

HQ Developments Ltd.

HQ Horgan's Quay

Flood Risk Assessment - Residential
Quarter

252901-00

P01 | 9 August 2019

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 252901-00




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1 Introduction

As part of the Strategic Housing Development Application for the proposed Horgan's Quay Residential development, a Flood Risk Assessment is required.

Arup has been appointed by the Applicants to prepare a Flood Risk Assessment (FRA) report, specifically in relation to the proposed residential development. This assessment was carried out in accordance with the "Guidelines for Planning Authorities, The Planning System and Flood Risk Management" published by the Department of Environment, Heritage and Local Government, (DoEHLG), and the Office of Public Works (OPW), published November 2009.

The FRA takes into account the Lee Catchment Flood Risk Assessment and Management Study (CFRAMS) report published by the OPW in March 2014, along with the proposed Lower Lee (Cork City) Drainage Scheme plans which are available in the public domain via www.lowerleefrs.ie.

The development is located downstream of Michael Collins Bridge at Horgan's Quay, on the north side of the North Channel of the River Lee in Cork City, at the point where the River Lee South and North Channels meet. Figure 1 presents a location map of the site.

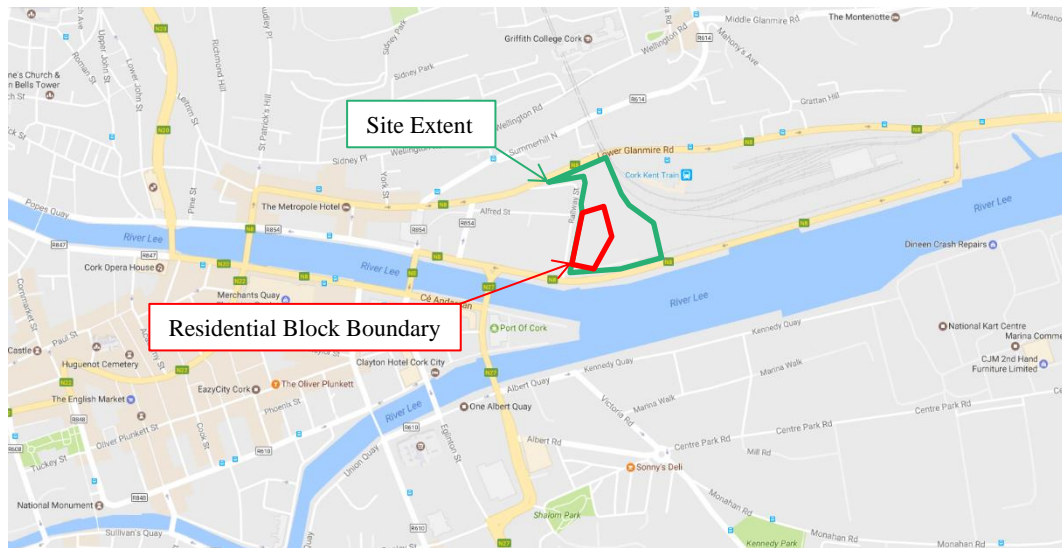


Figure 1: Residential Boundary and Site Extent (Source: Google Maps)

2 Description of Site and Site Location

The site is located at Horgan's Quay in Cork City. The proposed residential development is located at the south west corner of the overall site which is currently undergoing redevelopment.

The development will consist of an apartment building ranging in height from 7 to 10 floors over ground floor and will comprise 108 no. 1-bedroom apartments & 194 no. 2-bedroom apartments. At ground floor level, the development will consist of a creche to the corner of Railway Street and Alfred Street (272 sq. m) as well as 5 no. retail units ranging in size from 186 sq. m to 385 sq. m and totalling 1,231.4 sq. m.

The site is bounded by Penrose Quay footpath and roadway (N8) to the south, Railway Street to the west, Lower Glanmire Road (N8) to the north and Kent Train Station to the east.

Primary pedestrian and vehicular access to the proposed development will be off Horgan's Quay roadway and Railway Street as shown in Figure 3 below.

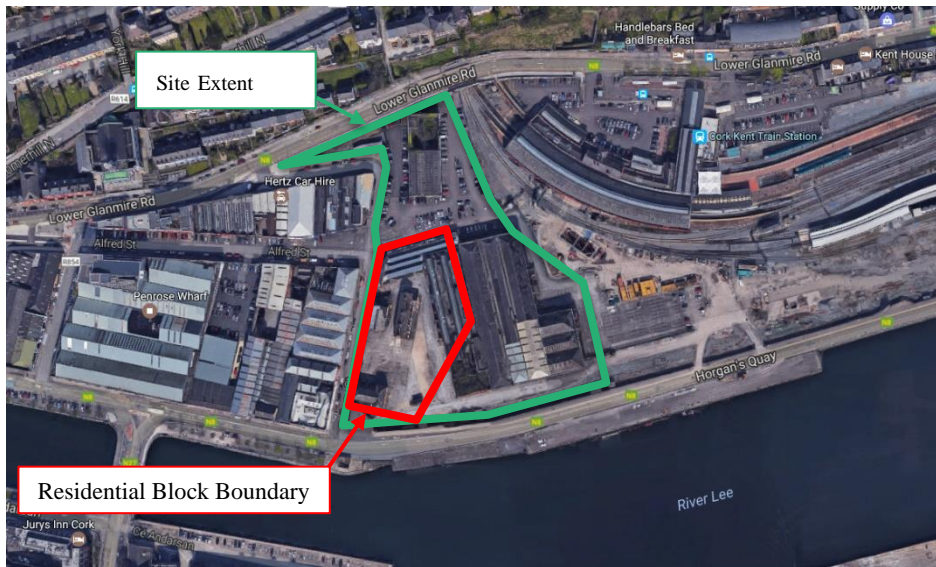


Figure 2: Site Boundary Aerial View (source: Google Maps)

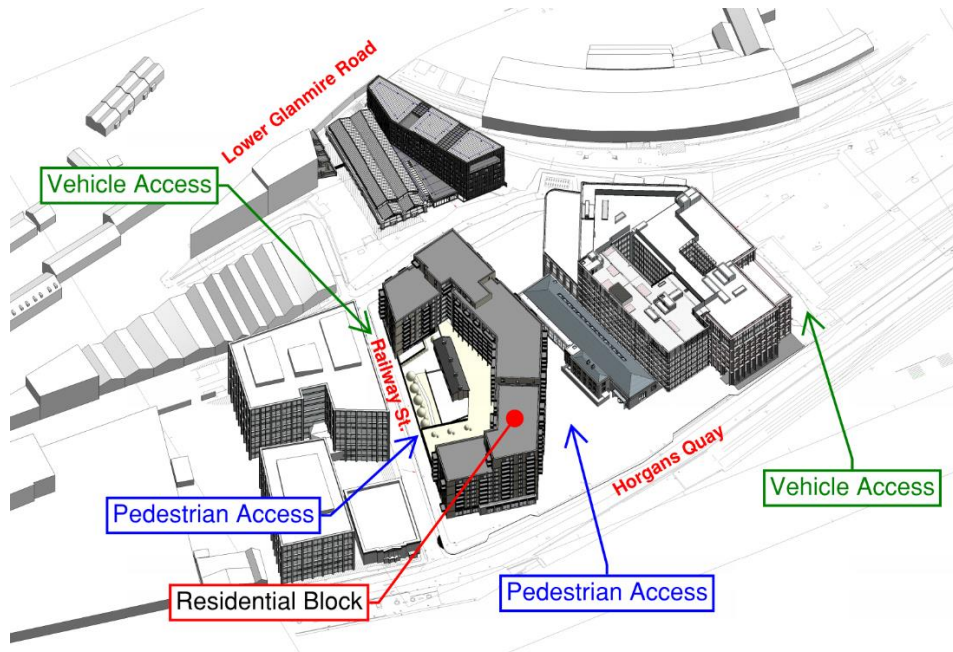


Figure 3: Proposed Site Access Routes

2.1 Existing Site Levels

The existing site ground levels range from 3.4mOD at the southern entrance to 5.0mOD at the northern boundary.

Penrose Quay roadway along the front of the site ranges in level along its centre line from 2.8 to 3.0mOD. The Horgan's Quay footpath ranges from 3.3 to 3.5mOD.

Penrose Quay roadway generally slopes down from north to south. The road levels along the southern (quay-side) edge range from 2.8 to 2.9mOD. Railway Street on the western boundary ranges in level from 3.2 to 4.4mOD and slopes down from north to south.

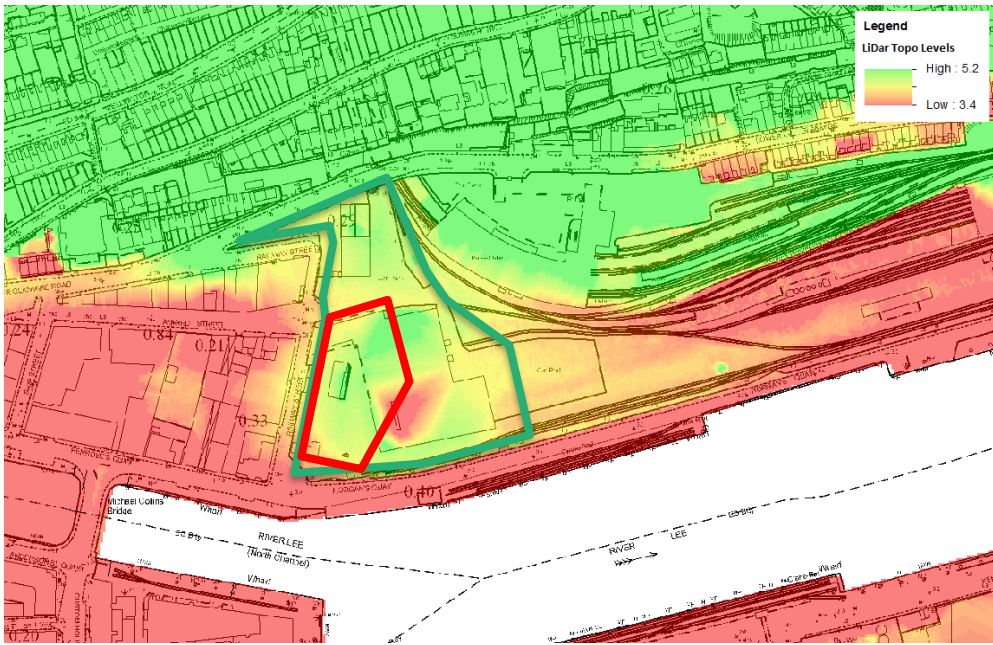


Figure 4: Site LiDAR Levels (Source: LiDAR data and OS Background Mapping)

3 Flooding Context of Proposed Development

3.1 Vulnerability of Proposed Development

Under the DoEHLG/OPW ‘Guidelines for Planning Authorities’, the proposed mixed-use development, due to incorporating the Residential facility, is classified as a ‘Highly Vulnerable Development’ (as per Table 3.1 of the Guidelines).

3.2 Flood Levels

The Lee CFRAMS flood maps published by the OPW in March 2014 is the most recent source of flood levels providing a range of return periods for the area of interest. They supersede the Irish Coastal Protection Strategy Study flood maps and the draft CFRAMS flood maps published in 2010.

Table 1 presents estimated flood levels for a range of return periods, in the vicinity of the proposed Horgan’s Quay Residential Development.

Table 1: Predicted flood levels in the vicinity of Horgan’s Quay (Source: Lee CFRAMS, 2014)

Lee CFRAMS Flood Extent Maps (March 2014):					
Flood Water Levels per Annual Exceedance Probability (AEP)					
AEP	Lee CFRAMS Node Points	Current Scenario		Mid-Range Future Scenario	
		Fluvial (mOD)	Tidal (mOD)	Fluvial (mOD)	Tidal (mOD)
10% (1 in 10)	8 LEE_1673	1.94	2.66	2.49	3.21
1% (1 in 100)	8 LEE_1673	2.75		3.31	
0.5% (1 in 200)	8 LEE_1673		3.00		3.58
0.1% (1 in 1000)	8 LEE_1673	3.07	3.21	3.64	3.77

Flood level predictions show that the area of Horgan’s Quay is tidally dominated, as tidal flood levels are between 0.14m and 0.72m higher than the comparable fluvial estimates. Figure 5 overleaf presents the tidal flood map at Horgan’s Quay.

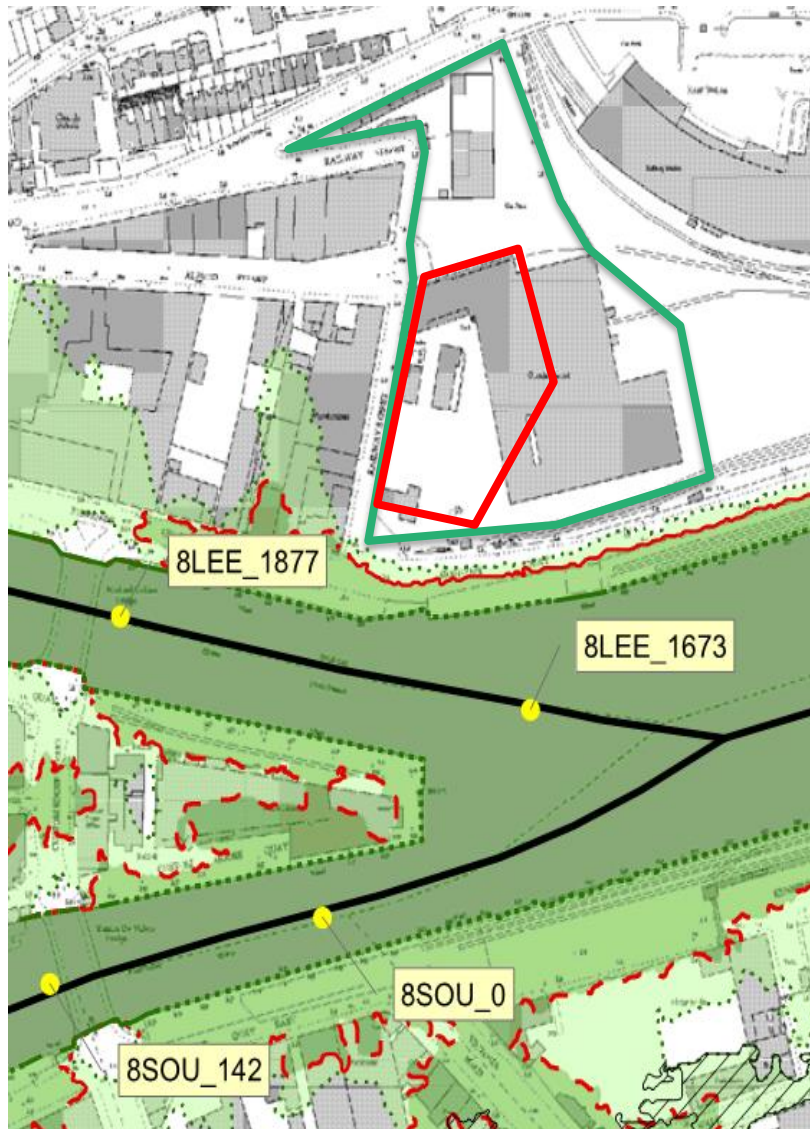


Figure 5: Site Boundary vs. Current Tidal Extent (Source: lee.cfram.com)

Based on the above predicted flood levels and the associated flood maps, the site of the Residential development, in accordance with the DoEHLG / OPW Guidelines, is located in Flood Zone C. Consequently, the proposed development is appropriate with respect of fluvial and tidal flooding.

The relevant fluvial and tidal flood maps are provided in Appendix A. An image of the site boundary overlaid on the Current Tidal Scenario Map is shown in for reference.

3.3 Pluvial Flooding

The proposed development will not increase hard standing areas and as a result, there will be no increase in surface water run-off.

3.4 Patterns of Tidal and Fluvial Flooding

Tidal flooding in Cork City is generally well forecasted by Cork City Council. Such flooding results from particular combinations of high tides, strong south/east winds and low atmospheric pressure and can be exacerbated by a higher, rainfall related, flooding in the River Lee. The duration and rise and fall of such tidally driven flooding generally follow the normal tidal cycle, albeit that there could be some acceleration in the rate of rise, due to meteorological effects and deceleration in the rate of fall due to increased fluvial flow. Peak tidal flood levels would normally last for only an hour or two and flow rates associated with such flooding would generally be very slow.

The highest tidal flood in recent times was in October 2004, when a water level of 2.9mOD was recorded at Parnell Bridge (on the South Channel) just upstream of the Horgan's Quay site. Similar levels were also recorded during the flood of January/February 2014. This compares to 2.66mOD for a 10% AEP event and 3.0mOD for a 0.5% AEP event.

As outlined in Section 3.2, the area of Horgan's Quay is dominated by tidal flooding and fluvially dominated events such as the November 2009 flood did not affect the area of Horgan's Quay.

3.5 Groundwater Flooding

Groundwater levels at the site respond to the water levels in the River Lee. The rise and fall of the groundwater water level typically lags by circa 1 metre in comparison to the river water levels. During an extreme event groundwater would rise but is expected to remain below the surface and therefore would not affect the proposed development. Figure 6 presents the groundwater recharge map and Figure 7 the vulnerability map as available from the Geological Survey Ireland (gsi).

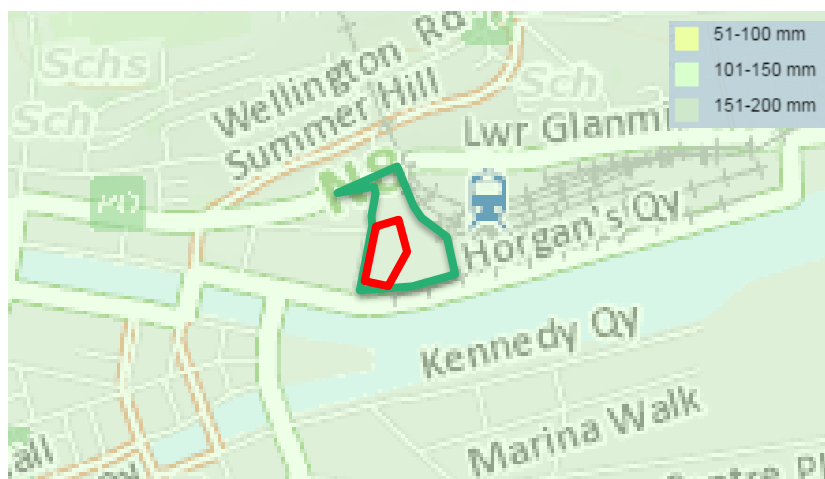


Figure 6: Groundwater Recharge [200mm/yr] (Source: gsi.ie)

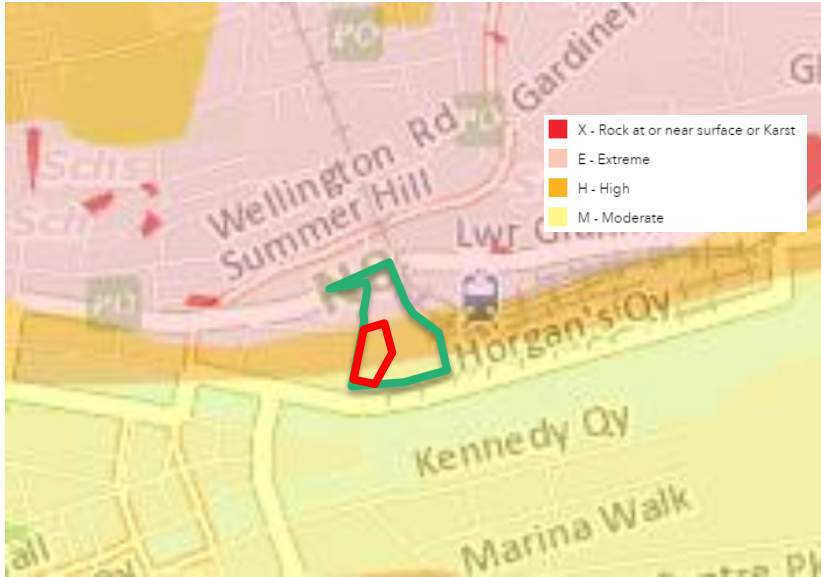


Figure 8: Groundwater Vulnerability (Source: gsi.ie)

It is important to note that these are only indicators of the potential groundwater flood risk. However, the above information from gsi coupled with knowledge of site levels results in a high level of confidence that the risk of groundwater flooding is low.

4 Flood Risk Assessment

4.1 Proposed Mitigation Measures Residential Development

The proposed Design Flood Level at the site is 3.0mOD, which corresponds to the 1 in 200 year tidal flood level.

Accounting for 0.55m increase due to climate change and incorporating 0.3m of freeboard for all habitable floor levels (residential development), the recommended threshold level should be set no lower than 3.85mOD Malin.

The proposed 3.85m threshold and ground floor level is above all the Lee CFRAMS predicted 'current' and mid-range future scenario fluvial and tidal flood levels, even for 1 in 1000 return period floods.

4.2 Consequences of Flooding on Occupancy of Site

The mitigation measures described above will provide a standard of protection of a 1 in 200 year tidal event for the current and mid-range future scenario (Lee CFRAMS, 2014).

Access and egress from the proposed development will be via Penrose Quay footpath and roadway and Railway Street footpath and roadway.

Tidal flooding (i.e. 1 in 200) at 3.0mOD Malin would result in approximately 0.5m of water on the Penrose Quay roadway and 0.2 to 0.3m of water on the footpath. Tidal floods of that magnitude are predictable under the current systems and it is expected that adequate notice will be given.

Currently, the Lower Lee (Cork City) Drainage Scheme is being carried out by the Office of Public Works. This follows on from the Lee CFRAMS and involves refinement of the CFRAMS flood level estimates, which will be used to develop a flood relief scheme for Cork City.

It is understood that the target protection level will be the current 1 in 100 fluvial / 1 in 200 tidal flood level, plus free-board allowance of typically 400mm. As a result, the Penrose's Quay area would be protected to a level in the order of circa 3.4mOD.

4.3 Proposal for Surface Water Management

As indicated in Section 3.3 above, there is no net increase in surface water runoff from the site as a result of the proposed development.

The proposed ground floor level of 3.85mOD is above the level of the surrounding streets and there is no significant risk of pluvial flooding.

4.4 Impact of the Proposed Development on Flood Storage and Conveyance

The proposed development will not increase the urban development footprint at this location and hence will not affect the existing conveyance capacity of the river channel and adjoining floodplain.