



APPENDIX 8-2

SITE SPECIFIC FLOOD RISK ASSESSMENTS

Meath County Council - Viewing Purposes Only!

SITE-SPECIFIC FLOOD RISK ASSESSMENT

**Moygaddy Castle SHD
For Sky Castle Ltd**

**PROJECT NO. S665
26 August 2022**



OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers



SITE-SPECIFIC FLOOD RISK ASSESSMENT

**Moygaddy Castle SHD
For Sky Castle Ltd**

**PROJECT NO. S665
26 August 2022**

Meath County Council - Viewing Purposes Only

SITE-SPECIFIC FLOOD RISK ASSESSMENT

for

Moygaddy Castle SHD,

at Moygaddy,

Co. Meath.



OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers

NOTICE

This document has been produced by O'Connor Sutton Cronin & Associates for its client, *Sky Castle Ltd.* It may not be used for any purpose other than that specified by any other person without the written permission of the authors.



DOCUMENT CONTROL & HISTORY

OCSC Job No.: S665	Project Code	Originator	Zone Volume	Level	File Type	Role Type	Number	Status / Suitability Code	Revision
	S665	OCSC	1C	XX	RP	C	0009	S4	P04
Rev.	Status	Authors	Checked	Authorised	Issue Date				
P04	S4	MK	AH	AH	26.08.2022				
P03	S4	MK	AH	AH	18.08.2022				
P02	S2	MK	AH	AH	16.08.2022				
P01	S2	MK	AH	AH	10.08.2022				

SITE-SPECIFIC FLOOD RISK ASSESSMENT

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
1 INTRODUCTION	1
1.1 Appointment.....	1
1.2 Administrative Jurisdiction	1
1.3 Site Location	1
2 SITE CONTEXT	3
2.1 Existing Site Overview	3
2.2 Proposed Development Context	3
3 SCOPE OF SITE-SPECIFIC FLOOD RISK ASSESSMENT	7
4 FLOOD RISK ASSESSMENT	8
4.1 Design Guidelines Overview	8
4.2 The Planning System and Flood Risk Management, Guidelines for Planning Authorities ..	8
4.3 Flood Risk Assessment.....	9
4.3.1 Flood Risk Assessment Stages	10
4.4 Flood Zones.....	10
4.5 Development Vulnerability.....	11
4.6 Sequential Approach	11
4.7 Meath County Council Development Plan 2021-2027	12
4.8 Kildare County Council Development Plan 2017-2023.....	13
4.9 Flood Risk Assessment and Management Plan for Meath CDP 2021-2027	14
4.10 Climate Change	15
5 STAGE 1 & 2 FLOOD RISK IDENTIFICATION & ASSESSMENT.....	16
5.1 Existing Hydrological Environment.....	16
5.2 Topographical Survey	17
5.3 Site Geology.....	17
5.4 Historical Maps	18
5.5 Historical Flooding.....	18
5.6 Fluvial Flooding	19

5.7 Flood Study on River Ryewater 21

5.8 Coastal Flooding..... 22

5.9 Pluvial Flooding..... 22

5.10 Estimate of Flood Zone and Levels 23

5.11 Proposed Development Context 23

5.12 Section 50 Application..... 24

6 CONCLUSIONS AND RECOMMENDATIONS 25

APPENDICES

- APPENDIX A. FLOODMAPS.IE REPORT
- APPENDIX B. CFRAM FLOOD EXTENT MAPPING
- APPENDIX C. RIVER RYEWATER FLOOD STUDY SCOPING REPORT

Meath County Council - Viewing Purposes Only!

1 INTRODUCTION

1.1 Appointment

O'Connor Sutton Cronin & Associates (OCSC) have been appointed by *Sky Castle Ltd* to carry out A Site-Specific Flood Risk Assessment for the proposed 360nr. unit residential and crèche development at Moygaddy, Co. Meath, which is located north east from the town of Maynooth, Co. Kildare.

1.2 Administrative Jurisdiction

The proposed development is located in the jurisdiction of Meath County Council (MCC), and therefore the site-specific assessment on flood risk was assessed with reference to the following:

- Meath County Development Plan 2021 - 2027;
- Maynooth Environs Local Area Plan;
- Greater Dublin Strategic Drainage Study (GDSDS);
- The Planning System and Flood Risk Management Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government and the Office of Public Works).

It is noted that this application is subject to Strategic Housing Development assessment through An Bord Pleanála.

1.3 Site Location

The subject site is located on the southernmost extent of County Meath, aligning with the county boundary to Co. Kildare, and is approximately 1.5km north from the town of Maynooth, Co. Kildare, as shown in **Figure 1.1**, with the main residential development site being immediately bound by:

- The Blackhall Little stream (as referenced by the EPA), to the east (partially);
- Local Road, L6219, to the north;
- Agricultural lands to the west; and
- River Ryewater to the south.

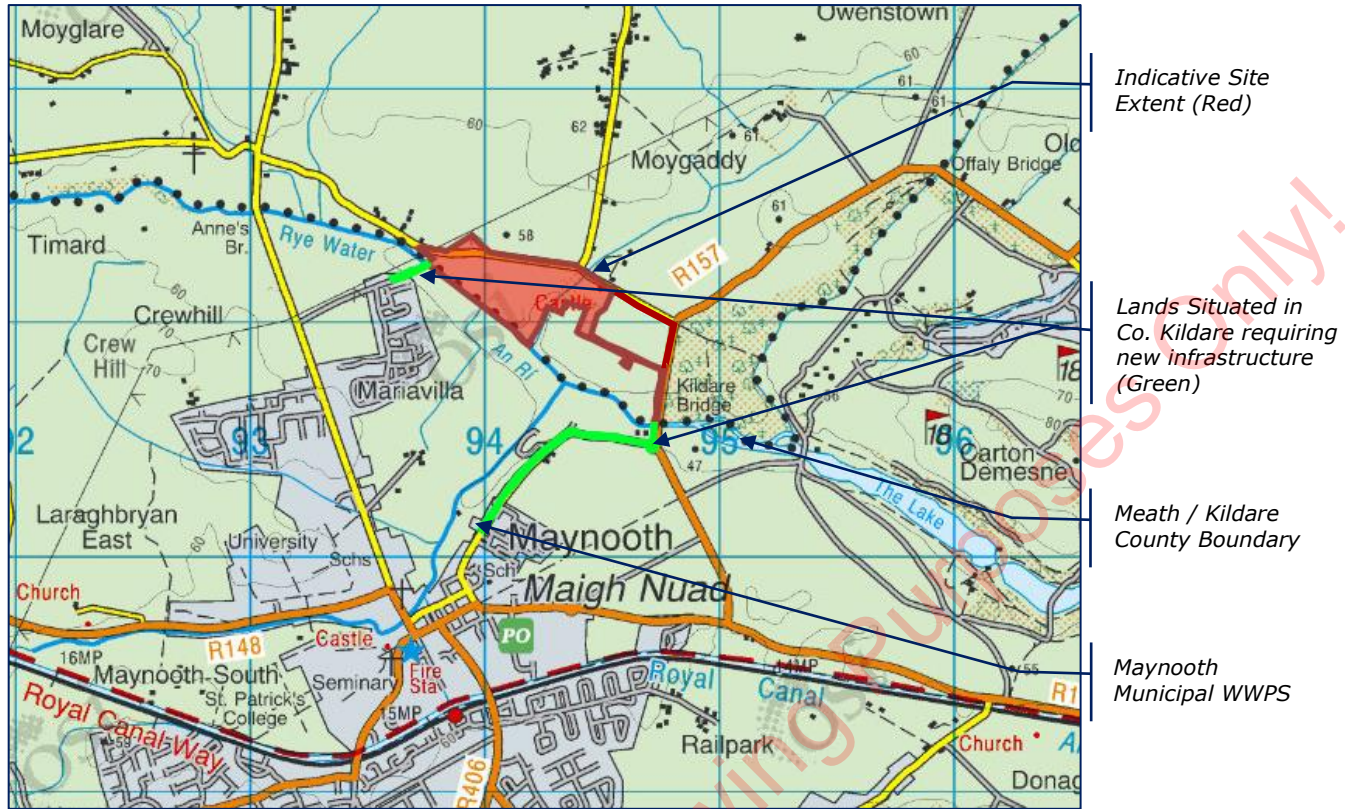


Figure 1.1 - Site Location (www.myplan.ie)

Meath County Council - Viewing Only!

2 SITE CONTEXT

2.1 Existing Site Overview

The overall gross site area that comprises this planning application (including offsite infrastructural works) is **c.19.52-hectares**, with c.7.89 ha of this zoned by Meath County Council for **A2 - New Residential**. Other areas within the development boundary are zoned for High Amenity, or include public road infrastructure.

The site is currently greenfield and used for agricultural purposes, and can be accessed from the L6219 Road which aligns the northern boundary of the subject site. Ground levels across the site typically fall gently from north to south, with a sharp decline at the southern and eastern boundaries, which align to the River Ryewater and the Blackhall Little stream respectively. Refer to *Section 5.2* for context of existing site levels.

2.2 Proposed Development Context

Planning Permission is sought by Sky Castle Ltd. for the development of a site which extends to 19.52 hectares gross site area in the townland of Moygaddy, Maynooth Environs, Co. Meath. The net developable area equates to 7.89 hectares which equates to a residential density of 45.6 units per hectare.

The proposed development will consist of the following:

1. Construction of 360 no. residential units comprising:
 - i. 196 no houses (including 19 no. 2 beds, 156 no. 3 beds and 21 no. 4 beds).
 - ii. 102 no. duplexes (including 51 no. 1 beds and 51 no. 2 beds) set out in 6 no. blocks.
 - iii. 62 no. apartments (including 26 no. 1 beds and 36 no. 2 beds) set out in 2 no. blocks.
2. Provision of a public park and playground with associated 42 no. car parking spaces adjacent to Moygaddy Castle and pedestrian and cyclist links along the River Rye. The overall public open space (including the High Amenity Lands) equates to 7.98 hectares.

3. Provision of private open spaces in the form of balconies and terraces is provided to all individual apartments and duplexes to all elevations.
4. Development of a two-storey creche facility (514 sqm), outdoor play area and associated parking of 29 no. spaces.
5. Provision of a single storey Scout Den facility, including a hall, kitchen, meeting room and ancillary facilities (220sqm) and associated parking of 6 no. spaces.
6. Provision of 4 no. bridge structures comprising:
 - i. an integral single span bridge at Moyglare Hall over the River Rye Water to connect with existing road infrastructure in County Kildare and associated floodplain works and embankments.
 - ii. a new pedestrian and cyclist bridge at Kildare Bridge which will link the proposed site with the existing road network in County Kildare.
 - iii. a new pedestrian and cycle bridge across Moyglare Stream on the L22148 adjacent to the existing unnamed bridge.
 - iv. a new pedestrian and cycle bridge over the Moyglare Stream linking the proposed residential site with the proposed Childcare Facility, Scout Den and Moygaddy Castle Public Park.
7. Provision of 500m of distributor road comprising of 7.0m carriageway with turning lane where required, footpaths, cycle tracks and grass verges. All associated utilities and public lighting including storm water drainage with SuDS treatment and attenuation.
8. Proposed road improvement and realignment works including:
 - i. realignment of a section of the existing L6219 local road, which will entail the demolition of an existing section of the road which extends to circa 2,500 sqm.
 - ii. Provision of pedestrian and cycle improvement measures along the L6219 and L22148 which abuts the boundary of Moygaddy House which is a Protected Structure (RPS ref 91558).

- iii. Provision of pedestrian and cycle improvement measures along the R157 which abuts the Carton Demense Wall which is a Protected Structure (RPS Ref 91556).
9. Provision of 2 no. vehicular and pedestrian accesses from the L6219 local road, and 1no. vehicular and pedestrian entrance from the L22148 and an additional vehicular and pedestrian access from the R157 to the Childcare and Scout Den facilities.
10. The proposed development will provide 283 no. of bicycle parking spaces, of which 200 no. are long term spaces in secure bicycle stores and 83 no. are short term visitor bicycle parking spaces. 12 no. bicycle spaces are provided for the creche and 12 no. bicycle spaces are provided for the Scout Den.
11. A total of 667 no. car parking spaces are provided on site located at surface level. The car parking provision includes 10 no. Electric Vehicle charging and Universally Accessible spaces allocated for the Apartment & Duplex units. All Houses will be constructed with provision for EV Charging.
12. Provision of site landscaping, public lighting, bin stores, 3 no. ESB unit substations, site services and all associated site development works.
13. A Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) has been included with this application.

The proposed site layout is shown in **Figure 2.1**, with context to the wider Maynooth Environs area that is in the Applicant's ownership.

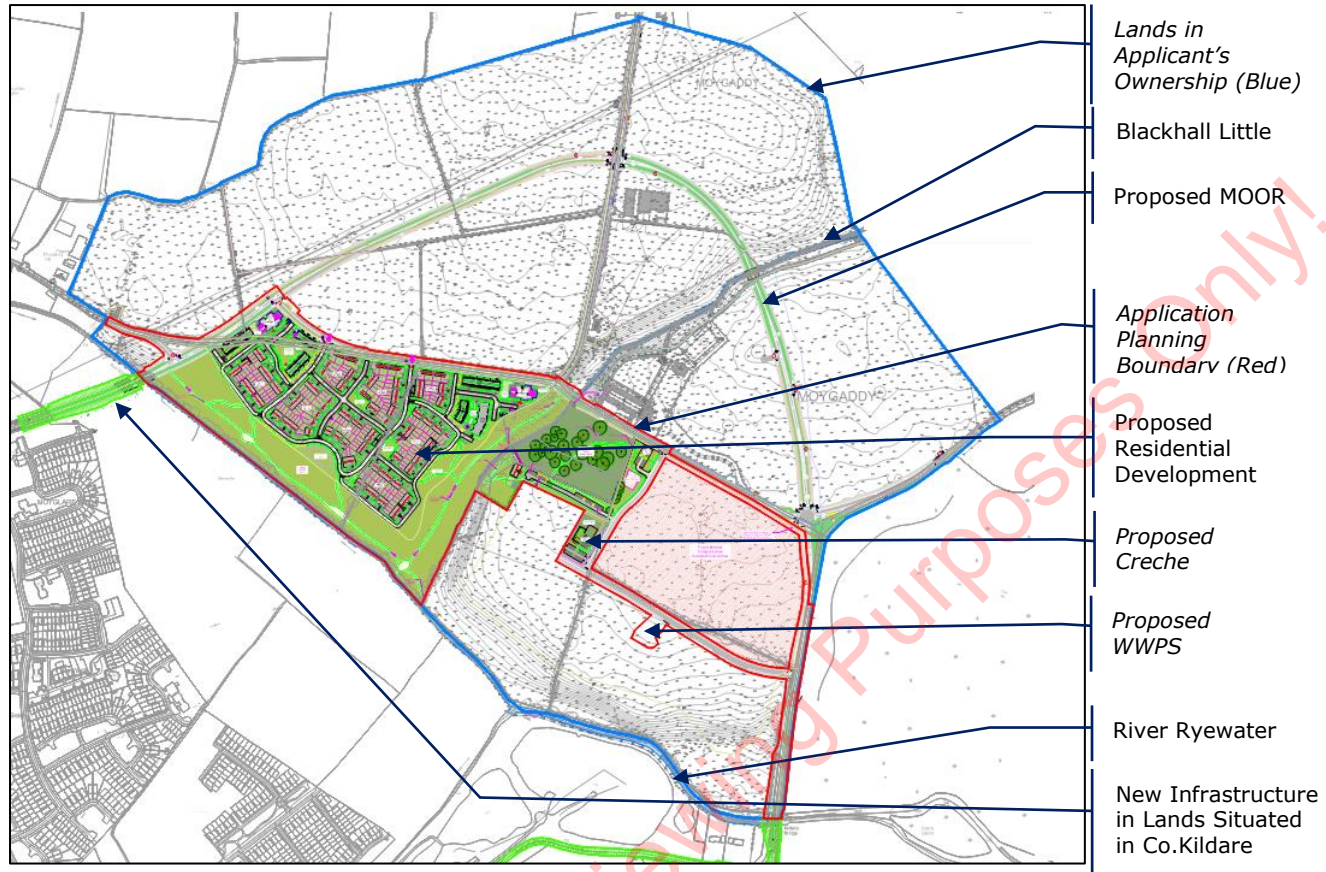


Figure 2.1 - Proposed Site Layout

3 SCOPE OF SITE-SPECIFIC FLOOD RISK ASSESSMENT

This Site-Specific Flood Risk Assessment (SSFRA) report was prepared by reviewing the available data from the Local Authority sources and national bodies *i.e.*, Meath County Council, Kildare County Council, Irish Water, The OPW, and the wider Design Team.

A detailed assessment of the proposed engineering infrastructure services associated with, the proposed development is provided under separate cover, as part of this application. Refer to document **S665-OCSC-1C-XX-RP-C-0002** for details.

An additional detailed flood study on the river Ryewater was carried out by JBA Consulting, for assessment of impact of the proposed development, and its associated new bridge structures; this has been submitted under separate cover, as part of this application, and has been considered as part of this SSFRA report.

This site-specific flood risk assessment was also prepared based on a comprehensive review of the information available from the following public sources:

- The Office of Public Works, the Planning System and Flood Risk Management;
- Meath County Council Development Plan 2021-2027;
- Kildare County Development Plan 2017 – 2023;
- Greater Dublin Strategic Drainage Study (GDSDS);
- OPW website www.floodinfo.ie;
- DECLG website www.myplan.ie;
- OPW website www.floodmaps.ie;
- Meath County Council's and Irish Water's Drainage and Watermain Records
MCC and Irish Water Records;
- Geological Survey of Ireland Maps;
- Architectural drawings;
- Topographical survey of the proposed site.

4 FLOOD RISK ASSESSMENT

4.1 Design Guidelines Overview

Any planning permission sought on the subject lands are required to adhere to the Local Authority requirements *i.e.*, the Meath County Council Development Plan, and as such, The Planning System and Flood Risk Management (FRM), Guidelines for Planning Authorities, in which, its Technical Appendices outline the requirements for a Site-Specific Flood Risk Assessment.

4.2 The Planning System and Flood Risk Management, Guidelines for Planning Authorities

The FRM Guidelines outline methodologies for the "transparent consideration of flood risk at all levels of the planning process, ensuring consistency of approach throughout the country".

"The core objectives of the FRM Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water runoff;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management flood risk management."

In order to achieve the aims and objectives that are set out in the FRM Guidelines, the key principles that should be applied to new development are as follows:

- Avoid the risk, where possible;
- Substitute less vulnerable uses, where avoidance is not possible; and

- Mitigate and manage the risk, where avoidance and substitution are not possible.

Justification for development is required in situations where 'avoid' and 'substitute' principles cannot be applied. This is further summarised in the FRM Guidelines Sequential Approach, as illustrated in *Figure 4.1*.

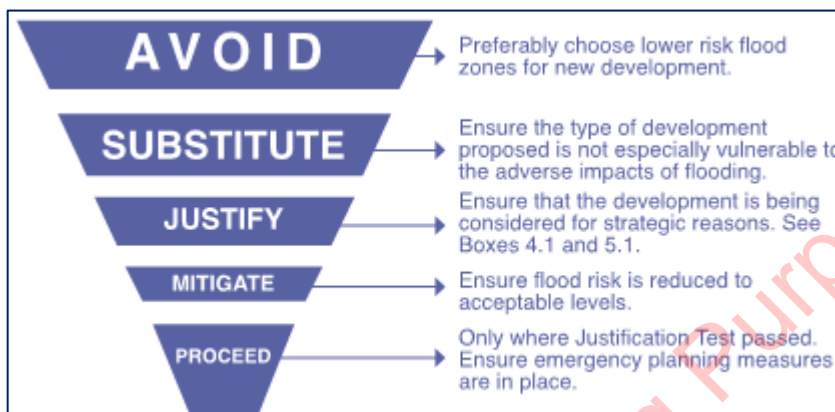


Figure 4.1 - Sequential Approach Principles in Flood Risk Management.

4.3 Flood Risk Assessment

The assessment of flood risk requires an understanding of where the water comes from (i.e., the source), how and where it flows (i.e., the pathways) and the people and assets that it affects (i.e., the receptors). This is illustrated further in *Figure 4.2*, as sourced from the FRM Guidelines.

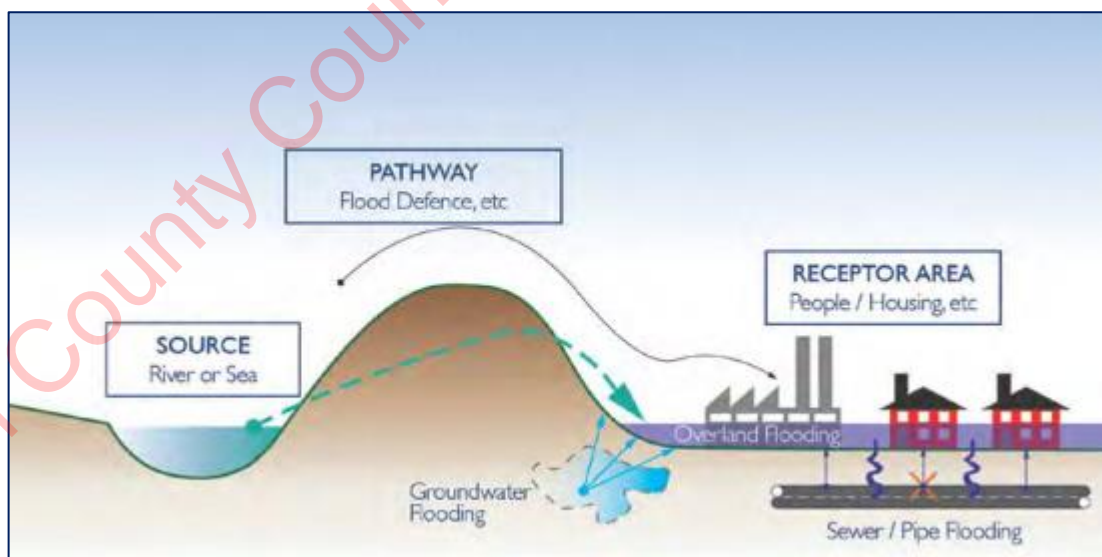


Figure 4.2 - Source - Pathway - Receptor Model

The main sources of flooding are rainfall, or higher than normal sea or river levels.

The main pathways include rivers, streams, sewers, drains, overland flow, and river and coastal floodplains and their assets.

Receptors typically include people, their property and their environment.

All three elements of this model must be examined as part of the flood risk assessment, including the vulnerability and exposure of receptors. In order to determine its potential consequence.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from a development locally and beyond the development site.

4.3.1 Flood Risk Assessment Stages

The FRM Guidelines outline that a staged approach should be adopted when carrying out a flood risk appraisal or assessment of flood risk for individual planning applications. "These stages are:

- **Stage 1** – Flood risk identification
- **Stage 2** – Initial flood risk assessment
- **Stage 3** – Detailed flood risk assessment

4.4 Flood Zones

The FRM Guidelines identifies three types, or levels, of flood zones, which are defined as follows:

1. **Flood Zone A** – where the probability of flooding from rivers and sea is highest (greater than 1%AEP for fluvial, or 0.5%AEP for coastal flooding);
2. **Flood Zone B** – where the probability of flooding from rivers and sea is moderate (between 0.1%AEP and 1%AEP for fluvial and between 0.1%AEP and 0.5%AEP for coastal flooding);

3. **Flood Zone C** – where the probability of flooding from rivers and sea is low (less than 0.1%AEP for both fluvial and coastal flooding).

4.5 Development Vulnerability

Table 3.1 of the PSFRM Guidelines classifies the proposed commercial development as being '**less vulnerable development**', based on its proposed land use and type of development.

Table 3.2 of the PSFRM Guidelines, reproduced in *Figure 4.3* below, illustrates the types of development that are considered appropriate to each flood zone, and those that would be required to meet the criteria of a Justification Test, which establishes the criteria under which desirable development of a site within a floodplain may be warranted.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

Figure 4.3 - Matrix of Vulnerability Vs. Flood Zone

Therefore, based on the table above, *Highly Vulnerable Development*, such as residential, is classified as '**appropriate**' if it is located within Flood Zone C.

4.6 Sequential Approach

A sequential approach, based on the development vulnerability and location with respect to flood zones, is a key tool in ensuring new development is first and foremost directed towards land that is at low risk of flooding. This approach is illustrated further in *Figure 4.4*.

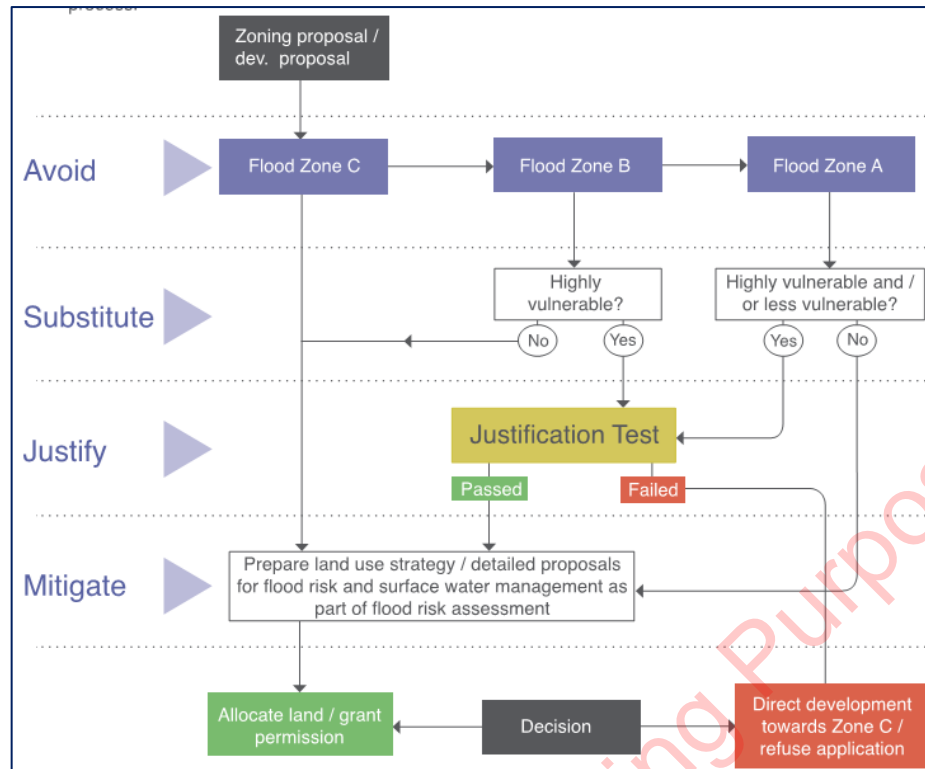


Figure 4.4 - Sequential Approach Mechanism (FRM Guidelines)

4.7 Meath County Council Development Plan 2021-2027

The Meath County Development Plan 2021-2027 identifies a number of policies relating to flooding, some are outlined below:

"INF POL 19: To implement the findings and recommendations of the Strategic Flood Risk Assessment prepared in conjunction with the County Development Plan review, ensuring climate change is taken into account.

INF POL 20: To require that a Flood Risk Assessment is carried out for any development proposal, where flood risk may be an issue in accordance with the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoECLG/OPW, 2009). This assessment shall be appropriate to the scale and nature of risk to and from the potential development and shall consider the impact of climate change.

INF POL 25: To have regard to the recommendations of the Fingal East Meath Flood Risk Assessment and Management Study (FEMFRAMS) and the Eastern Catchment Flood Risk Assessment and Management Study (CFRAMS).

INF POL 29: To facilitate the provision of new, or the reinforcement of existing flood defences and protection measures where necessary and in particular to support the implementation of flood schemes being progressed through the planning process during the lifetime of the Plan. The provision of flood defences will be subject to the outcome of the Appropriate Assessment process."

4.8 Kildare County Council Development Plan 2017-2023

The Kildare County Development Plan identifies a number of policies relating to flooding, some are outlined below:

"SW3 - Support and co-operate with the Office of Public Works in delivering the Catchment Based Flood Risk Assessment and Management Programme in particular the Eastern and South Eastern CFRAM studies and associated Flood Management Plans. The recommendations and outputs arising from these studies shall be incorporated in preparing plans and assessing development proposals.

SW4 - Support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks and the Flood Risk Regulations (SI No 122 of 2010).

SW5 - Manage flood risk in the county in accordance with the requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) and circular PL02/2014 (August 2014), in particular when preparing plans and programmes and assessing development proposals. For lands identified in the Strategic Flood Risk Assessment a site-specific Flood Risk Assessment to an appropriate level of detail, addressing all potential sources of flood risk, is required, demonstrating compliance with the aforementioned Guidelines or any updated version of these guidelines, paying particular attention to residual flood risks and any proposed site-specific flood management measures.

SW6 - Ensure effective management of residual risks for development permitted on floodplains."

4.9 Flood Risk Assessment and Management Plan for Meath CDP 2021-2027

A Strategic Flood Risk Assessment (SFRA) was prepared in conjunction with the Meath County development Plan 2021-2027 by JBA. The SFRA includes flood maps and review of the flood risk to the **Maynooth Environs** i.e., Moygaddy.

The MCC SFRA comments that *'The River Rye Water flows adjacent to the southern and eastern border of the settlement, and a further tributary flows through the settlement from a north easterly direction. The CFRAM management plan confirms that there is an additional measure for Maynooth, however this is in Kildare and does not impact County Meath. The floodplain of both watercourses is appropriately zoned as F1 or H1. Existing development has largely avoided areas of high flood risk'*.

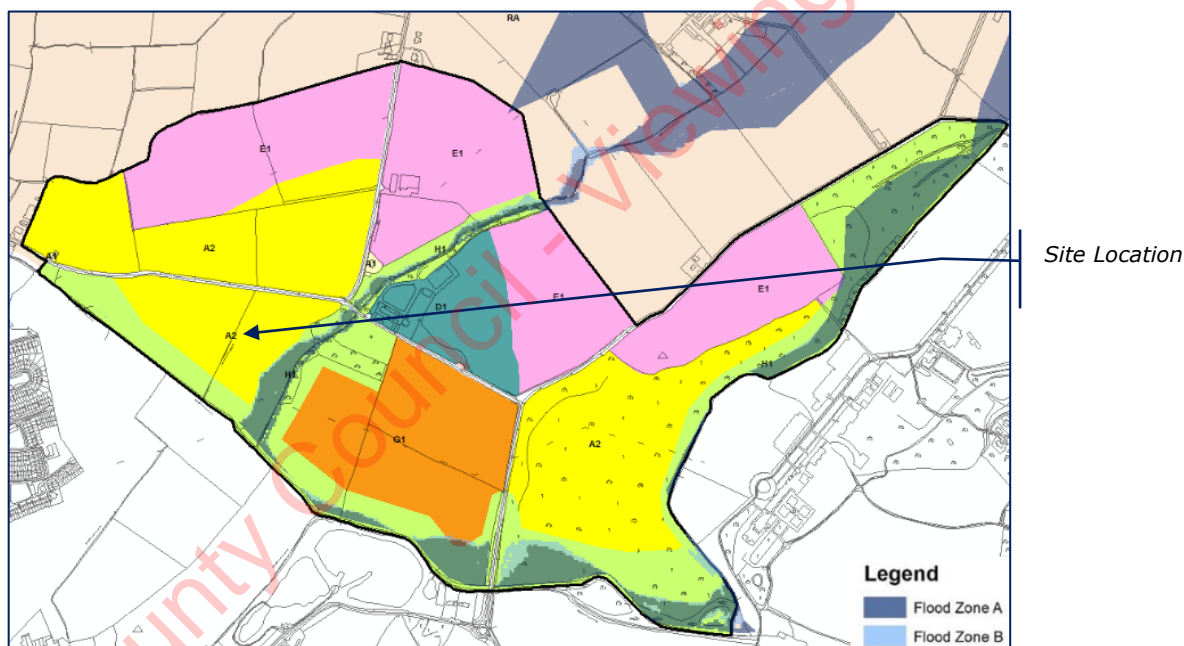


Figure 4.5 - Moygaddy Environs Flood Zones (MCC Dev Plan)

The conclusion of the Maynooth Environs SFRA review includes to *'Manage flood risk and development in line with approved policies and objectives. Ensure that the distributor road has appropriate site-specific FRA and OPW Section 50 consent.'*

4.10 Climate Change

Both the Greater Dublin Strategic Drainage Study (GSDSDS) and PSFRM Guidelines require that account be taken of the effects of climate change over the design life of a development, typically 100 years. Design parameters to take account of climate change were established in the *GSDSDS* and revised following later studies and Climate Change Sectorial Adaptation Plan Flood Risk Management (2015-2019) Development published by the OPW. These parameters are set out in Table 4-1.

Table 4-1: Climate Change - Impact on Design Parameters

Design Category	Impact of Climate Change
Drainage	20% increase in rainfall
Fluvial (River)	20% increase in flood flow
Tidal/Coastal	Sea level rise of 500 mm ¹

¹ Taken from Climate Change Sectorial Adaptation Plan Flood Risk Management (2015-2019) Development

5 STAGE 1 & 2 FLOOD RISK IDENTIFICATION & ASSESSMENT

Details of the information sources that were used as part of the flood risk identification and assessment associated with the subject development site are provided in *Section 2* of this report.

5.1 Existing Hydrological Environment

The river Ryewater is aligned to the southern boundary of the proposed development, with the Blackhall Little stream aligned to the east of the main residential development but through the overall development site; refer to Figure 5.1 - **Hydrological Environment surrounding the site.**

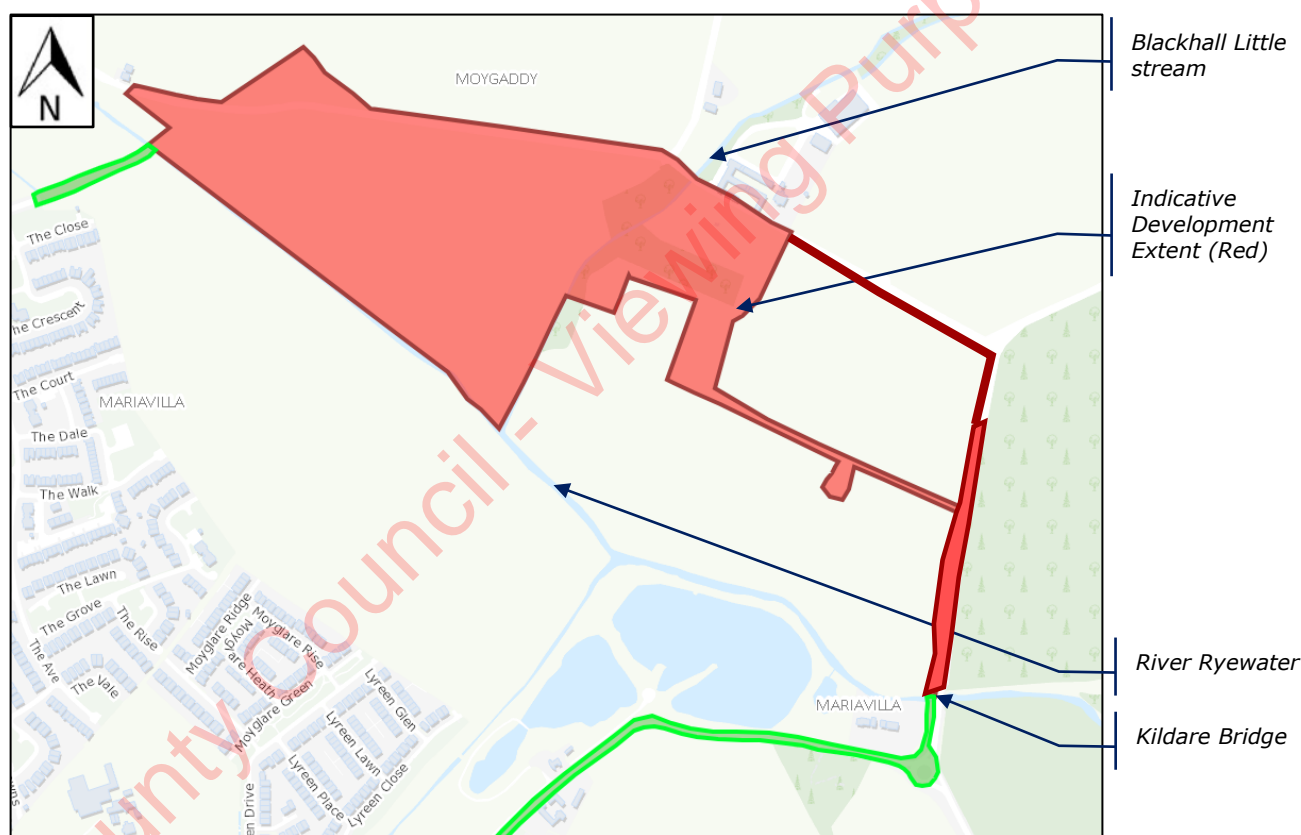


Figure 5.1 - Hydrological Environment surrounding the site

There are a number of agricultural, boundary drainage ditches throughout the subject lands that help to naturally drain the fields in their existing condition, with all local roads appearing to also be drained to the noted field ditches.

5.2 Topographical Survey

The main part of the overall development application, which is to contain the residential development site, has the existing L6219 road along its northern boundary that acts as a surface water catchment boundary. The entire site is then graded towards the river Ryewater, which aligns to its southern boundary, and the Blackhall Little stream, which aligns to the eastern boundary. There is also a shallow valley near the centre of the site, however, this is also graded towards the southern boundary. Refer to **Figure 5.2** for overview of site contours, indicated at 0.25m interval.

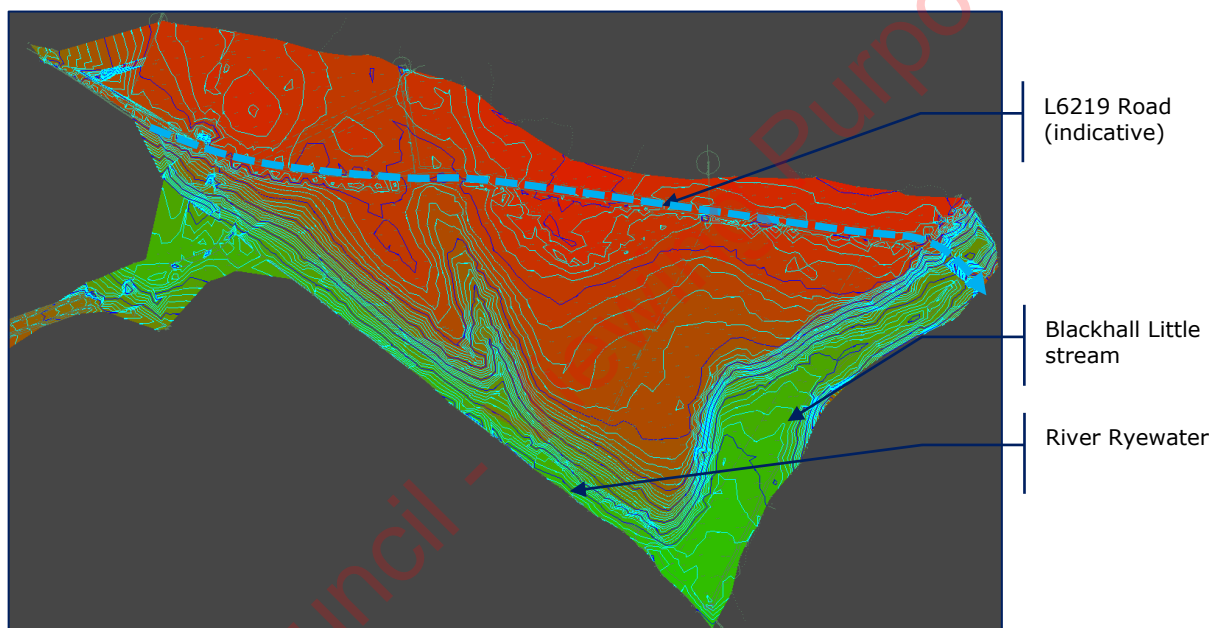


Figure 5.2 – Site Levels and Contour Overview of Residential Lands

Similarly, the area of land to the east of the Blackhall Little stream, which is to provide new creche facilities, Scout Den and public park, is graded gently towards the Blackhall Little stream, to its west.

5.3 Site Geology

The geology of the site was reviewed using data from the Geological Survey of Ireland (available at EPA map viewer). From review of this interactive map, the proposed development is located in an area where the ground has '*Deep poorly drained mineral - Derived from mainly calcareous parent materials*'.

The local groundwater is noted as being of low vulnerability, with the local aquifer being classified as being Locally Important, and Bedrock that is Moderately Productive, only in Local Zones

5.4 Historical Maps

The historical 6" (1837 – 1842) and the 25" (1888 – 1913) mapping have been examined. Historical mapping is often a very useful source of information for assessing the flood history of an area. The historical maps examined do not indicate flooding in the area proposed for this development.

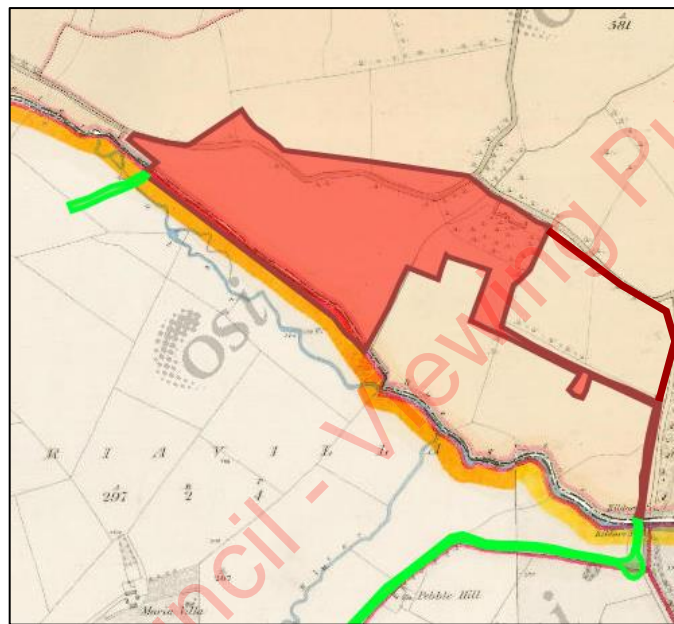


Figure 5.3 - Historic 6" Mapping

5.5 Historical Flooding

The Office of Public Works (OPW) collates all information available from reports of flooding from all sources on a nationwide basis. This information is available from the OPW's website www.floodmaps.ie, which was consulted in order to obtain any information on previous flooding in the vicinity of the site.

There is no recorded evidence of historical flooding associated with the subject site, nor in the immediate vicinity.

5.6 Fluvial Flooding

Fluvial flooding occurs when a river overtops its banks due to a blockage in the channel or the channel capacity is exceeded due to excess rainfall in its catchment area.

A review of the Meath County Development Plan (2021 – 2027), the Kildare County Development Plan, and the CFRAM mapping associated with the modelled river Ryewater indicates that predicted flooding extent is contained within the river's banks along the development's southern boundary, with all area subject to new development being located outside of Flood Zones A and B, as per **Figure 5.4** .

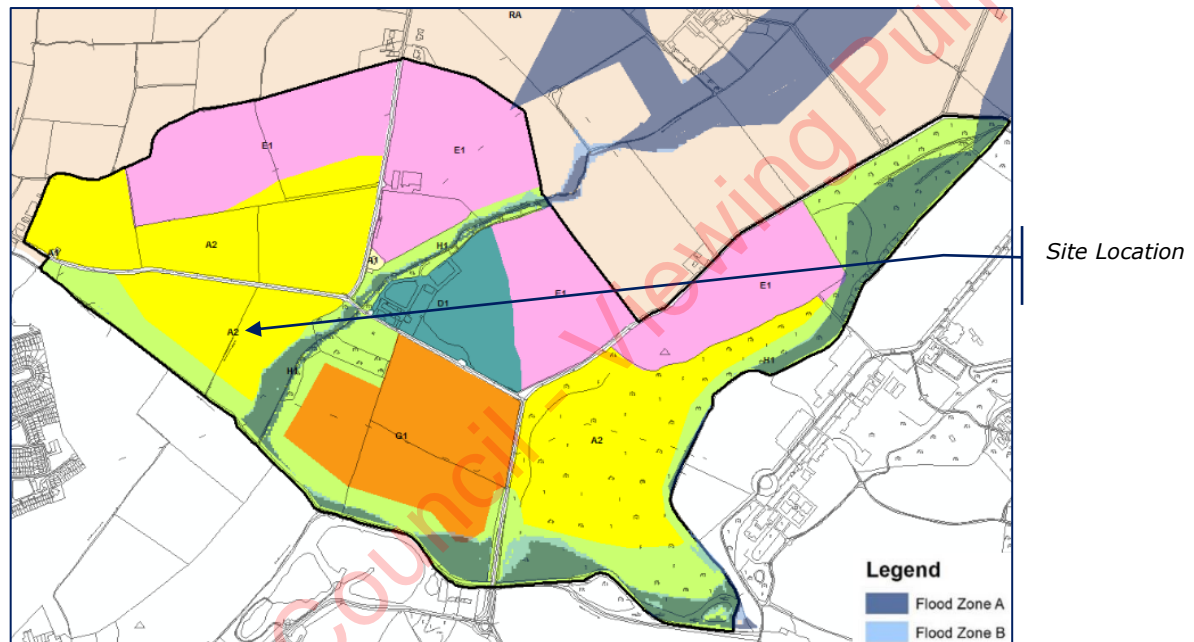


Figure 5.4 - Fluvial Flood Zones (MCC Development Plan)

Therefore, the proposed development is considered appropriate land use for the 'Highly Vulnerable Development' in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities.

The profile of the existing predicted flood extents, as illustrated on the CFRAM mapping, indicates that the river Ryewater currently floods from its southern bank, as a result of the significant difference in the over-bank levels i.e., the lands to the north of the river Ryewater are significantly higher than to the south.

Refer CFRAM Maps, included in **Appendix B** of this SSFRA report for further details and confirmation.

It is noted that as part of the proposed development, there are 3nr. bridge structures to be provided, as follows:

1. Vehicular bridge structure over river Ryewater, at western extent of proposed MOOR;
2. Pedestrian / Cycle bridge structure over the Blackhall Little stream, adjacent (southern side) to existing bridge on L6219 road;
3. Pedestrian / Cycle bridge structure at midway point along residential development, to link with location of new crèche and scout's den.

Refer to **Figure 5.5** for location of proposed bridge structures.

Each of these new bridge structures were assessed as part of the detailed flood modelling carried out by JBA Consulting, and discussed within their report that is submitted under separate cover. Refer to *Section 5.7* for further context.



Figure 5.5 - Bridge Locations

5.7 Flood Study on River Ryewater

JBA Consulting was appointed by the client Sky Castle Ltd. to prepare a Flood Risk Assessment and Management study for the proposed masterplan development that this site forms a part of. The primary source of data that was used to identify flood risk to the site was the Eastern CFRAM study and the Meath County Development Plan 2021-2027, and the Kildare County Development Plan 2017 - 2023. A review of this data showed that the lands along the river Ryewater and the Blackhall Little stream are subject to flooding during the 10%, 1% and 0.1% AEP fluvial flood events.

The scope of the detailed flood study was discussed and shared with both Meath County Council and Kildare County Council prior to developing the flood model. A copy of the scoping document is located in **Appendix C** of this SSFRA report.

The hydraulic model of the river Ryewater, Blackhall Little stream and Lyreen River was created by JBA Consulting, to assist in the estimation of potential flood risk to the proposed development. The results of this model show that the site is not impacted by fluvial flooding during the 1% and 0.1% AEP fluvial flood events.

The hydraulic model that was developed for the river Ryewater included the proposed new bridge structures, as described in *Section 5.6*, were included as part of the flood study.

Following this study, and as described within their FRA report, JBA concluded that the site is predominantly located outside of Flood Zones A and B. There is a localised area at the confluence of the Blackhall Little stream and the river Ryewater, which is located in Flood Zones A and B. Due to the purposeful siting of all of the new development outside of the identified extent of Flood Zones A and B, there is not a requirement for site specific mitigation measures to manage the risk of fluvial flooding.

Refer to JBA Consulting's Flood Risk Assessment which is submitted under separate cover as part of this application, a draft of which was issued to MCC for information and comment prior to final submission.

5.8 Coastal Flooding

Coastal flooding is caused by high sea levels resulting in the sea overflowing onto the land.

The proposed development site is located approximately 25.0km (air distance) west from the eastern coast, and is therefore **not** considered at Risk from Coastal Flooding.

5.9 Pluvial Flooding

Pluvial flooding occurs when overland flow, resulting from rainfall events, cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high-water level in the receiving watercourse.

The Catchment Flood Risk Assessment and Management Study (CFRAMS) is a national programme which to date has produced both a series of Preliminary Flood Risk Assessments (PFRA) which cover the entire country, as well as more detailed flood maps in certain catchments across the country.

Prior to the publication of the detailed CFRAMS flood mapping, a series of Preliminary Flood Risk Assessment (PFRA) maps were published. These maps indicated preliminary tidal and fluvial flood zones along with pluvial and groundwater risks.

These maps have been superseded by the more detailed CFRAMS maps in the area surrounding the site for tidal and fluvial flood risk.

A review of the OPW's online pluvial flood risk mapping indicates that there is no apparent risk of pluvial flooding, during extreme rainfall events. The proposed development includes the construction of a new surface water drainage network which will manage surface water runoff onsite, to reduce the runoff to less than the existing greenfield rate, and mitigate the risk of pluvial Groundwater Flooding

The OPW's Preliminary Flood Risk Assessment (PFRA) does not include an assessment of the flood risk posed by ground water in this area. This information is currently generated by Geological Survey Ireland (GSI) and will

be openly available information when published. There are no reported incidents of ground water flooding in the vicinity of the site.

5.10 Estimate of Flood Zone and Levels

From the available information, it can be concluded that all new residential development, crèche and scouts' den, is located outside Flood Zones A and B for pluvial, fluvial and tidal flooding.

It is noted that new bridge structures that are required as part of this application span across both the river Ryewater and Blackhall Little stream, with part of the structures located in Flood Zones A and B. As noted previously, these structures do not have any adverse impact on estimated flood levels.

The site is not located in an area which benefits from a flood defence.

5.11 Proposed Development Context

The proposed surface water drainage network associated with the proposed development, is to contain a number of sustainable drainage systems that will reduce the rainfall runoff volumes from site, discharge rates being reduced to **5.5 l/s/ha** for all design rainfall events up to, and including the 1% AEP, which is less than the greenfield runoff equivalent rates.

The development is to discharge the treated and attenuated rainfall runoff to the existing watercourse along its southern and eastern boundaries, namely the river Ryewater and Blackhall Little stream.

The surface water network is to typically comprise a gravity pipe network, with significant Sustainable Drainage Systems implemented, where practicable.

The typical traditional and Sustainable Drainage Systems (SuDS) provided, all of which have been designed in accordance with CIRIA C753, the SuDS Manual, are listed as follows:

- Rainwater Harvesting Butts at individual residential units;
- Pervious Paving in all private driveways and car parking spaces;
- Intensive landscaping, where practical;
- Swales and Filter Trenches, where allowable;

- Trapped road gullies on all road carriageways, to trap silt and gross pollutants;
- Silt traps to be provided on manholes immediately upstream of attenuation systems, as a further preventative measure to trap silt and other gross pollutants;
- Interception provisions at attenuation systems;
- Class 1 bypass fuel separator to be provided prior to discharging from site;
- Outlet pipe to comprise filter drain, for further interception of attenuated discharge.

The impact of the proposed bridge structures that are to be provided as part of this development – as described in *Section 5.6* – was assessed by JBA Consulting, as part of a wider flood study of the Moygaddy Environs, with the conclusions indicating that the proposed bridge structures will have no adverse impact on flood extent and levels.

Refer to JBA Consulting's Flood Study Report for further details, which is submitted under separate cover as part of this application.

5.12 Section 50 Application

A Section 50 application to the Office of Public Works (OPW) is to be submitted following grant of planning permission, for each of the proposed bridge structures.

It is noted that an assessment on potential flood risk, in line with OPW's Section 50 specific requirements, have been assessed as part of JBA consulting's flood study and risk assessment for the Maynooth Environs, with no adverse impact noted.

6 CONCLUSIONS AND RECOMMENDATIONS

The proposed commercial development is considered '**Highly Vulnerable Development**', in accordance with the guidance set out in The Planning System and Flood Risk Management (FRM) Guidelines.

A review of all available flood risk mapping, as discussed throughout this report, confirms that the proposed development avoids all predicted and identified flood risks, and with the exception of the proposed bridge structures, all new development is located outside of the predicted Flood Zones A and B.

Therefore, the proposed development is considered '**appropriate**' for development, in accordance with The Planning System and Flood Risk Management (FRM), Guidelines.

All finished floor levels are to be set at a minimum of 500mm above the 1%AEP fluvial flood level.

It is further noted that the proposed development has been designed to provide sufficient surface water drainage infrastructure to ensure no pluvial flooding on site for all design rainfall events up to, and including, the 1% AEP *while also allowing for an additional climate change factor of **20%** increase in rainfall intensity*. The proposed surface water drainage network has also been designed to attenuate all rainfall events to less than the greenfield equivalent runoff rates, so as to ensure no adverse impacts downstream as result of the proposed development. Refer to the Engineering Services Report, S665-OCSC-1C-XX-RP-C-0002, and associated design drawings for further details relating to the proposed surface water drainage network and management strategy.

Furthermore, the impact of the bridge structures that are to cross the river Ryewater and the stream were assessed by JBA Consulting as part of a wider flood study of the Moygaddy Environs, with the conclusions indicating that the proposed bridge structures will have no adverse impact on existing flood extent and levels. Refer to JBA Consulting's Flood Study Report that is submitted under separate cover as part of this planning submission for further details.

INTENTIONALLY BLANK

Meath County Council - Viewing Purposes Only!

APPENDIX A. FLOODMAPS.IE REPORT

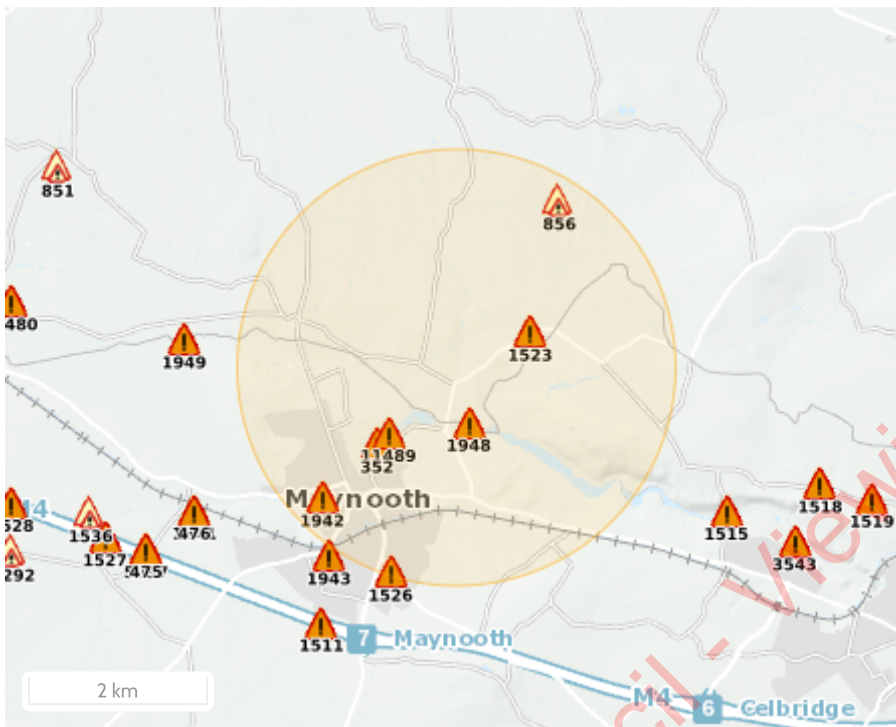
Meath County Council - Viewing Purposes Only!



Report Produced: 22/3/2022 11:52

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.





Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

8 Results

Name (Flood_ID)	Start Date	Event Location
1. Lyreen Maynooth Nov 2002 (ID-352) Additional Information: Reports (6) Press Archive (5)	15/11/2002	Approximate Point
2. Killeany/Affolus/Owenstown Recurring (ID-856) Additional Information: Reports (2) Press Archive (0)	n/a	Approximate Point
3. Dunboyne Maynooth Road, Meath Nov 2002 (ID-1523) Additional Information: Reports (2) Press Archive (2)	14/11/2002	Approximate Point
4. Laurence Avenue, Maynooth Nov 2002 (ID-1526) Additional Information: Reports (2) Press Archive (0)	14/11/2002	Approximate Point
5. Lyreen Maynooth College Nov 2000 (ID-1942) Additional Information: Reports (1) Press Archive (5)	05/11/2000	Approximate Point
6. Ryewater Maynooth Carton Nov 2000 (ID-1948) Additional Information: Reports (2) Press Archive (6)	05/11/2000	Approximate Point

Name (Flood_ID)	Start Date	Event Location
7.  Lyreen Maynooth University June 1993 (ID-3539) Additional Information: Reports (1) Press Archive (0)	01/06/1993	Approximate Point
8.  Lyreen River 24th Oct 2011 Maynooth (ID-11489) Additional Information: Reports (1) Press Archive (0)	24/10/2011	Approximate Point

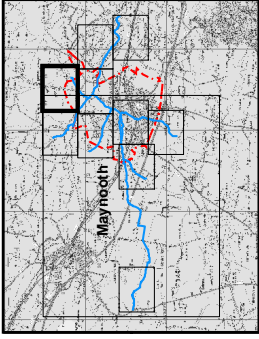
Meath County Council - Viewing Purposes Only!

APPENDIX B. CFRAM FLOOD EXTENT MAPPING

Meath County Council - Viewing Purposes Only!

Appendix B

CFRAM Flood Extent Mapping



IMPORTANT USER NOTE:
 THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Embankment
 - Wall
 - Detention Area
 - Standard of Protection of Road Drainage (Walls / Embankments)
 - 10% AEP
 - 0.1% AEP
 - Node Point
 - Node ID
 - Node Label

FINAL

REV: 02	NOTE: Amendment to Flood Extent. Bridge added in on Page 6.	DATE: 02/08/17
REV: 01	NOTE: Addition of downstream node.	DATE: 12/12/16



The Office of Public Works
 19, Bowcher Road
 Dublin 7
 Co. Dublin
 B12 6RZ
 E: oipw@opw.gov.ie

Map:

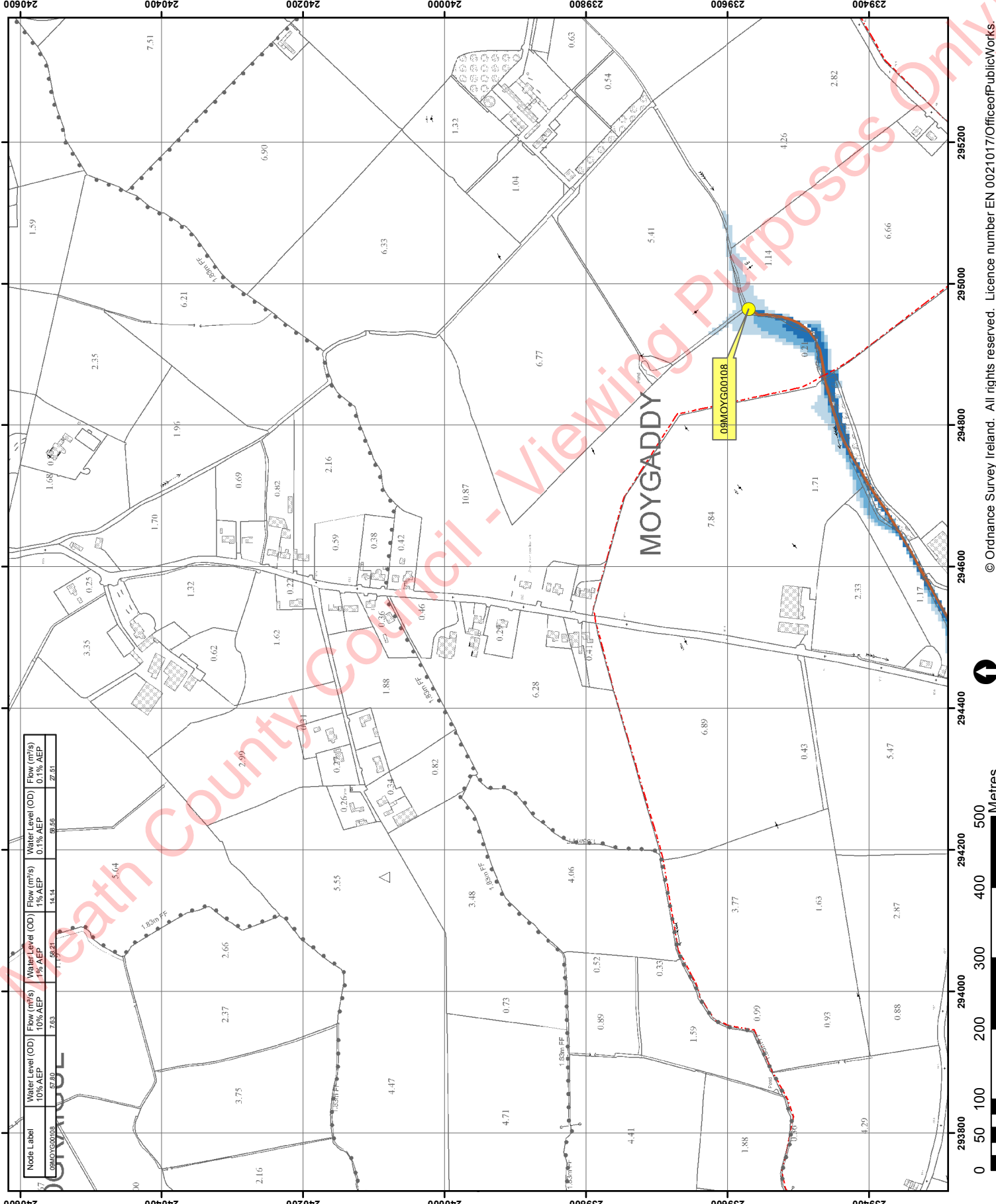
Maynooth Fluvial Flood Extents

Map Type: EXTENT
 Source: FLUVIAL
 Map Area: HPW

Scenario: CURRENT

Drawn By: C.C. Date: 1 December 2017
 Checked By: D.I. Date: 1 December 2017
 Approved By: G.G. Date: 1 December 2017

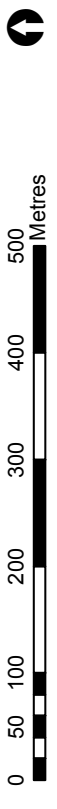
Drawing No.: E09MAY_EXFCD_F3_02
 Map Series: Page 2 of 11
 Drawing Scale: 1:5,000 @A3

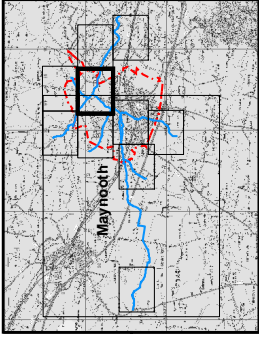


Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09MOYG00108	57.80	7.63	58.21	14.14	59.56	27.51

Leath County Council - Viewing Purposes Only

© Ordnance Survey Ireland. All rights reserved. Licence number EN 0021017/OfficeofPublicWorks.





IMPORTANT USER NOTE:
 THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Embankment
 - Wall
 - Delimited Area
 - Standard of Protection of Flood Defence (Walls / Embankments)
 - Node Point
 - Node ID
 - Node Label

FINAL

REV: 02	NOTE: Amendment to Flood Extent. Bridge added in on Page 8.	DATE: 02/08/17
REV: 01	NOTE: Addition of downstream node.	DATE: 10/12/16



OPW
 Office of Public Works

RPS
 RPS Group

The Office of Public Works
 15, Bowater Road
 Jonathan Swift Street
 Co. Wick
 B172,6RZ
 E: rps@opw.gov.ie

Map:
 Moyneeth Fluvial Flood Extents

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

Drawn By: C.C. Date: 1 December 2017

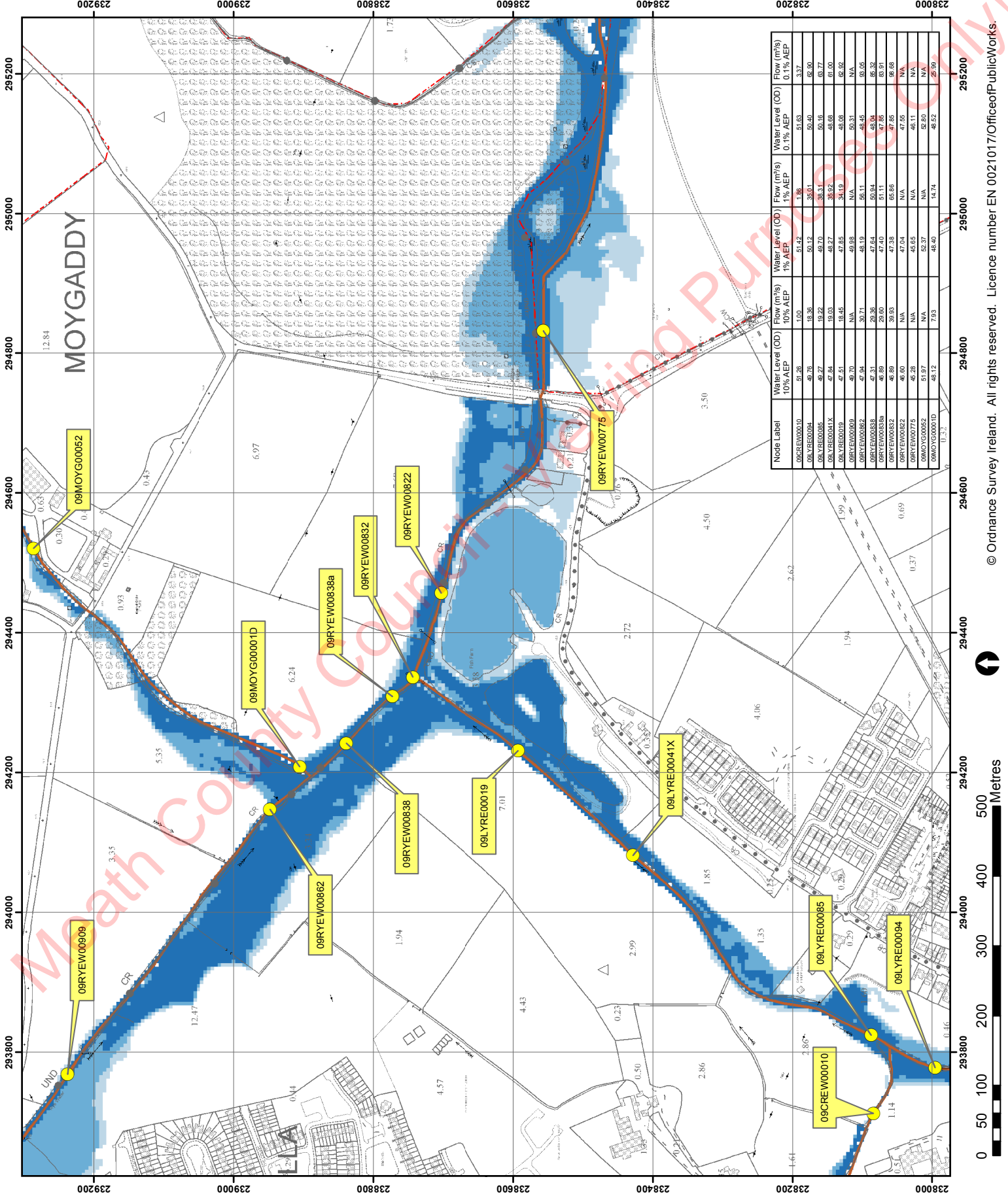
Checked By: D.I. Date: 1 December 2017

Approved By: G.G. Date: 1 December 2017

Drawing No.: E09MAY_EXFCFD_F3_09

Map Series: Page 9 of 11

Drawing Scale: 1:5,000 @A3



© Ordnance Survey Ireland. All rights reserved. Licence number EN 0021017/OfficeofPublicWorks.



APPENDIX C. RIVER RYEWATER FLOOD STUDY SCOPING REPORT

Appendix C
River Ryewater Flood Study Scoping Document

Meath County Council - Viewing Purposes Only!

Proposed scope of works

Overview

A flood model is to be developed for the River Ryewater and its tributaries, with the Kildare Bridge (east of Maynooth) as its downstream boundary. The flood modelling is to include a study and report, which is to complement and support a series of planning applications for a new masterplan development, and the Maynooth Environs LAP lands (Refer Sketch provided) that aligns the River Ryewater at Moygaddy, Maynooth Environs, Co. Meath. The final planning process will involve a number of individual applications, including the proposed Maynooth Outer Relief Road (MOOR).

The MOOR is to have a new vehicular bridge crossing, over the River Rye Water, and another culvert structure to allow crossing of the Moygaddy Stream. Refer attached for masterplan outline and location, along with indicative route of the MOOR. There is also a proposed cycle / pedestrian bridge to be provided, as an extension to existing structures, at the existing Moygaddy Stream and at the Kildare Bridge structures.

Scope

Scope of Works for Flood Modelling and Risk Assessment & Management at Moygaddy to include:

Comprehensive Flood Risk Assessment and Management study of the River Ryewater Catchment within the environs of Maynooth Environs, Co. Meath, including the potential impact from the proposed new development and the Maynooth Outer Orbital Road (MOOR).

The Flood Study and Flood Risk Assessment will be concluded in accordance with the requirements of the OPW's Planning System and Flood Risk Management Guidelines.

Provide detailed hydrological and hydraulic assessment of the River Ryewater and its tributaries, to include recent changes to the topography and new development within the catchment, since the OPW CFRAM programme, and ensure that the subject development, including the proposed MOOR, associated infrastructure upgrades, and Maynooth Environs LAP extent, takes cognisance of this and does not cause adverse impact on other properties.

An analysis is required to take account of detailed topographic and bathymetric survey of the subject development lands and River Ryewater, which will be made available (and a review of same information and specifying additional information for OCSC to procure should it be necessary). It is noted that OPW have made survey information available from the original CFRAM, which will form the base data input.

Changes that have knowingly occurred within the contributing catchment include:

- construction of, and raised profile of, the land between the VEC school and the river's southern bank, on the Kildare side of the river (survey currently being procured);
- Significant new residential development has occurred in recent years in the Kilcock environs, with several recent grants of permission;
- Significant development has occurred in the vicinity of the Lyreen Stream, which is a tributary east of Maynooth;
- Other changes to catchment areas identified as part of review.

All modelling, assessment and reporting should be prepared in accordance with the requirements of 'The Planning System and Flood Risk Management' Guidelines (DEHLG, 2009), along with review and compliance of the latest of both the Meath and Kildare Counties' development plans. The following outlines a list of required review and outputs, as part of updating flood model and producing report:

- Review of existing flood model and CFRAM mapping for River Rye Water, along with assessment of river's hydraulics that may have changed since last update;

Lands at Moygaddy | Flood Study & FRAM



- Undertake an updated hydrological assessment of the River Rye Water's catchment and floodplain, taking into account the changes to the catchment since the model was last updated, allowing also for Climate Change factors in line with current best practice and Local Government guidelines;
- Review all available as-constructed drawings and data, approved planning design drawings, and updated surveys, for catchment areas including new development and constructed flood mitigation measures;
- Develop, calibrate and verify, for agreement with both Meath County Council and Kildare County Council, a new 1D-2D linked hydro-dynamic model of the River Rye Water, including all above data and information that has changed since last update of model;
- Hydraulic model simulations shall include but not be limited to: Baseline 1 in 10, 100 & 1 in 1000-year ARI events, post-development 1 in 10, 100 & 1 in 1000-year events & modelling to demonstrate the impact of mitigation measures;
- Confirm and provide the flood zone mapping (A, B & C, as per FRM Guidelines), and flood extent mapping (indicating depths and flood elevation levels, for ARI events noted previously) for all lands adjacent to the River Rye Water, in the vicinity of the subject lands and MOOR, including climate change factors;
- Flood mitigation measures, and assessment of their impact, to be identified, assessed, and included in the model;
- Carry out iterative hydraulic review of the proposed MOOR bridge design (including embankment and flow through structures), and Moygaddy Stream crossing (likely an oversized culvert) to ensure no adverse impact on existing properties, and help to establish and inform design levels of the new bridge structure at Moyglare / Poundhill, with sufficient freeboard in line with FRM & OPW Section Guidelines;
- Carry out sensitivity analysis of for up to 60% blockage of all existing and proposed structures (including new bridge, bridge extensions for pedestrian / cycle, and culvert crossings) within model, including culvert structures provided as part of embankment works, and inform of required changes that may affect design of bridge structure;
- Prepare a Flood Risk Assessment report (FRAM Study) in line with the sequential approach set out in the FRM Guidelines, which shall serve as a comprehensive update to the 2010, or more recent if available, report.
- Allowance for discussions with Local Authorities, as required.

It is envisaged that this report will act as an updated FRAM study, demonstrating that the subject Maynooth Environs LAP lands, and the developed MOOR crossing design (of River Rye Water and Moygaddy Stream), are suitable for development with no adverse impact on existing properties.

Meath County Council - Viewing Purposes Only!



OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers

9 Prussia Street
Dublin 7
Ireland

T | +353 (0)1 8682000
F | +353 (0)1 8682100
W | www.ocsc.ie