

# Clonmel, Co Tipperary Flood Risk Assessment

Technical Report

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## Contract

This report describes work commissioned by [REDACTED], by a signed acceptance form dated 07/07/2023. [REDACTED] managed the project, and their representative was [REDACTED] JBA Consulting carried out this work.

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## Abbreviations

AEP .....	Annual Exceedance Probability
CFRAM .....	Catchment Flood Risk Assessment and Management
DoEHLG .....	Department of the Environment, Heritage, and Local Government
FB .....	Freeboard
FFL .....	Finish Floor Levels
FRA .....	Flood Risk Assessment
FSR .....	Flood Studies Report
FSU .....	Flood Studies Update
GSI .....	Geological Survey of Ireland
OPW .....	Office of Public Works
PFRA .....	Preliminary Flood Risk Assessment
RFI .....	Request for Further Information
SAAR .....	Standard Average Annual Rainfall (mm)
SFRA .....	Strategic Flood Risk Assessment
URBEXT .....	FEH index of fractional urban extent
WL .....	Water Level

# 1 Introduction

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) the proposed development must undergo a Flood Risk Assessment to ensure sustainability and effective management of flood risk.

## 1.1 Terms of Reference and Scope

JBA Consulting was appointed by [REDACTED] to prepare a Flood Risk Assessment (FRA) for the proposed development of a site located in Clonmel, Co. Tipperary. The report was prepared in response to a request for a Flood Risk Assessment.

## 1.2 Flood Risk Assessment; Aims and Objectives

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

The objectives of this FRA are to:

- Identify potential sources of flood risk.
- Confirm the level of flood risk and identify key hydraulic features.
- Assess the impact that the proposed development has on flood risk.
- Develop appropriate flood risk mitigation and management measures which will allow for the long-term development of the site.

Recommendations for development 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 development 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 Development Proposal

[REDACTED] intend to lodge a planning application with Tipperary County Council for a proposed mixed-use (Healthcare Campus, Retail and nursing home) along Davis Road, Clonmel, Co. Tipperary. The proposed development comprises of approx. 4,400 sqm Healthcare Campus, 1,440 sqm of Retail Unit, and 210sqm of Fast-Food unit, with approx. 300 car parking spaces.

The entire site comprises of Phase 1 and Phase 2 development. This report covers the wider masterplan area as presented in Figure 1-1. The site is further divided into the areas as presented in Figure 1-2.

Phase 1 is proposed as a medical campus to comprise of:

- Dedicated corporate administrative offices and day-clinics on the west of the site (Blocks A & B).
- Associated retails, pharmacy, dentist, health food store, etc., and café to the north of the site (Blocks C-H).
- Medical associate offices over associated retail e.g., paramedical enterprise offices, physiotherapy, counselling, psychology, etc. (Blocks C-H).

No overnight stays are envisaged for the medical campus.

Phase 2 is a proposed retirement/nursing home with adjoining mixed retail. The nursing home element of this phase will have overnight stays.

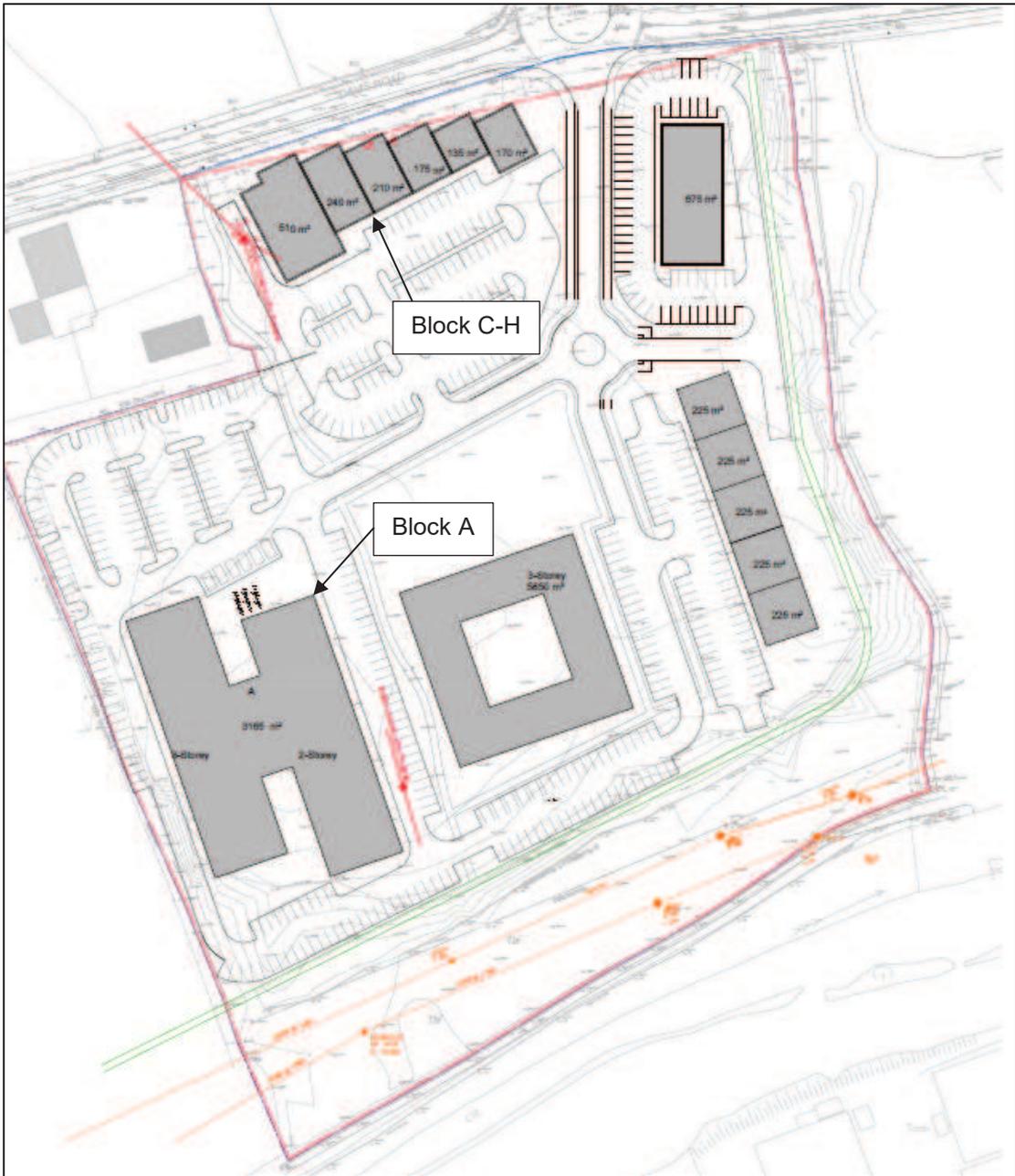


Figure 1-1: Indicative Site Layout

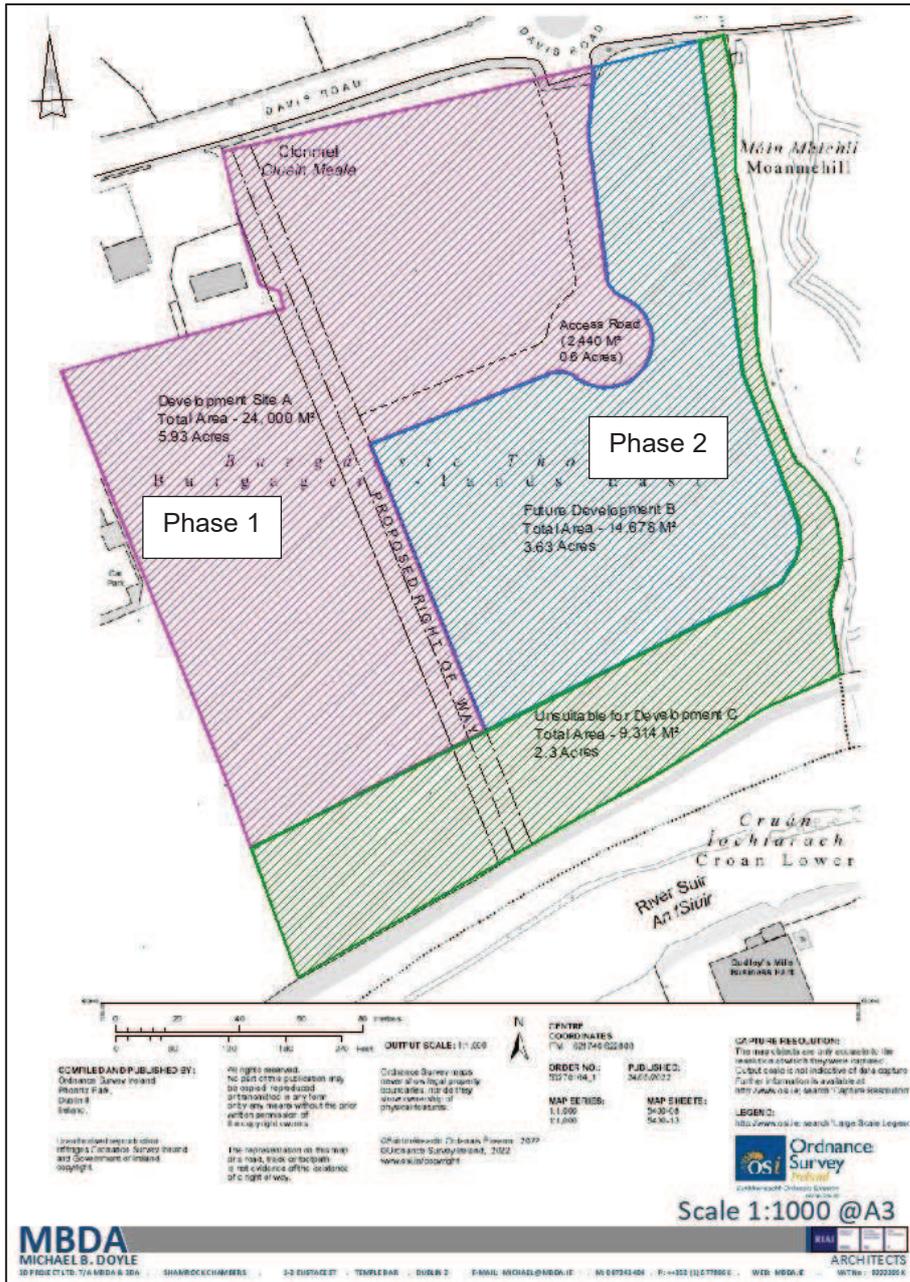


Figure 1-2: Development Areas

## 1.4 Report Structure

Section 2 contains background information and the development plan for the area. Section 3 gives the flood history and initial assessment. Section 4 outlines the Flood Risk Assessment (FRA) and site-specific mitigation details. The Justification Test for Development Management is outlined in Section 5. Conclusions are provided in Section 6.

## 2 Site Background

This section describes the proposed mixed use development site in Clonmel, Co. Tipperary, including watercourses, geology, and wider geographical area.

### 2.1 Location

The proposed development site is located in Clonmel, Co. Tipperary between the River Suir and the Davis Road (R707), refer to Figure 2-1. The site is located in a green field area. Access to the site is via the R707 along the site's northern boundary. Existing retail developments are located on the western boundary.

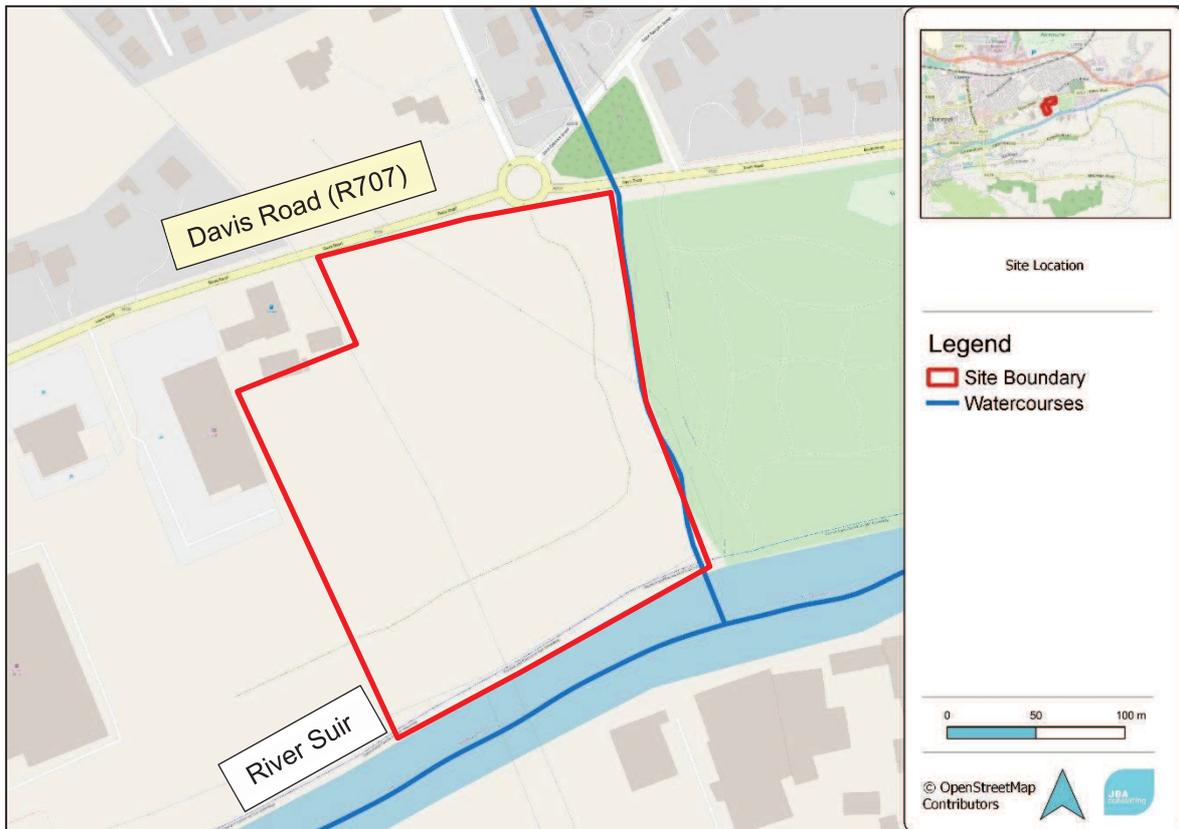


Figure 2-1: Site Location

### 2.2 Watercourses

The main hydrological feature of the area is the River Suir, located approx. 60m from the southern boundary of the site. The River Suir rises on the slopes of Devil's Bit Mountain, just north of Templemore in Co. Tipperary and approx. 100km north of the site. The River Suir flows into the Atlantic Ocean through Waterford. Another unnamed stream runs along the eastern boundary of the site. Refer to Figure 2-1.

### 2.3 Topography

A comprehensive site survey has been undertaken at the site. Review of the survey confirms that the site levels generally vary between 18mOD-20mOD and rise towards the centre of the site. For reference, the R707 levels along the northern boundary of the site are approximately 18mOD. Refer to Figure 2-2 for the visualisation of the topography within the site.

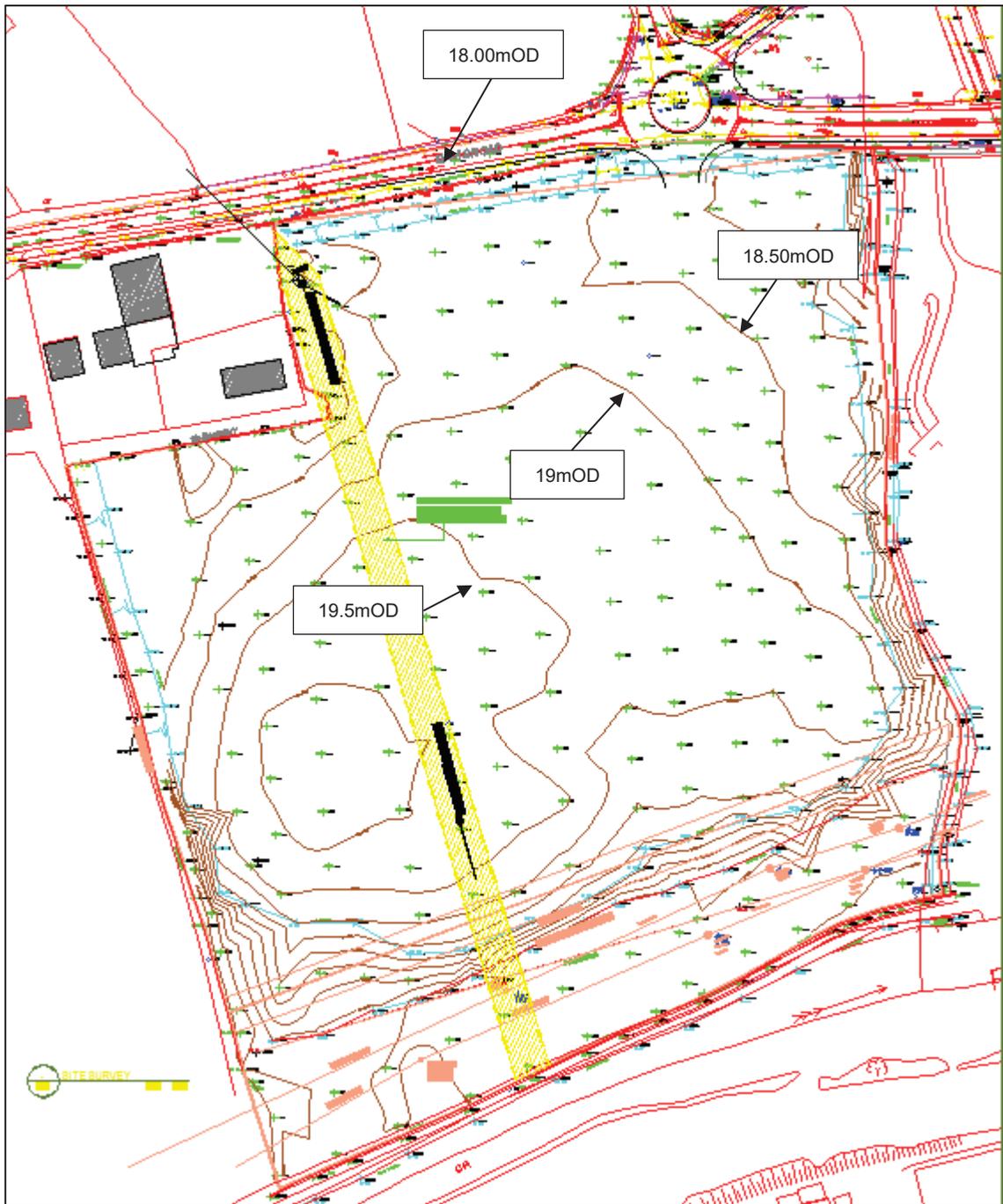


Figure 2-2: Site Topography

## 2.4 Site Geology

The geological and subsoil maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied and an extract of the subsoil map is presented in Figure 2-3.

The majority of the subsoil is made up of 'Made' ground. A section of the north eastern part of the site is underlain by shallow well drained mineral soils, 'BminSW'. The bedrock is composed of Waulsortian Limestones, described as massive, unbedded limestone.

There are no karst features in the area. Review of the GSI Groundwater Flood Data Viewer did not identify any groundwater flood risk within or surrounding the site.

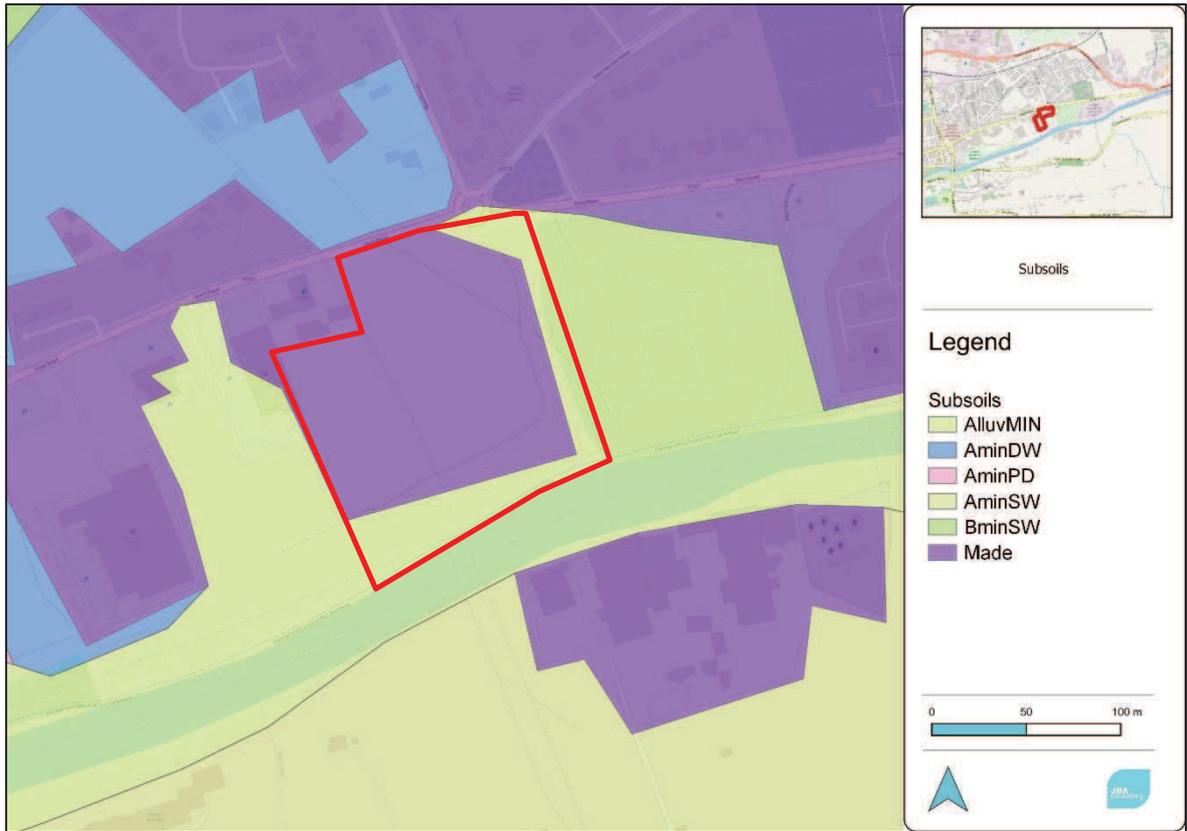


Figure 2-3: Site Subsoils

## 2.5 Clonmel and Environs Development Plan 2013 - 2019

Tipperary County Council is preparing a new Local Area Plan for Clonmel, which will set out the land use strategy for the town to ensure the town can grow, support employment and homes and can do so sustainably and successfully. The new development plan will be found in the document Clonmel Local Area Plan 2024 - 2030.

However, at present zoning is based on the Clonmel and Environs Development Plan 2013 - 2019. Under this plan, the subject site is within the development boundary for the town. The site is zoned to provide for commercial and retail users.

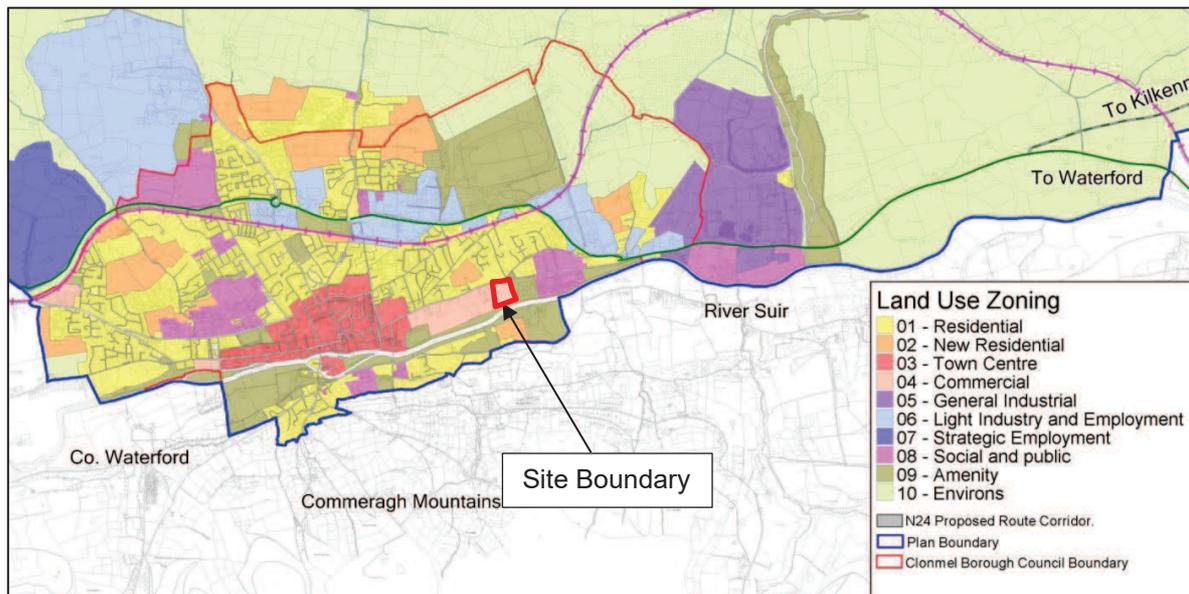


Figure 2-4: Clonmel and Environs Development Plan 2013 - 2019

As part of the Clonmel and Environs Development Plan (2013-2019) a Strategic Flood Risk Assessment (SFRA) has also been prepared. The aim of the SFRA is to identify flood risks within the development plan area and help guide appropriate development. Guidance has been provided for specific development areas within the town. It should be noted that the SFRA is based on the CFRAM mapping, and no additional modelling has been undertaken.

With reference to Section 8.3 of the SFRA, which outlines the flood risk and measures required for Opportunity Site 3: Davis Road, where the proposed site is located. The main points contained in the SFRA covering Opportunity Site 3 are as follows:

- The site is confirmed as being situated in Flood Zone B
- The flood defences have been designed to the 100-year standard plus climate change,
- The lands benefit from a flood warning system therefore, early preparedness and evacuation is possible,
- Compensatory flood storage is not required, nor is a freeboard allowance required,
- Climate Change and residual risk need to be assessed during a site-specific FRA.

## 2.6 Draft Clonmel Local Area Plan 2024 - 2030

The Draft Clonmel Local Area Plan 2024-2030 (LAP) is currently under development and will ultimately replace the Clonmel and Environs Development Plan 2013. Specific policies have been outlined to manage surface water and flood risk as outlined in Section 8.6 of the draft LAP.

It is noted that the associated flood maps (Figure 2-5) within the draft LAP places the site fully within Flood Zone C, including the lands to the west of the site that are shown to be located in Flood Zone B based on the CFRAM mapping.

Included in the Draft Clonmel Local Area Plan 2024-2030 area various land uses that have been subject to the Justification Test, refer to Figure 2-6. The sight area fails according to Note 10: Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement; (ii)

Comprises significant previously developed and/or under-utilised lands; (iii) Is within or adjoining the core of an established or designated urban settlement; (iv) Will be essential in achieving compact and sustainable urban growth; and (v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

However, under Draft Plan Policy 8.5, "applications for development on previously developed lands within Flood Zones A or B, shall be subject to site specific flood risk assessment and shall provide details of structural and non-structural flood risk management measures, such as those relating to floor levels, internal layout, flood-resistant construction, flood-resilient construction, emergency response planning and access and egress during flood events."

The limitation of the Land Use Zoning objectives and matrix is acknowledged in the Draft Clonmel Local Area Plan 2024-2030, where Flood Zone A/B overlap with Land Use Zoning Objectives. Land use should be limited to water-compatible development in Flood Zone A, and less vulnerable or water compatible uses in Flood Zone B, with a detailed site-specific Flood Risk Assessment required. This limitation shall take primacy over any other provision relating to these land use zoning objectives.

It should be noted that the SFRA Flood Map Figure 2-5, all proposed buildings proposed within the indicative layout (Figure 1-1) are located within Flood Zone C.

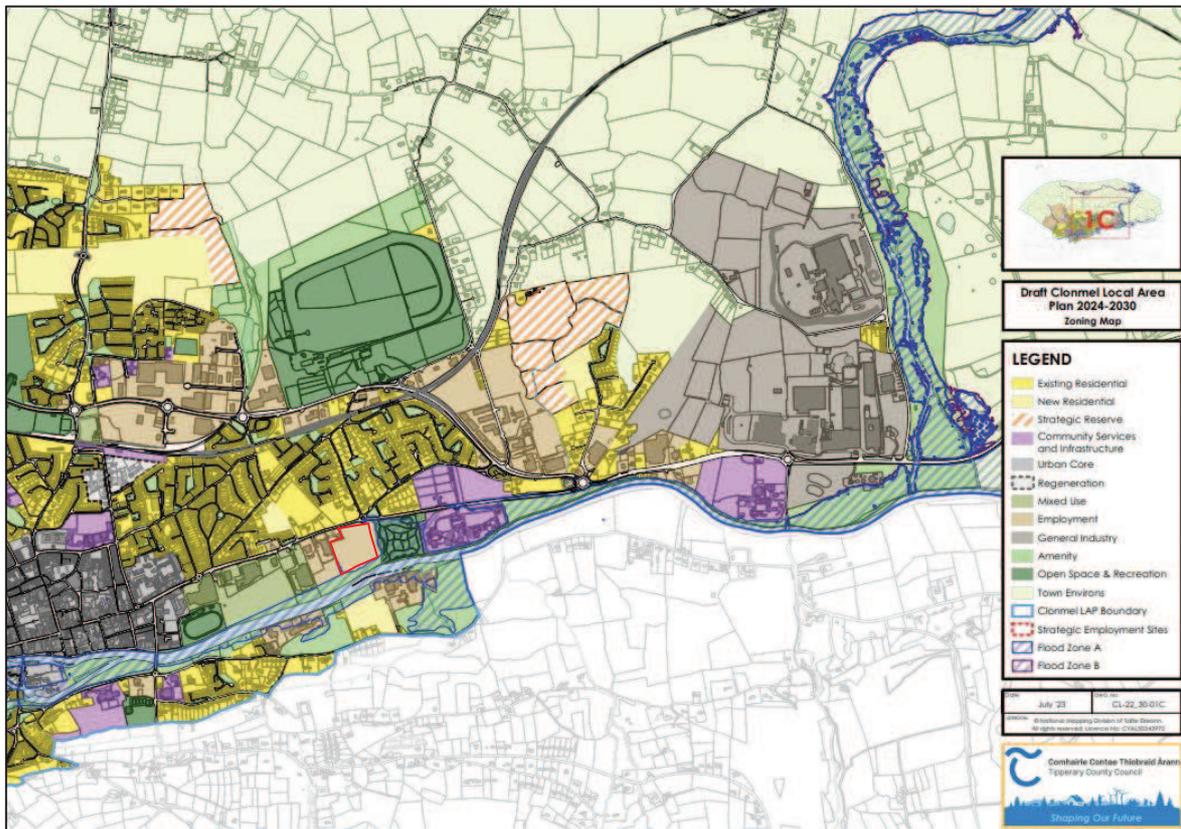


Figure 2-5: Draft Clonmel and Environs Development Plan 2024 - 2030

Site	Zoning in Draft Plan	Flood Zone	Justification Test (Fails, if one of the following fails; all must be passed for the test to be passed)			Overall Result
Lands associated with existing commercial developments	Employment Note that the meaning of zoning objectives has been influenced by the SFRA process and these meanings are explained in the Plan, including through the provisions repeated in this SFRA report.	A	Is the settlement targeted for growth under the NFP, RES, existing CDP and/or Draft CDP? Yes - Clonmel is designated as a 'Key Town' and 'Self-Sustaining Regional Growth Driver'. As set out in the Core Strategy of the Tipperary CDP 2022	Is the zoning of the lands required to achieve the proper planning and sustainable development of the settlement and in particular has the required sub-criteria been satisfied? No	Has flood risk assessment to an appropriate level of detail been carried out as part of the SEA as part of the plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impact elsewhere? These lands are largely developed. Policy 8.5 of the Plan would significantly limit the further development on these lands.	FAIL- however, see Draft Plan Policy 8.5

Figure 2-6: Draft Clonmel SFRA-Justification Test Extract (2024 - 2030)

## 3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site 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.

### 3.1 Flood History

Several sources of flood information were reviewed to establish any recorded flood history at, or near the site. This includes the OPW's website, <http://www.floodinfo.ie> and general internet searches.

#### 3.1.1 Floodinfo.ie

The OPW host a National Flood hazard mapping website, [www.floodinfo.ie](http://www.floodinfo.ie), which highlights areas at risk of flooding through the collection of recorded data and observed flood events. The following past flood events in the surrounding area are shown in Figure 3-1.

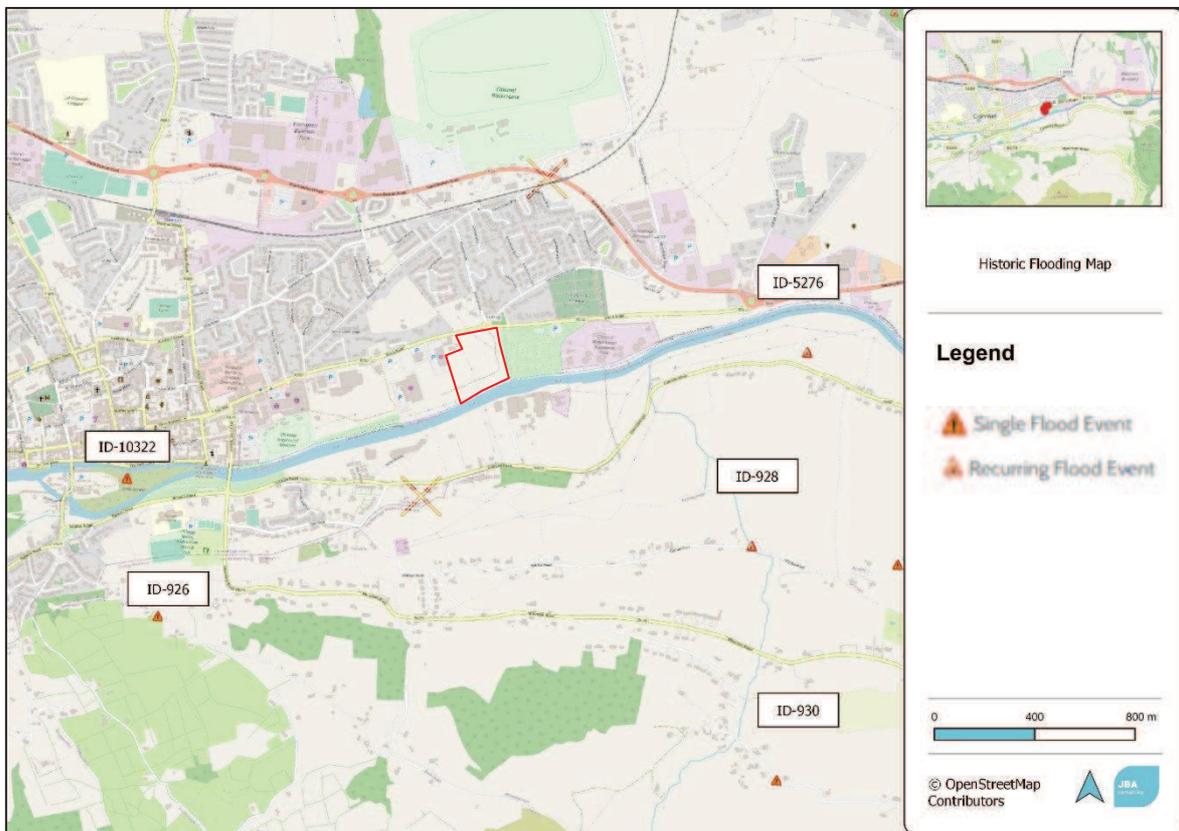


Figure 3-1: Historic Flooding Map

Review of the historic flooding record hasn't identified any flood events on site, however there are several flood events within 2km of the site boundary. Many of these flood events relate to flooding in November 2000. Flood locations recorded in the area for November 2000 are listed below:

- ID-5276 - Single flood event - Suir Kilgainy Clonmel
- ID-930 - Single flood event - Poulnagunogue, Clonmel
- ID-928 - Single flood event - Kilgainy Clonmel
- ID-926 - Single flood event - Scrothea C44

Flooding related to other events are listed below:

- ID-10322 - Single flood event - 30/09/2004 - Suir Clonmel

### 3.1.2 General Internet Searches

There were numerous reports of flooding in Clonmel from general internet searches. The largest flood event seems to have occurred in November 2000, when the River Suir reached its highest levels in over a century. This event resulted in extensive damage to properties, infrastructure, and agricultural lands. The water level inside of some resident's homes was greater than a metre, according to the Irish Times.

Flood defences were completed in the town in November 2012, which appear to be effective in containing flood waters. In February 2014, many towns along the River Suir saw extensive flooding after heavy rainfall. According to the Irish Times, the "completion of flood defence walls and installation of demountable barriers along the town's quays appear to have done their job, so far at least, as the river Suir was clearly travelling above road level this morning but remained below the top of the new walls".<sup>1</sup>

Flooding was reported again in 2021, forcing the Convent Road and a road at the Old Bridge to be closed. However, no properties were affected according to RTE.

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<sup>1</sup> 'The streets turned into a river' – The Irish Times

### 3.2 Predicative Flooding

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

- Suir Catchment Flood Risk Assessment and Management (CFRAM) Study

#### 3.2.1 Suir CFRAM Study

The primary source of data with which to identify flood risk to the site is the Suir CFRAM Study. The CFRAM consists of detailed hydraulic modelling of rivers and their tributaries. The River Suir has been modelled and flood extent maps for the fluvial scenario have been generated. The relevant flood maps are available through the CFRAM website (<http://www.floodinfo.ie/map/floodmaps/>).

Flood water spills from the River Suir and flow onto the site from the west. Flood depths on site during the 0.1% AEP event are up to 1m in depth, refer to Figure 3-3. These flood extents and depths are based on the undefended scenario. As shown in Figure 3-2, walls and embankments have been built along the banks of the River Suir, to contain flood water in extreme events. This is discussed further in Section 4.

Review of Figure 3-2 confirms that flood water partially enters the north-western corner of the site. The floodwaters flow in a general easterly direction through the site, flow back onto the R707 and continue east. The flood depths during the 0.1% AEP event are generally <0.5m.

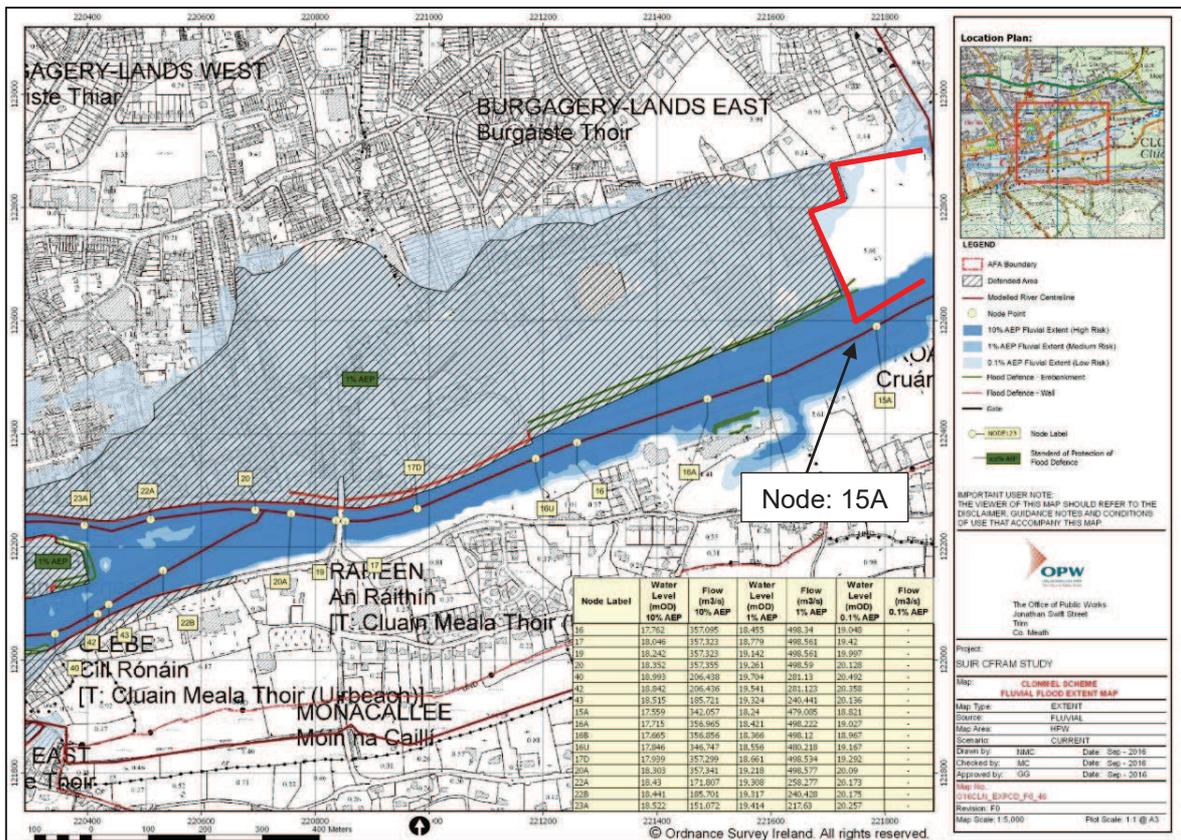


Figure 3-2: CFRAM Flood Extent Map 46

Table 3-1: CFRAM Node 15A

Node	Water Level (mOD) 10% AEP	Flow (m <sup>3</sup> /s) 10% AEP	Water Level (mOD) 1% AEP	Flow (m <sup>3</sup> /s) 1% AEP	Water Level (mOD) 0.1% AEP	Flow (m <sup>3</sup> /s) 0.1% AEP
15A	17.56	342.06	18.24	479.09	18.82	---

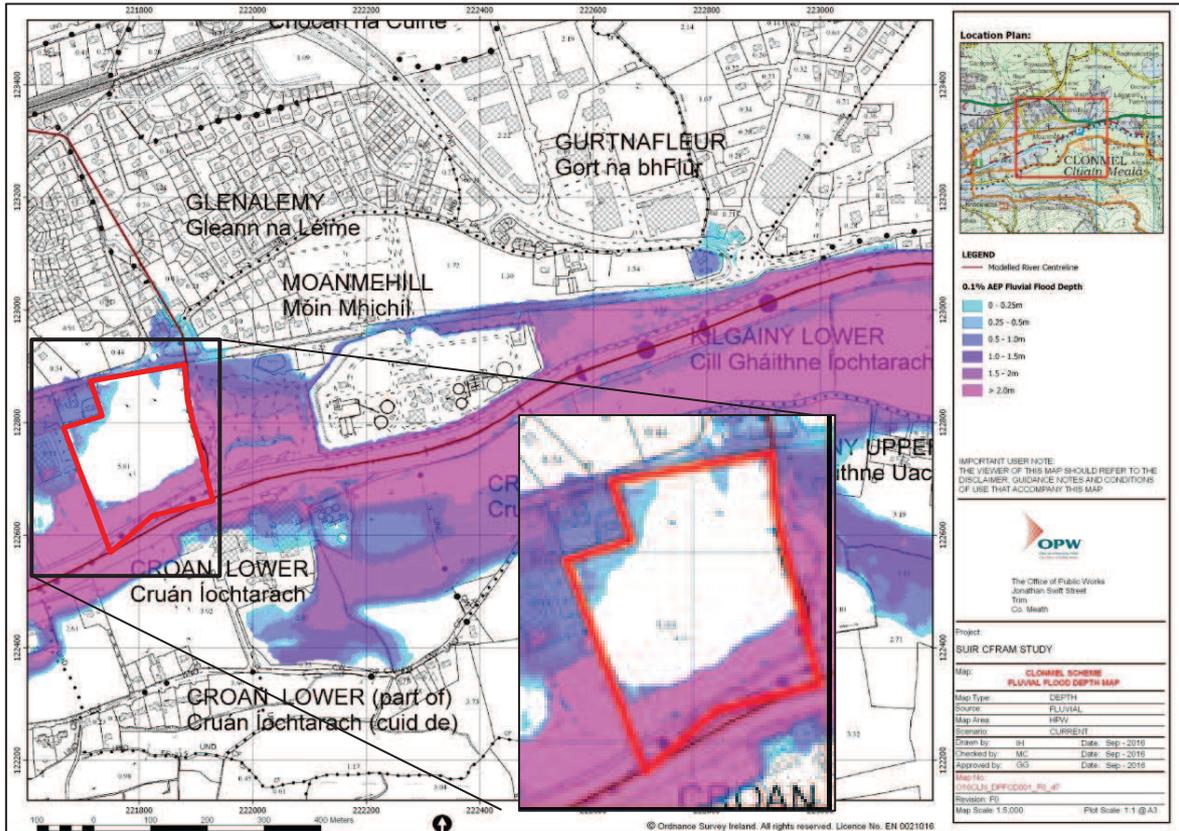


Figure 3-3: CFRAM 0.1% AEP Depth

### 3.3 Clonmel Flood Relief Scheme

The Office of Public Works, along with South Tipperary County Council, Clonmel Borough Council, and Water County Council worked on a steering group which was formed to develop and implement a flood relief scheme for Clonmel Town. The flood relief scheme aimed to offer the standard of protection against a flood with 1% probability of occurring each year, and to accommodate a 20% increase in design flow in future flood events. The scheme has been completed since November 2012.

Flood defence measures included tree felling, reinforced concrete walls, building of embankments and pumping stations, alterations and improvements to the drainage system, the placing of a contract for demountable defences and other ancillary works. In later phases of defence development new culverts, some channel widening, the replacement of two bridges and repairs to a further bridge, pumping stations and alterations and improvements to the drainage system were implemented. Again, provision was made for the erection of demountable defences. The overall scheme for Clonmel has benefitted approximately 500 properties. The effectiveness of the scheme depends on the erection of the demountable defences by Clonmel Borough Council staff upon receipt of a flood warning from the Flood Forecasting System developed by the OPW.

Several of the existing flood defences near the site can be seen in Figure 3-5.



## 3.4 Flood Sources

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.

### 3.4.1 Fluvial

Fluvial flooding is the result of river levels rising and flowing out of bank, across lands that are usually dry. The fluvial map from the Suir CFRAM has been reviewed and the site appears to be at risk from fluvial sources. Flood water spills from the River Suir and flows onto the site from the west.

Flood defences such as walls and embankments have been built along the banks of the River Suir, to contain flood water in extreme events. This is discussed further in Section 4.

The development will be mixed health care and retail, therefore has a classification of highly vulnerable/less vulnerable. The purpose of the report is to confirm the level of flood risk across the site.

### 3.4.2 Coastal

The site is located far from the coastline and therefore has no risk of tidal flooding. The risk of tidal flooding has been screened out at this stage.

### 3.4.3 Pluvial / Surface Water

Pluvial flooding is the result of rainfall-generated overland flows that arise before run-off can enter a watercourse or sewer. Review of the past flood events information doesn't indicate that the site experienced historic flooding, the site is a greenfield and the surface water will be attenuated to the river or infiltrated into the ground. Based on review of the available information, the site is not at risk of pluvial flooding.

### 3.4.4 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 low by the GSI mapping and there is no known risk of groundwater flooding in the area, thus it has been screened out at this stage.

## 4 Flood Risk Assessment

This section of the report will assess the likelihood of flooding at the site. This information will then be used to recommend master planning site options in line with the Tipperary County Development Plan 2022-2028, and the Planning System and Flood Risk Management Guidelines.

### 4.1 Flood Risk

Figure 4-1 below shows the existing flood risk to the development from the River Suir from the Suir CFRAM Study. The site is primarily in Flood Zone C, with portions of the proposed development located in Flood Zone B.

As shown in Figure 4-1, areas along the northern and western site boundary in within Flood Zone B as defined by the CFRAM Study.

Figure 4-1 outlines the post-development flood extents in proximity to the site once the proposed mitigation measures have been adopted. An embankment was constructed along the eastern boundary of the site and to the south and west of the site along the River Suir. The scheme has been complete since 2012, and the embankment can be seen in satellite imagery. This embankment had a proposed elevation of 19mOD. This sufficiently protects the site from the 1% AEP and 0.1% AEP events, refer to Table 3-1. The embankment and walls will contain water within the river channel in both the 1% AEP and 0.1% AEP event from direct inundation from its southern boundary. As previously noted, floodwaters enter the site from its north-western boundary and ultimately flow through the narrow section of the site and onto the R707.

It is recommended that the site layout is reviewed in the context of the development strategy outlined below. For the purpose of the FRA, the Health Care Centre and nursing home is classified as "highly vulnerable". All new mixed use/retail development can be placed within Flood Zone B, as defined by the baseline flood study - which would be the CFRAM Study.

The strategy for the car parking located within Flood Zone B to be retained as close to the existing ground level to maintain the flow pathway through the site to minimise the impact elsewhere. All FFLs are located above the 0.1% AEP flood event.

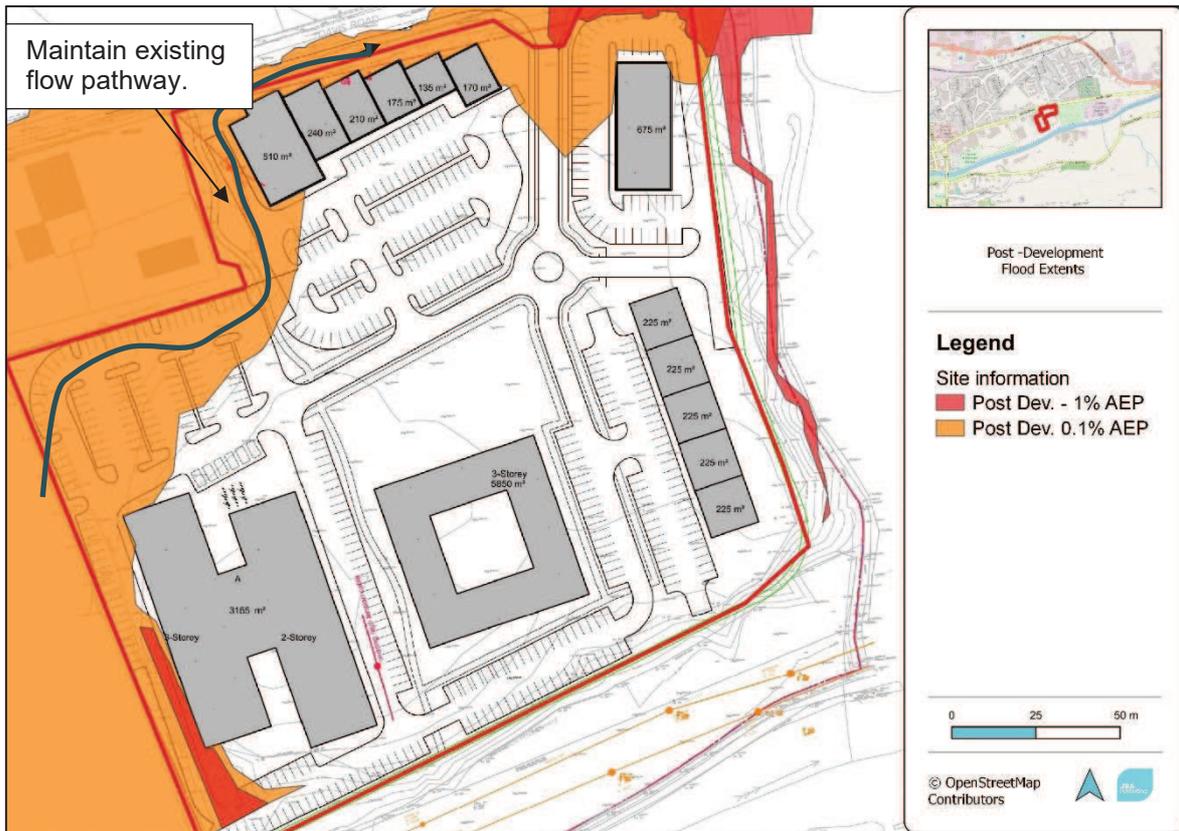


Figure 4-1: Existing Flood Risk and Proposed Development

## 4.2 Site Layout/ Finish Floor Level

The proposed mixed-use developments may be in Flood Zone B provided it passes the Justification Test, as they are classified as less vulnerable. The bottom floor of the development will be retail, while the top floor will contain the medical administration offices. A significant proportion of the site is at low probability of flooding however, it must be ensured that the proposed development infrastructure is located above the selected design event.

Minimum FFL of the development should be set to 19.12mOD to account for the 0.1% AEP event plus a freeboard of 300mm. Review of Figure 4-1 confirms that Buildings A, C and D are partially or fully within Flood Zone B, therefore a Justification Test for Development Management has been undertaken in Section 5. These buildings are proposed to be retail developments, which are classified as less vulnerable developments. Therefore, they are appropriate for Flood Zone B.

The retirement/nursing home is located in Flood Zone C, and the minimum FFL will be set at 19.12mOD. This will protect the nursing home from the predicted 1% AEP and 0.1% AEP flood levels.

It is noted that the R707 public road that provides access to the development is located in Flood Zone B, however it is recommended that all internal roads are set at a minimum level of 18.82mOD.

Table 4-1: Site Design Recommendations

AEP	Water Level (mOD)
1%	18.24
0.1%	18.82
Appropriate Freeboard	300mm
Recommended min. FFL	18.82mOD + 300mm = 19.12mOD
Recommended Road Levels	18.82mOD

#### 4.2.1 Access

Access to the site is maintained in the 0.1% AEP event along the Davis Road, should also drain away via the surface water system. Flood depths have been modelled as >500mm therefore emergence access can be maintained during a 0.1% AEP event. With the implementation of the early warning system, it is envisaged that the campus will be closed during a flood event.

### 4.3 Residual Risks

Residual risks are the risks remaining after all risk avoidance, substitution and mitigation measures have been taken. Two residual risks have been identified and are discussed in detail below.

#### 4.3.1 Drainage System Design Exceedance

The surface water system should be designed to ensure flood waters will be directed towards low-lying sections of the site in the event of a drainage system design exceedance or failure event.

#### 4.3.2 Flood Defence Failure

Residual risk is present from the embankment at the south of the site, and the flood defence wall at the western boundary. During a flood event, these may be at risk of breach or overtopping. However, these have been built specifically to cope with flood events, therefore failure is unlikely. There is a low residual risk of flood defence failure.

It should be noted that the majority of the site is located in Flood Zone C and all FFLs have been placed above the 0.1% AEP flood level plus freeboard. Therefore, if complete failure of the flood defences were to occur, the proposed development will not be impacted.

## 5 The Justification Test for Development Management

### 5.1 Strategy

As the development is partially located in Flood Zone B, the Justification Test (JT) has been undertaken to confirm the site is appropriate for development. The development is highly vulnerable development so the JT is required, as indicated in Table 3.1 of The Planning System and Flood Risk Management.

The planning guidance appropriate to this development is, "The Planning System and Flood Risk Management" and sets out a framework within which the planning authority should consider proposals for new development in areas of flood risk. This framework is called the Justification Test for Development Management.

In the following text, each of the criteria within the JT is responded to as they relate to the proposed development. For ease of reading, where the responses are supported by technical detail, which is contained in this report, an appropriate chapter has been referenced.

### 5.2 Justification Test: Part 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 the planning guidelines.**

According to the Clonmel & Environs Development Plan, the land use zoning is to provide for 'Commercial' use. The site is also included in Opportunity Site 3 within the SFRA which details the requirements for appropriate development in this area.

The proposed involve the development of a Medical Campus, Nursing Home and Retail units. The Medical Campus and Nursing Home are open for consideration uses, however there is currently policy within the Draft Clonmel Local Area Plan 2024-2030 restricting retail uses. **However, from flood risk perspective, based on the draft SFRA flood maps, all proposed buildings are located in Flood Zone C, therefore the proposals pass Part 1 of the Justification Test.**

Conclusion: It has been outlined that the proposed development which comprises medical properties are open for consideration uses, however there is currently policy within the Draft Clonmel Local Area Plan 2024-2030 restricting retail uses. Any new development must be placed above the relevant 1% AEP and 0.1% AEP flood levels and SFRA requirements.

### 5.3 Justification Test: Part 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**

All development will be placed above the 1% AEP and 0.1% AEP flood levels. Less vulnerable development, such as retail, may be placed within Flood Zone B, as the existing flood defences minimise flood risk. Mitigation measures have been outlined in Section 4, which ensure that the development will not increase the risk of flooding on site or elsewhere. The main strategy is to raised all FFLs above the 0.1% AEP plus freeboard while also maintaining the existing flow path through the site.

Conclusion: Based on the draft SFRA flood maps, the retail/medical day care and nursing home are located in Flood Zone C. **Mitigation measures have been included to maintain the minor flow path through the site (as provided by the CFRAM mapping) which will ensure that the development will not increase flood risk elsewhere.**

**(ii) the development proposal includes measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible**

The proposed development will be located in Flood Zone C and all FFLs will be raised above the 0.1% AEP events and will not be impacted by the predicted flood events.

Conclusion: All medical/retail and nursing home areas will be located above the 1% and 0.1% AEP flood levels plus appropriate freeboard.

**(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**

The proposed development has been designed with sufficient freeboard to account for any uncertainty. Flood defences also protect the site against the 1% AEP and a 20% increase in flow from climate change. Access to the site can be maintained during a flood event, however it is envisaged that all develop will be closed following the implementation of the early warning system.

Residual risks (flood defence failure) have also been considered in the development of the mitigation measures.

**(iv) The development proposed will 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 proposed development has been designed for a green fields site and is compatible with good urban design.

## 6 Conclusion

JBA Consulting has undertaken a detailed Flood Risk Assessment for the proposed development located in Clonmel, Co. Tipperary. The proposed development will consist of the construction of a Healthcare Campus, Retail Units, Nursing home and associated 300 car parking spaces.

From reviewing the available sources of flooding, the CFRAM mapping indicates that some of the site has been shown to be at risk of inundation from the 0.1% AEP fluvial flood event from the River Suir approx. 60m south of the site boundary. No historic flooding was identified at the site, however flooding occurred in the surrounding area prior to the completion of the Clonmel Flood Relief Scheme. **The most up to date flood map, the draft SFRA flood map places all buildings (retail, medical campus and nursing home within Flood Zone C. Therefore, the proposals are compliant with the FRA guidelines.**

It is now recommended that the site layout is designed to ensure that a flow path can be maintained for the 0.1% AEP flood event. This will ensure that there is no negative impact on flood risk to the surrounding properties post-development. The FFL will also be raised above the 0.1% AEP flood level with appropriate freeboard. This will ensure that Healthcare Campus, Retail Unit, and nursing home will not be impacted by the 0.1% AEP event.

The Flood Risk Assessment and strategic development recommendations were undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and agrees with the core principles contained within.

# Appendices

## A Appendix - 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 years, a 1% AEP flood 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 purpose of the Planning Guidelines, there are 3 types of levels of flood zones, A, B and C.

Zone	Description
<b>Flood Zone A</b>	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
<b>Flood Zone B</b>	Moderate probability of flooding, between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/ tidal.
<b>Flood Zone C</b>	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 consider 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 will be maintained in perpetuity.



### A.3 Consequences of Flooding

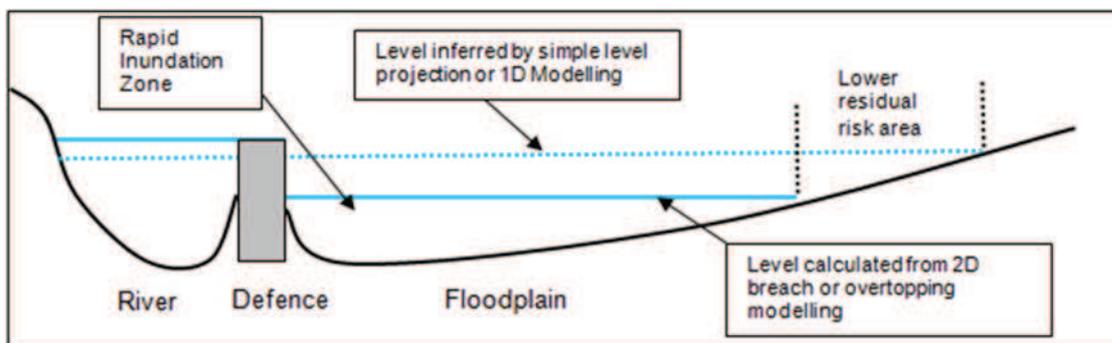
Consequences of flooding depend on the Hazards caused by flooding (depth of water, speed of flow. Rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g., age-structure of the population, presence, and reliability of mitigation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

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on type of development, nature, 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, such as changing rooms.
- **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 known as residual risk:



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