APPENDIX 8.1

STAGE 3 FLOOD RISK ASSESSMENT REPORT

ENVIROLOGIC

HYDROGEOLOGICAL · HYDROLOGICAL CONSULTING

Stage 3 Flood Risk Assessment

LOCATION:	Coolpowra, Ballyneheskerah, Coolnagrenagh and Gortlusky, Co. Galway
PREPARED FOR:	Halston
PREPARED BY:	Cian O'Sullivan (MSc) and Regan Phipps (PgCert)
REVIEWD BY:	Colin O'Reilly PhD (Hydrology)
DATE:	30th April 2024
REFERENCE:	3064

ENVIROLOGIC. LTD. ROBERTSON HOUSE, UNIT 49 BALDOYLE IND EST, D13 · 01 8322176 · 087 2024695 · INFO@ENVIROLOGIC.IE

Contents

1 INTRODUCTION

The following flood risk assessment has been prepared by Cian O'Sullivan (MSc) and Regan Phipps (PGCert) and been reviewed by Colin O'Reilly (PhD) of Envirologic Ltd. on behalf of Halston.

This report is intended to satisfy the requirements of Galway County Council, relating to a proposed development in the townlands of Coolpowra, Ballynaheskeragh, Coolnageeragh and Gortlusky, Co. Galway. The proposed development is being referred to as 'Project Coolpowra' and will consist of a Reserve Gas-Fired Power Generator, GIS Substation and Energy Storage System.

As per the Flood Risk Management Guidelines (2009), where flood risk may be an issue for any proposed development, a flood risk assessment (FRA) should be carried out that is appropriate to the scale and nature of the development and the risks arising. The flood risk assessment outlined herein is intended to be sufficiently detailed to quantify the risks and effects of any flooding, necessary mitigation measures, together with recommendations on how to best manage any residual risks. As per the document 'The Planning System and Flood Risk Management (2009)' the flood risk assessment will consist of the following sections:

- Site description
- Site layout
- S-P-R model; sequential approach; justification test
- Determination of flood level
- Mitigation measures
- Conclusions

A site walkover and surveys of local hydrology was performed by Envirologic on 1st and 2nd May 2024 and 21st May 2024.

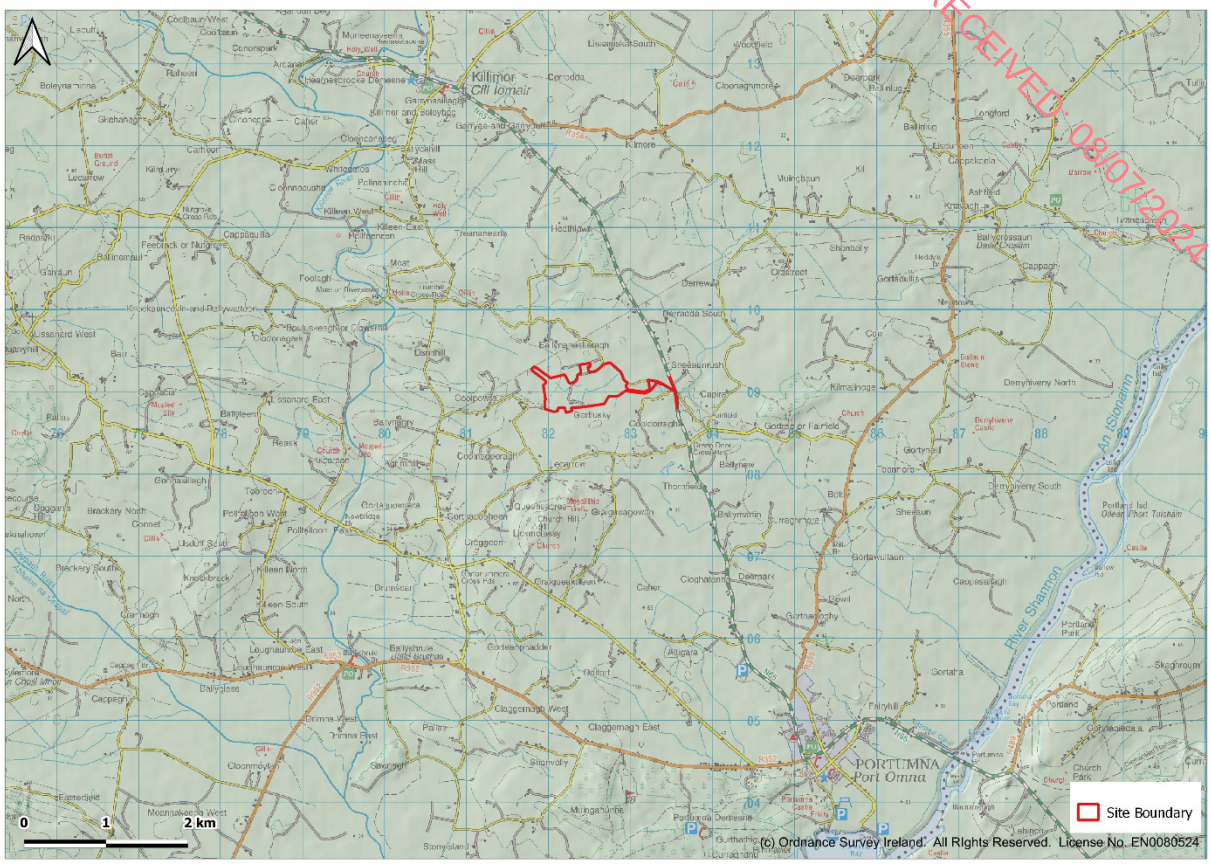
2 SITE DESCRIPTION

2.1 SITE LOCATION

The subject site is located in the townlands of Coolpowra, Ballynaheskeragh, Coolnageeragh and Gortlusky, Co. Galway, approximately 5 km northwest of Portumna town (Figure 1). The main portion of the site is positioned 500 m west of the N65, with an internal site access road providing connection between the two.

The regional topography is considered flat to gently undulating. The 1:50,000 OS Discovery map shows that the nearest topographical feature of note in the locality is a small hummock at Churchill (91 mOD), 2 km to the south. The surrounding landscape is dominated by moderate intensity grassland agriculture.

Figure 1 - Site Location and Topography



2.2 SITE LAYOUT

The proposed development site has an area of 42 ha. The site can be described as having an irregular shape comprised of (i) a central area which has an east-west length of 995 m and north-south width of 415 m. This area is bounded to the east by a local road, (ii) an internal access road which connects the eastern end of this central area with the N65, and (iii) a 230 m northwestern spur. An existing 400kv GIS substation is located adjacent to the northeast boundary of the site. There is one detached house standing within the site boundary, with farmyard infrastructure present (Figure 2). It is intended to demolish existing infrastructure on the site and construct the following:

- A Reserve Gas-Fired Generator comprised of three OCGT Units;
- Upgrade and replacement of the existing 400kV AIS substation with a 400kV GIS substation;
- Alternative Technology infrastructure such as Long Duration Energy Storage (LDES) and a Synchronous Condenser.

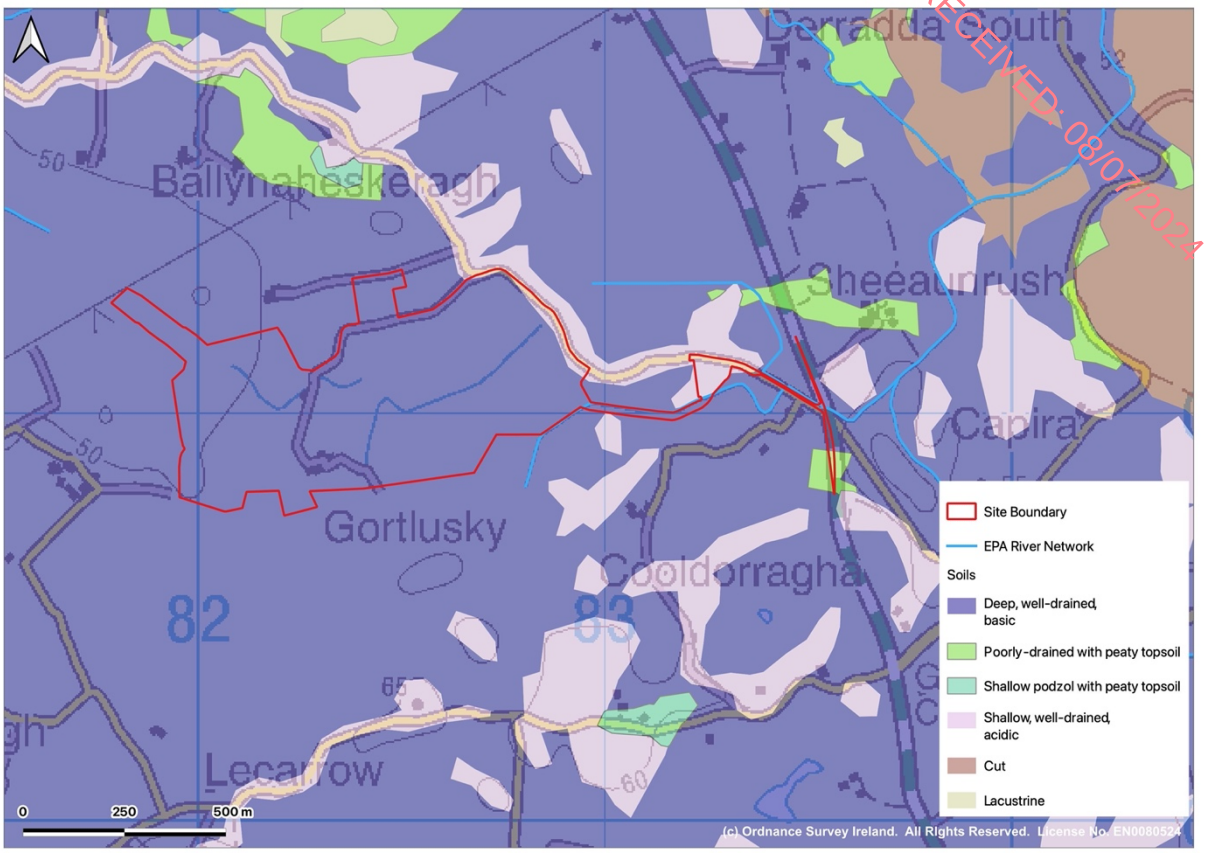
Figure 2 - Current Site Layout with EPA river network overlain

2.3 SOILS & GEOLOGY

2.3.1 Soils

Teagasc soil maps indicate that the soil within the application boundary is a uniform cover of deep, well-drained mineral soil with a basic chemical signature (Figure 3). The soil group can be described as a Grey Brown Podzolic or Brown Earth.

Figure 3- General Soil Classification

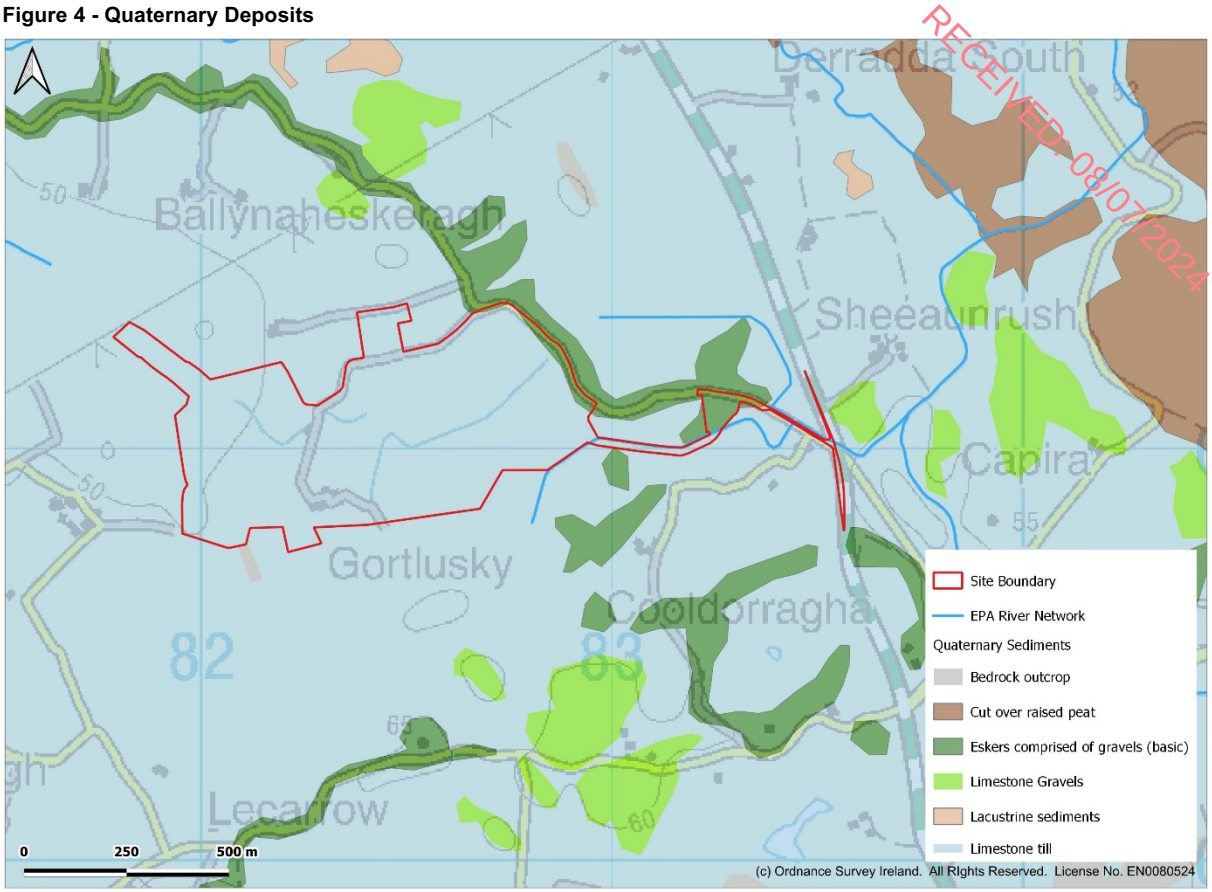


2.3.2 Quaternary Deposits

The quaternary period encompasses the last 1.6 million years and deals with the subsoils and sediments that were deposited over the bedrock described below. The Pleistocene (1.6 million years – 10,000 years ago) is commonly known as the last Ice Age, which was a period of intense glaciation separated by warmer inter-glacial periods, and it is during this period that the quaternary sediments seen today were deposited. Large amounts of ponded water were present at this stage resulting in considerable fluvioglacial sedimentation.

The majority of the site is underlain by glacial till derived from limestone. Some isolated mounds of limestone gravels are present in the area along with a graded ridge of esker sands and gravels which underlie the local road to the east (Figure 4). This combination of deposit type is characteristic of sub-glacial mechanisms resulting in well drained soils of homogenous nature.

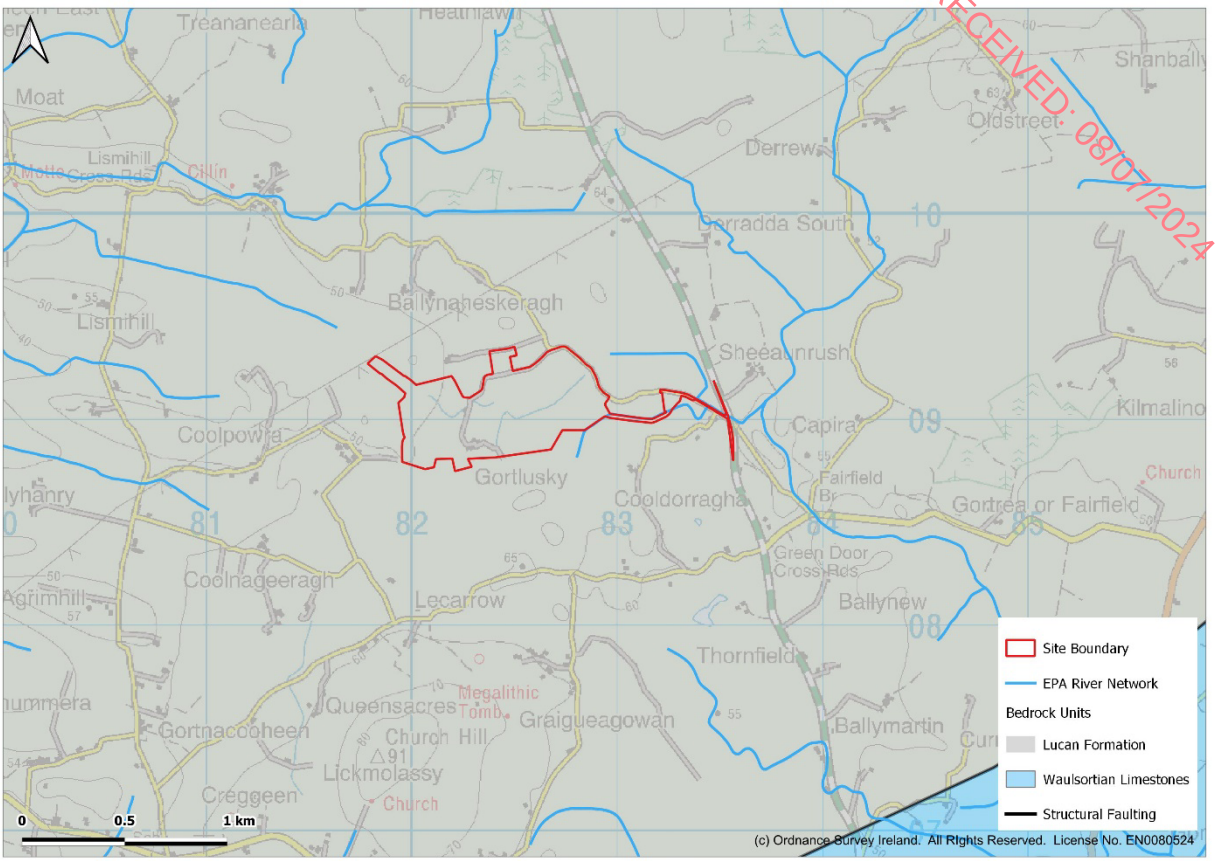
Figure 4 - Quaternary Deposits



2.3.3 Bedrock & Structural Geology

The site is underlain by the Lucan Formation. This formation consists of impure bedded limestone with shale and/or clay impurities. There are no structural geological features such as faulting mapped in the immediate vicinity of the site, as demonstrated in Figure 5.

Figure 5 - Geology of the Surrounding Area



2.4 HYDROLOGY

2.4.1 Catchment Description

The two dominant sub-catchments in the area are the Gortaha (Catchment 025B), which drains to the east, and the Kilcrow (Catchment 025C), which drains to the west. These rivers are both part of the Lower Shannon Hydrometric Area.

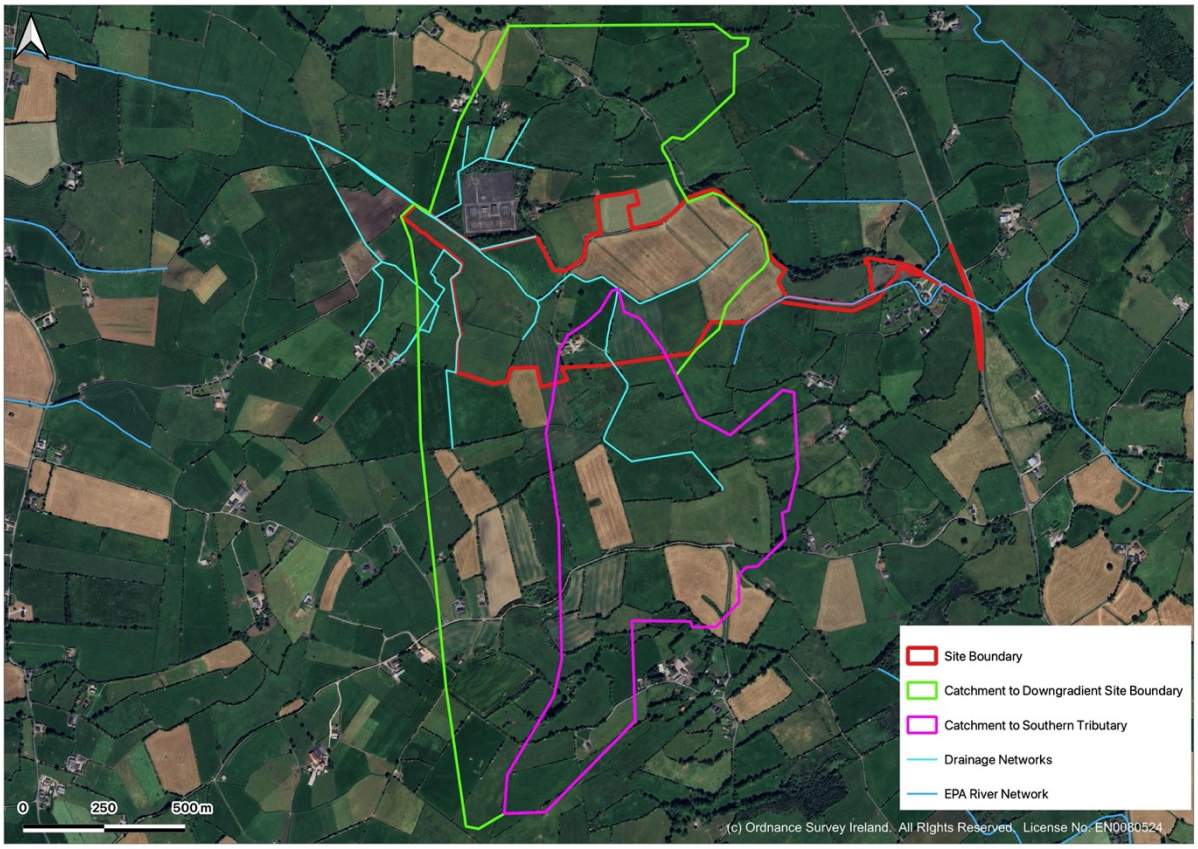
The EPA River Network database suggests that the divide between the Gortaha and Kilcrow river catchments lies within the site boundary, near the current Oldhill Substation. Subsequent groundtruthing and consultation of the OPW Drainage Maps indicate however that the catchment divide is just east of the site and that all rainfall-runoff generated on the site drains westwards, outfalling to the Kilcrow River, 2 km to the west.

The drainage network serving the site is dominated by an east to west flowing central channel which itself becomes the Treananearla Stream (first order stream) a short distance downstream of the site. This central channel originates at the eastern end of the central site area, stopping just short of the local road. This catchment was delineated by topographical contours, reference to the OPW and EPA drainage network maps, and ground truthing as part of the site walkover. The catchment area contributing run-off to the downgradient site boundary has an area of 2.0 km^2 (see Figure 6).

There are two culverts in place along the central channel within the site boundary. These provide road crossings for access to farm land and a dwelling. Both culverts have a diameter of 950 mm.

There are several field boundary drains present within the site that contribute to the run-off at its downstream end. The largest of these drains extends 950 m south, outfalling to the central stream just east of the on-site dwelling. This drainage channel has a sub-catchment of 0.675 km^2. There are two culverts present on this tributary, with pipe diameters of 650 mm and 500 mm. The 500 mm culvert lies immediately upstream of the confluence of the tributary and the main channel whilst the 650 mm culvert acts as a field crossing further upstream. There is a 1 m drop from the invert of the tributary channel to the invert of the main channel, resulting in a high velocity cascading flow regime at the confluence. The combined flows then continue westward. There are no other drainage channels that contribute significant flow to the central channel within the site.

Figure 6 - Contributing Catchment to Site Run-off



2.4.2 Designated Areas

Designated areas within the area are presented in Table 1. The River Shannon is hydraulically connected to the site via downstream drainage. There are a number of sites associated with Lough Derg to the south, as well as the Ardgraigue Bog SAC to the north.

Table 1– Summary of Designated Sites Within a 15 km Radius of the Site

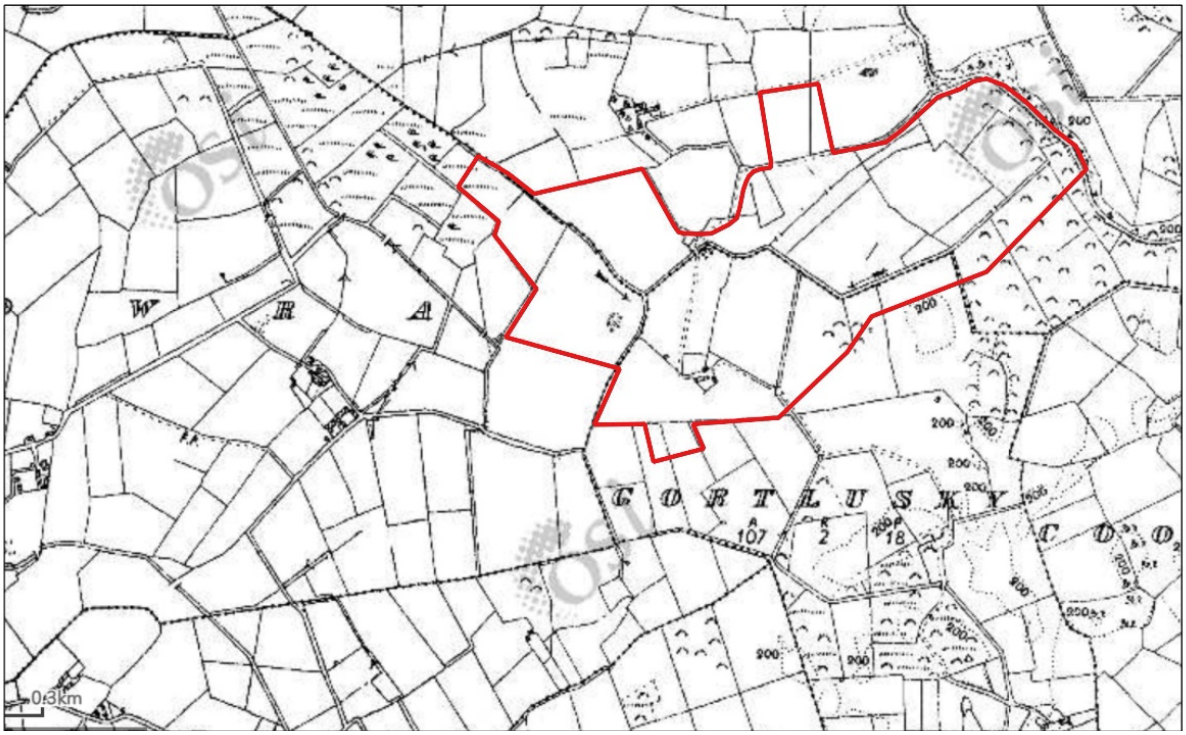
Natura 2000 Site	Site Code	Location at Closest Point to the Proposed Project
River Shannon Callows SAC	000216	6 km east
Ardgraigue Bog SAC	004026	4.5 km north
Lough Derg, North East Shore SAC	002241	5.5 km south
Lough Derg SPA	004058	5.5 km south

2.4.3 Flooding History

2.4.3.1 Historical OSI Maps

The historical 6" OSI maps (1830-1930) show no evidence of historical flooding at the application site (Plate 1). It is noted from the historical 6" maps that flow direction on the central channel is towards the centre of the site but the flow direction from this point is unclear. It is likely that subsequent arterial drainage works deepened drains to promote a westerly flow direction.

Plate 1 - Historical 6" OSI maps (1830 – 1930)



2.4.3.2 OPW Flood Hazard Mapping

Consultation of the OPW flood hazard mapping tool shows that no previous flood events occurred within or near the site. Two flood events have been reported within 5 km of the site boundary. The nearest of these was in 1995,

3 km to the southwest where the Kilcrow River passes through Newbridge Bridge at Gortanummera. It was recommended at the time that additional drainage maintenance works be deemed a priority for the area.

2.4.4 Flood Risk Indicators

2.4.4.1 National Indicative Fluvial Mapping (NIFM)

The margins flanking the Kilcrow and Gortaha rivers are covered by the OPW National Indicative Fluvial Mapping (NIFM), demonstrating flooding is not extensive. The drainage channels within the site, or immediately downstream, have not been covered by the OPW NFIM programme.

2.4.5 CFRAM

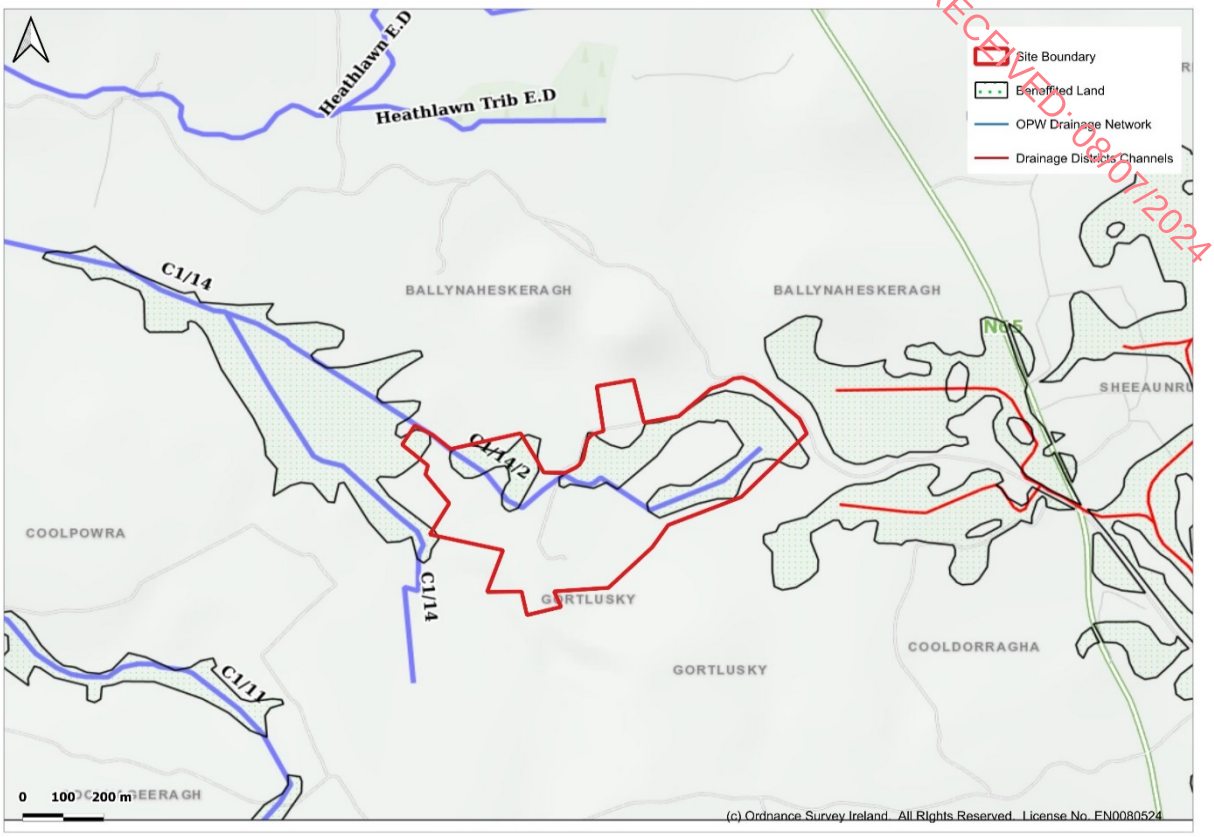
The OPW FloodInfo resource shows that neither the site nor the Kilcrow or Gortaha rivers have been covered by detailed CFRAM hydraulic modelling.

2.4.6 Benefiting Lands

Plate 2 shows that a portion of the application area lies within benefitting lands. These maps were prepared to identify areas that would benefit from land drainage schemes and typically indicate low lying land near watercourses that would be prone to flooding. The emphasis of these schemes was the improvement of agricultural land. With respect to the application site the map confirms that the central channel is maintained as part of the Killimor Arterial Drainage Scheme (Channel 14/2).

It is noted that the OPW Drainage Map also corresponds with the drainage network layout that was groundtruthed as part of the site walkover. This is further evidence that the EPA river network is incorrect.

Plate 2 - Drainage Channels and Benefitting lands proximal to the site boundary



3 SEQUENTIAL TEST & VULNERABILITY MATRIX

3.1 SEQUENTIAL APPROACH

The 'Planning System and Flood Risk Management Guidelines for Planning Authorities (2009)' require the planning system at national, regional, and local levels to:

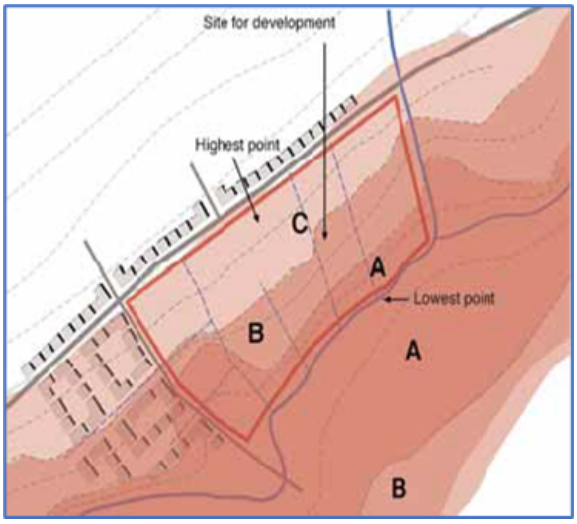
- Avoid development in areas at risk of flooding by not permitting development in flood risk areas, particularly floodplains, unless where it is fully justified that there are wider sustainability grounds for appropriate development and unless the flood risk can be managed to an acceptable level without increasing flood risk elsewhere and where possible, reducing flood risk overall.
- Adopt a sequential approach to flood risk management based on avoidance, reduction and then mitigation of flood risk as the overall framework for assessing the location of new development in the development planning processes; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach is used to assess flood risk at the site and, where there is variability, to assign appropriate zones in accordance with the Guidelines (DoEHLG, 2009). As shown inPlate 3, Zone A, applied to areas with a high probability of flooding, defines areas with the highest risk of flooding from rivers (i.e. more than 1% probability

or more than 1 in 100). Development in this zone should be avoided and/or only considered in exceptional circumstances. Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available in areas at lower risk that also meet the objectives of proper planning and sustainable development. Zone B is applied to areas with a moderate probability of flooding from rivers. (i.e. a 0.1% to 1% probability or between 1 in 1000 and 1 in 100), with Zone C having a low probability of flooding.

With respect to coastal flooding Zone A is applied to areas with the highest risk of coastal flooding (i.e. more than 0.5% probability or more than 1 in 200 year return period). Development in this zone should be avoided and/or only considered in specified circumstances. Zone B is applied to areas with a moderate probability of coastal flooding (between 1 in 200 and 1 in 1000), with Zone C having a low probability of coastal flooding (less than 0.1% or 1 in 1000). The Flood Risk Assessment will clarify within which zone the site lies.

Plate 3 – Schematic map showing use of the Sequential Approach to assign Flood Risk Zones (DoEHLG, 2009)



3.2 VULNERABILITY MATRIX

Clause 2.16 of the Flood Management Guidelines (OPW, 2009) states: 'The classification of different land uses and types of development as highly vulnerable, less vulnerable and water-compatible is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings.'

The Planning System and Flood Risk Management guidelines provide three vulnerability categories based on the development type. The proposed works fall into the following vulnerability categories as follows:

- **Highly vulnerable = residential, hospitals, schools, essential infrastructure, emergency service facilities.**
- Less vulnerable = buildings used for retail, warehousing, commercial, industrial and non-residential institutions.
- Water-compatible development = amenity open space, outdoor sport and recreation.

The proposed development is considered to be 'essential infrastructure' and therefore comes under 'highly vulnerable development'. Different types of development are appropriate in each of the Flood Zones, based on their vulnerability to flood risk. Hence: