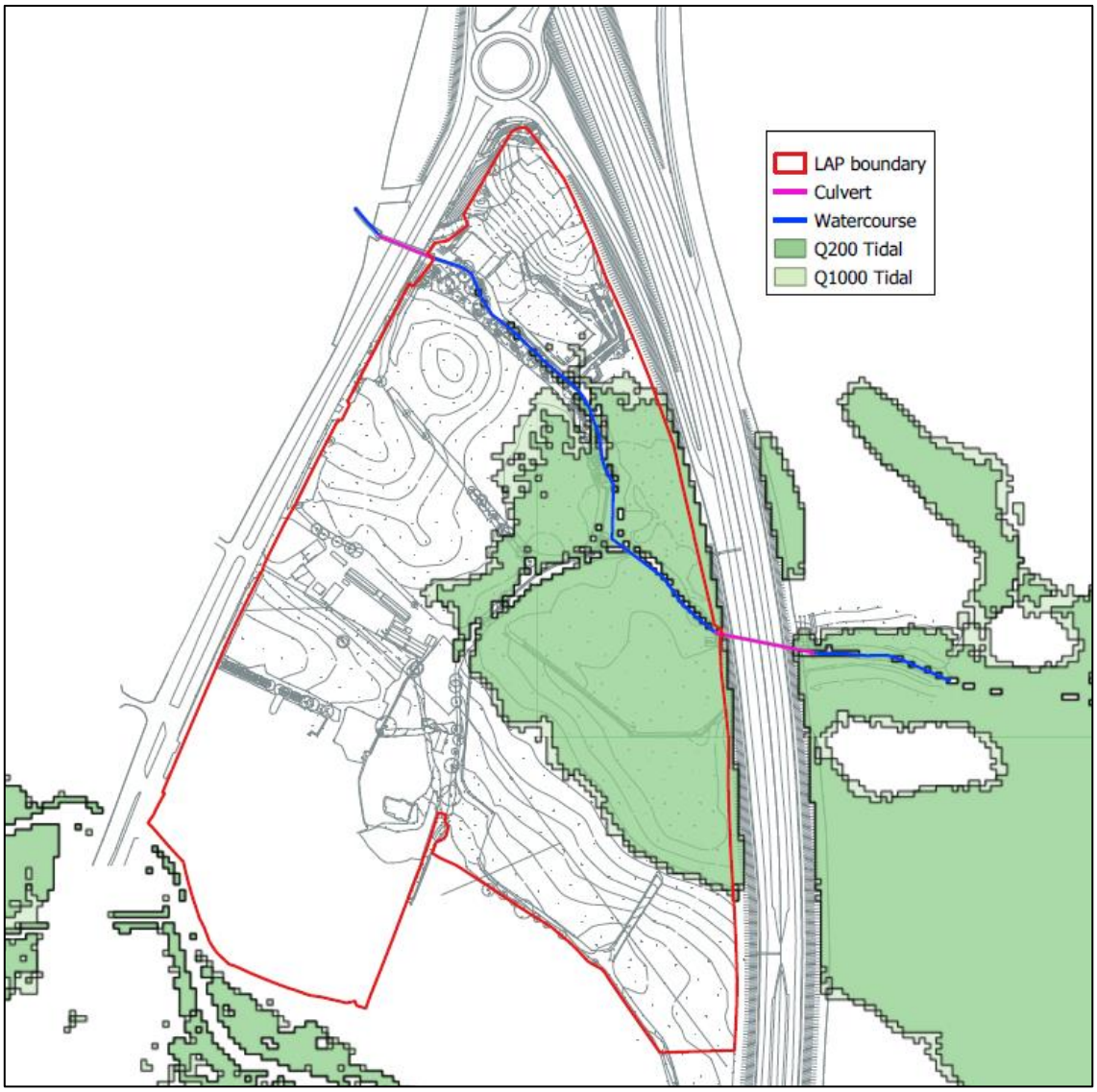


Figure 4-6 Flood Extents for Mid-Range Future Scenario National Coastal Flood Hazard Mapping 2021

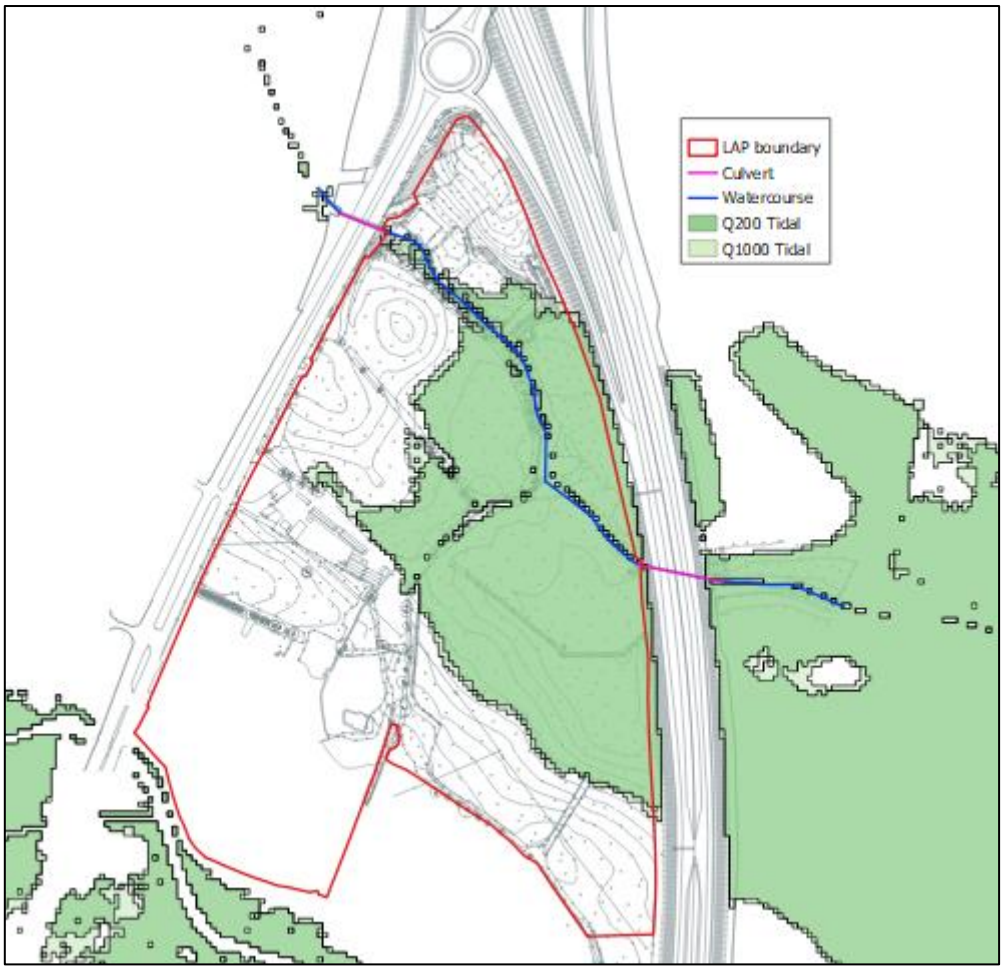


Figure 4-7 Flood Extents for High End Future Scenario National Coastal Flood Hazard Mapping 2021

4.3 Pluvial Flooding

The PFRA mapping shown in **Figure 4-2** above does not indicate any pluvial flooding for the site. ***It is recognised that the PFRA mapping was developed through a national scale level and is therefore only indicative of potential areas of pluvial flooding, However,*** the natural site drainage ~~is as described in Section 2.2. The site and the lands surrounding it are mostly flat so~~ ***and topography of*** the site is ~~unlikely to be subject to any overland flow paths~~ ***such that pluvial flooding is unlikely to occur. The LAP area is naturally draining towards the south-east corner of the site and the Lissenhall Stream.*** ~~The southern part of the site is higher and slopes towards the Lissenhall stream but~~ Adequately designed drainage systems should reduce any risk overland flow.

4.4 Groundwater Flooding

A groundwater flood hazard assessment was undertaken as part of the FEMFRAM. A desk study reviewed all the available data on groundwater to produce an assessment of the groundwater flood risk in the FEM FRAM study area to investigate the necessity of groundwater monitoring in the study area and possibly recommend groundwater monitoring locations if required. The study also investigated the mechanisms by which groundwater flooding can occur in the area and their possible remedial measures. The hydro-geological conditions in the FEM FRAM study area together with all other available information indicated that the conditions do not exist for groundwater flooding; therefore groundwater flooding is not a significant risk within the FEM FRAM study area.

Similarly the OPW PFRA carried out a national scale Groundwater Flooding Report which concludes that groundwater flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area. The PFRA mapping shown in **Figure 4-2** above does not indicate any groundwater flooding for the site.

Probabilistic and historic groundwater flood maps have been prepared by Geological Survey Ireland through the 2016-2019 GW Flood Project. The Groundwater Flood Probability Maps show the probabilistic flood extent of groundwater flooding in limestone regions and are focussed primarily (but not entirely) on flooding at seasonally flooded wetlands known as turloughs. The Historic Groundwater Flood Map shows the observed peak flood extents caused by groundwater in Ireland and are largely based on the winter 2015 / 2016 flood event which was the largest flood on record in many areas. This project did not identify any groundwater flooding within the LAP area.

An assessment of potential flooding from groundwater should still be carried for development if they are proposing basements or deep excavations. For developments such as this, boreholes should be carried out and the installation of a piezometer to establish the depth of the groundwater table in relation to the base of the excavation should be undertaken. If the water table is within 1 meter of the ground level then the development needs to be conditioned to ensure that the basement is adequately sealed / tanked. All basements must be properly designed in accordance with British Standard BS8102:2009.

4.5 Sources of Flooding Review

Table 4-1 and **Table 4-2** present a summary of the initial flood risk assessment. The primary risks to the site are from coastal and fluvial flooding therefore a more detailed appraisal of these flooding mechanism should be undertaken, refer to **Section 5** for the further assessment. If deemed necessary mitigation measures should be identified to reduce the risk of flooding.

Table 4-1 Summary of flood risk identification

Flooding Source	Comments	Risk (low/medium/high)
Fluvial	The flood maps shows that parts of the site adjacent to the Lissenhall stream are vulnerable to fluvial flooding. The Broadmeadow River does not inundate the site along the southern boundary. More detailed hydraulic modelling should be carried out to further investigate flooding to the site.	High
Pluvial	The risk of pluvial flooding is low. A surface water An adequately designed drainage system should mitigate against any risk of pluvial flooding.	Low
Groundwater	Groundwater flooding is not identified as a significant risk. No further assessment required for this FRA however if basements or deep foundations are proposed as part of the development an assessment of groundwater flooding should be undertaken.	Low
Coastal	The flood maps shows that parts of the site adjacent to the Lissenhall stream are vulnerable to tidal flooding. The Broadmeadow River does not inundate the site along the southern boundary. More detailed hydraulic modelling should be carried out to further investigate flooding to the site.	High

Table 4-2 Flood Risk Identification Matrix for the Development Site

Flood Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overtop, breach	People / Property	Medium/high	Medium	Medium/high
Fluvial	Overbank	People / Property	Medium/high	Medium	Medium/high
Surface water (pluvial)	Blockage Overflow	People / Property	Low	Low	Low
Groundwater	Raising Water Level	People / Property	Low	Low	Low
Human/Mechanical Error	Gates Remain Open/Do not close	People / Property	Low	Low	Low

5 INITIAL FLOOD RISK ASSESSMENT

5.1 Introduction

The Flood Risk Identification found that the site is primarily at risk from fluvial and coastal flooding with a low risk from pluvial flooding as detailed in **Table** 4-2.

5.2 Fluvial Flooding

5.2.1 FEMFRAM Study

Figure 5-1 shows the FEMFRAM flood extents for the LAP study area. It shows that the site is primarily impacted by the 0.1% AEP event. The FEMFRAM hydraulic model was a 1D model with no 2D element. The FEFRAM assessed that 2D was not required as the river passes through rural areas and its hydraulic behaviour can be accurately modelled using 1D modelling techniques. The Lissenhall Stream was modelled together with the Broadmeadow Estuary model, as the tidal boundary conditions were calculated at an offshore location near the mouth of the estuary.

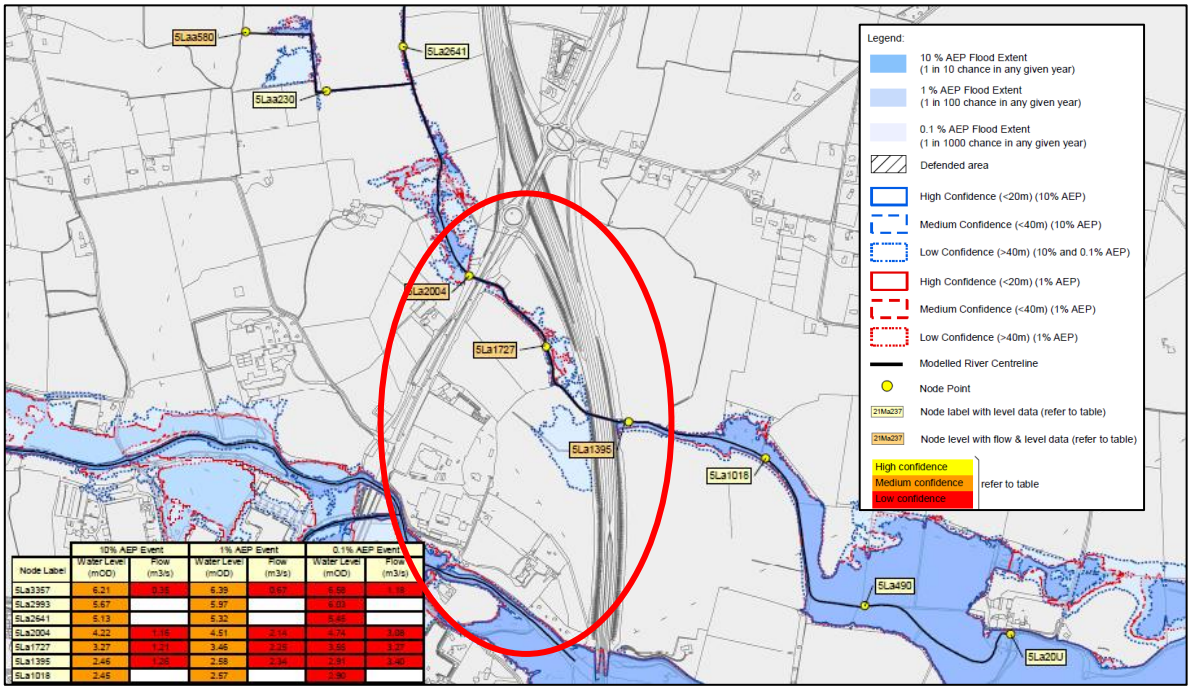


Figure 5-1 FEMFRAM Existing Fluvial Flood Extents

The main flooding in the FEMFRAM study is at lower reaches of the stream within the study area as the ground flattens and the M1 culvert (as shown in **Figure 5-2 and Figure 5-3**) causes backwater effects causing over bank flooding on both sides of the river. The FEMFRAM study also included a downstream tidal boundary to account for joint occurrence of tidal and fluvial flooding.

Figure 5-2 Culvert under the M1 on the LAP Lands

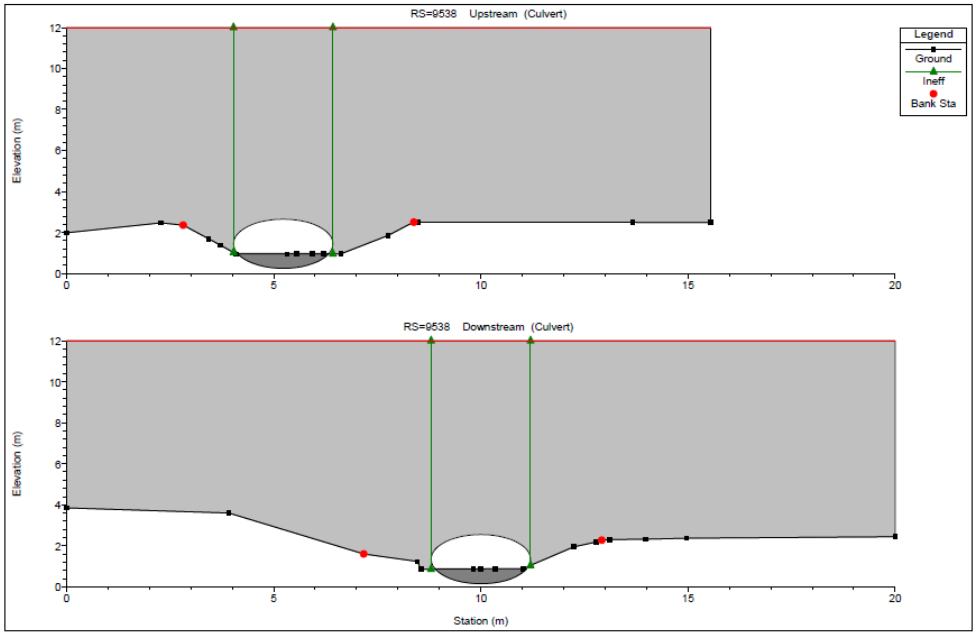


Figure 5-3 Culvert under the M1 modelled in HEC RAS

5.2.2 Hydrology

The model utilised the steady state analysis based on flows generated in the FEMFRAM Study, from node 5La1395 downstream of the site as shown in **Figure 5-1**, and included 20% increase for climate change.

5.2.3 Joint Probability

Additionally, to account for a joint occurrence of high tide and fluvial flooding, known as joint probability, a downstream tidal boundary condition was added to the model. The tidal boundary levels were derived from the FEMFRAM tidal node 5La1018 as shown in **Figure 5-8**. A detailed investigation of joint probability analysis was undertaken for the FEMFRAM Study and the joint probability scenarios used in that study were replicated in the hydraulic modelling. The joint probability scenarios are shown in **Table 5-1.** The applicable joint probability scenarios are a 1% AEP Fluvial Flood Event with a 20% AEP Tidal Flood Event and a 0.1% AEP Fluvial Flood Event with a 2% AEP Tidal Flood Event. The fluvial flows and tidal boundary conditions are shown in **Table 5-2** below.

Table 5-1 Combinations of individual return periods necessary to produce design event

Joint Probability Scenario	Boundary return period	
	Fluvial	Tidal
50% (2 year)	50%	50%
20% (5 year)	20%	50%
20% (5 year)	50%	20%
10% (10 year)	10%	50%
10% (10 year)	50%	10%
4% (25 year)	4%	50%
4% (25 year)	50%	4%
2% (50 year)	2%	50%
2% (50 year)	50%	2%
1% (100 year)	1%	20%
1% (100 year)	20%	1%
0.5% (200 year)	1%	10%
0.5% (200 year)	10%	0.50%
0.1% (1000 year)	0%	2%
0.1% (1000 year)	2.0%	0.1%

5.2.4 Climate Change Scenarios

The fluvial flows and tidal boundary levels were increase by 20% and 0.5m respectively for a Mid-Range Future Scenario In line with the OPW's ~~Climate Change Adaptation Plan~~ ***Flood Risk Management – Climate Change Sectorial Adaptation Plan*** a Mid-Range Future. The fluvial flows and tidal boundary conditions are shown in **Table 5-3** below.

Table 5-2 Fluvial flows and tidal boundary conditions

Return Period (yrs)	2	5	10	25	50	100	200	1000
AEP %	50	20	10	4	2	1	0.5	0.1
FEM FRAMS Growth Factors	1	1.52	1.89	2.38	2.76	3.16	3.57	4.6
Node 5La1395 Fluvial Flow (m3/s)	0.67	1.01	1.26	1.76	2.04	2.34	2.64	3.4
Node 5La1018 Tidal Downstream levels (mOD)	2.409	2.546	2.650	2.787	2.891	2.995	3.099	3.341

Table 5-3 Fluvial flows and tidal boundary conditions with allowances for climate change

Return Period (yrs)	2	5	10	25	50	100	200	1000
AEP %	50	20	10	4	2	1	0.5	0.1
Node 5La1395 Fluvial Flow (m3/s) + 20%	0.80	1.22	1.51	2.11	2.45	2.80	3.17	4.08
Node 5La1018 Tidal Downstream levels (mOD) + 0.5m	2.91	3.05	3.15	3.29	3.39	3.50	3.60	3.84

5.2.5 Hydraulic Modelling

Hydraulic modelling was undertaken ~~by Molony Millar (on behalf of FCC)~~ for the preliminary design of the LAP. A 1D model was developed in HEC-RAS (Version 5.0.6). The model geometry was built from a topographical survey procured by Molony Millar Consulting Engineers. The survey was completed by Precision Surveys in January 2017. A surface was built in AutoCAD Civil 3D and cross sections for every 20m of the river length were extracted from the surface using sample lines. These cross sections were exported to HEC-RAS and the downstream M1 culvert was added to the model. The upstream fluvial flows and downstream tidal boundaries were inputted into the model for each scenario. The HEC-RAS model extents are show in **Figure 5-4** and **Figure 5-5**. The Manning's *n* coefficient, which is used in the HEC RAS model to represent roughness, was selected based on the site conditions. The values of Manning coefficient are shown in the **Table 5-4** below:

Table 5-4 Manning's n values

1D Manning's n values
Main channel. Bank clean, straight, full stage, no rifts or deep pools, 0.030
Main channel. Bank slopes clean, winding, some pools and shoals, 0.040
Main channel. Bank slopes with gabions, 0.025
Culvert Manning's n for Top, 0.016
Culvert Manning's n for Bottom, 0.020

5.2.5.1 Existing Scenario for Fluvial Flooding

Figure 5-6 shows the modelled 1% AEP and 0.1% AEP events for the existing fluvial flooding scenario. Comparison of **Figure 5-1** and **Figure 5-6** shows similarities differences between the two. The 1% AEP is confined to the north side of the stream while the 0.1% AEP extends over a large area to the south of the stream. **Table 5-5** shows a similar~~ity~~ levels between the FEMFRAM and SFRA levels and flows for Node 5La13955. A more conservative flow was applied upstream for the SFRA model which is highlighted in **Table 5-5** as the SFRA levels and flows for the node 5La 1717 are higher than those of the FEMFRAM.

Table 5-5 Comparison of flows and levels

	5La1727		5La13955	
AEP %	1	0.1	1	0.1
FEM FRAMS Flows	2.25	3.27	2.34	3.4
FEM FRAMS Levels	3.46	3.55	2.58	2.91
SFRA Flows	2.34	3.4	2.34	3.4
SFRA Levels	4.26	4.39	2.55	2.88

Indicative Flood Volumes derived from Volume Stage curves were estimated for the Q100 and Q1000 event out of bank flooding are shown in **Table 5-6**.

Table 5-6 Flood Volumes

AEP %	1	0.1
Left Bank (m^3)	616	659
Right Bank (m^3)	0	3274
Total (m^3)	616	3933

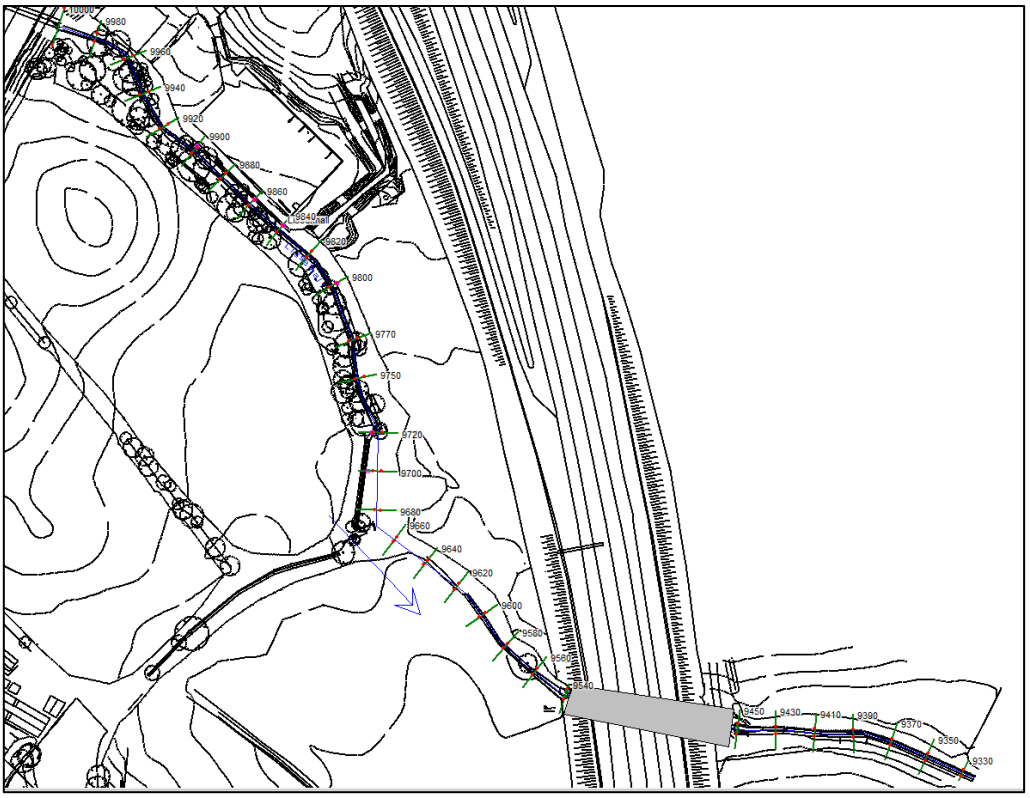


Figure 5-4 HEC-RAS Model Space

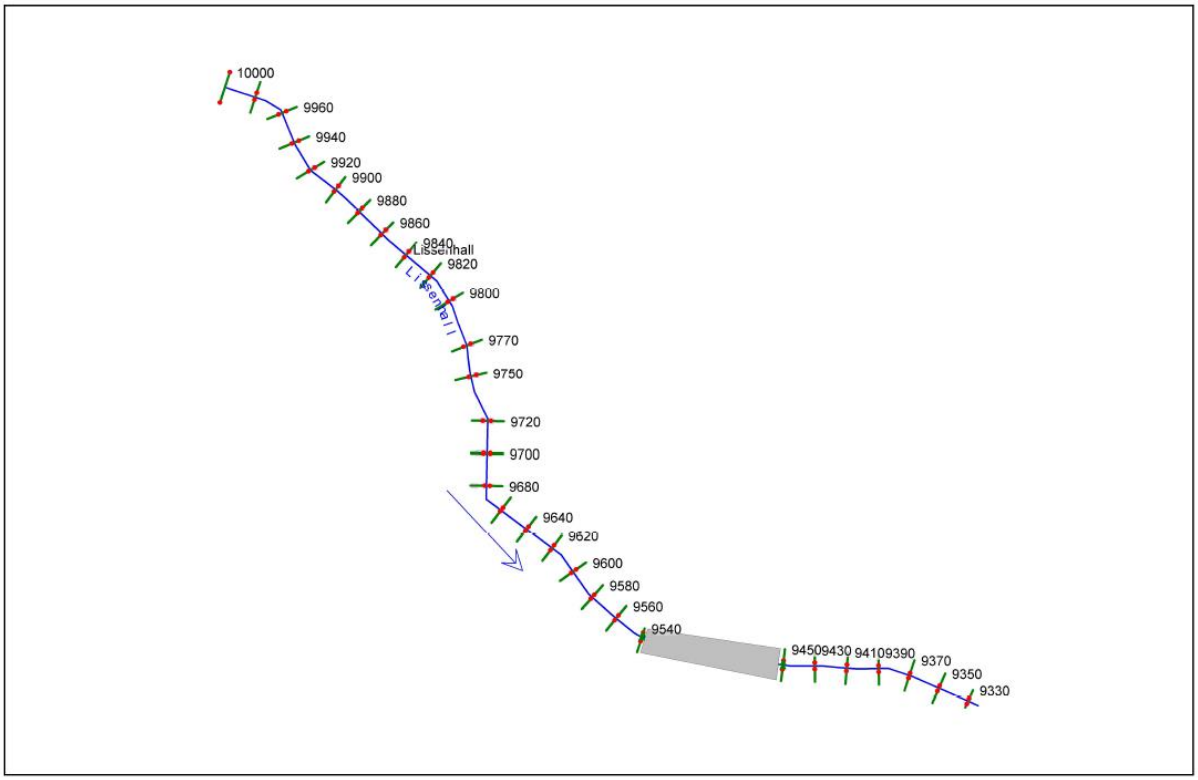


Figure 5-5 HEC-RAS Model Geometry

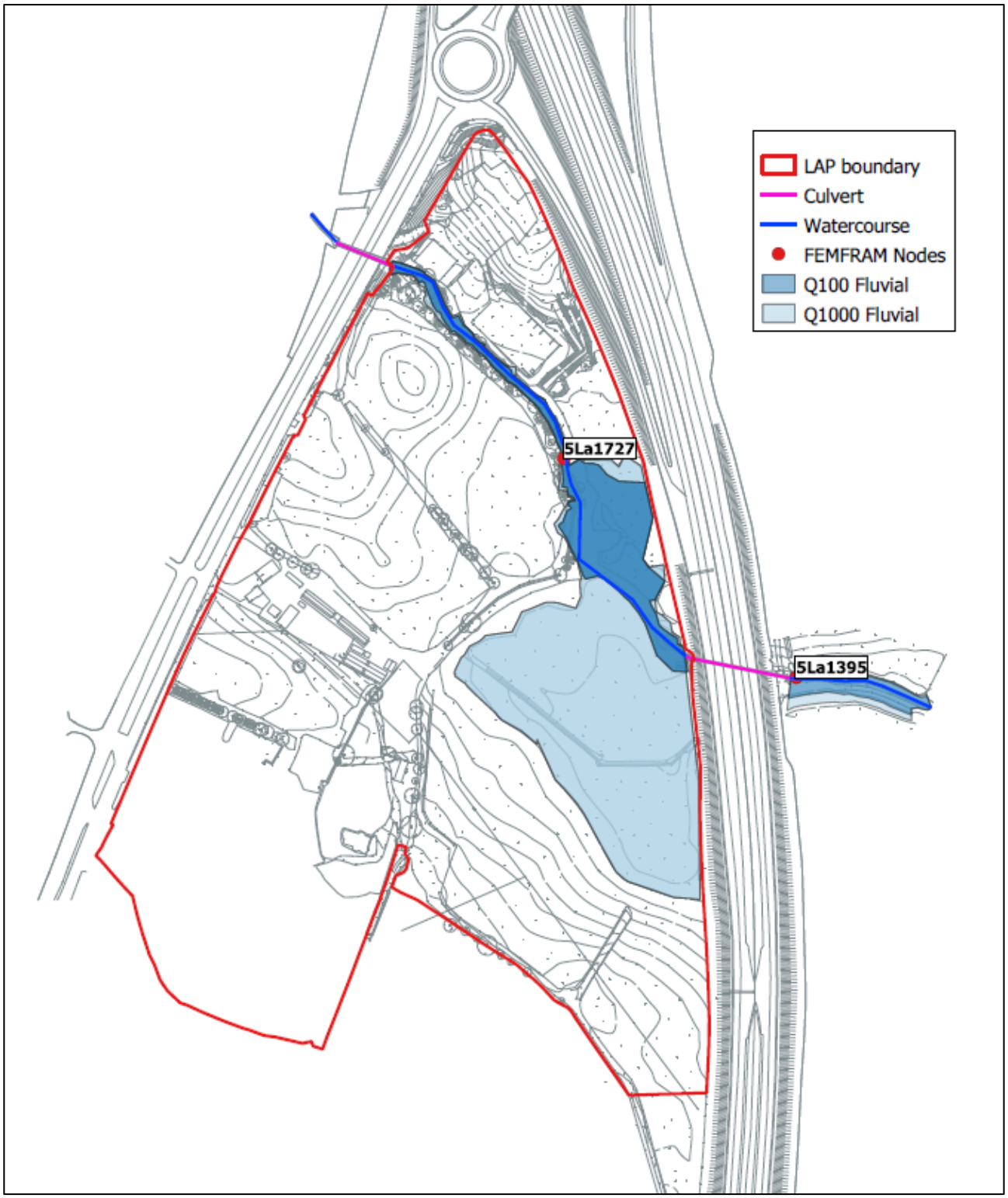


Figure 5-6 Preliminary Design Existing Fluvial Flood Extents

5.2.5.2 Climate Change Scenario for Fluvial Flooding

Figure 5-7 shows the modelled climate change fluvial flood extents for the 1% AEP and 0.1% AEP events. Comparison of **Figure 5-6** and **Figure 5-7** shows increases the 1% AEP event could expand to the existing 0.1% AEP event while the 0.1% AEP will increase in extents upstream.

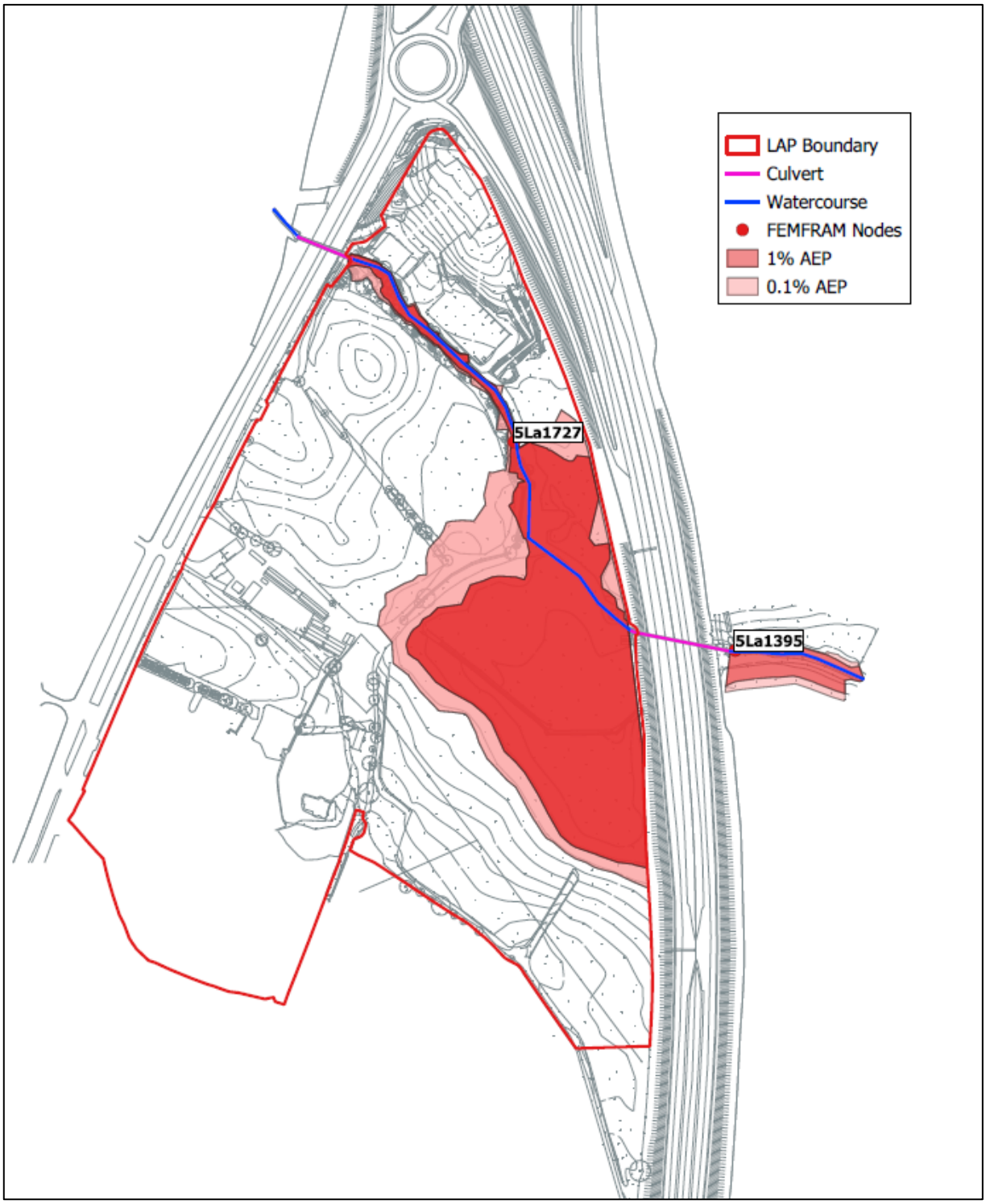


Figure 5-7 Preliminary Design Climate Change Scenario Fluvial Flood Extents

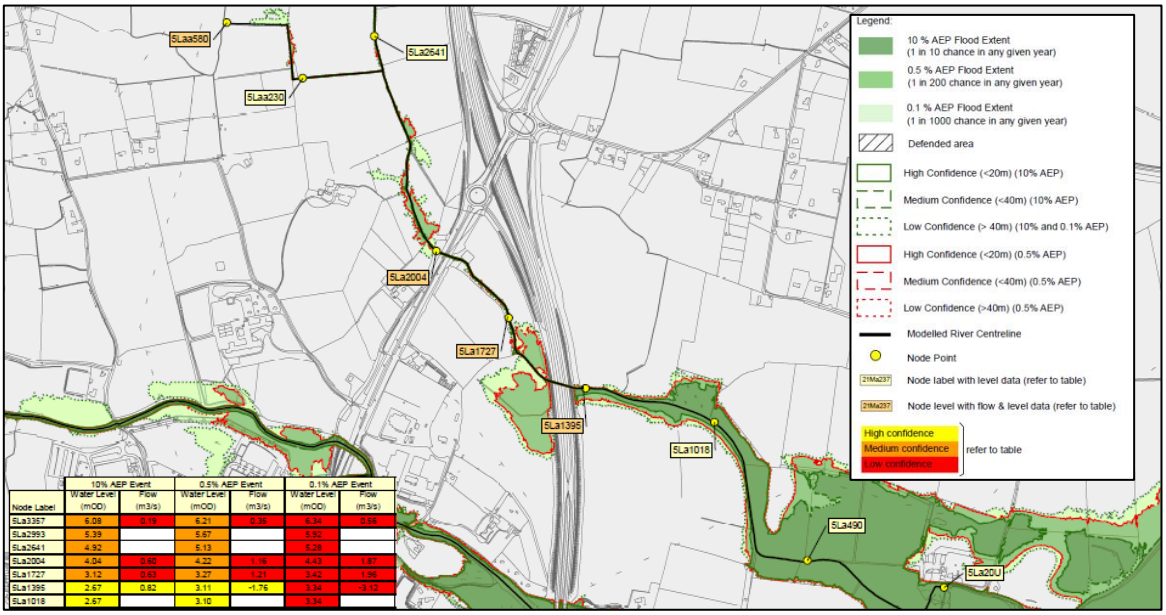
5.3 Tidal Flooding

5.3.1 FEMFRAM study

The FEMFRAM study found that the flapped outfall located at the downstream extent of the Lissenhall Stream provides limited benefits in preventing the propagation of high tides and storm surges west of the outfall and was not considered an option for a flood defence. This is because high tides and storm surges can bypass this structure downstream of the outfall along the Broadmeadow estuary coastline. Therefore tidal flows impact on the water levels in the Lissenhall Stream upstream of the flapped outfall. **Figure 5-8** shows the FEMFRAM tidal flood extents for the LAP study area. It shows that the site is primarily impacted by the 0.5% and 0.1% AEP events. The main flooding in the FEMFRAM study is at lower reaches of the stream adjacent to the M1 culvert.

5.3.2 Preliminary Design Hydraulic Modelling

The FEMFRAM tidal levels were applied across the site to match the flood level from the FEMFRAM study. **Figure 5-9** shows the tidal extents generated.



Node Label	10% AEP Event Water Level (mOD)	10% AEP Event Flow (m3/s)	0.5% AEP Event Water Level (mOD)	0.5% AEP Event Flow (m3/s)	0.1% AEP Event Water Level (mOD)	0.1% AEP Event Flow (m3/s)
5La3357	6.08	0.19	6.21	0.35	6.34	0.66
5La2993	5.39		5.67		5.92	
5La2641	4.92		5.13		5.28	
5La2004	4.04	0.80	4.22	1.16	4.43	1.87
5La1727	3.12	0.63	3.27	1.21	3.42	1.96
5La1395	2.67	0.82	3.11	-1.76	3.24	-3.12
5La1018	2.67		3.10		3.24	

Figure 5-8 FEMFRAM Existing Coastal Flood Extents

Comparison of **Figure 5-8** and **Figure 5-9** shows that the tidal flooding extents are broadly similar.

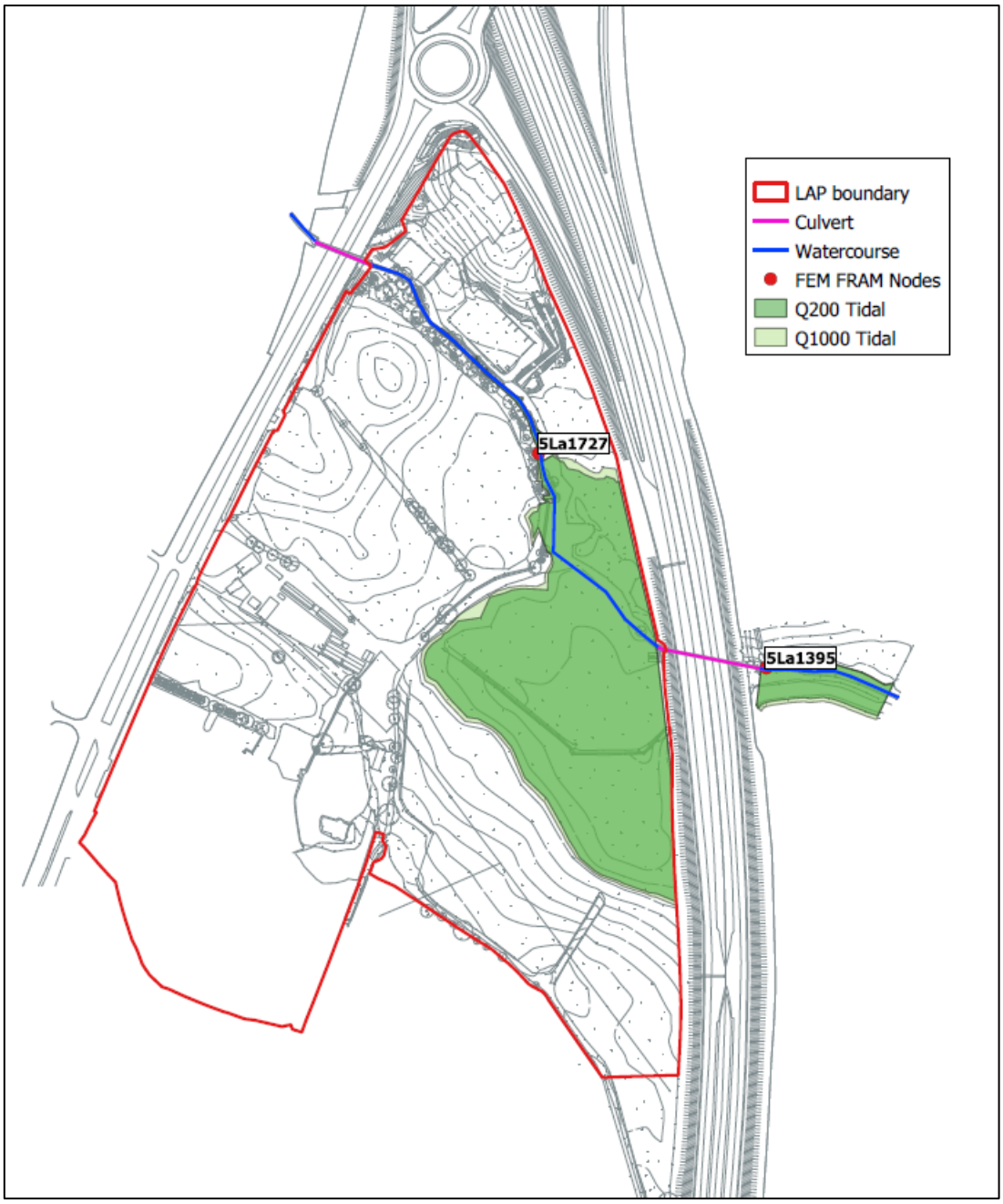


Figure 5-9 Preliminary Design Existing Tidal Flood Extents

5.3.2.1 Climate Change Scenario for Tidal Flooding

Figure 5-10 shows the climate change tidal flooding extents for the ~~1~~*0.5*% AEP and 0.1% AEP events.

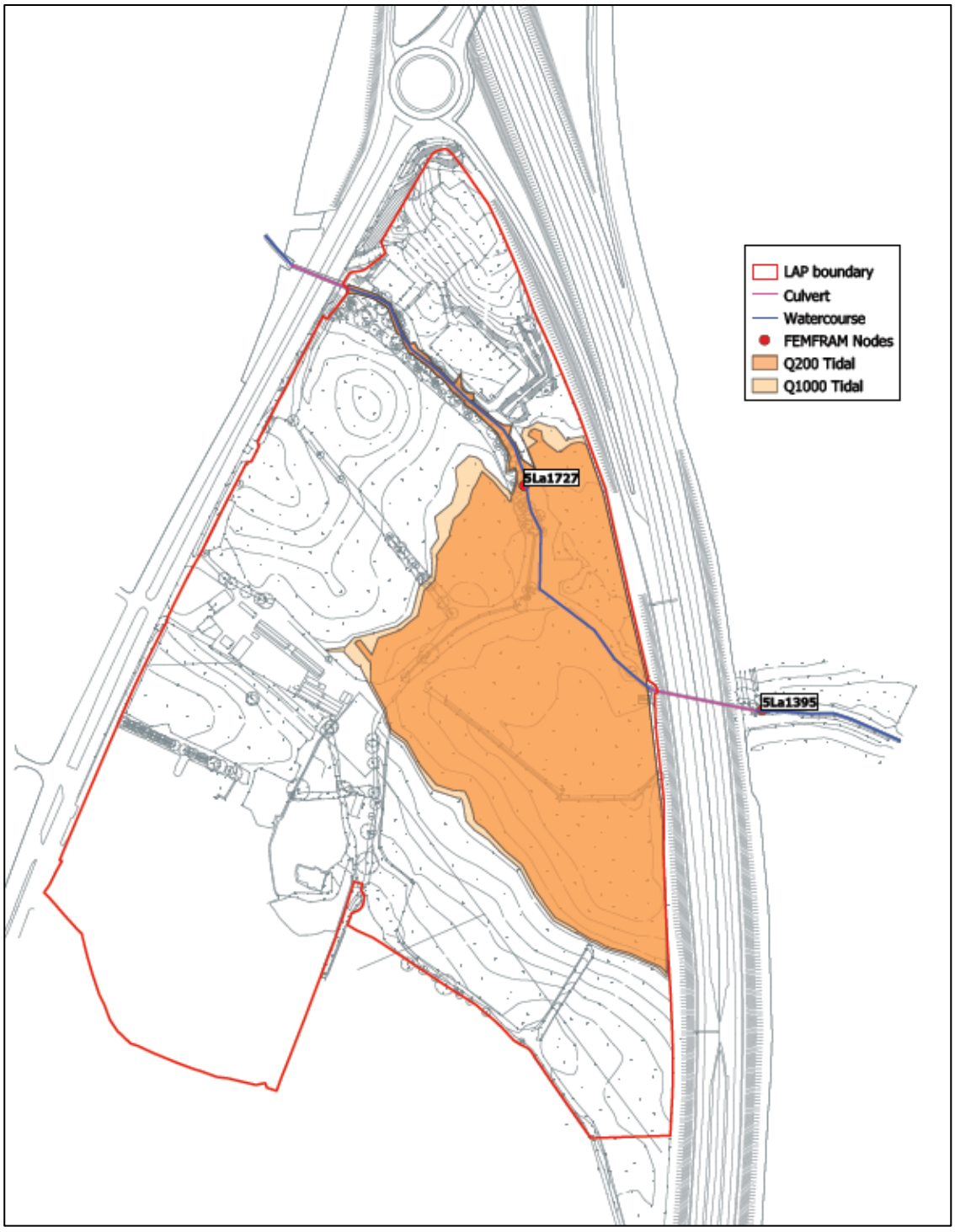


Figure 5-10 Preliminary Design Climate Change Tidal Flood Extents

5.3.2.2 Comparison with National Coastal Flood Hazard Mapping 2021

Comparing **Figure 5-9** with **Figure 4-5** shows that for the existing scenario the flooding extents are very similar. The climate change scenarios as shown **Figure 5-10** and **Figure 4-6** indicate that the National Coastal Flood Hazard Mapping 2021 has larger extents however, the surface data used in that study is not as detailed for the SSFRA and any the SSFRA flood extents are more reflective of on-site conditions.

5.4 Flood Zones

Flood Zones for the site were extracted as the worst case scenario flooding for the combined effects of the fluvial and tidal flooding without the inclusion of climate change. **Figure 5-11** shows the Flood Zones A and B.

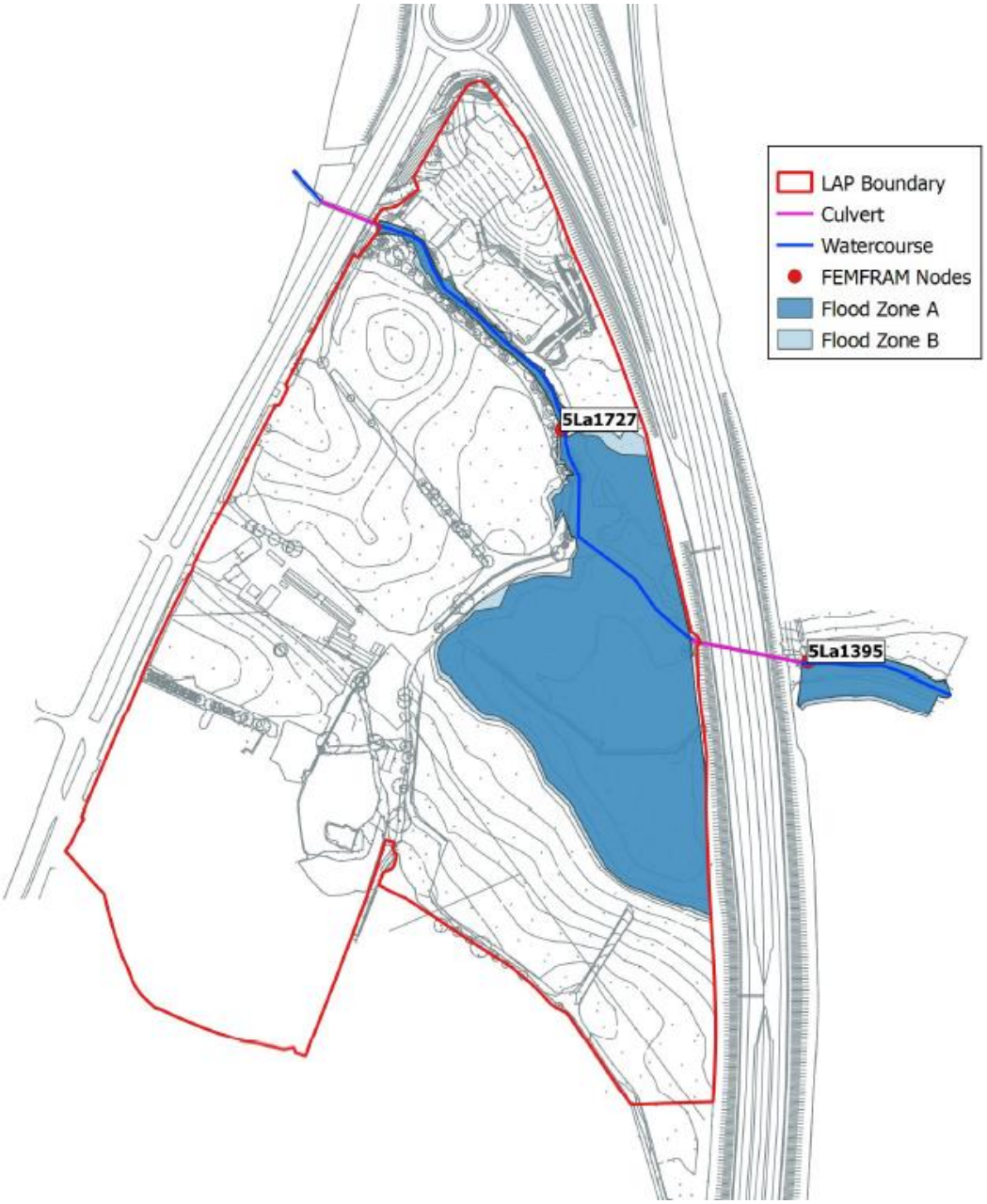


Figure 5-11 Preliminary Design Flood Zones

Figure 5-12 shows the proposed layout for the Development Area. The principal mitigation measure for the Development Area is avoidance with the development located in Flood Zone C. The flood zone areas have identified as open green space. Some areas of the development could be located in areas sensitive to increased flood extents due to climate change therefore their finished floor levels will be set at 0.5m above the flood zone levels.

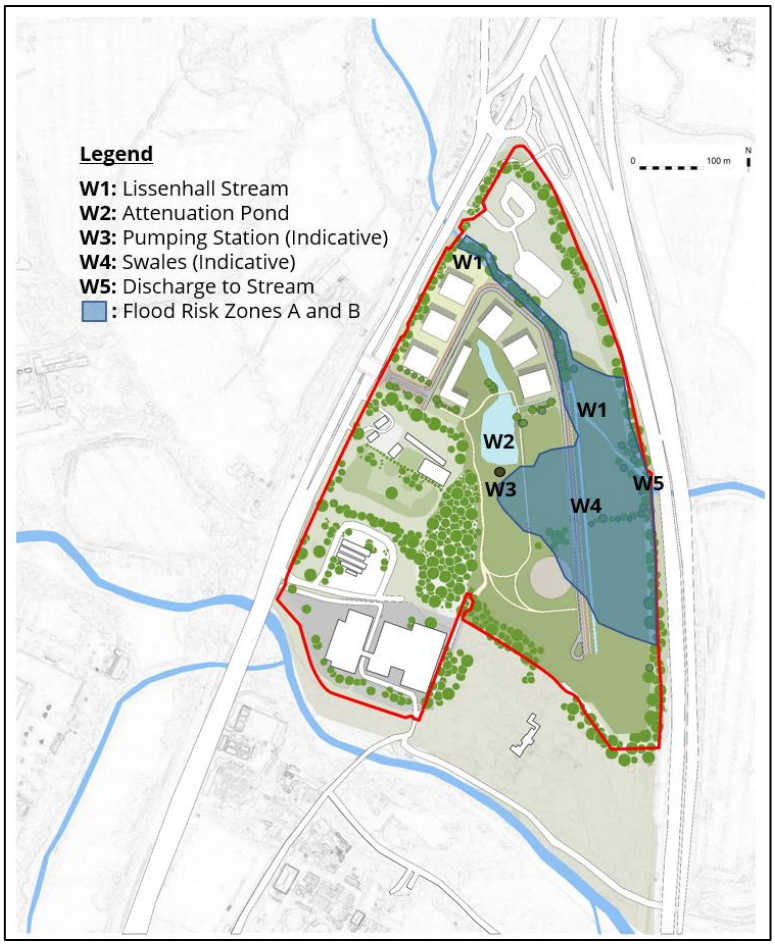


Figure 5-12 Proposed layout for the Development Area

5.5 Pluvial Flooding

As discussed in **Section 4** the risk of pluvial flooding is deemed to be low. However, a surface water assessment should be carried out for the proposed development to improve site drainage. All development must ensure that surface water runoff is managed to ensure that greenfield runoff rates are maintained and that there are no downstream impacts. FCC County Development Plan 2017-2023 requires that all "developments shall carry out a surface water and drainage assessment and shall be compliant with the Greater Dublin Strategic Drainage Study (GDSDS) (2005) and the Greater Dublin Regional Code of Practice for Drainage Works (2012) to ensure that drainage from the site is managed sustainably."

The outline surface water drainage strategy for the site has been developed for the LAP by Molony Millar in accordance with the recommendations and guidance from the FCC County Development Plan 2017-2023 and also the SuDS Strategy for the Lissenhall East LAP. The SuDS strategy outlined that:

- New surface water drainage networks will be required as part of developments within lands zoned for new office, research and development and high technology/high technology manufacturing type development. These networks should be designed in accordance with this SuDS Strategy, CIRIA C753 'The SuDS Manual' and the Greater Dublin Strategic Drainage Systems (GDSDS);
- SuDS measures will be required as part of these new developments to ensure quantity and quality of surface water runoff does not negatively impact the surrounding environment. The required infrastructure includes wetlands / ponds for Lissenhall;
- A variety of SuDS techniques have been assessed which are suitable for inclusion as part of the development of the LAP area; and
- Pond(s) should be constructed in the central eastern area close to the location of the culvert which drains under the M1. Attenuation volumes should be incorporated in the design of the pond(s).

Figure 5-12 shows the outline drainage proposals for the LAP which incorporates a variety of SuDs measures for the development including an attenuation pond, swales and landscaped areas. The main attenuation pond for the site is to be constructed for the Development Area in the centre of the LAP lands. This is an outline drainage strategy which should be advanced to include more details of attenuation sizing calculations as part of planning applications for the zoned lands. The drainage strategy for planning should examine these other following recommendations from the SuDS Strategy:

- Permeable Paving is recommended for use in all parking areas and landscaped areas,
- Any commercial and educational facilities should incorporate rainwater harvesting for use within the facility. These facilities should also examine the feasibility of green roofs and green walls,
- Subject to subsoil permeability, filter drains may be required to drain landscaped areas and other small green areas within the development. Runoff from green areas should, where possible, infiltrate directly to groundwater. It is recommended that swales are constructed adjacent to the proposed drainage route to provide conveyance and treatment of runoff from the carriageway. These swales can also be used to provide separation between footpaths / cycle tracks and the carriageway, and
- Runoff from each development upstream of ponds should be limited to existing greenfield runoff rates. Attenuation should be provided for the 1% AEP rainfall event + ~~10~~*20*% allowance for Climate Change.
- ***Attenuation ponds are to be located outside of Flood Zone A and B, with design volumes and discharge rates to include allowance for predicated coastal and fluvial flood levels at the outlet of the attenuation pond.***

5.6 Residual Risk

Residual risks are those risks which remain after all risk avoidance, substitution and mitigation measures have been implemented, on the bases that such measures can only reduce risk, not eliminate it.

The key residual risks identified within the LAP area are blockage of the M1 culvert and uncertainty associated with predicted sea level rise.

- ***M1 Culvert blockage***
  - ***The existing culvert under the M1 is an existing constraint on the hydraulic capacity of the Lissenhall Stream. The potential for blockage of this structure could further increase fluvial flood extents and water levels within the LAP area. Increasing the capacity of this culvert would increase coastal flood risk to the site and should therefore not be considered an option. Appropriate mitigation of the residual risk to fluvial flooding should therefore be achieved through the design and construction of a suitably sized inlet trash screen with an overflow structure to prevent an increase in water levels upstream of the structure.***
- ***Sea Level Rise***
  - ***As the site is shown to be sensitive to sea level rise within the MRFS and HEFS conditions, proposed site layout is cognisant of the potential increase in flood extents to avoid future food risk where possible. Proposed finished floor levels and safe access and egress is required to be assessed within a SSFRA with an appropriate freeboard allowance above the High-End Future Scenario. Where development cannot avoid future flood extents it must be shown within the SSFRA that there is no increase in flood risk either within or outside of the LAP area. As the primary source of flooding coastal, this SFRA is of appropriate detail to recommended that appropriate mitigation of this risk can be achieved.***

6 SUMMARY AND CONCLUSION

This SFRA report reviewed the available flood risk information for the site. The site contains both Flood Zone A and Flood Zone B and a “Less Vulnerable” type development which calls for a Justification Test together with appropriate mitigation measures before any developments proposals are allowed in or near the identified flood zones. The report contained a comparison of the extents of these flood zones as defined in the FEMFRAM and the preliminary design flood model for the LAP.

The LAP lands have been identified as lying predominantly within Flood Zone C. The Flood Zones A and B have been identified as open green space. The principal mitigation measure for the Development Area is avoidance with new development located in Flood Zone C. However, development proposals within the LAP lands shall still subject to a SSFRA at planning application stage as the site contains Flood Zones A and B. A Justification Test based on the best available information has been provided in **Appendix A** detailing the mitigation measures required for SSFRAs. Some areas of the development could be located in areas sensitive to increases flood extents due to climate change therefore their finished floor levels will be set at 0.5m above the flood zone levels ***with an allowance for climate change***. A Flood Zone Map is shown in **Appendix B**.

Any proposals for development within the LAP land should include an appropriately detailed SSFRA. The SSFRAs shall be undertaken in accordance with:

- The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014); and
- The flood risk management policies outlined in the FCC CDP 2023-2029 (and subsequent updated CDP).

The SSFRAs should address (but not limited to) the following:

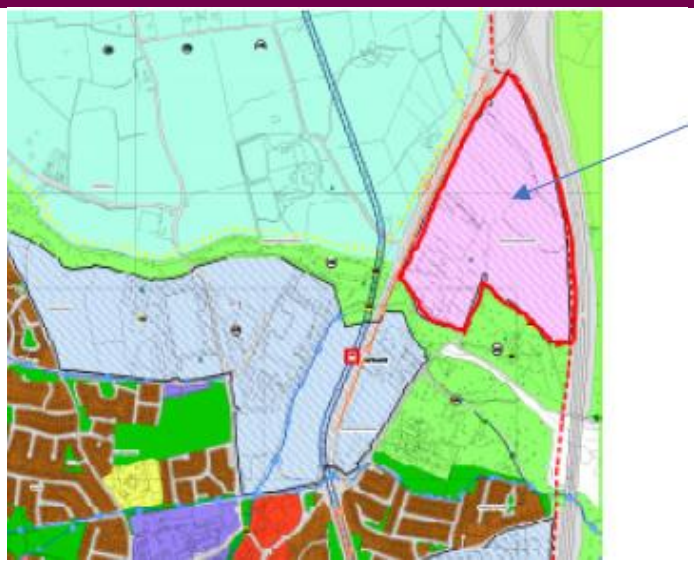
- ***All sources of flood risk to the site***
- The sequential approach should be applied through site planning and should avoid encroachment onto, or loss of, the flood plain;
- If development cannot be avoided in the floodplain or not substituted for a less vulnerable type then a Justification Test for Development Management must be completed and all criteria of the test must be satisfied for development in a flood risk area to be permitted.
- Highly Vulnerable Development shall not be permitted in Flood Zone A or B;
- Less vulnerable development proposals should not be considered in Flood Zone A area unless it meets all the criteria of the Development Management Justification Test.
- ***Water Compatible land uses are appropriate for development in Flood Zone A, though should not increase flood risk within or outside of LAP lands.***
- ~~Development in Flood Zone A should be water compatible and should not increase flood risk either within or outside of the LAP lands~~;
- Existing land uses which are water compatible that coincide with floodplains or adjacent to watercourses should be maintained to avoid vulnerable development in these areas.
- ***Due to the potential sensitivity of the site to predicted sea level rise and the M1 culvert constraint***, the minimum finished floor level for Highly Vulnerable Development should be above the Flood Zone B (0.1% AEP) ***flood*** level ***with an allowance for climate change*** plus suitable freeboard. The recommended level of freeboard is 500 mm for fluvial ***and coastal*** flood levels ***whichever is greater***.
- The minimum finished floor level for Less Vulnerable Development should be above the Flood Zone A (1% AEP ***fluvial or 0.5% AEP Coastal, whichever is greater***) level ***with an allowance for climate change*** plus suitable freeboard. The recommended level of freeboard is 500 mm for fluvial ***and coastal*** flood levels
- Proposals should not impede existing flow paths or cause flood risk impacts to the surrounding areas.

- Applications should outline the emergency procedures that will be applied in the event of a flood. Evacuation routes should be identified but if this is not possible then containment may be considered if it is considered safe and practical to do so.
- Compensatory storage for development that results in a loss of floodplain must be provided on a level for level basis, the lands should be in close proximity to the area that storage is being lost from, the land must be within the ownership of the developer and the land given to storage must be land which does not flood in the 1% AEP event. Also the compensatory storage area should be constructed before land is raised to facilitate development.
- ***Should address residual risk of culvert blockage of the M1 culvert though the design of a trash inlet screen with an overflow to appropriately mitigate residual risk from blockage of this structure***
- ***Should include an appropriate freeboard allowance for climate change such that finished floor levels and safe access and egress routes are provided with consideration of the predicted High End Future Scenario Coastal flood levels.***
- ~~Should address residual risk of culvert blockage (where applicable), increased flood extents under climate change scenarios and pluvial risk which should be aimed at setting finished floor levels.~~

It is noted that any SSFRA is required to be accompanied by Section 50 consent from the Office of Public Works for the construction, replacement or alteration of bridges and culverts over any watercourse within the LAP area

This LAP is valid for six years from the date of adoption by the Council. Its validity may be extended, in year 5 of the LAP for a further 5 years, if deemed appropriate by a resolution of the Council. This LAP's focus for new development during its' duration will be on the western boundary and central area of the overall LAP lands. However, the LAP also provides policy context for potential future development within the site in anticipation of the development of the MetroLink Project (anticipated in 2035). It is acknowledged that any future additional development on the Lissenhall East LAP lands beyond what is currently specified in the Development Framework is indicative only and that any such potential future development will only occur having regard to all relevant environmental, transport, flood risk and planning assessment requirements. Any proposals for future development within a flood zone shall include an appropriately detailed SSFRA.

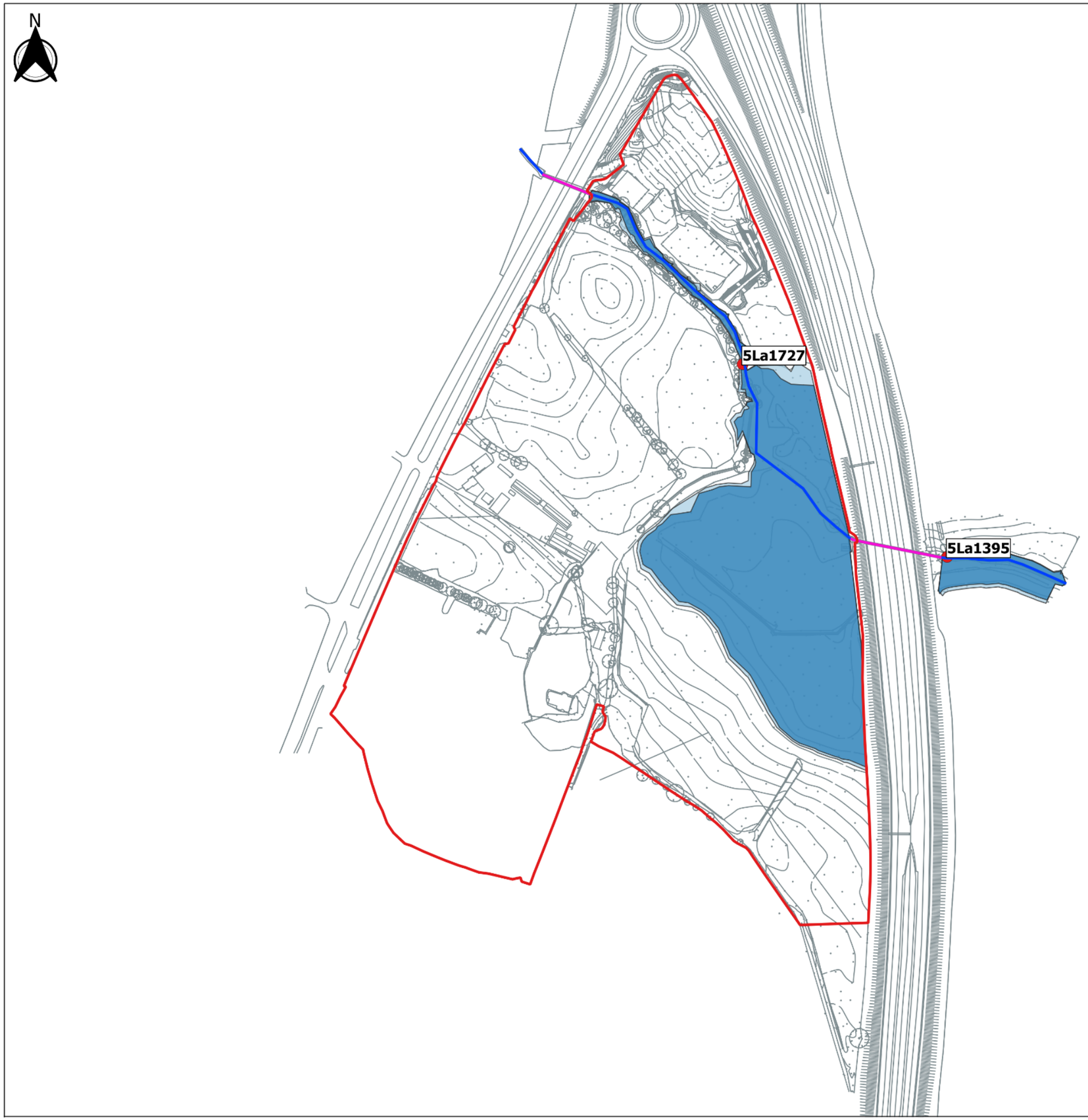
Appendix A
Justification Test

Lissenhall East Local Area Plan	
	
The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.	Swords is a key location designated in the draft Regional and Economic Strategy (RSES) and the County Development Plan for large scale employment. The RSES also acknowledge the development potential of the LAP lands *"The development of a mixed-use urban district on the northern side of Swords at Lissenhall, has potential to deliver significant housing, along with high tech, research and development-based employment within a campus setting at Lissenhall East."*
The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and in particular:	The LAP lands are zoned "HT" High Technology in the *Fingal County Development Plan 2017 – 2023*, the stated objective of which is: "*Provide for office, research and development and high technology/high technology manufacturing type employment in a high quality built and landscaped environment.*
(i) Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement;	These are underutilised lands within the development boundary of Swords identified for development-based employment.
(ii) Comprises significant previously developed and / or underutilized lands;	These are underutilised lands within the development boundary of Swords.
(iii) Is within or adjoining the core of an established or designated urban settlement;	The lands are within the development boundary of Swords, one of the three Key Towns in the Dublin Metropolitan Area in the draft Regional Spatial & Economic Strategy for the Eastern and Midland Regional Assembly.
(iv) Will be essential in achieving compact and sustainable urban growth; and	The lands are within the development boundary of Swords adjacent to the planned MetroLink (and Metrolink Estuary Stop).
(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.	There are limited suitable lands within Fingal for large scale High Tech development. Alternatives are constrained in many cases by the absence of local planning policy, remoteness from existing and planned high capacity public transport and / or population centres. The Lissenhall East LAP lands by virtue of their proximity to Swords, served by the future MetroLink

	provide a potential opportunity to develop a high quality High Tech employment area within Fingal.
A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere. N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment	A SFRA was undertaken for the site which identified that the LAP lands have been identified as lying predominantly within Flood Zone C. The Flood Zones A and B have been identified as open green space. The principal mitigation measure for the Development Area is avoidance with new development located in Flood Zone C. ***The SFRA identifies blockage of the M1 culvert as a likely source of residual risk to the LAP area as there is no alternative flow path for water to leave the site. It is therefore a requirement that development of the site includes an inlet screen to the culvert which is to be designed using best practice and in accordance with the relevant guidelines to appropriately mitigate the risk of blockage to the development.*** However, development proposals within the LAP lands shall still subject to a SSFRA. The following items that should be addressed in the SSFRA (but not limited to): – The sequential approach should be applied through site planning and should avoid encroachment onto, or loss of, the flood plain; – If development cannot be avoided in the floodplain or not substituted for a less vulnerable type then a Justification Test for Development Management must be completed and all criteria of the test must be satisfied for development in a flood risk area to be permitted. – Highly Vulnerable Development shall not be permitted in Flood Zone A or B; – Less vulnerable development proposals should not be considered in Flood Zone A area unless it meets all the criteria of the Development Management Justification Test. – ***Water Compatible land uses are appropriate for development in Flood Zone A, though should not increase flood risk within or outside of LAP lands.*** ~~– Development in Flood Zone A should be water compatible and should not increase flood risk within or outside of the LAP lands;~~ – Existing land uses which are water compatible that coincide with floodplains or adjacent to watercourses should be maintained to avoid vulnerable development in these areas. – The minimum finished floor level for Highly Vulnerable Development should be above the Flood Zone B (0.1% AEP) level plus suitable freeboard. The recommended level of freeboard is 500 mm for fluvial ***and coastal*** flood levels ***with an allowance for climate change***; – The minimum finished floor level for Less Vulnerable Development should be above the Flood Zone A (1% AEP ***fluvial or 0.5% AEP coastal***) level plus suitable freeboard. The recommended level of freeboard is 500 mm for fluvial ***and coastal*** flood levels ***with an allowance for climate change***

- Proposals should not impede existing flow paths or cause flood risk impacts to the surrounding areas.
- Applications should outline the emergency procedures that will be applied in the event of a flood. Evacuation routes should be identified but if this is not possible then containment may be considered if it is considered safe and practical to do so.
- Compensatory storage for development that results in a loss of floodplain must be provided on a level for level basis, the lands should be in close proximity to the area that storage is being lost from, the land must be within the ownership of the developer and the land given to storage must be land which does not flood in the 1% AEP event. Also the compensatory storage area should be constructed before land is raised to facilitate development.
- Should address residual risk of culvert blockage ***of the M1 culvert though the design of a trash inlet screen with an overflow to appropriately mitigate residual risk from blockage of this structure*** ~~(where applicable), increased flood extents under climate change scenarios and pluvial risk which should be aimed at setting finished floor levels.~~
- ***Should include an appropriate freeboard allowance for climate change such that finished floor levels and safe access and egress routes are provided with consideration of the predicted High End Future Scenario Coastal flood levels.***

Appendix B
Flood Zone Map



Legend

- LAP Boundary
- Culvert
- Watercourse
- FEMFRAM Nodes
- Flood Zone A
- Flood Zone B

Client

Fingal County Council
Comhairle Contae Fhine Gall

Project **Draft Lissenhall East LAP**

Title

Flood Zone Map

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Notes

Appendices

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