TOBIN

Clare County Council
Inis Cealtra Visitor Centre Jetty
Flood Risk Assessment

COMHAIRLE CONTAE AN CHLÁIR
CLARE COUNTY COUNCIL

BUILT ON KNOWLEDGE

Document Control Sheet	
Document Reference	Stage 2 – Flood Risk Assessment
Client:	Clare County Council
Project Reference	10912

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
A	Draft Issue	FOC	09/10/2024	ST	15/10/2024	KD	16/10/2024
B	Final Issue	FOC	22/11/2024	ST	22/11/2024	KD	22/11/2024

Table of Contents

1. Introduction 1
1.1 Development Description 2
2. Flood Risk Management Guidance 3
2.1 The Planning System and Flood Risk Management Guidelines 3
2.2 The Flood Risk Management Climate Adaption Plan 5
2.3 Clare County Development Plan (2023 – 2029) 6
3. Initial Flood Risk Assessment 8
3.1 Past Flood Events 8
3.2 OPW Preliminary Flood Risk Assessment (PFRA) Study 9
3.3 Catchment Flood Risk Assessment and Management Study 11
3.4 OPW Drainage Districts and Arterial Drainage Schemes 12
3.5 Geological Survey Ireland Mapping 13
4. Detailed Flood Risk Assesment 15
4.1 Coastal Flooding 15
4.2 Fluvial Flooding 15
4.3 Pluvial Flooding 15
4.4 Groundwater Flooding 15
4.5 The Justification Test 16
5. Conclusions 17

List of Tables

Table 2.1: Decision Matrix for Determining the Appropriateness of a Development 3
Table 2.2: Climate Change Adaptation Allowances for Future Flood Risk Scenarios 5

List of Figures

Figure 1-1: Site Location 1
Figure 1-2: Site Layout 2
Figure 2-1: Criteria of the Justification Test 4
Figure 3-1: Past Flood Events 8
Figure 3-2: Indicative Flood Mapping [extract from PFRA Map 227] 9

Figure 3-3: PFRA Flood Extents 10
Figure 3-4: CFRAM Existing Fluvial Flood Extents 11
Figure 3-5: CFRAM MRFS Fluvial Flood Extents 12
Figure 3-6: GSI Mapping of Groundwater Flooding 13
Figure 3-7: GSI Mapping of Karst Features 14

1. INTRODUCTION

TOBIN were appointed by Clare County Council. to undertake a Flood Risk Assessment (FRA) for a proposed jetty (see Figure 1-2) at Inis Cealtra, Co. Clare. The subject site is located on Lough Derg.

The Planning System and Flood Risk Management (PSFRM) Guidelines categorise types of development into three vulnerability classes based on their sensitivity to flooding. As per Table 2.1 for the classification of vulnerability of different types of development in the PSFRM Guidelines, "jetties" are categorized as "water compatible" development and as such are considered appropriate in any Flood Zone.

The subject site is bounded and connected to Inis Cealtra to the southeast. All other directions are bound by Lough Derg.

The hydraulic feature of particular interest to the subject site is Lough Derg. The subject site is adjacent to Inis Cealtra which is an island located in lough Derg. Lough Derg is a freshwater lake that spans approximately 96km^2. Originating from its northern headwaters and extending southward before connecting to the River Shannon, which then flows into the Atlantic Ocean via the Shannon Estuary approximately 80km southwest of the subject site.

The purpose of this Stage 2 FRA report is to identify, quantify, and communicate the risks of flooding, if any, to the proposed development.

Figure 1-1: Site Location

1.1 Development Description

The proposed development comprises the construction of a Breakwater Jetty from an existing access platform on Inis Cealtra Island, Lough Derg, County Clare.

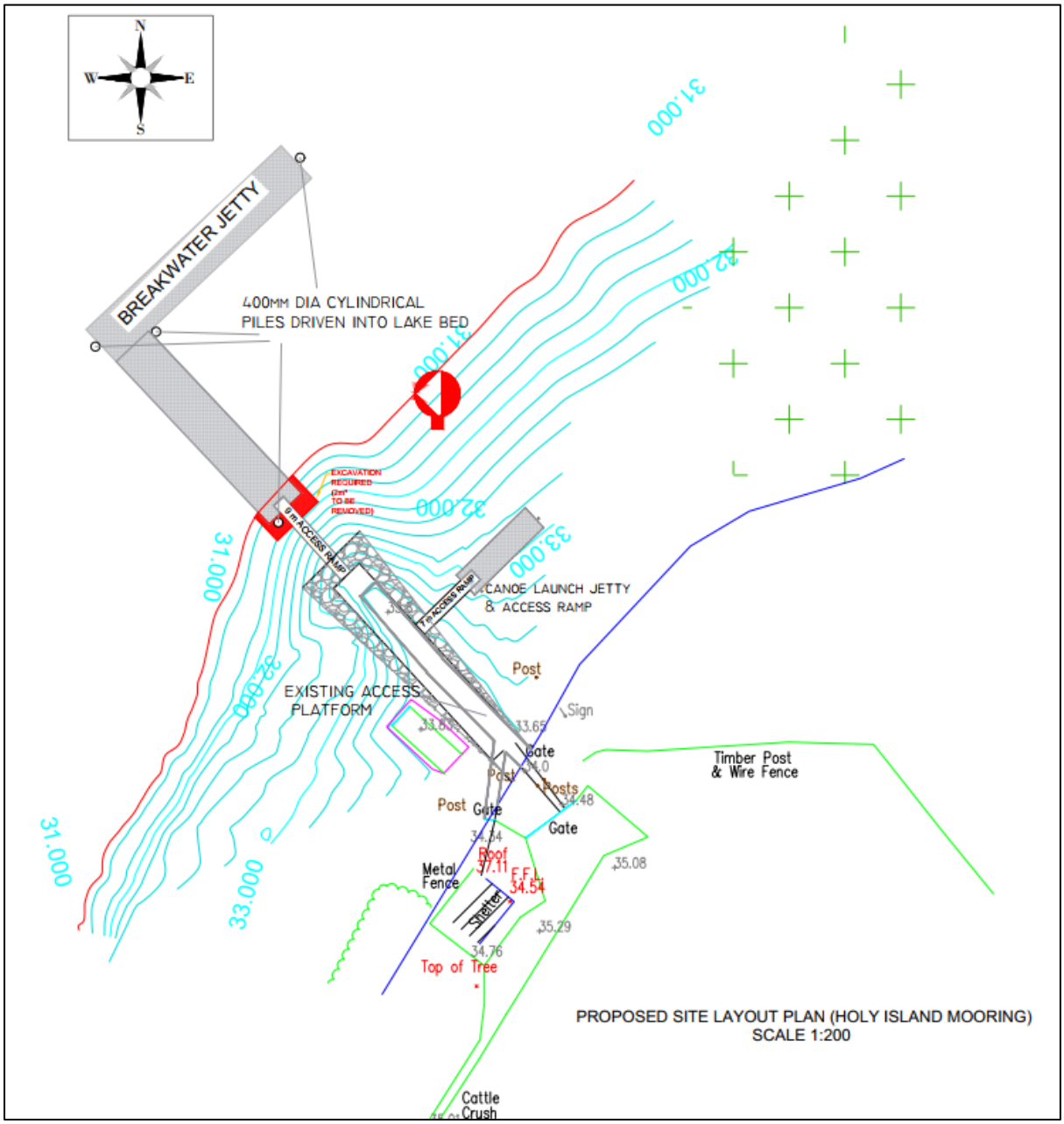

Figure 1-2: Site Layout

2. FLOOD RISK MANAGEMENT GUIDANCE

This Stage 2 Flood Risk Assessment was carried out in accordance with the following flood risk management guidance documents:

- The Planning System and Flood Risk Management Guidelines for Planning Authorities
- Flood Risk Management Climate Change Sectoral Adaptation Plan
- Clare County Development Plan (2023 – 2029)

2.1 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) were published in 2009 by the Office of Public Works (OPW) and Department of the Environment, Heritage, and Local Government (DoEHLG). Their aim is to ensure that flood risk is considered in development proposals and the assessment of planning applications.

2.1.1 Flood Zones and Vulnerability Classes

The PSFRM Guidelines discuss flood risk in terms of three flood zones (A, B, and C), which correspond to areas of high, medium, or low probability of flooding, respectively. The extents of each flood zone are based on the Annual Exceedance Probability (AEP) of various flood events.

The PSFRM Guidelines also categorise different types of development into three vulnerability classes based on their sensitivity to flooding. The guidelines classify Jetties as "water compatible" and are therefore considered appropriate in any Flood Zone.

Table 2.1 shows a decision matrix that indicates which types of development are appropriate in each flood zone and when the Justification Test (see Section 2.1.2) must be satisfied. The annual exceedance probabilities used to define each flood zone are also provided.

Table 2.1: Decision Matrix for Determining the Appropriateness of a Development

Flood Zone: (Probability)	Annual Exceedance Probability (AEP)	Highly Vulnerable	Less Vulnerable	Water Compatible
A (High)	Coastal Flooding: More frequent than 0.5% AEP Fluvial & Pluvial Flooding: More frequent than 1% AEP	Justification Test Required	Justification Test Required	Appropriate
B (Medium)	Coastal Flooding: 0.1% to 0.5% AEP Fluvial & Pluvial Flooding: 0.1% to 1% AEP	Justification Test Required	Appropriate	Appropriate
C (Low)	Fluvial, Pluvial & Coastal Flooding: Less frequent than 0.1% AEP	Appropriate	Appropriate	Appropriate

2.1.2 Justification Test

Any proposed development being considered in an inappropriate flood zone (as determined by Table 2.1) must satisfy the criteria of the Justification Test outlined in Figure 2-1(taken from the PSFRM Guidelines).

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 2-1: Criteria of the Justification Test

2.2 The Flood Risk Management Climate Adaption Plan

The Flood Risk Management Climate Change Sectoral Adaptation Plan was published in 2019 under the National Adaptation Framework and Climate Action Plan. This plan outlines the OPW's approach to climate change adaptation in terms of flood risk management.

This approach is based on a current understanding of the potential impacts of climate change on flooding and flood risk. Research has shown that climate change is likely to worsen flooding through more extreme rainfall patterns, more severe river flows, and rising mean sea levels.

To account for these changes, the Adaptation Plan presents two future flood risk scenarios to consider when assessing flood risk:

- Mid-Range Future Scenario (MRFS)
- High-End Future Scenario (HEFS)

Table 2.2 indicates the allowances that should be added to estimates of extreme rainfall depths, peak flood flows, and mean sea levels for the future scenarios.

Table 2.2: Climate Change Adaptation Allowances for Future Flood Risk Scenarios

Parameter	Mid-Range Future Scenario (MRFS)	High-End Future Scenario (HEFS)
Extreme Rainfall Depths	+ 20%	+ 30%
Peak River Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 0.5 m	+ 1 m

For the purpose of this flood risk assessment, the proposed development has been assessed against the Mid-Range Future Scenario as it represents a likely future scenario.

2.3 CLARE COUNTY DEVELOPMENT PLAN (2023 – 2029)

The current Clare County Development Plan 2023-2029 was adopted on 9th March 2023 and came into effect 20th April 2023. Chapter 2 outlines Clare County Council's strategy for Climate Action.

Section 2.8 outlines Clare County Council's approach to flood risk management and sets out the following objectives:

CDP 2.6 *Flood Risk Assessment and Management*

It is an objective of Clare County Council:

a) To ensure development proposals have regard to the requirements of the SFRA and Flood Risk Management Guidelines; and where required are supported by an appropriately detailed hydrological assessment / flood risk assessment.
b) To ensure that flood risk assessments include consideration of potential impacts of flooding arising from climate change including sea level rise and coastal erosion.
c) To integrate sustainable water management solutions, prioritising nature-based solutions (such as SUDS, nonporous surfacing and green roofs) into development proposals.
d) To include Natural Water Retention Measures (NWRMS) where appropriate in consultation with the Office of Public Works (OPW) and other relevant stakeholders.
e) To support investment in the sustainable development of capital works under the Flood Capital Investment Programme and Flood Risk Management Plans developed under the Catchment Flood Risk Assessment and Management (CFRAM) process.
f) To ensure that potential future flood information obtained/generated through the Development Management process is used to inform suitable adaptation requirements in line with the Guidelines for Planning Authorities on Flood Risk Management (DoECLG & OPW, 2009).

CDP 2.7 *Coastal Erosion and Flooding*

It is an objective of Clare County Council to:

a) To support measures (including Integrated Coastal Zone Management (ICZM)) for the management and protection of coastal resources and communities against sea level rise, coastal erosion, flooding and other threats and the implementation of adaptation responses in vulnerable areas.
b) To monitor the impact of Climate Change on the potential shock flows of surface water on to Clare's beaches during severe weather events, and how increased surface water flows will impact on bathing water quality and erosion of the beach infrastructure.

CDP 2.8 *Floods Directive and CFRAMS*

It is an objective of Clare County Council:

a) To support the implementation of the EU Floods Directive 2007/60/EC to manage flood risks.
b) To implement the recommendations of the Catchment Flood Risk Assessment and Management Study (CFRAMS) programme as it relates to County Clare and to ensure that flood risk management policies and infrastructure are progressively implemented.

CDP 2.9 *Effective Collaboration to Implement River Basin Management Plans and the Water Framework Directive*

It is an objective of Clare County Council:

a) To ensure a cross-agency collaborative approach to implementing the River Basin Management Plan.
b) To ensure effective co-ordination between the requirements of the Flood Directive and the Water Framework Directive.
c) To promote a catchment-based approach to water management to facilitate cross boundary collaboration and shared responsibility.
d) To support bottom-up community initiatives through the integrated catchment management approach.
e) To support the work of the Local Authority Waters Programme in promoting an integrated approach to catchment management.

CDP 2.10 *Flood Relief Schemes*

It is an objective of Clare County Council:

a) To Support investment in subsequent projects by capital spending agencies to deliver flood relief schemes under the National Strategic Outcome, Transition to a Low Carbon and Climate Resilient Society. Such projects should be future proofed for adaptation to consider potential impacts of climate change.
b) To require that all infrastructure and energy providers/operators provide for adaptation measures to protect strategic infrastructure (including roads, railways, ports and energy infrastructure) from increased flood risk associated with climate change.

With regards to Jetties, the following objective is in place

CDP 13.9 Ports, Jetties, harbours, quays, and piers

a) To facilitate the maintenance and improvement of the existing port, jetty, harbour and slipways for the purposes of public transport, industry, commerce, sea rescue, tourism, aquacultural and recreation

3. INITIAL FLOOD RISK ASSESSMENT

3.1 PAST FLOOD EVENTS

The OPW's National Flood Information Portal[1] provides past flood event records of flooding reports, meeting minutes, photos, and/or hydrometric data. Based on the flood map shown in Figure 3-1, there are historical flood extents recorded on the banks of Lough Derg, 150m northwest of the subject site. The flood extents are as a result of flooding from Lough Derg, however there are no extents shown on Inis Cealtra.

Figure 3-1: Past Flood Events

[1] floodinfo.ie

3.2 OPW Preliminary Flood Risk Assessment (PFRA) Study

In 2009, the OPW produced a series of maps to assist in the development of a broad-scale FRA throughout Ireland. These maps were produced from several sources.

The OPW's National Preliminary Flood Risk Assessment (PFRA) Overview Report from March 2012 noted that *"the flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location".*

Figure 3-2 provides an overview of the fluvial, coastal, pluvial, and groundwater indicative flood extents in the vicinity of the subject site.

As per Figure 3-2, the subject site is predicted to be liable to flooding from Lough Derg

Figure 3-2: Indicative Flood Mapping [extract from PFRA Map 227]

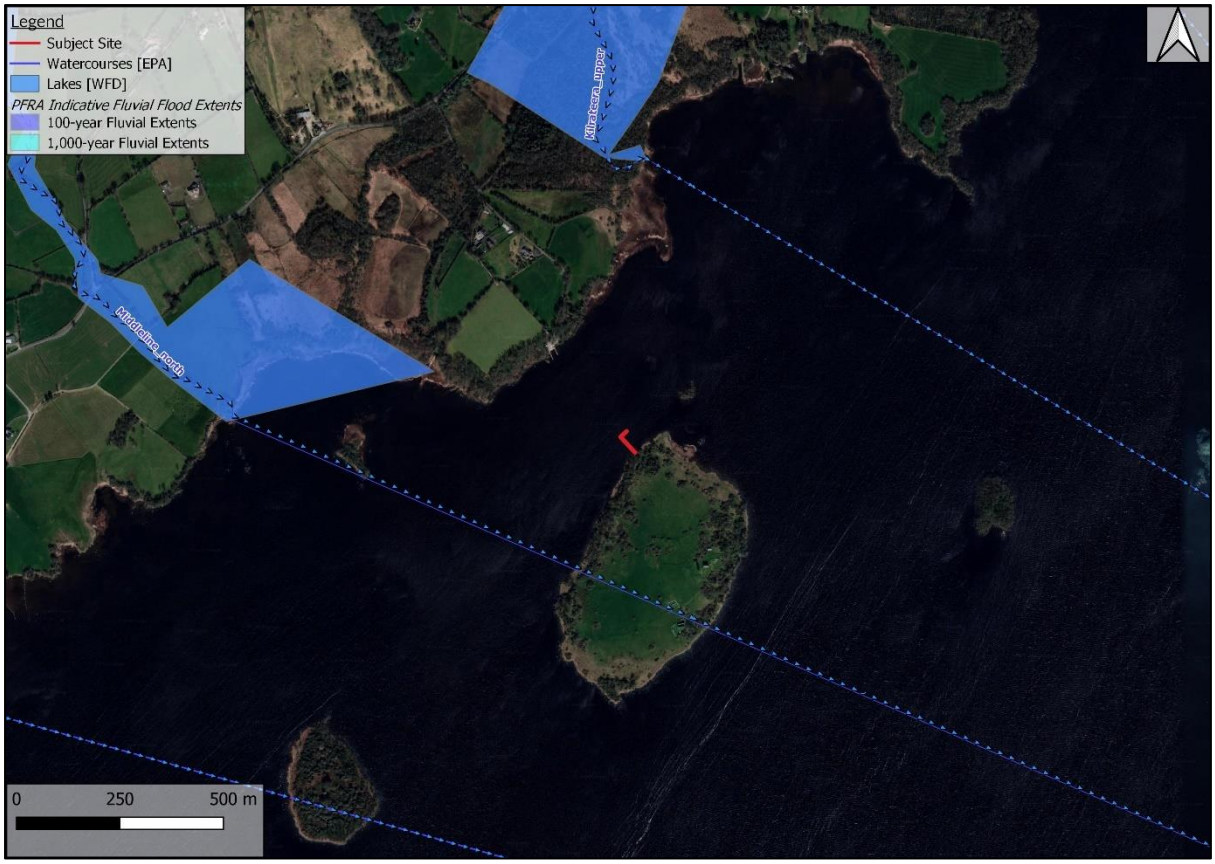

Figure 3-3: PFRA Flood Extents

The PFRA mapping indicates no areas of pluvial flooding within the subject site. The fluvial flood extents are seen to be approximately 500m west of the subject site.

Limitations on potential sources of error associated with the PFRA maps include:

- Assumed channel capacity (due to absence of channel survey information)
- Absence of flood defences and other drainage improvements and channel structures (bridges, weirs, culverts)
- Local errors in the national Digital Terrain Model (DTM)
- Lack of detailed hydrology and hydraulic analysis

Improved hydraulic modelling was carried out through the Catchment Flood Risk Assessment and Management Study (CFRAM) in 2015 (discussed in Section 3.3) and is considered more accurate than the PFRA study as it utilised surveyed river geometry and was subject to greater model performance.

3.3 CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

In 2015, the OPW produced flood maps as part of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The flood extents in these maps are based on detailed modelling of Areas for Further Assessment identified by the National Preliminary Flood Risk Assessment.[2].

3.3.1 Fluvial Flood Risk (CFRAM)

Lough Derg, within which the subject site is located was modelled as part of the CFRAM study. CFRAM mapping of the 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) predicted fluvial flood extents is presented in Figure 3-4. The predicted flood mapping produced as part of the CFRAM study indicates that the entire subject site is liable to fluvial flooding in the 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) events. Based on the fluvial extent mapping produced as part of the CFRAM study, the entire subject site is located in Flood Zone A.

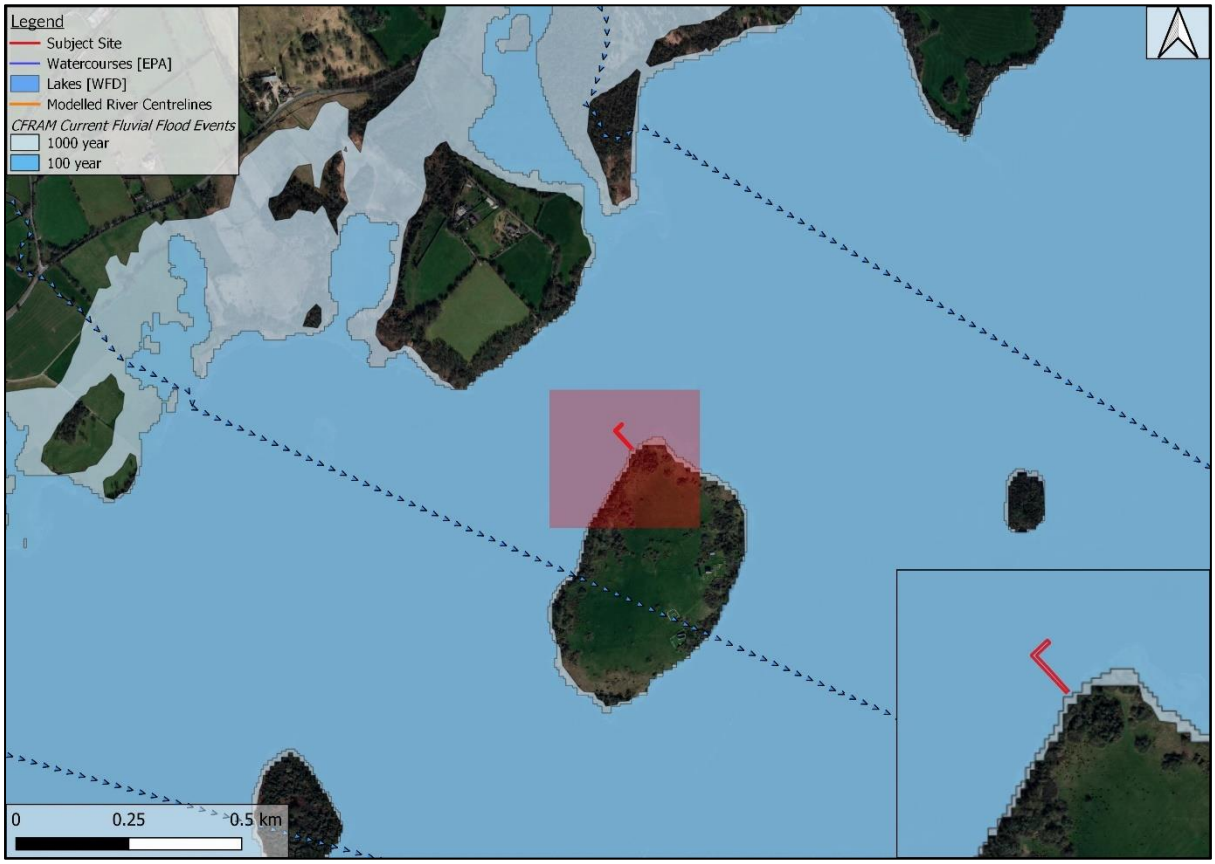

Figure 3-4: CFRAM Existing Fluvial Flood Extents

Figure 3-5 shows the MRFS fluvial flood extents produced as part of the CFRAM Study during the 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) MRFS flood events. Again, the CFRAM study indicates that the entire subject site is liable to fluvial flooding in the 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) MRFS events

[2] https://www.floodinfo.ie/about_frm/

Figure 3-5: CFRAM MRFS Fluvial Flood Extents

3.4 OPW Drainage Districts and Arterial Drainage Schemes

The OPW Drainage Districts were carried out by the commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding.[3] The local authorities are charged with the responsibility to maintain Drainage Districts.

Benefited lands are areas that were previously subject to poor drainage and/or flooding but that have benefited from the implementation of Arterial Drainage Schemes carried out under the Arterial Drainage Act 1945.

The subject site has not benefited from any arterial drainage scheme and is not located in a Drainage District.

[3] www.floodinfo.ie

3.5 GEOLOGICAL SURVEY IRELAND MAPPING

Based on a review of the OPW's Preliminary Flood Risk Assessment (PFRA) mapping (see Figure 3-2) there is no noted risk of groundwater flooding to the subject site.

GSI Groundwater Flooding Probability Maps[4] for the subject site were reviewed. There are no groundwater flood extents in the vicinity of the subject site.

Figure 3-6: GSI Mapping of Groundwater Flooding

As the subject site is in Lough Derg, the subject site is susceptible to surface water flooding. The entire subject site is within the surface water flood extents.

Geological Survey Ireland (GSI) subsurface mapping of karst features[5] in the area show that there are no karst features located in the vicinity of the subject site (see Figure 3-7). The closest karst feature to the subject site is a spring located 5.1km west of the subject site.

[4]FloodInfo.ie | National Flood Information Portal, Available at: https://www.floodinfo.ie/map/floodmaps/

[5]GSI Groundwater Data Viewer, Available at: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef

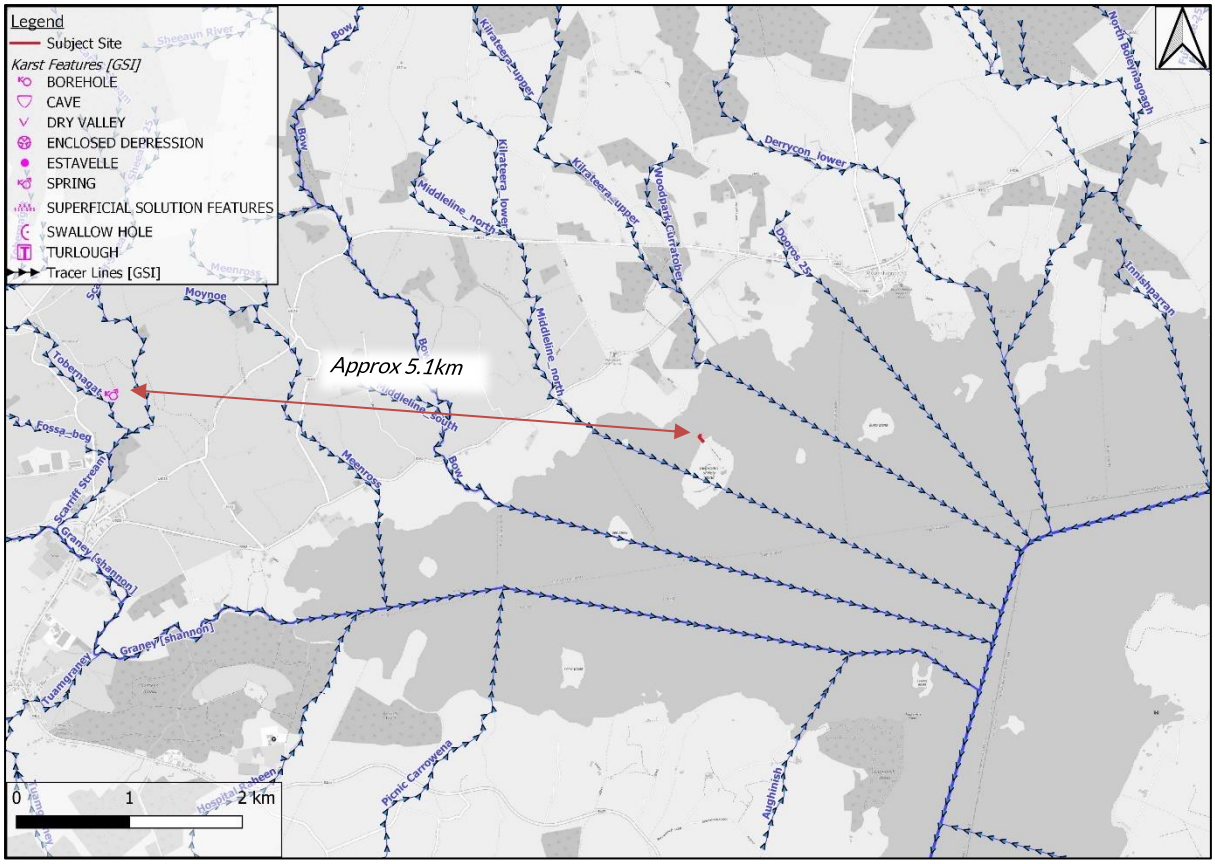

Figure 3-7: GSI Mapping of Karst Features

4. DETAILED FLOOD RISK ASSESMENT

With reference to the PSFRM guidelines, the proposed development is comprised of 'water compatible' (Jetty) elements.

Therefore, Jetties are appropriate in any Flood Zone.

4.1 COASTAL FLOODING

The subject site is located approximately 80km inland from coastal waters and ground levels at the island are at minimum 30.8mOD.

Therefore, it is estimated that the risk of coastal flooding to the subject site will be very low.

4.2 FLUVIAL FLOODING

The hydraulic feature of consideration to the subject site is Lough Derg. CFRAM mapping for the existing and MRFS indicates that the entirety of the subject site is liable to fluvial flooding in a 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) events.

As Jetties are considered "water compatible", they are appropriate in any flood zone. However, it is necessary to assess and confirm that the jetty do not pose any residual risk of flooding elsewhere. The Jetty is located on lough Derg, which has an approximate area of 96km^2. The jetty itself has an area of 278m^2, as the jetty is located within a lake it is assumed that the water will be relatively calm with minimal wave action.

The NSL (natural surface level) at the jetty location is 33.34mOD and it is proposed that the finished level of the jetty is 33.84mPD, which provides 500mm of freeboard above the NSL.

Given the relatively small size of the jetty compared to the vast area of Lough Derg, as well as the lakes relatively calm nature with minimal wave action, it is estimated that the proposed breakwater jetty will not significantly impact flood risk elsewhere.

4.3 PLUVIAL FLOODING

The PFRA indicative mapping indicates that the subject site is not at risk of pluvial flooding.

The jetty will be designed to ensure that pluvial water flows off efficiently, preventing water ponding and minimizing residual risks associated with extreme pluvial flood events.

Consequently, the risk of pluvial flooding for the proposed jetty is estimated to be minimal.

4.4 GROUNDWATER FLOODING

Based on a review of Geological Survey Ireland (GSI) subsurface mapping of karst features (Figure 3-7), predicted groundwater flooding in the area (Figure 3-6), and the PFRA study (Figure 3-2), there is evidence to suggest liability to surface water flooding to the proposed Jetty.

The jetty will be designed to rise and fall with the water levels within the lake, ensuring it always remains above the surface of the lake. Therefore, the risk of groundwater flooding to the jetty will be minimal.

4.5 THE JUSTIFICATION TEST

The proposed jetty is appropriate in any flood zone; therefore, no justification test is required.

5. CONCLUSIONS

TOBIN was appointed by Clare County Council to carry out a Stage 2 FRA for the proposed construction of a jetty on Inis Cealtra, Lough Derg, County Clare.

With reference to the PSFRM guidelines, the proposed development is comprised of "water compatible" (jetty) elements.

Coastal Flooding

The subject site is not expected to be at risk of coastal flooding due to its large distance inland from coastal waters

Fluvial Flooding

Jetties are considered water compatible and therefore allowed in any flood zone.

Given the relatively small size of the jetty compared to the vast area of Lough Derg, as well as the lakes relatively calm nature with minimal wave action, it is estimated that the proposed breakwater jetty will not significantly impact flood risk elsewhere.

Therefore, the risk of fluvial flooding to the subject site is very low.

Pluvial Flooding

Pluvial mapping was published as part of PFRA mapping and indicated that the subject site is not liable to pluvial flooding.

The jetty will be designed to ensure that pluvial water flows off efficiently, preventing water ponding and minimizing residual risks associated with extreme pluvial flood events.

Therefore, the risk of pluvial flooding to the subject site is very low.

Groundwater Flooding

The surface water flood risk to the proposed jetty will be removed due to its ability to rise and fall with the water levels within the lake

Based on the results of this flood risk assessment, it is estimated that the risk of flooding to the proposed development will be minimal, and that the development will not increase the risk of flooding elsewhere.

www.tobin.ie