Forward Planning
Galway County Council
Prospect Hill
Galway

Our Ref: 190946
Your Ref:

30th July 2021

Re: Submission on Draft Galway County Development Plan 2022-2028 – Lands at Garraun, Oranmore on behalf of Martina Guinnane

Dear Sir/Madam,

On behalf of our client Martina Guinnane, [redacted] we wish to make the following submission on lands at Gurrane, Oranmore, Co. Galway. The subject lands form part of the Garraun Urban Framework Plan Area and are identified in Figure 1 below (hatched black).

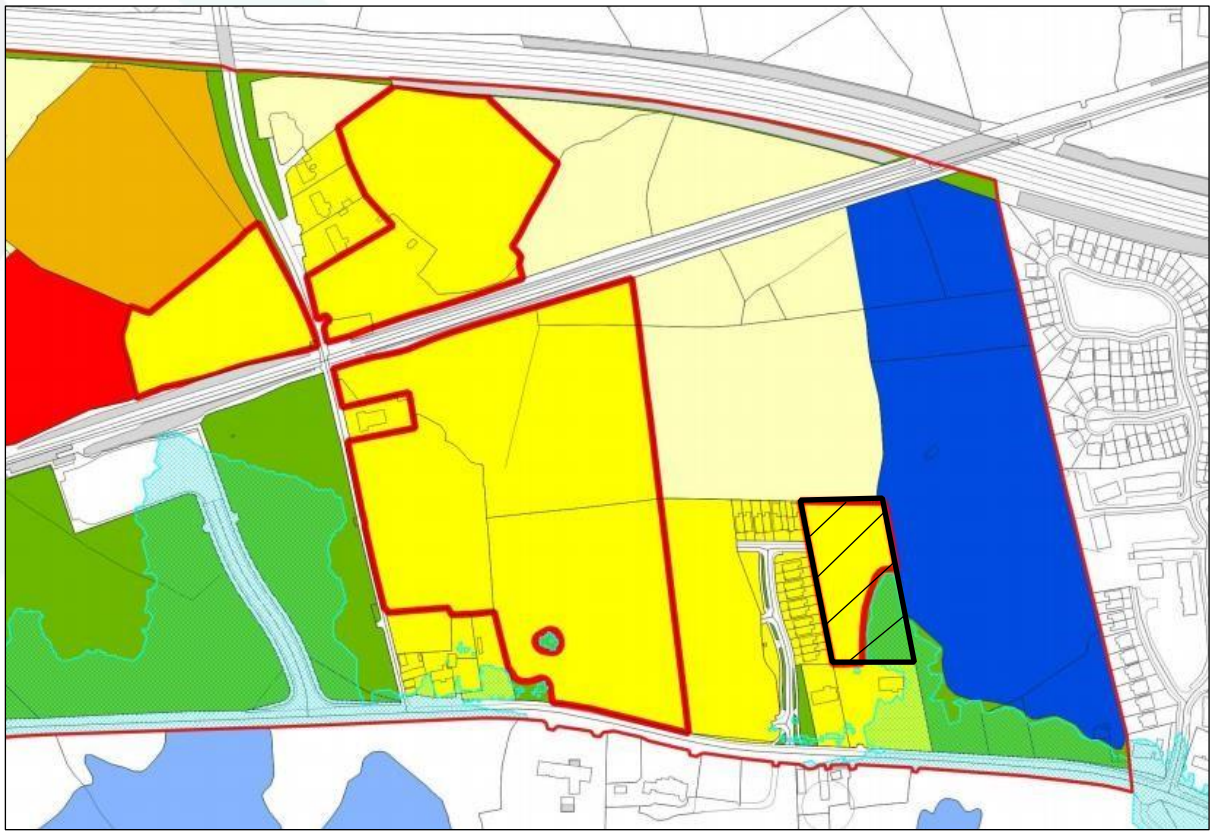


Figure 1 - Subject Lands

We note that the subject lands are predominantly zoned 'Residential (Phase 1)' with the south-eastern corner of the lands being zoned 'OS- Open Space/Recreation & Amenity'/'Constrained Land Use'. In the first instance it should be noted that our client welcomes the proposed land use zoning of 'Residential

(Phase 1)' on the subject lands and we would request that these are retained in the adopted Galway County Development Plan 2022-2028. This submission primarily pertains to the south eastern corner of the subject lands and the area zoned 'OS- Open Space/Recreation & Amenity'/'Constrained Land Use'.

We note that Objective GUFP 7 of the Framework Plan sets out the purpose of the Constrained Land Use zoning objective as follows:

'To facilitate the appropriate management and sustainable use of flood risk areas within the Garraun Urban Framework Plan.'

We understand that the 'OS- Open Space/Recreation & Amenity' zoning is linked to the 'Constrained Land Use' i.e. the Draft Strategic Flood Risk Assessment indicates that these lands may be at risk of flooding and the OS zoning is utilised to ensure that no inappropriate development may occur at this location. More commentary in relation to the matter of flood risk is set out later in this submission and, indeed, it should be noted that a Flood Risk Assessment on the subject lands prepared by Langan Consulting Engineers Ltd, is enclosed with this submission.

We note that Objective GUFP 1 'Residential Development' of the Gurraun Framework Plan sets out the purpose of the Residential Land Use zoning objective as follows:

'Support the development of lands designated as Residential (Phase 1) within the lifetime of the County Development Plan, subject to normal planning, access and servicing requirements.

The Planning Authority's strategic vision of the Gurraun Framework Plan as a flagship neighbourhood which sets new standards in sustainable contemporary living, and with excellent access to public transport is noted. The importance of delivering an orderly and sustainable development of a high quality, contemporary and compact new public transport focused settlement is a key concept for the Plan Area. The creation of this sustainable and walkable neighbourhood with appropriate residential densities is contingent on providing an appropriate quantum and format of residentially zoned lands. Indeed, the provision of viable and developable sites to deliver the vision is fundamental to achieving the overall strategy goal for the Framework Area.

The subject lands extend to approximately 0.8 Hectares with the south-eastern corner (constrained land use) comprising approximately 0.175 Hectares. This results in a developable area, omitting the area zoned 'OS- Open Space' of approximately 0.675 Ha. The Planning Authority will be aware, based on the topographic analysis in the Framework Plan, that the subject site slopes from north to south. In addition to this the site is relatively constrained simply on the basis of the existing buildings which surround it and the adjoining land use zoning objectives on the undeveloped lands which abut it. There is an existing residential housing estate located immediately adjacent to the western boundary of the site while there are 2 no. existing residential dwellings abutting the southern boundary. The lands to the north are zoned Residential (Phase 2) while the lands to the east are zoned 'CF – Community Facilities'. The Planning Authority will note that neither of these adjoining zoning objectives will facilitate Residential (Phase 1) development i.e., the provision of residential units during the lifetime of the upcoming Development Plan (2022-2028). On the basis of the matters outlined above it is considered reasonable to conclude that the subject lands are significantly constrained based on site area, shape, topography and adjoining buildings/structures and proposed land use zonings.

These constraints may serve to hinder the development potential of the subject lands particularly in the context of delivering new residential development in accordance with the strategic goals outlined in the Gurraun Framework Plan. In the interest of proper planning and sustainable development it therefore becomes necessary to consider how the development potential of the subject lands might be enhanced. One such solution would be to provide an additional area of 'Residential (Phase 1)' in

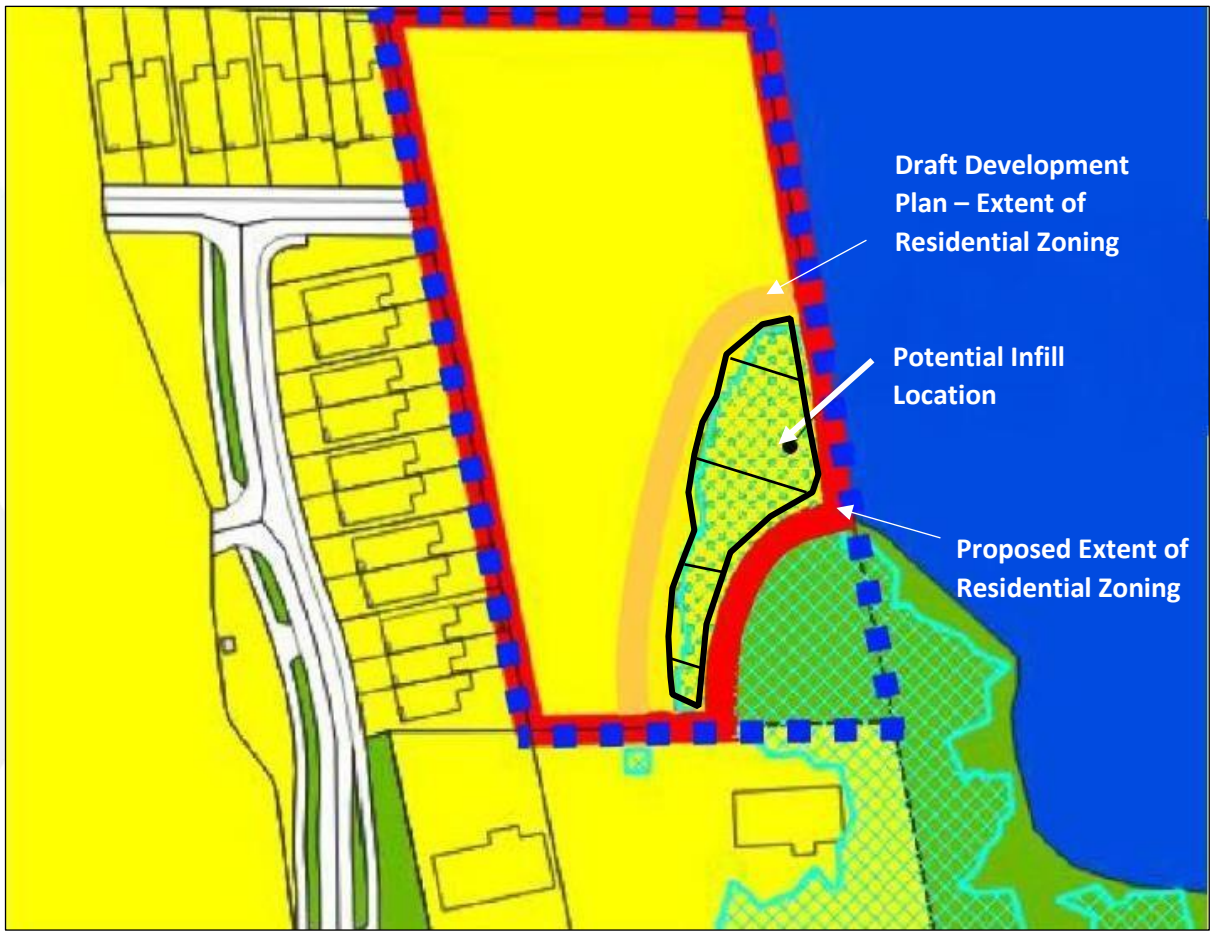


Figure 2- Proposed Zoning Line (Extract from Enclosed Flood Risk Assessment)

The provision of a relatively small additional area of 'Residential Phase 1' zoning would result in a significant enhancement of the development potential of the subject lands. This additional extent is denoted by the red line in Figure 2 above and forms the basis of the enclosed Flood Risk Assessment.

The primary source of flood risk at this location arises from extreme coastal flood event scenarios. Unlike fluvial (river) flooding, coastal flood extents in large ocean bays are unaffected by loss of flood storage arising from minor infilling of lands to achieve safe design levels for development projects. For example, in the event that the landowner undertook some minor infilling in the south-eastern corner of the site (within area hatched black in Figure 2 above) using material form the northern end of the site an assessment could be made on the potential loss of flood storage arising. The area hatched in black would require to be filled with approximately 600mm of material to bring it into Flood Risk Zone C (to a level at which residential development would be appropriate/acceptable). This level of fill equates to a volume of material of approximately 432 sq.m. The resultant impact on water/flood levels in Galway

lieu of a portion of the 'OS- Open Space/Recreation & Amenity'/'Constrained Land Use (CLU)' zoning. The rationale for the OS/CLU land use zoning objective is noted and understood. However, as per OPW Guidance and the principles of the Flood Risk Management Guidelines 2009 it may be possible to zone lands for residential development which may have a degree of flood risk associated with them provided that certain criteria can be met and the principles of the 'Justification Test' are considered.

Bay would be 0.0013mm. It can be concluded that this impact would be negligible and would not in any way cause or exacerbate flood risk elsewhere.

A key element of the development management justification test that the Planning Authority would need to undertake in the event that a planning application was submitted on the subject lands in due course, would be whether the proposed development would cause/exacerbate flood risk elsewhere. Based on the example outlined above it is considered reasonable to conclude that there would be a negligible impact in terms of flood risk. We would refer the Planning Authority to Sections 1.4 and 1.5 of the enclosed Flood Risk Assessment for more detailed information in respect of this matter.

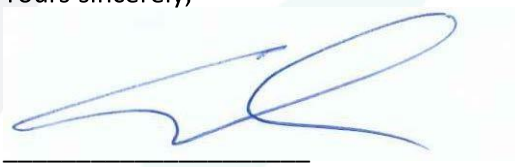
As outlined above it is considered that a relatively small degree of infilling on the subject lands would not contravene OPW Guidance or the principles of the Flood Risk Management Guidelines 2009. The provision of an additional area of 'Residential (Phase 1)' zoning as per Figure 2 above would assist in creating a large and more viable are of land for the purposes of progressing a residential development in in line with the aspirations of the Garraun Urban Framework Plan.

On behalf of our client, and on the basis of the above, we would respectfully request that the 'Residential (Phase 1)' land use zoning is extended on the subject lands as per Figure 2 above in lieu of an area of the 'OS- Open Space/Recreation & Amenity'/'Constrained Land Use' zoning.

We trust that the information set out above, in conjunction with the enclosed Flood Risk Assessment, will be given due consideration in the preparation of the Galway County Development Plan 2022-2028.

Should you require any further information in respect of this matter please do not hesitate to get in touch with this office.

Yours sincerely,



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Encl.

LANGAN

CONSULTING ENGINEERS

FLOOD RISK ASSESSMENT

SUBMISSION REGARDING GCC COUNTY DEVELOPMENT PLAN 2022-2028 FOR DEVELOPMENT LANDS AT GARRAUN SOUTH, ORANMORE, CO. GALWAY

MARTINA GUINNANE, [redacted] C/O MKO IRELAND

21097-RP-2301-FL01 | JULY 2021

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QUALITY CHECK SHEET

DOCUMENT TITLE: FLOOD RISK ASSESSMENT

PROJECT TITLE: SUBMISSION REGARDING GCC COUNTY DEVELOPMENT PLAN 2022-2028 FOR DEVELOPMENT LANDS AT GARRAUN SOUTH, ORANMORE, CO. GALWAY

CLIENT: MARTINA GUINNANE, [redacted] C/O MKO IRELAND

DOCUMENT REF: 21097-RP-2301-FL01

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-	Internal draft	26th July 2021	MOH	TMcH	James Langan BE CEng MIEI
DR01	Draft Issue	29th July 2021	MOH	TMcH	James Langan
DR02	Draft Issue	30th July 2021	MOH	TMcH	James Langan
FL01	Final Issue	30th July 2021	PC	TMcH	James Langan

AUTHOR, CHECKER AND APPROVER DETAILS

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1 EXECUTIVE SUMMARY

1.1 CONTEXT

Galway County Council (GCC) has published a draft County Development Plan 2022-2028 for public consultation. GCC has invited any interested parties to make submissions or observations regarding the draft Development Plan. MKO Ireland Ltd is preparing a submission on behalf of Martina Guinnane, [redacted]

[redacted] for her lands at Garraun, Oranmore, Co. Galway. Lands owned are outlined in a dashed blue line in Figure 1.1 below.

The majority of the development landholding is designated for Residential Phase 1 Land Use. A portion of the subject development landholding has been designated as 'Constrained Land Use' in the draft County Development Plan 2022-2028 (see Figure 1.1). The 'Constrained Land Use is classified as Flood Zone A/B as per the OPW CFRAM coastal flood mapping and development plan Strategic Flood Risk Assessment.

Langan Consulting Engineers (LCE) is appointed to carry out a site-specific Flood Risk Assessment (FRA) to support/ justify a submission to amend the land use zoning at the subject development lands. This assessment is based on the principles of the Office of Public Works (OPW) "Planning System and Flood Risk Management Guidelines" as published in November 2009 by the Department of the Environment, Heritage and Local Government.[1].

Figure 1.1 Extract from the draft GCC County Development Plan - Proposed Land-Use Zoning Garraun[2]

[1] "Planning System and Flood Risk Management Guidelines" published in November 2009 by the Department of the Environment, Heritage and Local Government, including the Technical Appendices.

[2] Draft Galway County Development Plan 2022-2028, Galway Metropolitan Area, Garraun, Land Use Zoning Map

1.2 LAND-USE ZONING AMENDMENT

In order to ensure the development viability of the landholding a minor amendment to the proposed Residential Phase 1 boundary is required. This minor amendment has major impacts on the viability of residential site layouts, access road circulation and housing positioning. The proposed landowner amended Residential Phase 1 boundary is outline in Figure 1.2 below. This proposed amendment will result in a portion of the Residential Phase 1 lands being located within the 'Constrained Land Use' extents. As per the OPW Guidance, the zoning of lands within the 'Constrained Land Use' as Residential Phase 1 is acceptable subject to a Justification Test and site-specific Flood Risk Assessment. This process has been implemented on a number of site across the proposed GCC County Development Plan 2022-2028.

An assessment of flood risk and a proposed mitigation of this risk is outlined below. The mitigation proposed will have negligible impact on flood risk in the surrounding area. In addition to this proposal, a preliminary Justification Test is outlined to support the use of these lands for Residential Phase 1 development.

Figure 1.2 Landowner Proposed Amended Land-Use Zoning Garraun

1.3 ASSESSMENT AND MITIGATION OF FLOOD RISK AS PER OPW GUIDANCE

The primary source of flood risk at the development lands is from extreme coastal flooding. The flood extent shown on the CFRAM mapping has been reviewed and confirmed as broadly accurate based on the site topographic information.

Unlike fluvial (river) flooding, coastal flood extents in large ocean bays is unaffected by loss of storage due to minor infilling. To mitigate flood risk on the portion of lands within Flood Zone A/B, the landowner proposes to carry out minor infilling works to bring the existing lands above the Flood Zone A/B level. The infilling proposed will be using existing site materials from the south-eastern corner of the site (i.e. within Flood Zone A/B). This reprofiling of the site will offer compensatory storage for flooding within the lands.

The volumes of infill, compensatory storage and net loss of storage are outlined in Table 1.1 below. Also included is the estimated impact of this loss of storage across the broader flood plain of Galway bay. **Table 1.1 Flood storage summary**

	Infilling in Flood Zone A/B	Compensatory Storage in Flood Zone A/B	Net Loss of Flood Storage	Impact on Flood Levels within Galway Bay
Average level (m)	0.6	0.3	432m^3	Considering Galway bay only, conservative estimates for loss of flood storage of 432m^3 would result in flood level rise of 0.0013mm. This is deemed negligible.
Average volume (m^3)	732	300		

1.4 JUSTIFICATION TEST

1.4.1 OPW GUIDANCE

As per section 5 of the 2009 “Planning System and Flood Risk Management Guidelines”1,

“where a planning authority is considering proposals for development in areas at a high or moderate risk of flooding that include types of development that are vulnerable to flooding and that would generally be inappropriate, the planning authority must be satisfied that the development satisfies all of the criteria of the Justification Test as it applies to development management outlined in Box 5.1 below.”

In order to support the planning authority in review of this proposal, a Justification Test, as per Box 5.1 of the guidelines (see Figure 1.3) has been completed.

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

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.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Figure 1.3 Justification Test as per Box 5.1[1]

1.4.2 JUSTIFICATION TEST: DEVELOPMENT PLAN ZONING (BOX 5.1, POINT 1)

Residential development on the subject lands is accepted in principle. The planning related justification is addressed in full by MKO Ireland in their submission report.

1.4.3 WILL NOT INCREASE FLOOD RISK ELSEWHERE (BOX 5.1, POINT 2 (I))

Minor infilling is proposed within the development lands. It is not expected that development will increase flood risk elsewhere. This is confirmed through an assessment of topography and calculation of infilling, compensatory flood storage and the impact on loss of storage as outlined in Section 1.3 above.

1.4.4 THE DEVELOPMENT TO INCLUDE METHODS TO MINIMISE FLOOD RISK (BOX 5.1, POINT 2 (II))

Any development will include the following measures to remove or reduce the risk of flooding:

- All dwellings and access/ egress will be provided at or greater than the estimated design flood level
- The site drainage system for a development on the subject lands should include appropriate stormwater attenuation prior to discharge during extreme events.
- A development here will have negligible impact on the current flood risk and will not increase the existing risk of flooding elsewhere.

1.4.5 MANAGE RESIDUAL RISKS (BOX 5.1, POINT 2 (III))

The following are key components in the management of residual risk for this area:

- All dwellings and access/ egress is provided at or greater than the estimated design flood level
- Emergency access from all dwellings to be safe guarded through the site layout configuration
- The site drainage system for a development on the subject lands should include appropriate stormwater attenuation prior to discharge during extreme events
- Existing drains, culverts, gullies and drainage systems should be maintained

1.4.6 MEETS WIDER PLANNING OBJECTIVES (BOX 5.1, POINT 2 (IV))

Residential development on the subject lands is accepted in principle. The planning related justification is addressed in fully by MKO Ireland in their submission report.

1.4.7 ACCEPTANCE OF RESIDUAL RISK

The measures proposed to reduce/ remove flood risk and to manage any residual risk are outlined above. These measures should be considered for any future proposed development in these lands.

1.4.8 MAJOR DEVELOPMENT (GUIDELINES SECTION 5.27)

As per the requirements of section 5.27 of the 2009 OPW flood guidelines, this document includes an appropriate FRA and a Justification Test as it applies to development. This FRA follows the principals of the sequential approach.

1.4.9 JUSTIFICATION TEST CONCLUSION

The proposed development of a small portion the subject landholding classified as Flood Zone A and Flood Zone B is deemed acceptable based on satisfying the requirements of the Justification Test as outlined in the OPW “Planning System and Flood Risk Management Guidelines”.

1.5 CONCLUSION

The primary source of flood risk in this area is from extreme tidal flood events. There is no record of any significant flood history within the extents of the proposed development boundaries by a statutory body.

The subject landholding has been zoned based on the OPW “Planning System and Flood Risk Management Guidelines”. The majority of the subject landholding is located in Flood Zone C. Under the OPW Planning System and Flood Risk Management Guidelines published in November 2009, highly vulnerable development, such as dwelling houses would generally be considered appropriate in Flood Zone C.

A small portion of the subject landholding is located within Flood Zone A and B. To mitigate flood risk on the portion of lands within Flood Zone A/B, the landowner proposes to carry out minor infilling works to bring the existing lands above the Flood Zone A/B level. The infilling proposed will be using existing site materials from the south-eastern corner of the site (i.e. within Flood Zone A/B). This reprofiling of the site will offer compensatory storage for flooding within the lands.

Considering Galway bay as the flood plain only, conservative estimates for loss of flood storage of 432m^3 would result in flood level rise of 0.0013mm. This is deemed negligible. Based on this finding, the impact of any development on flooding elsewhere is considered negligible.

In order to confirm the appropriateness of this portion for development, a Justification Test is included within this Flood Risk Assessment. The proposed development of a small portion the subject landholding classified as Flood Zone A and Flood Zone B is deemed acceptable based on satisfying the requirements of the Justification Test as outlined in the OPW “Planning System and Flood Risk Management Guidelines”.

1.6 RECOMMENDATIONS

An estimated design flood level for any development, including a freeboard factor to account for a margin of safety, climate change and model uncertainty should be established. All buildings and infrastructure should be designed based on the estimated flood levels.

All site surface water management design should consider the impact of any discharge on flooding elsewhere. The final stormwater system should be designed by appropriately qualified and experienced personnel and include SuDS measures.

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2 PROJECT DETAILS

2.1 INTRODUCTION

Galway County Council (GCC) has published a draft County Development Plan 2022-2028 for public consultation. GCC has invite any interested parties to make submissions or observations regarding the Draft Galway County Development Plan 2022-2028.

MKO Ireland Ltd is preparing a submission on behalf of Martina Guinnane, [redacted] for her lands at Garraun as shown in Figure 2.1. Langan Consulting Engineers (LCE) is appointed to carry out a site-specific Flood Risk Assessment (FRA) to support/ justify a submission to amend the land use zoning at the subject development lands.

This FRA comprised of:

- a desk study;
- a site visit;
- an assessment of historical flooding in the area;
- an assessment of the impact of the development on flooding in the area; and
- a detailed assessment based on the Office of Public Works (OPW) "Planning System and Flood Risk Management Guidelines" as published in November 2009 by the Department of the Environment, Heritage and Local Government

The location of the proposed development is shown in Figure 2.1. and Figure 2.2 below. The locations ITM co-ordinates are 537440, 725351

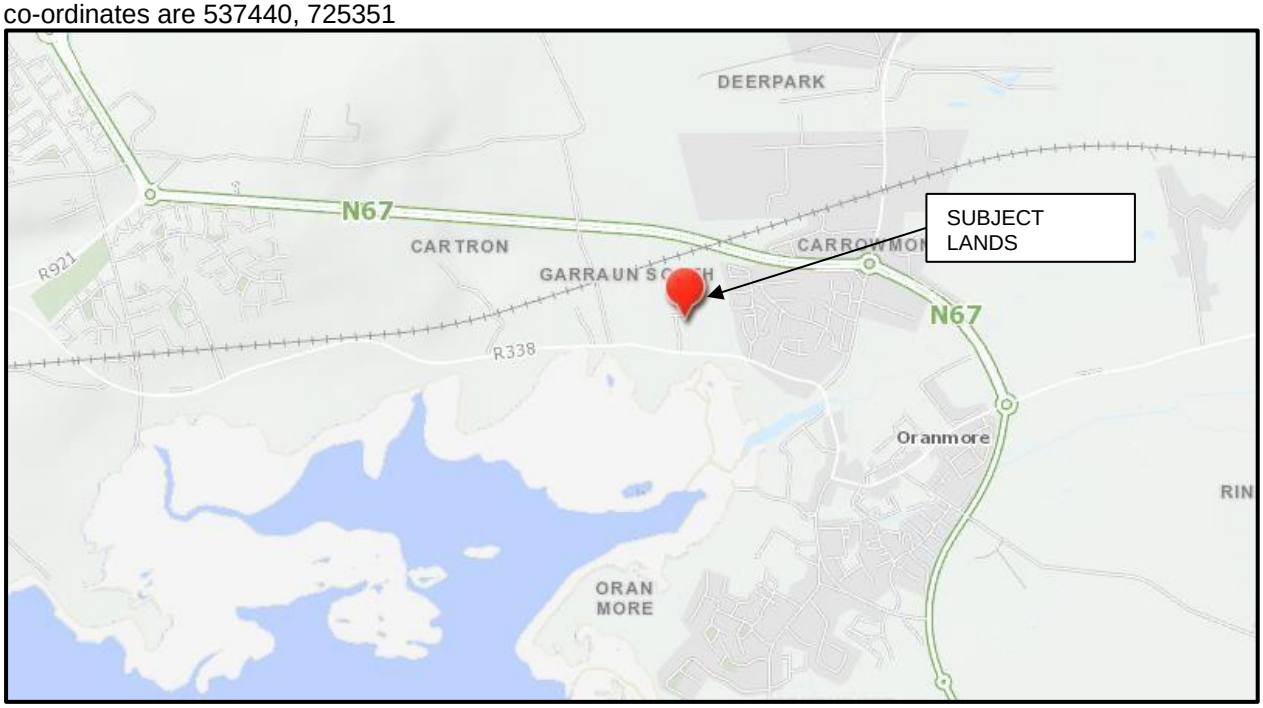

Figure 2.1 Location of the subject lands

Figure 2.2 Location of the proposed development lands

2.2 SITE VISIT AND SURVEY

The proposed development lands were visited on the 14th July 2021. A topographical survey of hydraulic features in the vicinity of the site was carried out by LCE. The survey is relative to Irish Transverse Mercator (ITM) and Ordnance Datum Malin Head [Geoid: OSGM02]. It is assumed the survey is relative to Irish Transverse Mercator (ITM) and Ordnance Datum Malin Head [Geoid: OSGM02]. All levels referred to in this report are relative to Ordnance Datum Malin Head (mOD) [Geoid: OSGM02].

2.3 ASSUMPTIONS

This report is based on the following assumptions:

- All development information is based on a data provided by Client.
- It is assumed all 3rd party information is current and accurate.
- Prediction of future flood levels is based on available historical records.
- The impact climate change will have on future trends is accounted for, however there remains a residual uncertainty in the prediction of the impact of climate change on flooding.
- The findings are subject to adequate design and maintenance of drainage networks and flood defences.
- It is assumed that CFRAM Ordnance Datum levels are provided based on the OSGM02 Geoid.

2.4 ABBREVIATIONS AND DEFINITIONS

2.4.1 ABBREVIATIONS

AFA	Area for Further Assessment
CFRAM	Catchment Flood Risk Assessment and Management
CIRIA	Construction Industry Research and Information Association
EPA	Environmental Protection Agency
FRA	Flood Risk Assessment
GPS	Global Positioning System
GSI	Geological Survey of Ireland

ha	hectares
ITM	Irish Transverse Mercator
LAP	Local Area Plan
LCE	Langan Consulting Engineers Ltd
mOD	Meters Ordnance Datum (Malin, unless otherwise noted)
ICPSS	Irish Coastal Protection Strategic Study
MRFS	Mid-range Future Scenario
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems

2.4.2 KEY DEFINITIONS

Alluvium	A deposit of clay, silt, and sand left by flowing floodwater in a river valley or delta, typically producing fertile soil.

3 SITE CHARACTERISTICS[3,4][5]

3.1 SITE TOPOGRAPHY

3.1.1 EXISTING TOPOGRAPHY

The proposed development lands are a green-field site in an urban location. The north and east of the subject lands are bounded by agricultural lands. The south of the site is bounded by an existing dwelling. The west of the site is bounded by a new residential housing estate under construction.

3.2 SITE DRAINAGE CHARACTERISTICS

Oranmore Bay is located south to the subject property, this bay drains Oranmore and its hinterlands. An overview of the regional drainage network is outlined in Figure 3.1. An overview of the local drainage network is outlined in Figure 3.2.

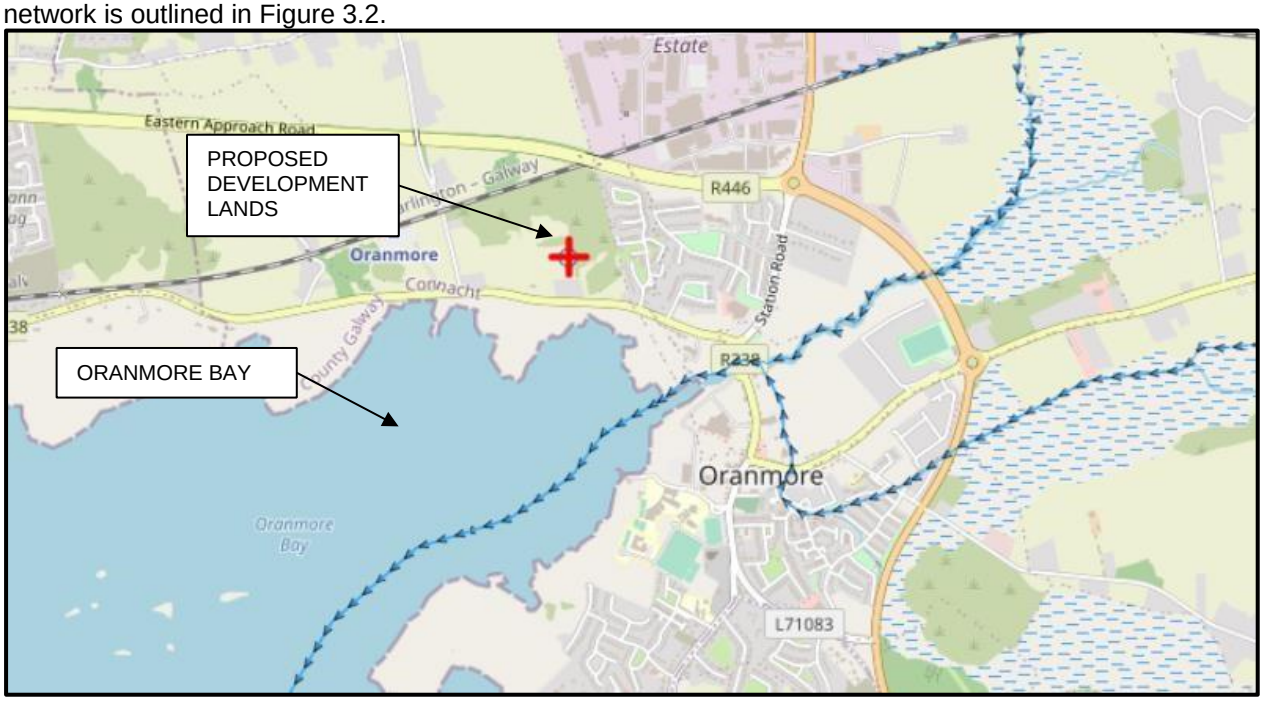

Figure 3.1 Regional drainage network overview[5]

[3] LCE topographic survey, 14th July 2021.

[4] www.gsi.ie

[5] www.epa.ie

Figure 3.2 Local drainage network overview[5]

Figure 3.3 View of Oranmore Bay from dwelling to the south of proposed development lands

3.3 GEOLOGY AND HYDROGEOLOGY[4]

The Geological Survey of Ireland (GSI) national bedrock map (1:1,000,000) shows the bedrock geology at the subject lands to be *"Till derived from limestones"*. The area is classified as a "*Regionally Important Aquifer- Karstified conduit"* (see Figure 3.4 and Figure 3.5 below).

There is a karst feature noted to the southeast of the subject lands (see Figure 3.6). There is a borehole located approximately 0.4km southeast of the proposed development lands.

GSI soil maps show soils in the vicinity of the proposed development lands are classed as *"bedrock outcrop or subcrop"* and *"till derived from limestone"* (see Figure 3.7).

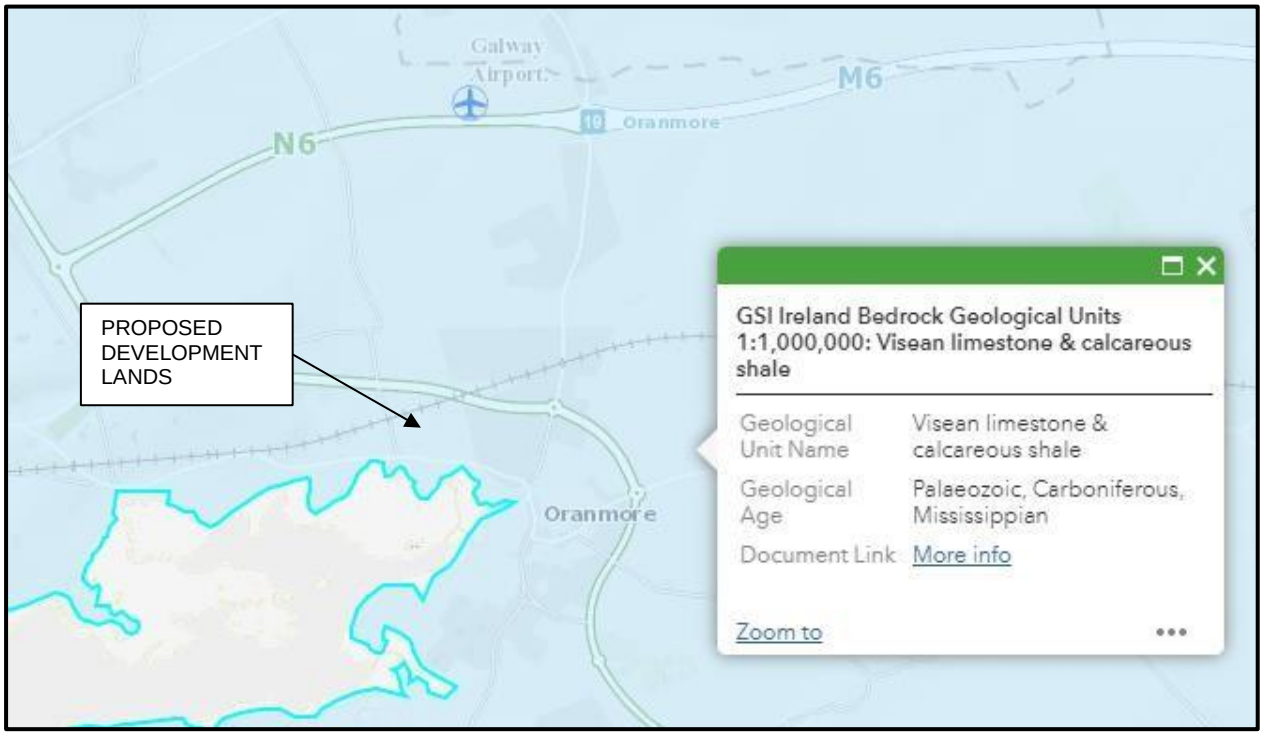

Figure 3.4 GSI bedrock mapping

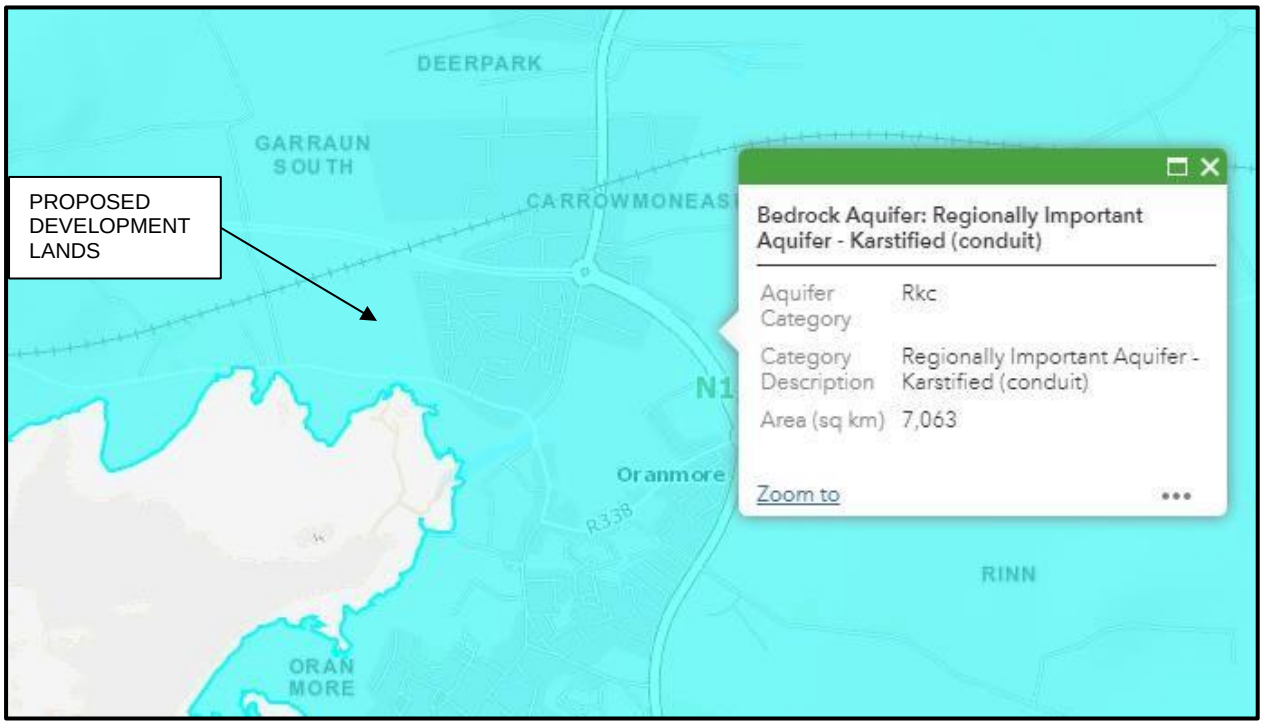

Figure 3.5 GSI groundwater aquifer mapping

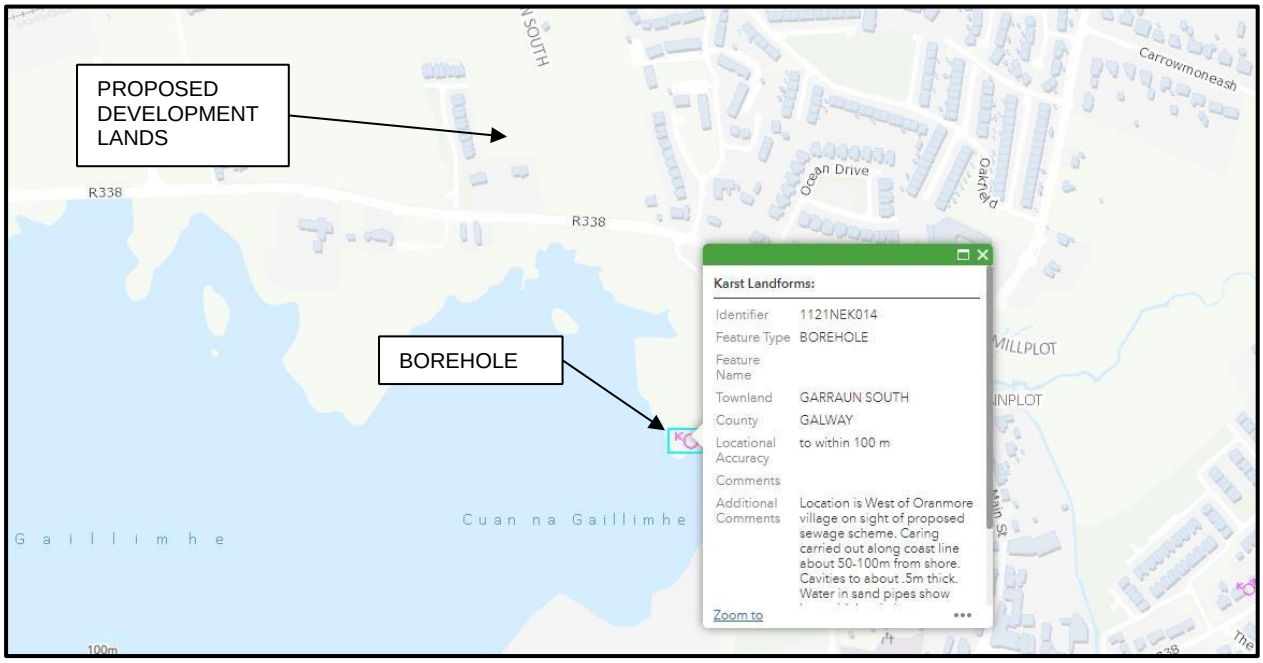

Figure 3.6 GSI karst features

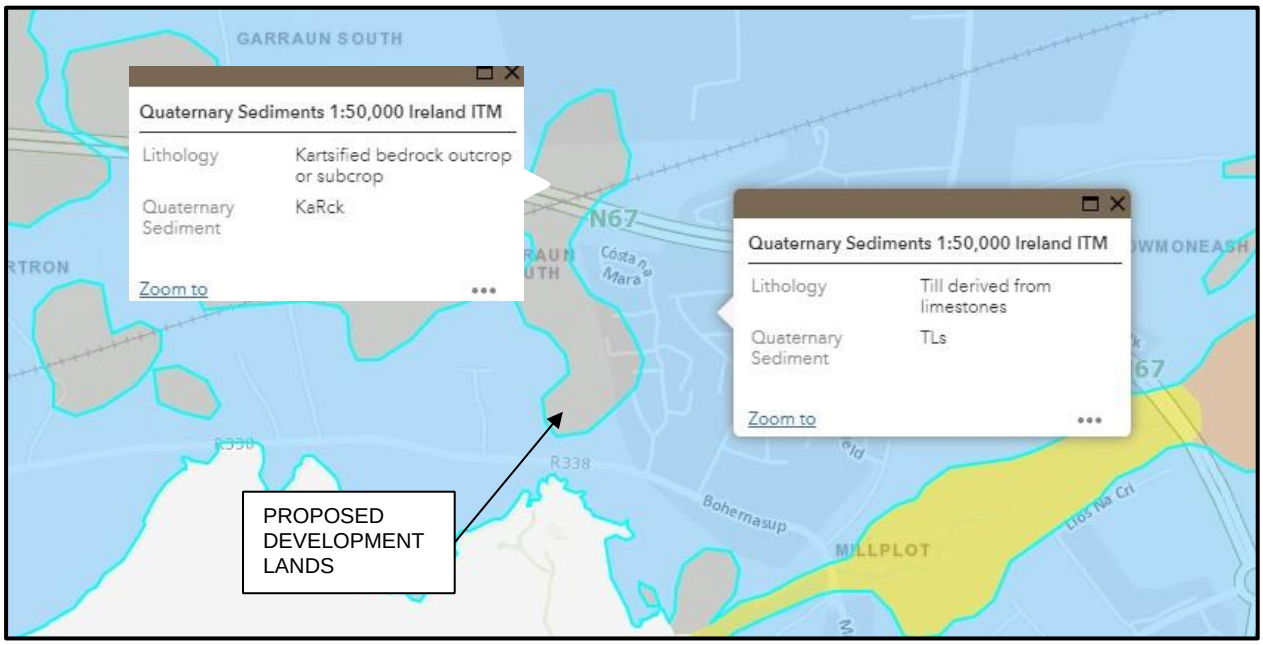

Figure 3.7 GSI soils mapping [4]

3.4 HYDROLOGY

3.4.1 HYDROLOGY

The Met Eireann average annual reference rainfall data (1981-2010) for the area is estimated as 1,266mm[6].

[6] www.met.ie

3.4.2 SURFACE HYDROLOGY

Regionally the subject lands are located within the Western River Basin District. A description of the drainage features and surface hydrology is included in section 3.2 above.

3.4.3 GROUNDWATER HYDROLOGY4

The subject lands are located within the Industrial Facility groundwater body. The flow regime is noted as "*Karstic*". The groundwater vulnerability on site is noted as *"X, High and Extreme'*. The recharge coefficient for the underlying aquifer ranges from 60% to 80%.

3.5 MARINE CHARACTERISTICS

3.5.1 GENERAL

The shoreline to the south of the subject property is located along the northeast of Oranmore bay (see Figure 3.8 below). The bay is aligned in an east-west direction with no opening exposed to the open Atlantic due to the number of headlands and islands in the bay.

The majority of the bay west of the study site is noted on the Admiralty chart of the area as partially drying out at low tides (see Figure 3.9).

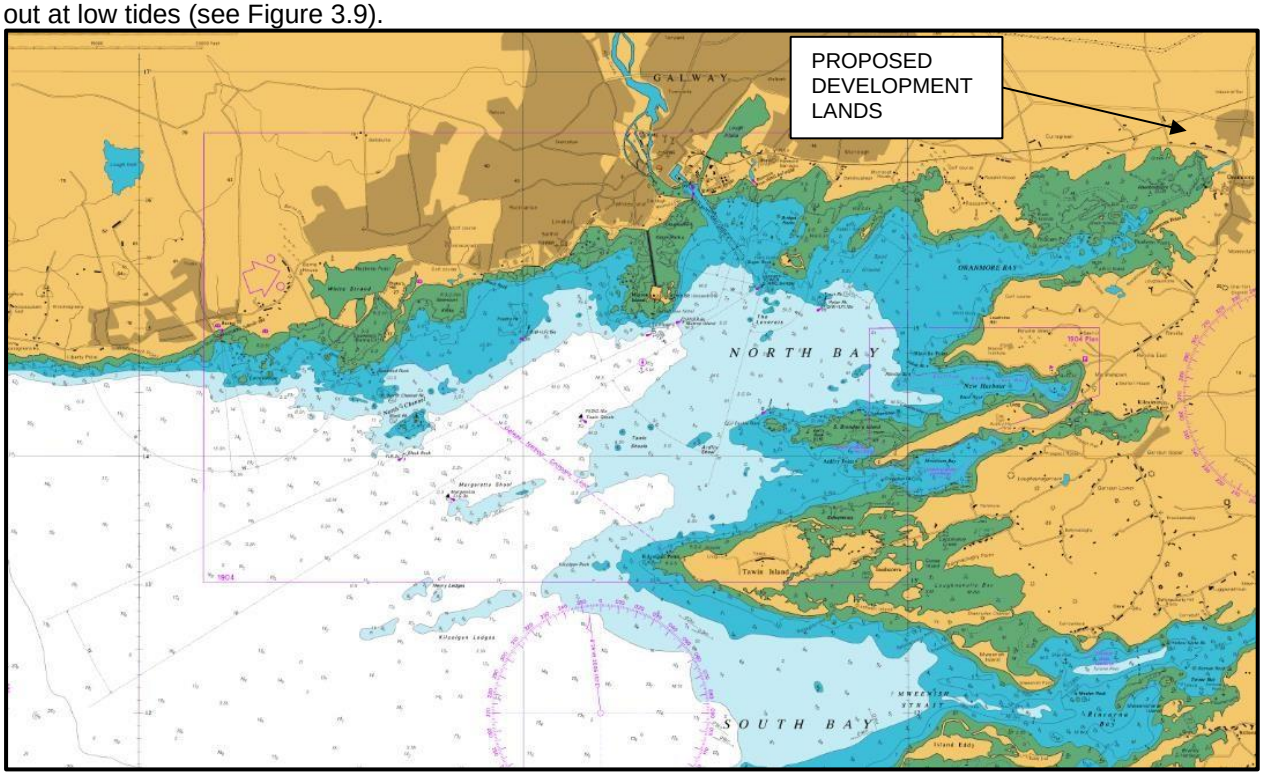

Figure 3.8 Admiralty Chart of the bay

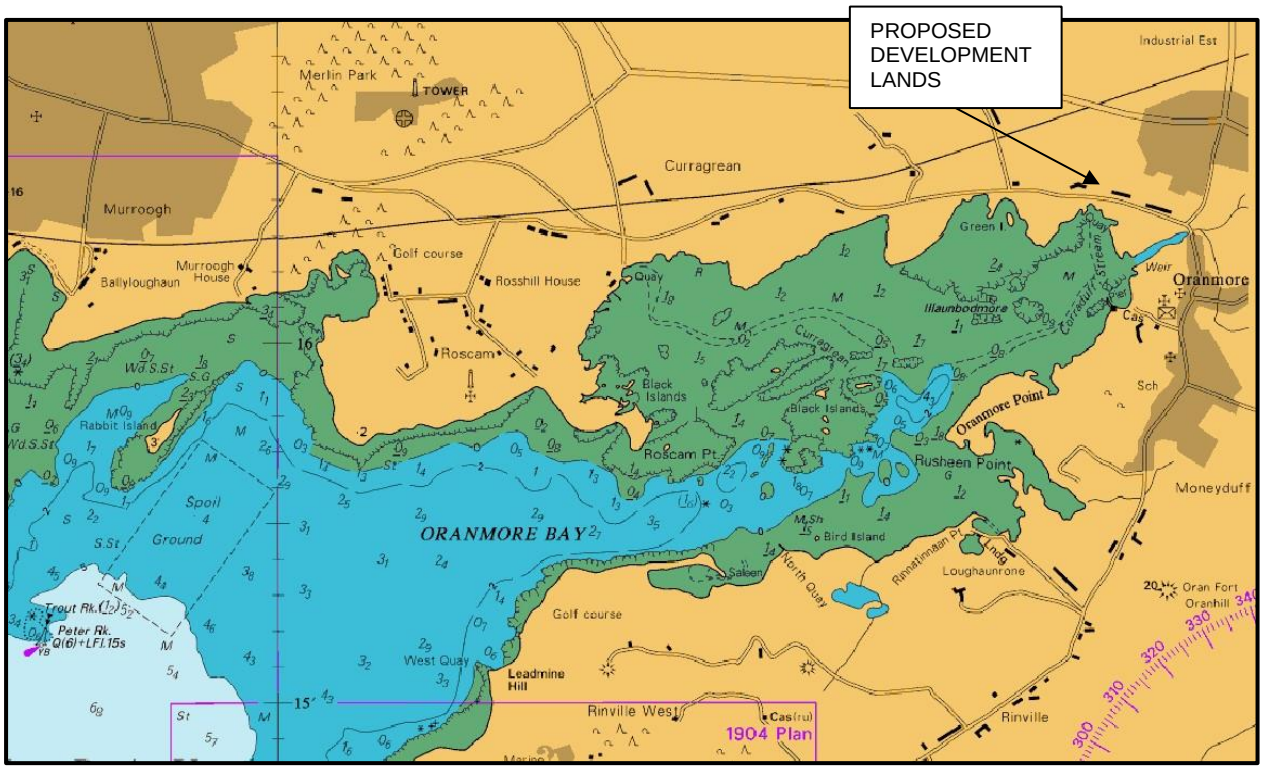

Figure 3.9 Admiralty Chart of the area at the study site

3.5.2 TIDE LEVEL

Table 3.1 below provides indicative tide levels in the area. Levels are provided in meters to Chart Datum (mCD) and Ordnance Datum Malin Head (mOD). This report references tidal levels to the Malin Head (mOD) datum. The tide levels are based on the Admiralty tide levels. Predicted tide levels vary due to environmental/atmospheric conditions. Low atmospheric pressure, wind, tide and storm surges can result in higher or lower tides than those predicted.

Table 3.1 Galway bay tide data

Tidal Elevation	Admiralty Level (m CD)	Admiralty Level (m ODM)
Highest Astronomical Tide (HAT)	+5.6	+2.7
Mean High Water Springs (MHWS)	+5.1	+2.2
Mean High Water Neaps (MHWN)	+3.9	+1
Mean Low Water Neaps (MLWN)	+2	-0.9
Mean Low Water Springs (MLWS)	+0.6	-2.3
Lowest Astronomical Tide (LAT)	+0.0 (assumed)	-2.9

3.5.3 WAVE DATA

There is no risk of wave attack at the proposed development lands due to it being protected from the open sea by the R338. Only very small, localised wind waves may occur at the site.

4 BACKGROUND INFORMATION

In order to inform the assessment of flood risk at the site, the following information sources were explored.

4.1 HISTORICAL FLOODING

4.1.1 HISTORICAL ORDNANCE SURVEY MAPPING[7]

Available historical maps were researched. The historical mapping for the proposed development lands area is shown Figure 4.1 and Figure 4.2. There is no historical reference to an area "liable to flooding" in the vicinity of the subject development site.

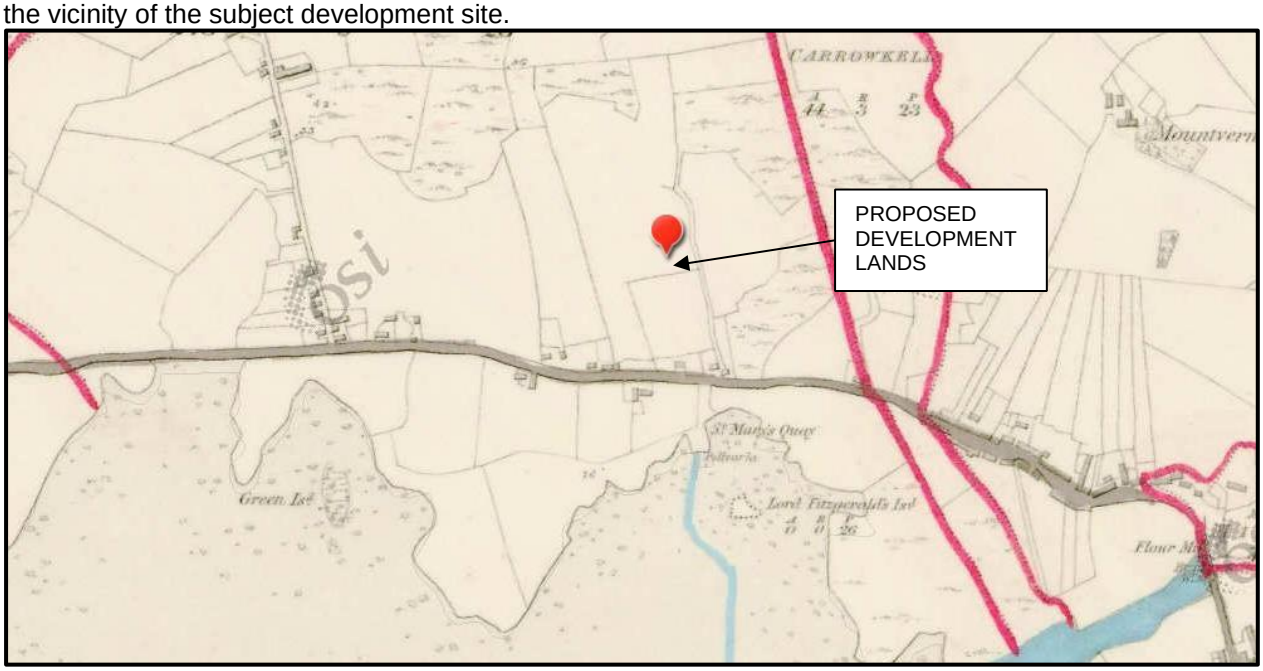

Figure 4.1 OSI historical 6 Inch colour (1837-1842)

[7] www.geohive.ie

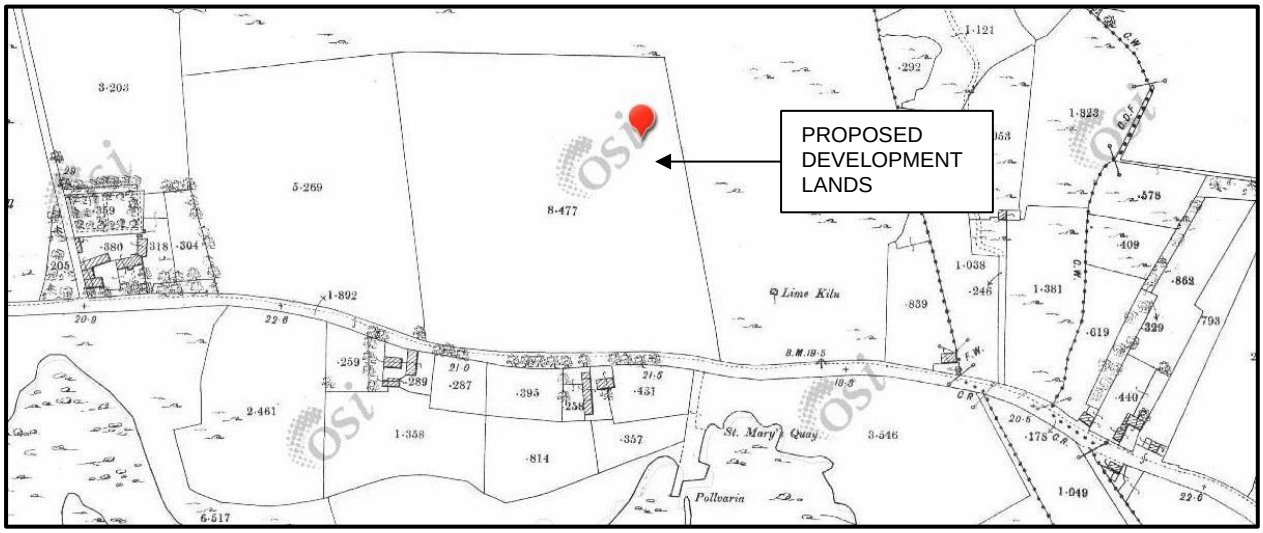

Figure 4.2 OSI historical 25-Inch first edition B&W (1888-1913)

4.1.2 PUBLIC FLOODING RECORDS

Available historical flood maps and reports on floodinfo.ie[8] were consulted. Mapping for Oranmore is shown in Figure 4.3. The following historical flood events are noted in the vicinity of the proposed development lands:

- A flood event was noted 0.4km southwest of the proposed development lands. The event is Green Island Oranmore and is noted as be recurring. Flooding here is associated with the Coastal (Doolin Point).
- The St Maty's Quay, Oranmore flood event is approximately 0.4km southeast of the proposed development lands. This flood event is noted as being recurring. Flooding here is associated with the Coastal (Doolin Point).

[8] www.floodinfo.ie

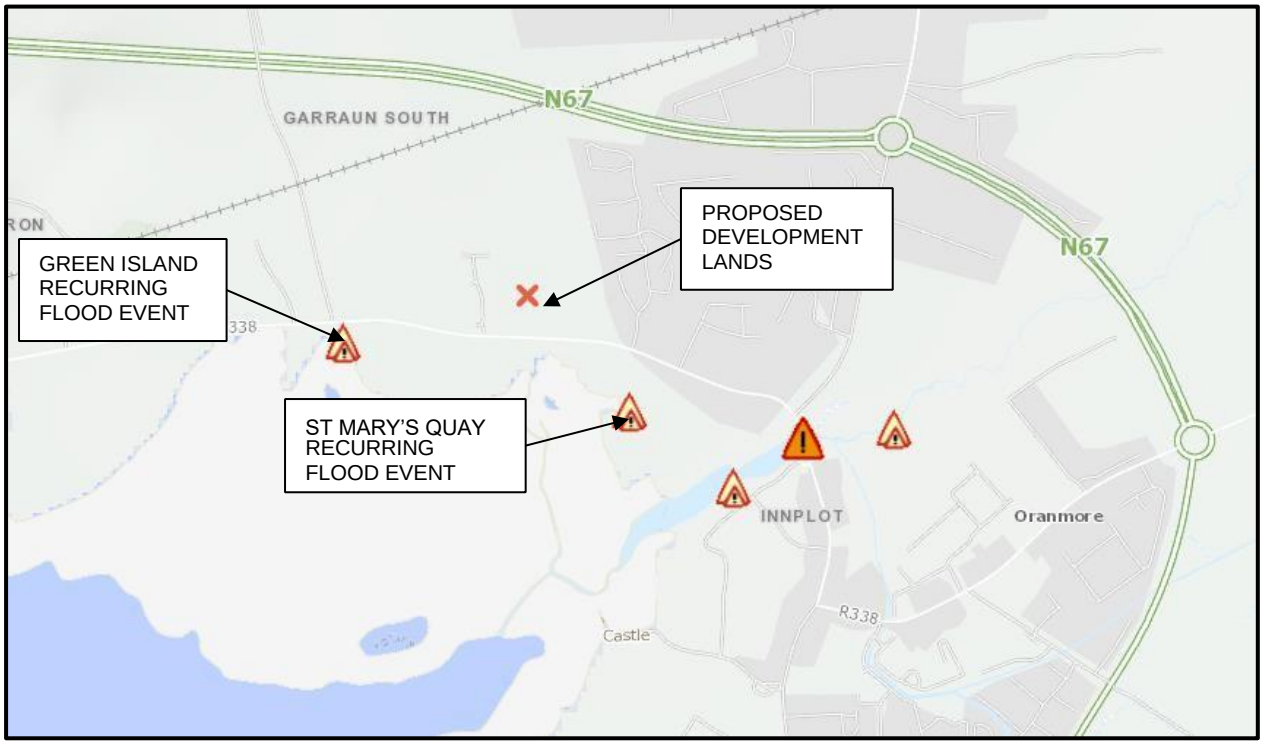

Figure 4.3 Floodinfo.ie – flood report

4.1.3 EXTREME TIDE LEVEL RECORDS

Anecdotal evidence collected by LCE in the Oranmore area indicates that the highest tide level in recent history occurred during the storm Eleanor event in 2018. Historical tide data for Galway Bay confirm a maximum tide level during storm Eleanor in January 2018 as +3.9mOD.

4.1.4 HISTORICAL FLOODING CONCLUSION

No evidence of flooding is available relating to the subject Garraun landholding, however on review of the site topography, it is possible tidal water encroached on a small portion of the southeast corner of the landholding during the January 2018 event.

4.2 OPW PFRA INDICATIVE FLOOD MAPS

The OPW Preliminary Flood Risk Assessment (PFRA) maps are the preliminary flood risk maps prepared as part of the Catchment Flood Risk Assessment and Management (CFRAM) programme. These maps highlight areas of potential flood risk.

Available 2011 CFRAM PFRA flood maps were consulted[9]. The PFRA mapping for the subject lands area is shown in **Error! Reference source not found.**.

The subject lands are located close to an area noted as flooding locally during the 1 in 200-year coastal event. However, these maps are at a very coarse resolution. A more accurate localised assessment shall be considered.

[9] OPW CFRAM data

Figure 4.4 PFRA mapping

4.3 PREDICTIVE FLOOD MAPS PRODUCED UNDER THE CFRAM STUDIES

Predictive flood extent maps have been produced by the OPW as part of the CFRAM programme. These maps highlight areas of potential flood risk, excluding and including an allowance for climate change.

The Western CFRAM study included this area of Oranmore in the AFA. CFRAM AFA maps illustrate the fluvial flood extent for the present condition under the 1 in 10, 1 in 100 and 1 in 1000-year condition. The mapping indicates there is no fluvial flood risk adjacent to the proposed development lands for the 1 in 100 and 1 in 1000-year flood events. The October 2016 CFRAM AFA mapping for the proposed development lands area is shown in Figure 4.5 below.

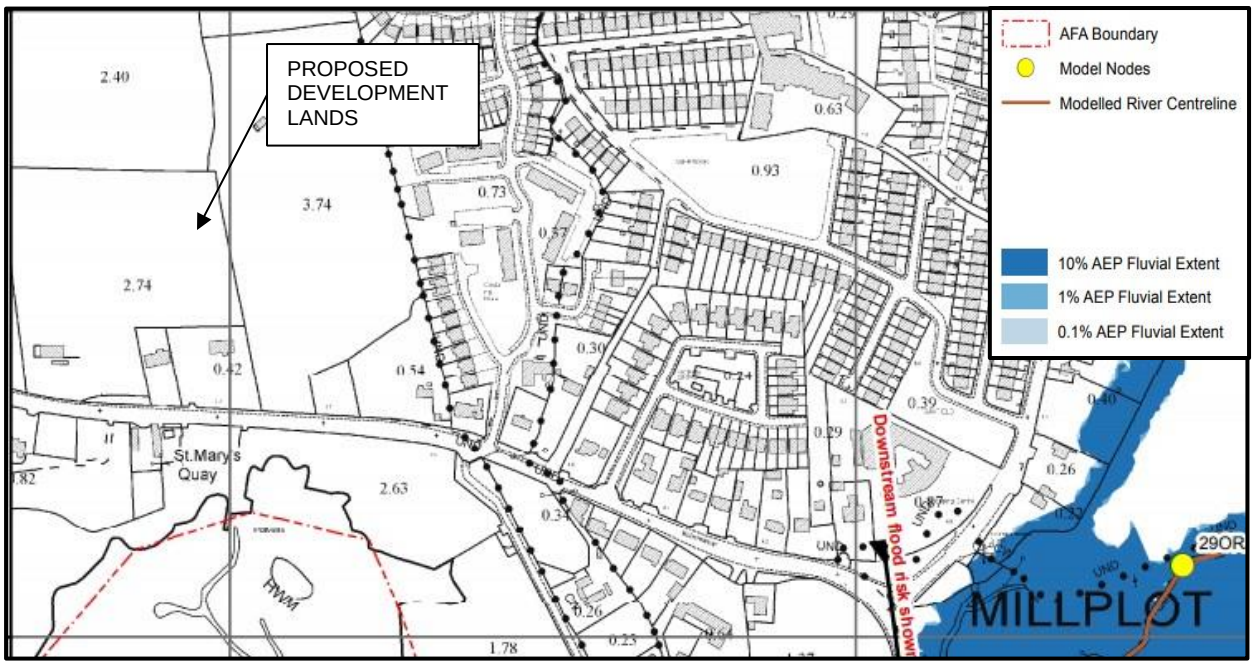

Figure 4.5 CFRAM AFA fluvial mapping

CFRAM AFA maps illustrate the tidal extent for the present-day scenario under the 1 in 10, 1 in 200 and 1 in 1000-year condition. The mapping indicates that there is some risk of flooding to the site for the 1 in 1000year conditions. The October 2016 CRFAM AFA mapping for the proposed development lands are shown in Figure 4.6 below.

Figure 4.6 CFRAM AFA coastal mapping

4.4 RIVER BASIN MANAGEMENT PLANS AND REPORTS

The RBMP for Ireland (2018-2021) was published in April 2018.[10] The RBMP does not contain any information or requirements which impact directly on this site-specific FRA. In line with the objectives of the RBMP all flood mitigation measures should be designed to consider the potential impact of possible measures on water bodies.

Where necessary, surface water run-off from the proposed development should be attenuated on-site, prior to discharge to the adjacent watercourse. This will reduce the quantity of water to be disposed of to the existing watercourses in the vicinity.

All site drainage should be designed in accordance with Sustainable Drainage systems (SuDS) principles[11].

The flood risk management plans as noted on the OPW flood information portal[12] were reviewed. The following flood risk management measures are noted in the vicinity of the proposed development lands:

- Oranmore Measures
- The development of a flood forecasting system. The development of a coastal flood forecasting system for Galway Bay, including Oranmore. To progress as part of the National Flood Forecasting Service.
- Galway Bay South East Catchment Measures

[10] River Basin Management Plan for Ireland 2018-2021, as prepared by the Department of Housing, Planning and Local Government, April 2018.

[11] CIRIA C609 Sustainable drainage systems.

[12] www.floodinfo.ie

- Maintenance of Arterial Drainage Schemes. The OPW has a statutory duty under the Arterial Drainage Act, 1945, and the Amendment of the Act, 1995, to maintain the Arterial Drainage and Flood Relief Schemes constructed by it under those Acts.
- Maintenance of Drainage Districts. The statutory duty of maintenance for 4,600 km of river channel benefiting from Drainage District Schemes rests with the relevant Local Authorities.
- Measures applicable in all areas
- Sustainable Planning and Development Management
- Sustainable Urban Drainage Systems (SuDS)
- Adaptation Planning
- Land Use Management and Natural Flood Risk Management
- Maintenance of Channels not part of a Scheme
- Flood Forecasting and Warning
- Emergency Response Planning
- Promotion of Individual and Community Resilience
- Individual Property Protection
- Flood-Related Data Collection
- Voluntary Home Relocation

The overall impact of new flood risk management measures is anticipated to be positive. Details of surface water management within the development are provided in section 5.3 of this report.

4.5 BENEFITTING LANDS MAPS

Historical data contained on maps and Local Authority records of flooding in the area. No lands in the vicinity of the proposed development lands are identified on the Arterial Drainage mapping as having benefitted by drainage works carried out historically by the OPW. The Arterial Drainage mapping for the proposed development lands are shown in Figure 4.7 below.

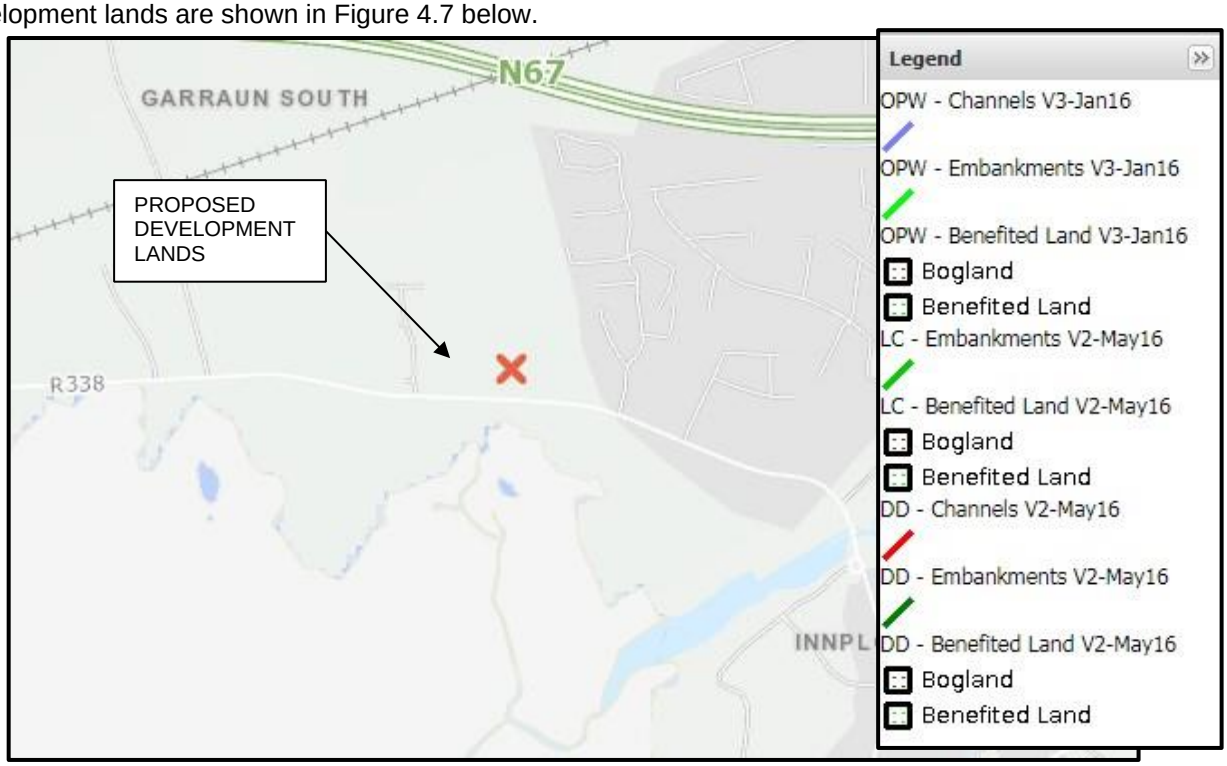

Figure 4.7 OPW benefiting lands[8]

4.6 IRISH COASTAL WAVE AND WATER LEVEL MODELLING STUDY (ICWWS) 2018

The ICWWS report presents the work undertaken and the findings of Phase 1 of the Irish Coastal Wave and Water Level Modelling Study (ICWWS) 2018. Phase 1 provides an update to the Extreme Coastal

Water Levels for the coast of Ireland, originally presented as output from the Irish Coastal Protection Strategy Study (ICPSS) undertaken between 2004 and 2013, which estimated water levels for a range of Annual Exceedance Probability (AEP) events at a series of points around the coast of Ireland.

The adoption of the Mid-Range Future Scenario (MRFS) is assumed appropriate for this scale of development, unless otherwise instructed by the relevant planning authorities.

Table 4.1 Extreme water level

Return Period	Existing Scenario (m ODM)	Mid-range Future Scenario (MRFS) (m ODM)
1:200 year	+4.06	+4.56
1:1000 year	+4.31	+4.81

4.7 STRATEGIC FLOOD RISK ASSESSMENTS

A Strategic Flood Risk Assessment (SFRA) is included in the proposed Galway County Development Plan 2022-2028. The SFRA indicates that the majority of the proposed development landholding is located in Flood Zone C. It indicates that some lands are located in Flood Zone A/B (see **Error! Reference source not found.**). The Flood Zone A/B area is based on CFRAM mapping and aligns with the Constrained Landuse outlined on the proposed land-use zone mapping.

The SFRA requires that any future planning application(s) on this area should include a site-specific flood risk assessment in accordance with “The Planning System and Flood Risk Management Guidelines for Planning Authorities, (DoECLG Nov. 2009)”.

4.8 NATIONAL, REGIONAL AND LOCAL SPATIAL PLANS

Galway County Council (GCC) has published a draft County Development Plan 2022-2028 for public consultation. A portion of the subject development landholding has been designated as ‘Constrained Land Use’ in the draft County Development Plan 2022-2028 (see Figure 4.8). The ‘Constrained Land Use is Flood Zone A/B as per the OPW CFRAM coastal flood mapping and development plan Strategic Flood Risk Assessment.

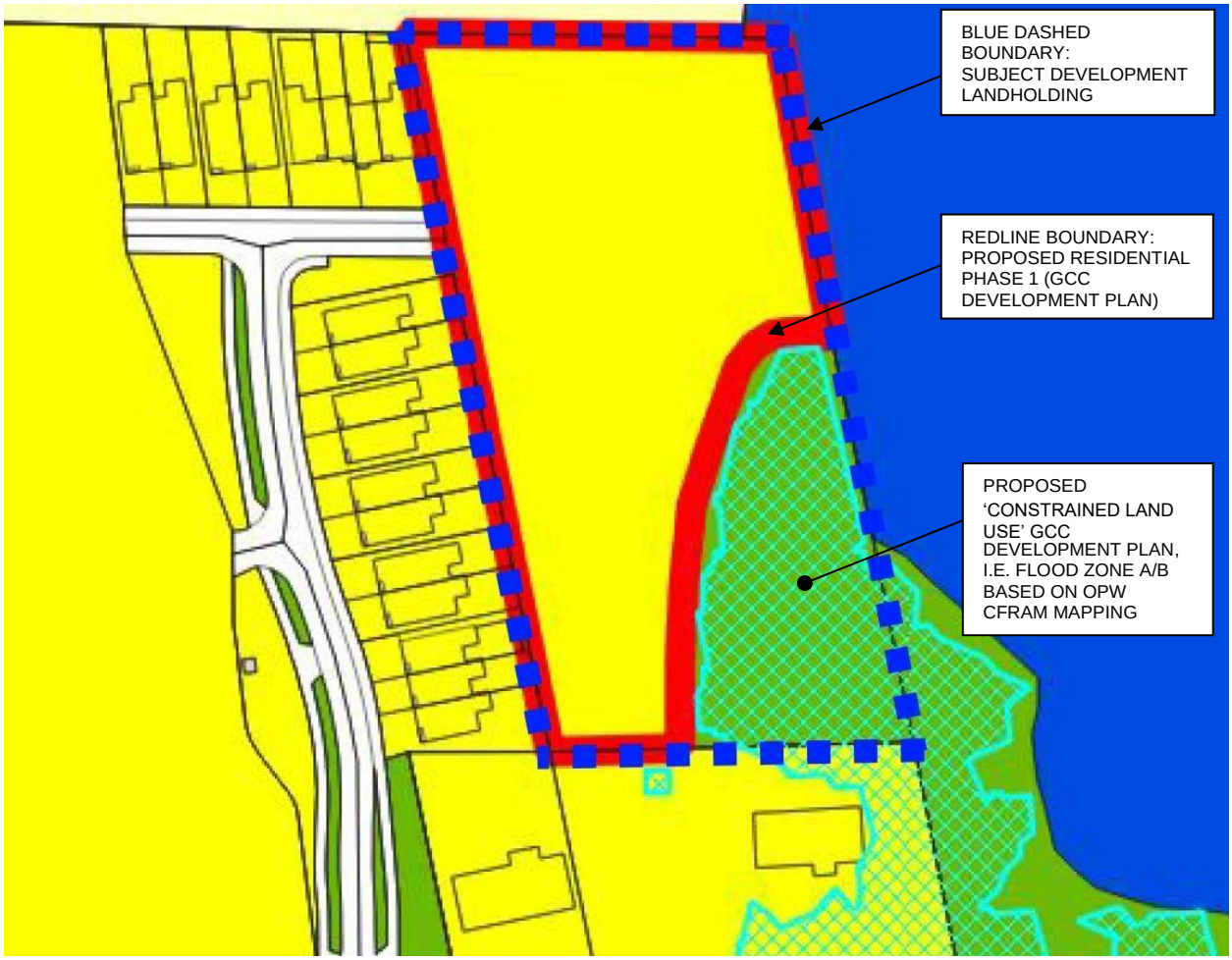

Figure 4.8 GCC Proposed Land-Use Zoning Garraun

5 FLOOD RISK ASSESSMENT

5.1 FLOOD SOURCES AT THE SITE

The predominant flood risk at the development site is from coastal flooding.

5.2 FLOOD ZONES

5.2.1 ZONE DEFINITIONS

The "Planning System and Flood Risk Management Guidelines" as published in November 2009 by the Department of the Environment, Heritage and Local Government use three different flood zones to define areas of flood risk.[1] Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined for the purposes of these guidelines:

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1 in 100year for river flooding and 1 in 200-year for coastal flooding). Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 1 in 1000year and 1 in 100-year for river flooding and between 1 in 1000-year and 200-year for coastal flooding). Less vulnerable development, such as retail, commercial and industrial uses, site used for short-let for caravans

and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone.

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 1 in 1000-year for both river and coastal flooding). Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast).

5.2.2 FLOOD ZONE LEVELS

Flood zones are defined on the basis of the 1 in 200-year and 1 in 1000-year extreme water levels from various flood sources. The results of the modelling carried out for the 2016 CFRAM and 2018 ICWWS studies in the area were analysed. These model results from the ICWWS study and a site-specific topographical survey were used to understand the flood zoning at the proposed development lands.

The approximate modelled water level for the 1 in 200-year and 1 in 1000-year return period at the subject property are provided in Table 5.1. Based on the levels in Table 5.1 and the existing site levels from topographical surveys it is confirmed that the flood zone extents are broadly in agreement with the Constrained Land-use outlines. Some interpolation was required to establish contours for flood zone extents.

The majority of the lands are located in Flood Zone C. A portion of lands are located within Flood Zone A and B.

Table 5.1 Flood zone levels

Flood Zone	Flood Probability	Level (mOD)
A	Greater than 0.5% (1 in 200-year)	Below +4.06
B	0.5% (1 in 200 year) to 0.1% (1 in 1000-year)	+4.06 to +4.31
C	Smaller than 0.1% (1 in 1000year)	Above +4.31

5.3 ASSESSMENT AND MITIGATION OF FLOOD RISK AS PER OPW GUIDANCE

The primary source of flood risk at the development lands is from extreme coastal flooding. The flood extent shown on the CFRAM mapping has been reviewed and confirmed as broadly accurate based on the site topographic information.

Unlike fluvial (river) flooding, coastal flood extents in large ocean bays is unaffected by loss of storage due to minor infilling. To mitigate flood risk on the portion of lands within Flood Zone A/B, the landowner proposes to carry out minor infilling works to bring the existing lands above the Flood Zone A/B level. The infilling proposed will be using existing site materials from the south-eastern corner of the site (i.e. within Flood Zone A/B). This reprofiling of the site will offer compensatory storage for flooding within the lands.

The volumes of infill, compensatory storage and net loss of storage are outlined in Table 5.2 below. Also included is the estimated impact of this loss of storage across the broader flood plain of Galway bay. **Table 5.2 Flood storage summary**

	Infilling in Flood Zone A/B	**Compensatory Storage in Flood Zone A/B**	**Net Loss of Flood Storage**	**Impact on Flood Levels within Galway Bay**
Average level (m)	0.6	0.3	432m^3	Considering Galway bay only, conservative estimates for loss of storage of 432m^3 would result in 0.0013mm. This is deemed negligible.
Average volume (m^3)	732	300		

5.4 IMPACT OF DEVELOPMENT ON FLOODING ELSEWHERE

Based on the findings above, it is not expected that the proposed development of these lands would have an impact on flooding elsewhere.

All site surface water management design should consider the impact of any discharge on flooding elsewhere. The final stormwater system should be designed by appropriately qualified and experienced personnel.

5.5 RESIDUAL RISK

There is a residual flood risk at the proposed development lands inherent in the design and maintenance of the adjacent drainage network. This residual risk is mitigated through freeboard; however, all findings are subject to adequate design and maintenance of drainage networks and flood defences. There remains a residual risk of flooding to the proposed development due to the management of the surrounding drainage network (i.e. cleaning of gullies, outfalls) by a 3rd party.

5.6 JUSTIFICATION TEST

As per section 5 of the 2009 "Planning System and Flood Risk Management Guidelines"1,

"where a planning authority is considering proposals for development in areas at a high or moderate risk of flooding that include types of development that are vulnerable to flooding and that would generally be inappropriate, the planning authority must be satisfied that the development satisfies all of the criteria of the Justification Test as it applies to development management outlined in Box 5.1 below."

In order to support the planning authority in review of this proposal, a Justification Test, as per Box 5.1 of the guidelines (see Figure 1.3) has been completed (see Executive Summary in Section 1).