Amendment
No.1

Comhairle Contae an Chláir
Clare County Council

Shannon Town and Environs Local Area Plan 2012–2018

Amendment No. 1

17th June 2019

To change the zoning of part of the lands at Illaunmanagh, Shannon, to a revised land use zoning objective of 'Community' to facilitate an extension to the existing Burial Ground.

Flood Risk Assessment

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Abbreviations

AEP	Annual Exceedance Probability
CFRAM	Catchment Flood Risk Assessment and Management
DECLG	Department of Environment, Community and Local Government
DoEHLG	Department of the Environment, Heritage and Local Government
EPA	Environmental Protection Agency
FRA	Flood Risk Assessment
GSI	Geological Survey of Ireland
LAP	Local Area Plan
mOD	Meters above Ordnance Datum
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
POR	Provisional Options Report
SFRA	Strategic Flood Risk Assessment

1 Introduction

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) the proposed Amendment to the Shannon Town and Environs Local Area Plan 2012-2018 must undergo a Flood Risk Assessment (FRA) to ensure sustainability and effective management of flood risk.

1.1 Terms of Reference

JBA Consulting was appointed by Clare County Council to prepare a SFRA in order to support a change in zoning within a proposed amendment to the Shannon Town and Environs Local Area Plan 2012-2018. The proposed zoning change is from Open Space to Community land in support of an extension to an existing local burial ground (see Figure 1-1).

1.2 Flood Risk Assessment Aims and Objectives

This study is being completed to inform the future zoning of the site as it relates to flood risk. It aims to identify, quantify and communicate the risk of flooding to land, property and people and the measures that would be recommended to manage the risk.

The objectives of this Strategic Flood Risk Assessment are:

- Identify potential sources of flood risk;
- Confirm the level of flood risk and identify key hydraulic features;
- Assess the impact of the proposed change of subject site land use zoning objective;
- Develop appropriate flood risk mitigation recommendations and management measures which will allow for the long-term future development of the site.

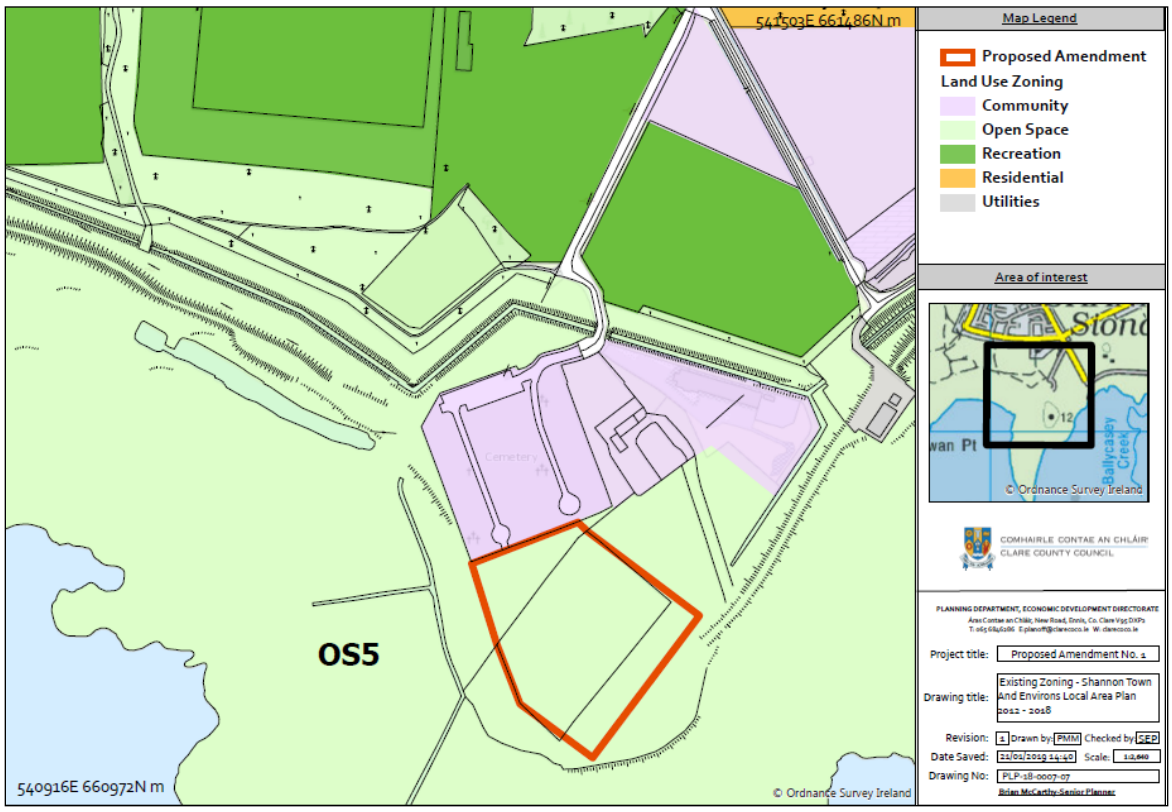
Recommendations for planning have been provided in the context of the OPW / DECLG planning guidance, "The Planning System and Flood Risk Management". A review of the likely effects of climate change, and the long-term impacts this may have on any change in zoning has also been undertaken.

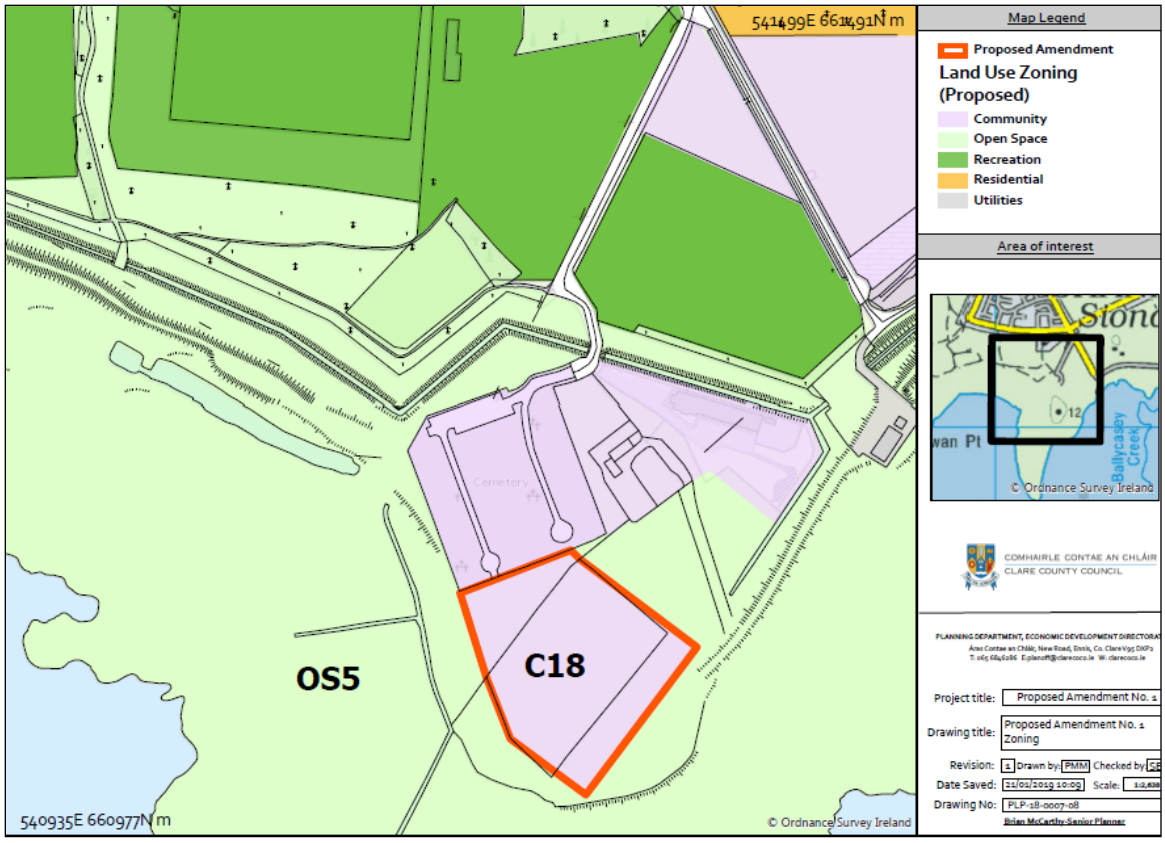
For general information on flooding, the definition of flood risk, flood zones and other terms see 'Understanding Flood Risk' in Appendix A.

1.3 Report Structure

Section 2 of this report gives an overview of the study location and associated watercourses. Section 3 contains background information and initial assessment of flood risk. Site specific mitigation measures are outlined in Section 4, while conclusions are provided in Section 5.

Figure 1-1 Existing Zoning and Proposed Zoning





2 Site Background

This section describes the site, subject of the proposed Amendment to the Shannon Town and Environs Local Area Plan 2012-2018 at Illaunmanagh, Shannon, Co. Clare.

2.1 Location

The subject site is situated at Illaunmanagh, Shannon, Co. Clare. The site is currently occupied by allotments. Open space surrounds the site to the east, south and west. The existing cemetery is located to the north of the site. Access to the subject site is via the existing cemetery at Illaunmanagh.

Figure 2-1 Site Location

2.2 Watercourses Summary

The key hydrological feature located near the site is the Shannon Estuary which is situated c.50m to the southeast of the subject site. The Shannon Estuary is tidal at this location.

The flood defences in Shannon prevent the ingress of the tide into the town itself, however they also restrict the movement of flows or subject to sluices they prevent the tide backing up the watercourse. To avoid the condition where tide locking behind the defences causes significant ponding and risk to property many of the watercourses are pumped across the defences when tidal levels are high.

A back drain that flows towards Tullyvarraga Pumping Station flows in an easterly direction to the north of the site.

To provide further background, the Shannon Town fluvial catchment boundaries have been delineated through height data and drainage drawings, Figure 2-2 below delineates five separate catchment boundaries each having a single outfall into the Shannon Estuary, blue catchments are managed by the Airport Authority and green are managed by Clare County Council.

The blue lines indicate approximate lengths of open channel, the extensive sub-surface pipe and culvert network has not been represented in this figure.

Each catchment has a numbered outfall (1-5), a total of four have a pumping station with the remaining outfall being a flapped gravity discharge (3). A summary of the outfall information is provided in Table 2-1. The total catchment area is approximately 32km^2 with pumping station

capacity in excess of 200,000 gal/min. Tullyvarraga, (no. 5) is situated c. 800m east of the subject site and drains a total area of 15km^2.

Figure 2-2 Shannon Fluvial Catchment Boundaries and Open Channel Watercourses

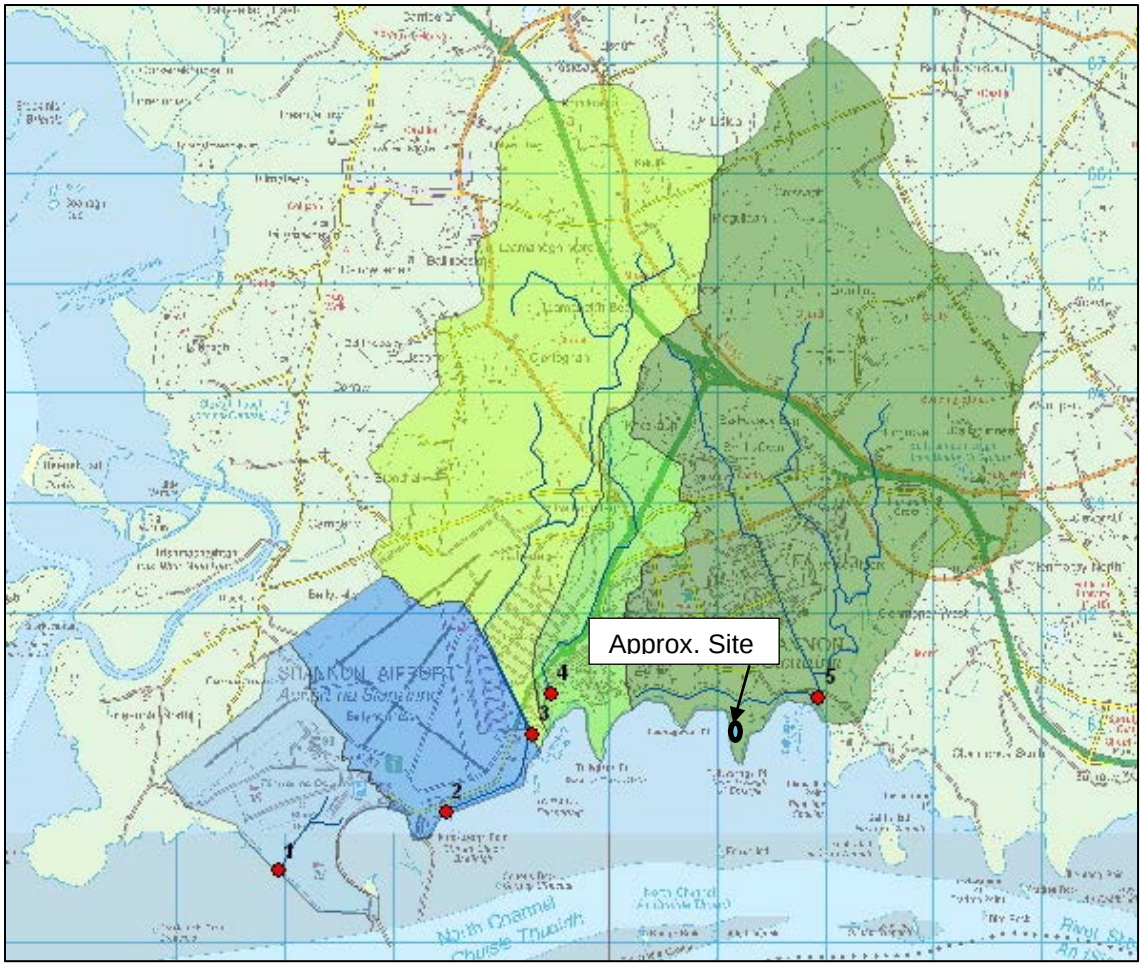


Table 2-1 Summary of Shannon Fluvial Catchment Outfall Information

No.	Area (km^2)	Description	Operator	Pump Capacity
1	2.30	Lagoon Pumping Station	Shannon Airport	Aska Sykes 6" diesel 1200 gal/min Aska Sykes 8" diesel 2000 gal/min
2	3.18	Canal Pumping Station	Shannon Airport	Two KSB Amacan P700-470 One Emu KPR 500 Unknown Capacity
3	9.09	Canal Gravity Flapped Outfall	Clare CoCo	n/a
4	2.13	Drumgeely Pumping Station	Clare CoCo	Two 20,000 gal/min electric
5	14.97	Tullyvarraga Pumping Station	Clare CoCo	Two 20,000 gal/min electric Two 65,000 gal/min electric Two small submersible electric (siltation avoidance)

2.3 Local Site and Topography

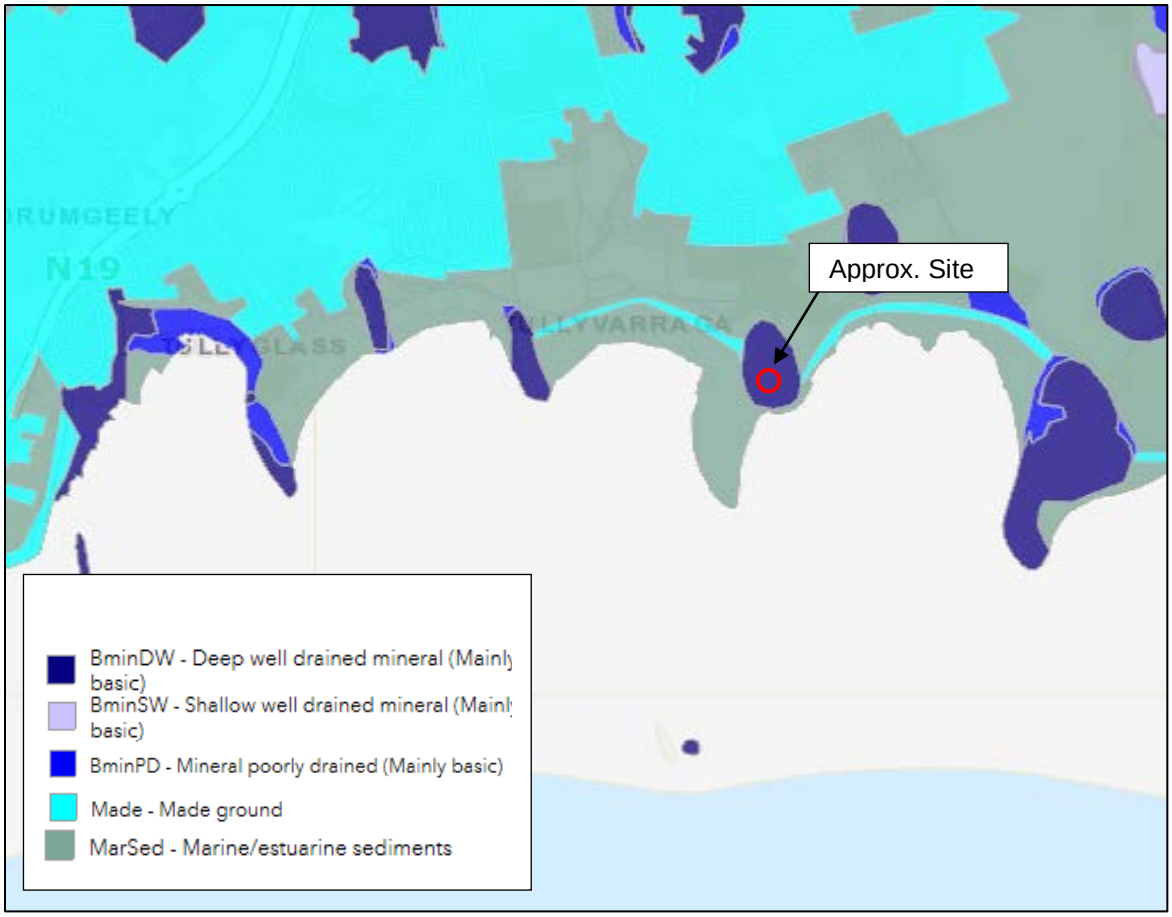
The site of the subject proposed Amendment is currently occupied by allotments and is zoned as Open Space OS5 in the LAP. Open Space exists to the south east and west of the site, with the Illaumunagh graveyard to the north (zoned Community). There is an incline from west to east of c. 4m where the land slopes from c.7mOD to c.12mOD. There is also a fall in the site from north to south where the land slopes from c.10-12mOD to c.8mOD.

2.4 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied. The underlying bedrock of the area is Ballysteen Formation which is a

dark, muddy limestone, shale. It is irregularly bedded and nodular bedded argillaceous bioclastic limestones, interbedded with fossiliferous calcareous shales. The subsoil is deep well drained mineral which is oval shaped. The mineral soils are surrounded by marine sediments and given the high elevation of these soils it is likely that prior to the flood defences being installed, the local area would have been a dry island during more extreme/high tidal events.

Figure 2-3 Site Subsoils



3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site, the subject of the proposed Amendment is conducted using historical and predictive information. This identifies any sources of potential flood risk to the site and reviews historic flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections. Further detail on the Planning Guidelines and technical concepts are provided in Appendix A.

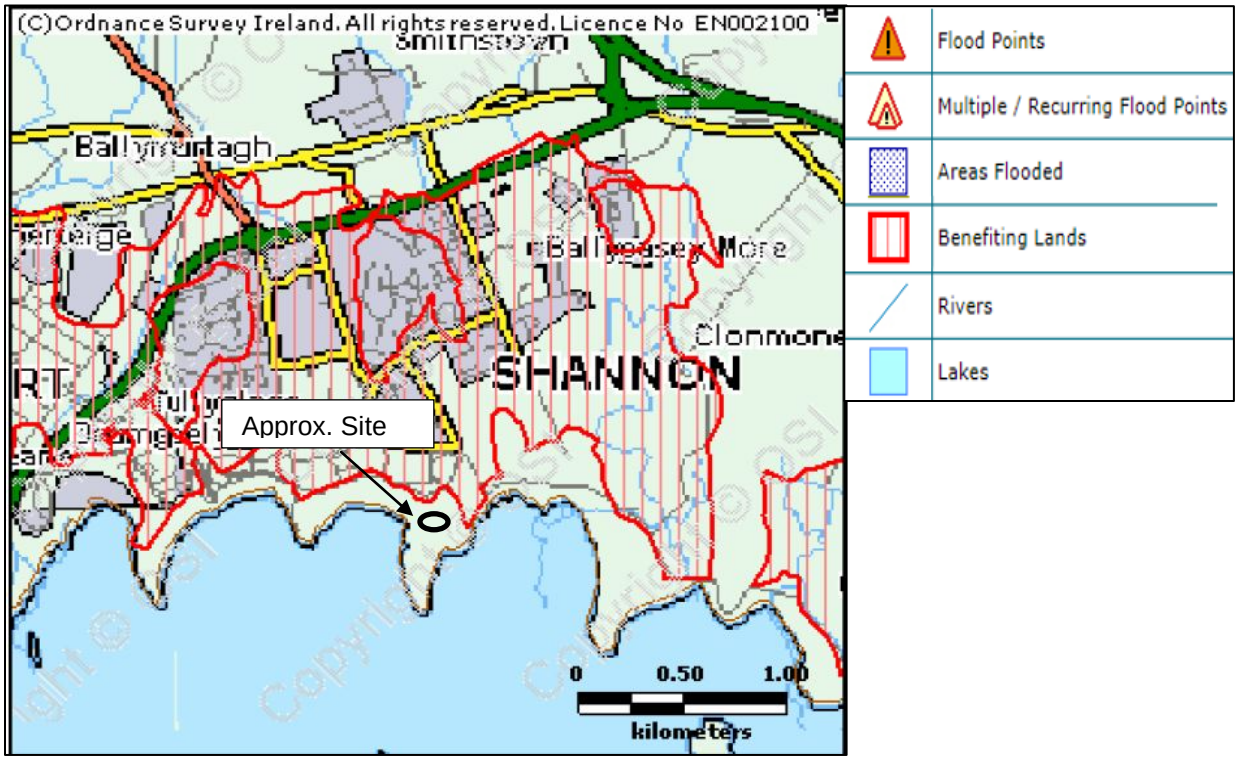
3.1 Flood History

A number of sources of flood information were reviewed to establish any recorded flood history at, or near the site. This includes the OPW's website, www.floodmaps.ie and general internet searches.

3.1.1 Floodmaps.ie

The OPW host a National Flood hazard mapping website, www.floodmaps.ie, which highlights areas at risk of flooding through the collection of recorded data and observed flood events. See Figure 3-1 for historic floods in the area. As can be seen below, a review of these maps shows no previous flood events, located near or within the site.

Figure 3-1 Floodmaps.ie



3.1.2 Internet Searches and Anecdotal Evidence

While there were no reports found of flooding in Shannon itself , The Irish Times newspaper dated May 3rd 2017 cites an article headed 'Shannon deemed at risk but we've never had a flood' The article goes onto describe how history shows no record of Shannon Town or its airport ever experiencing flooding and locals having been surprised to hear their defences are 'not fit for purpose'. The report highlights the point that Shannon has not experienced flooding.

3.2 Indicative Flood Mapping

The subject area has been a subject of two indicative flood mapping or modelling studies and other related studies and plans:

- OPW Preliminary Flood Risk Analysis (PFRA);
- Shannon Catchment Flood Risk Assessment and Management Study (CFRAM)

The level of detail presented by each method varies according to the quality of the information used and the approaches involved. In this case, whilst the Shannon CFRAM offers a greater detail on the landward side of the defences it does not provide a map of flooding on the seaward side of

the defence where the proposed site is located, it is therefore very limited in its use and the PFRA map and ICPSS levels present the best available flood map for the site.

3.2.1 OPW Preliminary Flood Risk Analysis (PFRA)

The Preliminary Flood Risk Assessment (PFRA) is a requirement of the EU Flood Directive (2007/60/EC). One of the PFRA deliverables is flood probability mapping for various sources: pluvial (surface water), groundwater, fluvial and tidal. The PFRA is a preliminary or 'indicative' assessment and analysis to identify areas potentially prone to flooding. The coastal flooding depicted in Figure 3-1 below is derived from the ICPSS data and is the best available estimate of flood levels in the Shannon Estuary. The PFRA mapping does not have regard to the flood defence embankments - as instructed by the Planning System and Flood Risk Management.

By way of background the ICPSS (Irish Coastal Protection Strategy Study) is a national study that was commissioned in 2003 with the objective of providing information to support decision making about how best to manage risks associated with coastal flooding. The ICPSS analysis was used within the CFRAM study for representing tidal levels.

Review of the OPW PFRA flood maps does not indicate any risk of tidal, fluvial, groundwater or pluvial flooding to the site subject of the proposed Amendment.

Figure 3-1 OPW PFRA Map

As seen in Table 3-1, the ICPSS Point closest to the site, S24, indicates tide flood levels of 4.21mOD for 0.5% Annual Exceedance Probability (AEP) tide levels of 4.56mOD for the 0.1% AEP tide levels, these equate to the flood levels for Zone A and Zone B respectively. ICPSS Point S24 is located c.2.2km south of the proposed Amendment site.

Table 3-1 Flood Event Probabilities for ICPSS Point S24

AEP %	Return Period (yrs)	Tide Levels (mOD)
50	2	3.22
20	5	3.42
10	10	3.57
5	20	3.72
2	50	3.92
1	100	4.07
0.5	200 (Zone A)	4.21
0.1	1000 (Zone B)	4.56

The Flood Zone map below has been compiled using the LiDAR data derived from Clare County Council and is a direct projection of the tidal flood levels noted in Table 3-1 above. As directed by the Planning System and Flood Risk Management Guidelines; it does not take account of the defences and therefore shows flooding to the defended lands to the north.

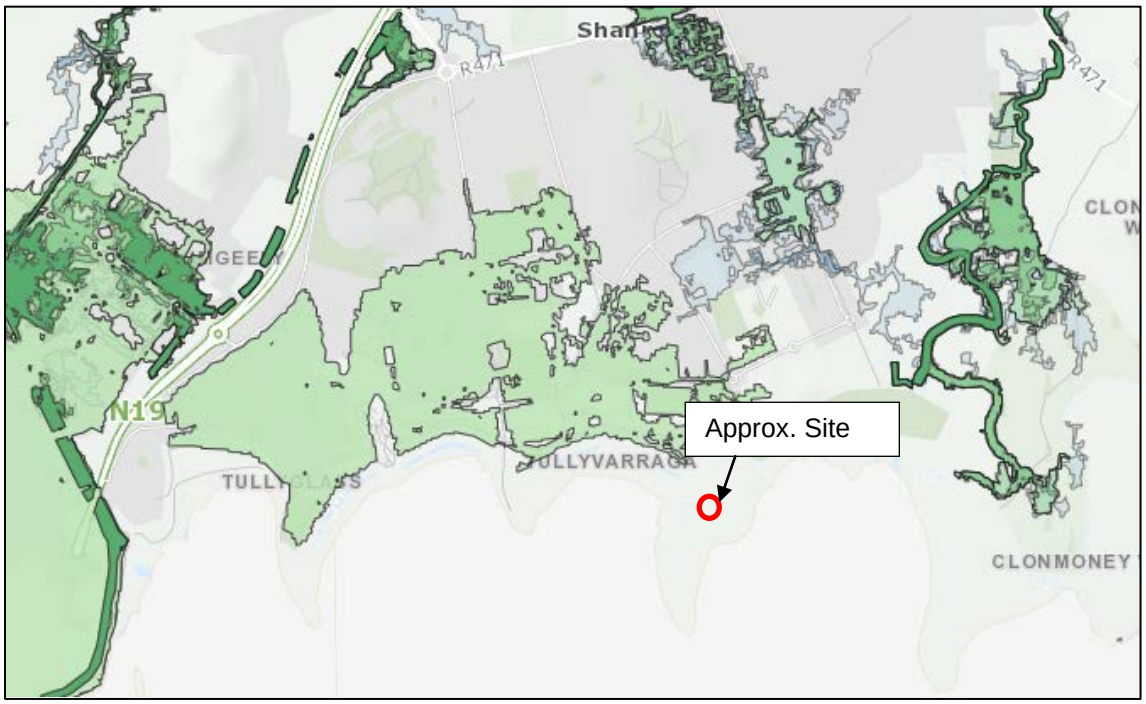
The Flood Zone map is a re-projection of the PFRA map using more detailed topographic data (LiDAR). It allows us to view the site in greater spatial detail and also verifies that the PFRA mapping is correct. The mapping is more accurate than the PFRA mapping due to the higher quality source of the height model (LiDAR). The output in Figure 3-2 below confirms that due to the high natural elevation of the site, it is located entirely in Flood Zone C - at low probability of flooding.

Figure 3-2 ICPSS Flood Zone Map (projected by JBA using LiDAR from Clare County Council)

3.2.2 Shannon CFRAM

The Shannon Catchment Flood Risk Assessment and Management Study (Shannon CFRAM Study) involved detailed hydraulic modelling of rivers and their tributaries. Shannon is within Unit of Management 27 of the Shannon CFRAM study. Final coastal maps for the 10%, 0.5% and 0.1% AEP for tidal sources are publicly available through the CFRAM study website, along with the fluvial maps for the 10%, 1% and 0.1% AEP events. See Figure 3-2 below where the site of the proposed Amendment currently falls outside the scope of the mapping study. That is due to the fact that this representation is limited to the landward side of the defences.

Figure 3-2 Shannon CFRAM Mapping



3.3 Sources of Flooding

The initial stage of a Flood Risk Assessment requires the identification and consideration of probable sources of flooding. Following the initial phase of this Flood Risk Assessment, it is possible to summarise the level of potential risk posed by each source of flooding. The flood sources are described below.

3.3.1 Fluvial

The proposed Amendment site is at low probability of flooding from fluvial sources, there is a back drain on the landward side of the defences which flows into Tullyvarraga Pumping Station, but this does not impact the site.

3.3.2 Tidal

The primary source of flood risk to the site is tidal flooding. The Shannon Estuary is in very close proximity to the subject site. Based on the Shannon LiDAR data submitted to JBA Consulting by Clare County Council, it shows the site is in excess of 3.4 metres above the 0.1% tidal flood event which has a water level of 4.56mOD; the site is therefore in Flood Zone C (low probability of flooding), see Figure 3-2 .

While there are defence embankments in place in Shannon, the proposed site is on a raised hillock that is naturally above any flood levels. The Shannon embankments tie into the high ground.

3.3.3 Pluvial

Pluvial or surface water flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer. The OPW PFRA mapping indicates that the risk of pluvial flooding to the site is low.

3.3.4 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry. Groundwater flood risk is confirmed to be moderate from the GSI mapping however the PFRA mapping indicates groundwater risk to the site itself is low.

4 Flood Risk Assessment

4.1 Flood Risk Summary

The proposed Amendment site is at low probability of flooding (within Flood Zone C) and is suitable for the proposed Community land use zoning objective, the overall flood risk to the site is low.

The following section makes further recommendations for the management of development to the site at development management stage.

4.2 Mitigation Recommendations for Future Development

4.2.1 Development Strategy

Should there be any buildings within the site there is no recommended minimum finished floor level due to site levels being in excess of 3.4m above the 0.1% ICPSS flood level and >2.4m above any further climate change considerations.

Normal precautions should be made for the design of any stormwater management proposals. Should there be any buildings within the site; the threshold should be raised to be circa 150 mm above surrounding hardstanding in order to reduce the risk of surface water flooding from exceedance.

4.2.2 Residual Risk

Residual risk to the site is low from exceedance events, climate change and wave overtopping given the freeboard above current tidal levels. There are no further management recommendations.

The main residual risk to the site would potentially be limited access from the road to the north passing through the defended flood zone. For example, if there were a tidal breach/overtopping event then access could be impacted. Given that the site is less vulnerable to the impacts of flooding and the probability of embankment failure is low then the risk is also low. There are no specific recommendations for the management of this residual risk.

5 Conclusion

JBA Consulting has undertaken a site specific Strategic Flood Risk Assessment for the proposed Amendment No.1 to the Shannon Town and Environs Local Area Plan 2012-2018 where it is proposed to change the zoning of part of the lands at Illaunmanagh, Shannon, which are currently zoned as Open Space OS5 to a revised land use zoning objective of 'Community ' in order to facilitate an extension to the existing Burial Ground at this location. The amended land use zoning for part of the lands currently zoned as Open Space OS5 is proposed as follows;

Community C18

The lands are zoned as Community to solely facilitate the extension of the Illaunmanagh Burial Ground. Any proposed development to extend the Burial Ground onto these lands shall be subject to the requirement to undertake an appropriate assessment at project level.

The flood risk assessment confirms that as the proposed Amendment site is within Flood Zone C, it is at low risk of flooding and the amendment as proposed is considered appropriate.

The existing site levels of the subject Amendment site are currently well in excess of the ICPSS tidal flood extents and also sufficiently above the High-End Future Scenario climate change event. No further significant development management recommendations have been made. Residual risk has also been reviewed and is low.

The Flood Risk Assessment was undertaken in accordance with The Planning System and Flood Risk Management Guidelines. It confirms that the site is in accordance with the core principles contained within these Guidelines.

Appendices

A Understanding Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

A.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period (in years). A 1% AEP flood has a 1 in 100 chance of occurring in any given year.

In this report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table: Conversion between return periods and annual exceedance probabilities

Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

A.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purposes of the Planning Guidelines, there are 3 types or levels of flood zones, A, B and C.

Zone	Description
Flood Zone A	Where the probability of flooding is highest; greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/tidal flooding.
Flood Zone B	Moderate probability of flooding; between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/tidal.
Flood Zone C	Lowest probability of flooding; less than 0.1% from both rivers and coastal/tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

Indicative Flood Zones (OPW & DoEHLG 2009)

A.3 Consequence of Flooding

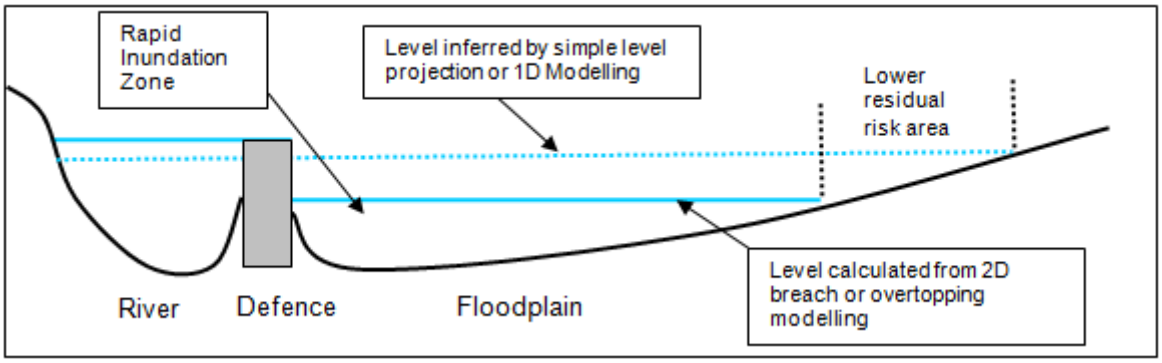
Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc.).

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are summarised as:

- Highly vulnerable, including residential properties, essential infrastructure and emergency service facilities;
- Less vulnerable, such as retail and commercial and local transport infrastructure;
- Water compatible, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

A.4 Residual Risk

The presence of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level or a breach occurs. This is known as residual risk.



SHANNON TOWN AND ENVIRONS LOCAL AREA PLAN

2012
2018

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Amendment No.1

Shannon Town and Environs LAP 2012–2018
Flood Risk Assessment

17th June 2019