



APPENDIX 8-2

**SITE SPECIFIC FLOOD RISK
ASSESSMENTS**

Meath County Council - Viewing Purposes Only!

Site-Specific Flood Risk Assessment

PRIMARY CARE CENTRE & NURSING HOME

For Sky Castle Ltd

PROJECT NO. S665

26 August 2022



OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers



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**Site-Specific Flood Risk
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for

PRIMARY CARE CENTRE & NURSING HOME,

at Moygaddy,

Co. Meath.



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Site-Specific Flood Risk Assessment

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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 primary care centre and nursing home at Moygaddy, Co. Meath.

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).

1.3 Site Location

The subject site is located adjacent to the Dunboyne Road (R157) at Moygaddy, along the Co. Meath/ Co. Kildare border, as shown in **Figure 1.1**. The proposed development site is immediately bound by:

- Dunboyne Road (R157), to the east;
- Agricultural Lands, to the north, and west; and
- River Ryewater to the south.

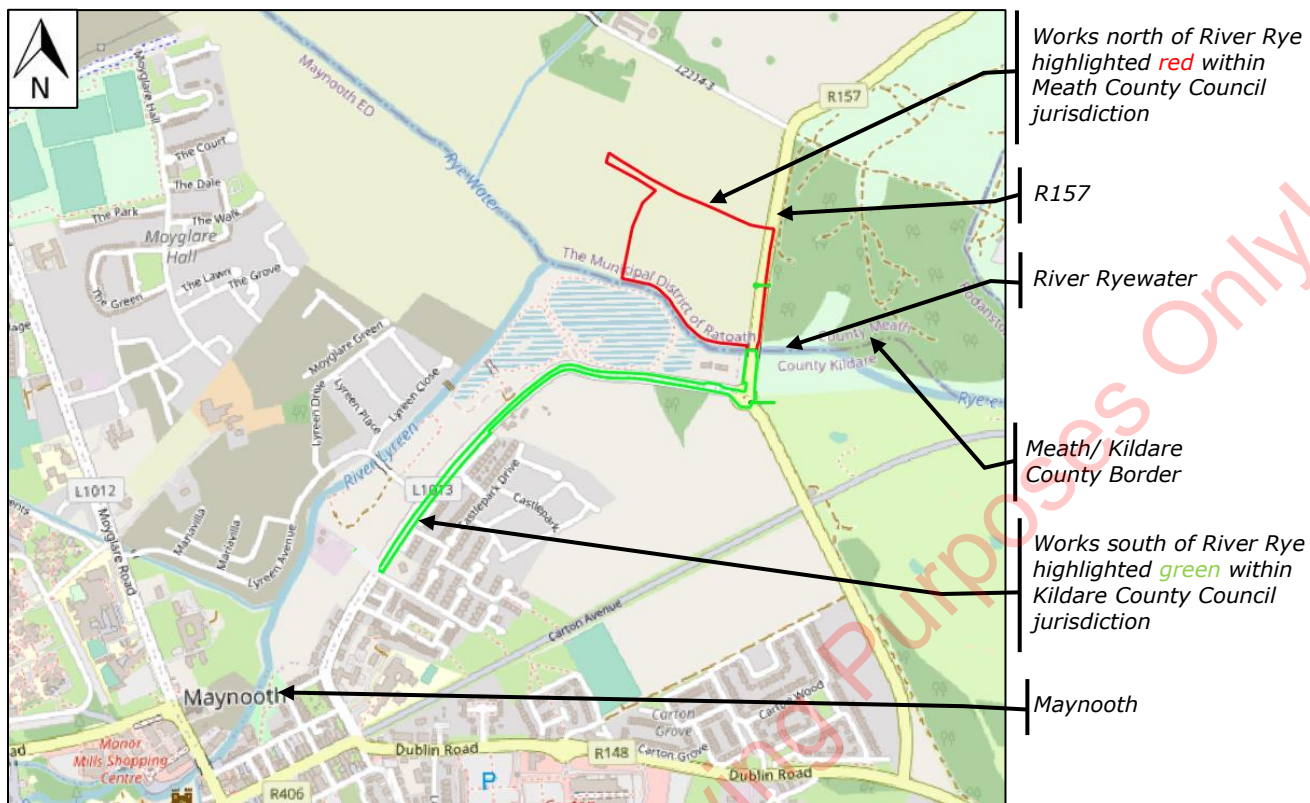


Figure 1.1 - Site Location

2 SITE CONTEXT

2.1 Existing Site Overview

The overall gross site area that comprises this planning application is **c.7.9-hectares**, with c.4.8ha of this zoned by Meath County Council for **G1 - Community Infrastructure**.

The site is currently greenfield and used for agricultural purposes. R157 regional road is located to the east of the subject site. Currently there is no vehicular access to the subject site off the R157. Ground levels across the site fall from northwest to southeast, with a sharp decline at the southern boundary, which align the river Ryewater.

2.2 Proposed Development Context

Planning Permission is sought by Sky Castle Limited for the development of a site which extends to 7.94 hectares, on land to the west of the R157 Dunboyne Road, County Meath, north of the town of Maynooth, in the townland of Moygaddy. This site is located in the Maynooth Environ Lands.

The proposed development comprises:

1. Construction of a new two-storey Nursing Home of 156 no. bedrooms with a Gross Floor Area (GFA) of 8,576m², including vehicular drop-off area and service road.
2. Construction of a new three-storey Primary Care Centre (PCC) with a Gross Floor Area (GFA) of 3,049m², including vehicular drop-off area.
3. The development includes a shared surface car park providing 161 no. car parking spaces (comprising of 151 no. standard car parking spaces and 10 no. accessible car parking spaces) and approximately 160 no. bicycle parking spaces.
4. Provision of foul and surface water drainage including an underground wastewater pumping station.
5. Connection to potable water supply at Kildare Bridge.
6. Provision of communal (semi-private) and public open space.

7. Provision of hard and soft landscaping including amenity equipment, fencing and gates.
8. Provision of substation and public lighting.
9. Proposed road improvement and realignment works along the R157 which abuts the Carton Demense Wall which is a Protected Structure (RPS Ref 91556), including:
 - i. Construction of a new 2-way, 6m-wide access road from the R157 Dunboyne Road to include a priority T-junction on the R157 which includes a right-turn lane from the R157 into the access road,
 - ii. Upgrade works to a section of the R157 from the new site entrance south to Kildare Bridge on the R157 (representing delivery of a 15m-wide portion of the Maynooth Outer Relief Road (MOOR)), including creation of a new 2m-wide footpath, 3m-wide cycle lane and pedestrian and cycle link adjacent to Kildare Bridge,
 - iii. Provision of pedestrian and cycle improvement measures.
10. All other site development works and services ancillary to the proposed development.
11. A Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) will be submitted to the planning authority with the planning application.

The proposed site layout is shown in **Figure 2.1**.



Figure 2.1 - Proposed Development Layout

3 SCOPE OF SITE-SPECIFIC FLOOD RISK ASSESSMENT

This Site-Specific Flood Risk Assessment Report was prepared by reviewing the available data from the Local Authority sources and national bodies *i.e.*, Meath 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-1B-XX-RP-C-0002** for details.

JBA Consulting have carried out a detailed Flood Risk Assessment on the masterplan area that includes this development and the entire Maynooth Environs, which also includes an updated model of the river Ryewater and local tributaries within the vicinity of Moygaddy. This report has been submitted under separate cover as part of this application.

The flood risk assessment was prepared based on a comprehensive review of the information available from the following 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;
- 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*.

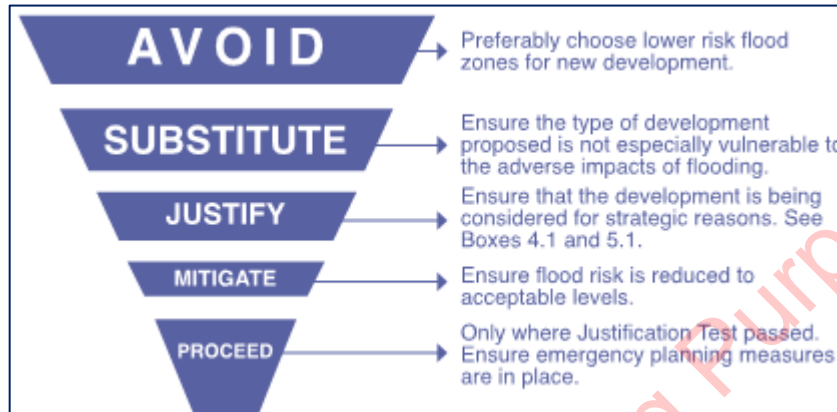


Figure 4.1 - Sequential Approach Principles in Flood Risk Management.

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.

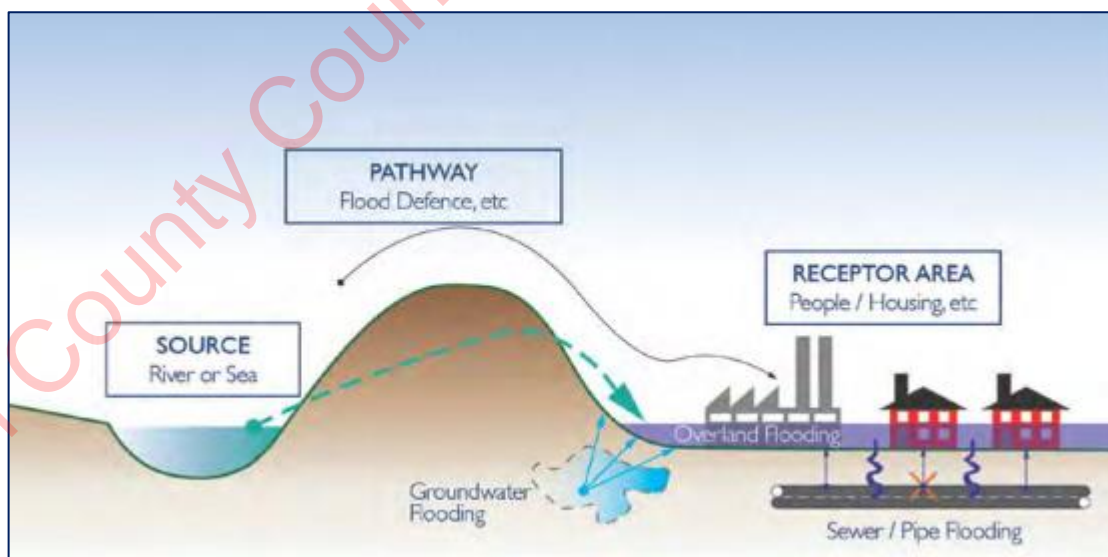


Figure 4.2 - Source - Pathway - Receptor Model

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 hospitals, 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*.

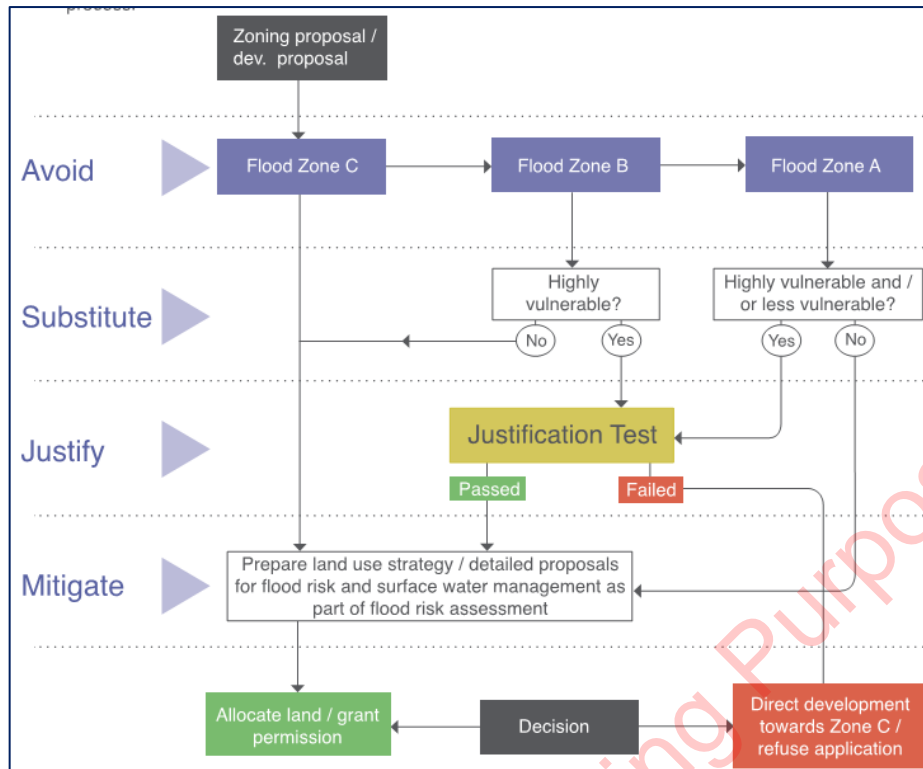


Figure 4.4 - Sequential Approach Mechanism (FRM Guidelines)

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'.*

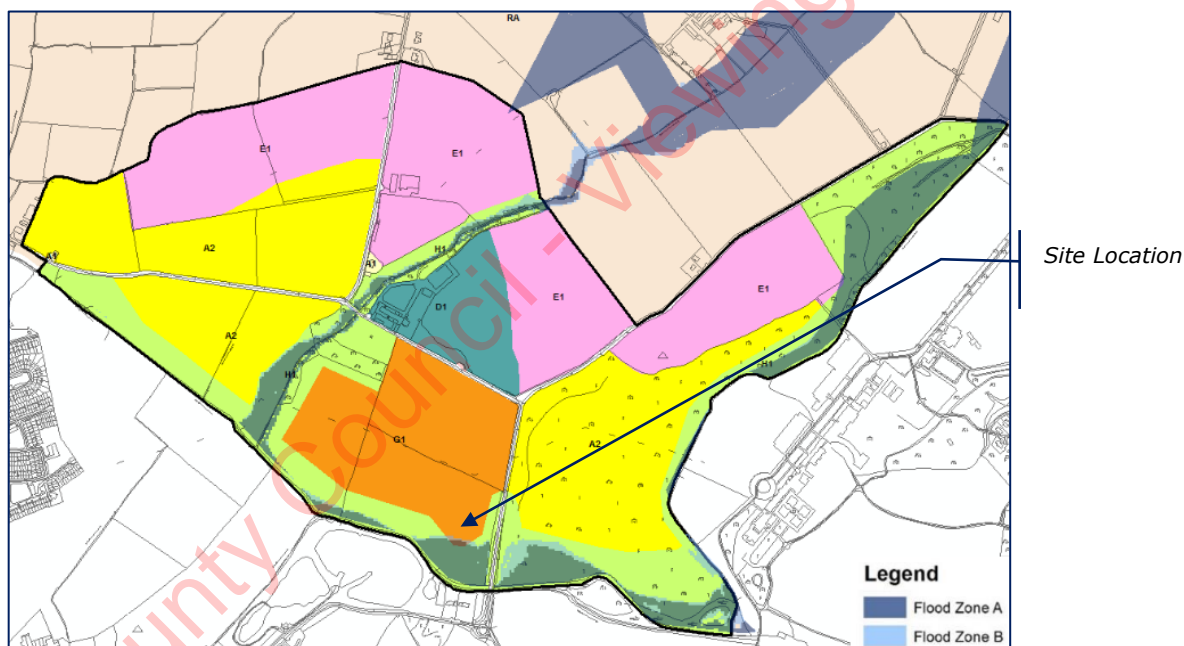


Figure 4.5 - Moygaddy Environs Flood Zones (MCC Dev Plan)

The proposed development has been purposely sited outside of Flood Zones A and B, as identified by the OPW's Catchment Flood Risk Assessment and Management (CFRAM) mapping of the river Ryewater.

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 with the southern boundary of the proposed development; refer to Figure 5.1.



Figure 5.1: Hydrological Environment surrounding the site

There are also existing open land drains along the northern and eastern extent of the development site, which receive local rainfall runoff and direct it to the river Ryewater.

5.2 Topographical Survey

Ground levels across the site fall from northwest to southeast, with a sharp decline at the southern boundary, which aligns the river Ryewater.

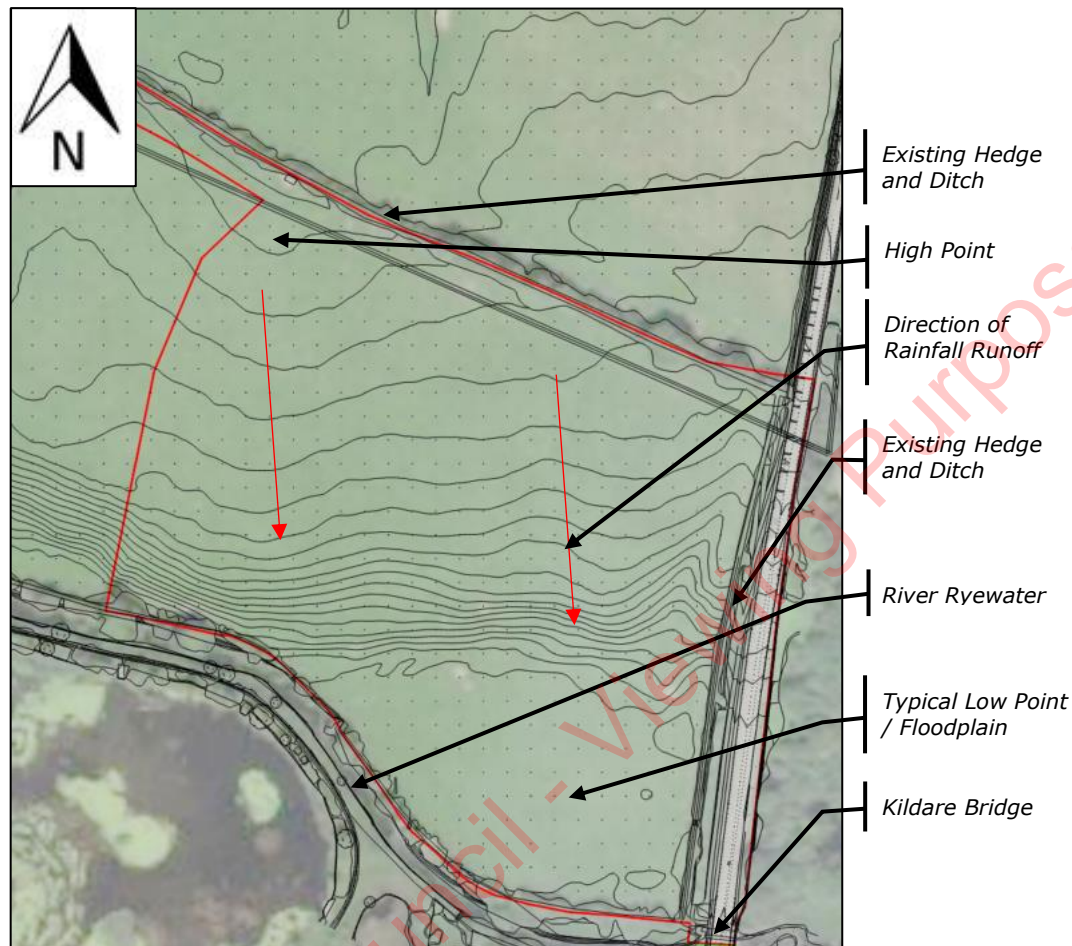


Figure 5.2: Site Contours

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.

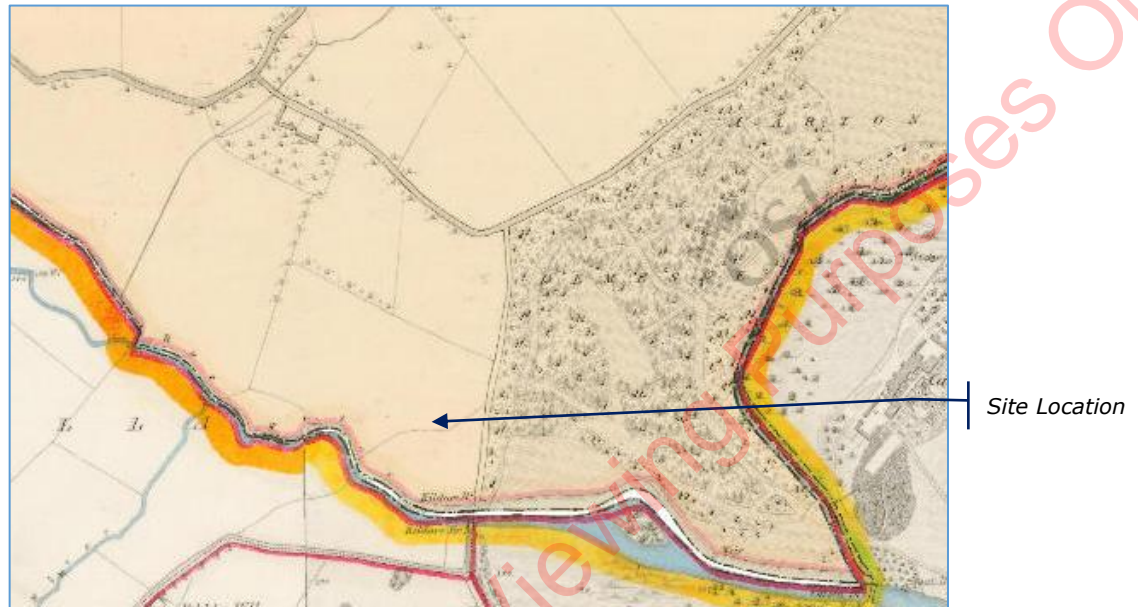


Figure 5.3 - Historical 6" Map (www.myplan.ie)

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.

Refer to **Figure 5.4** for an excerpt from the interactive mapping.

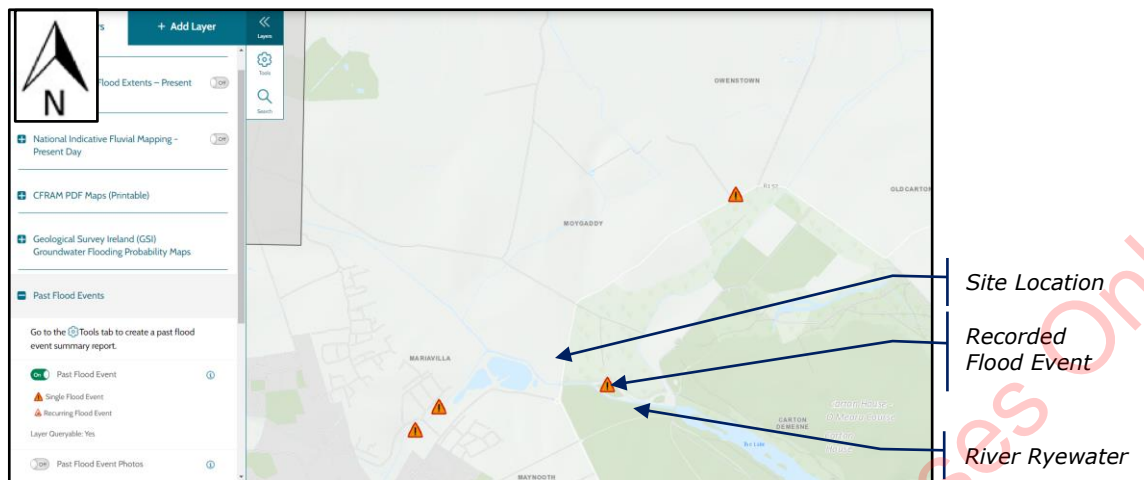


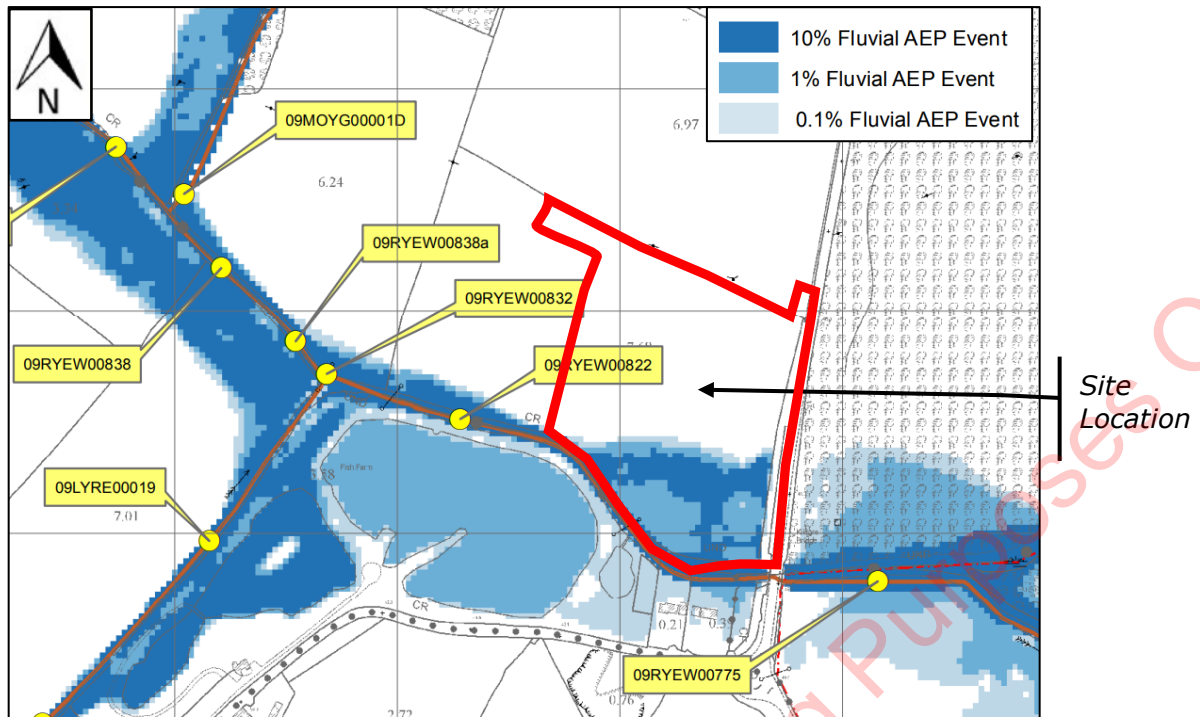
Figure 5.4 – OPW Historical Flooding (www.floodmaps.ie)

Refer to **Appendix A** of this SSFRA for a copy of the Historical Flooding Report.

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, the Kildare County Development Plan, and the CFRAM mapping associated with the modelled river Ryewater indicates that predicted flooding extent is contained within the relatively low-lying of the subject lands upstream of the Kildare Bridge, with some additional flood extent noted overbank on the Kildare side of the river, outside of the site's development boundary.



| 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 |
|--------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 09CREW00010 | 51.26 | 1.00 | 51.42 | 1.86 | 51.63 | 3.37 |
| 09LYRE00094 | 49.76 | 18.36 | 50.12 | 35.01 | 50.40 | 62.90 |
| 09LYRE00085 | 49.27 | 19.22 | 49.70 | 38.31 | 50.16 | 63.77 |
| 09LYRE00041X | 47.84 | 19.03 | 48.27 | 35.92 | 48.68 | 61.00 |
| 09LYRE00019 | 47.51 | 18.45 | 47.85 | 34.19 | 48.08 | 62.92 |
| 09RYEW00909 | 49.70 | N/A | 49.98 | N/A | 50.31 | N/A |
| 09RYEW00862 | 47.94 | 30.71 | 48.19 | 56.11 | 48.45 | 93.05 |
| 09RYEW00838 | 47.31 | 29.36 | 47.64 | 50.94 | 48.04 | 85.32 |
| 09RYEW00838a | 46.89 | 29.60 | 47.40 | 51.11 | 47.85 | 83.91 |
| 09RYEW00832 | 46.89 | 39.93 | 47.38 | 65.86 | 47.85 | 98.68 |
| 09RYEW00822 | 46.60 | N/A | 47.04 | N/A | 47.55 | N/A |
| 09RYEW00775 | 45.28 | N/A | 45.65 | N/A | 46.11 | N/A |
| 09MOYG00052 | 51.97 | N/A | 52.37 | N/A | 52.80 | N/A |
| 09MOYG0001D | 48.12 | 7.93 | 48.40 | 14.74 | 48.52 | 25.99 |

Figure 5.5 - River Ryewater CFRAM excerpt

It is noted that the proposed nursing home and primary care centre, and its associated car parking and infrastructure, has been purposely sited outside of the identified extent of Flood Zones A and B i.e., within Flood Zone C. This is to ensure appropriate land use for the 'Highly Vulnerable Development' in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities.

A low-lying southern portion of the subject lands are located in Flood Zones A and B, upstream of the Kildare Bridge; however, no development is to occur in this area, with all new buildings and paving to be located in Flood Zone C. The

existing flood plain *i.e.*, areas in Flood Zones A and B will not have their levels altered, with the exception of the new pedestrian and cycle bridge structure and the utility infrastructure that will traverse the river Ryewater.

As indicated on the **Figure 5.5** below proposed development is located outside the 1% Fluvial AEP Event.

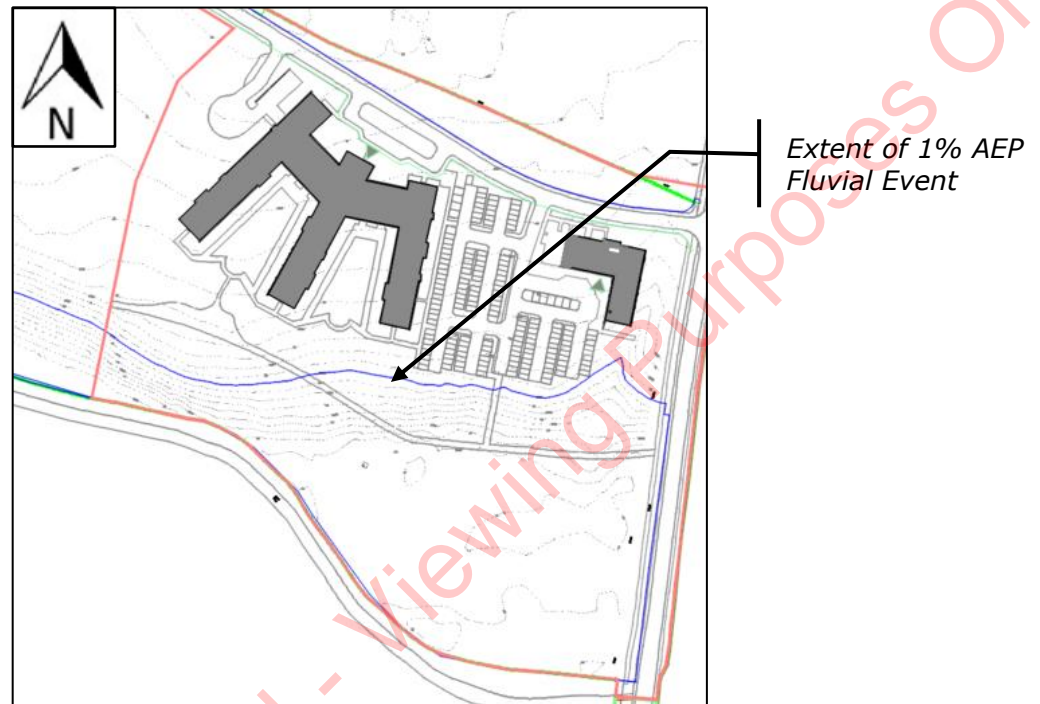


Figure 5.6 - River Ryewater CFRAM excerpt

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, on the Kildare side of the river Ryewater, 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.

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 *i.e.*, the Moygaddy Environs, which 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 south of the subject site, upstream of the Kildare Bridge, are subject to flooding during the 10%, 1% and 0.1% AEP fluvial flood events. This area is already considered a flood zone from current CFRAM mapping.

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**.

The hydraulic model of the river Ryewater, Moygaddy 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 5.12*, 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 localised area at the upstream side of the Kildare Bridge that is located in Flood Zones A and B, however, with the exception of the new bridge structure and new utility infrastructure that is to cross under the river, no works are to be carried out in this flood plain. Due to the purposeful siting of the 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.

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 flooding onsite. Refer to the Engineering Services report, submitted under separate cover, for further details of the surface water drainage design that is to serve the new development.

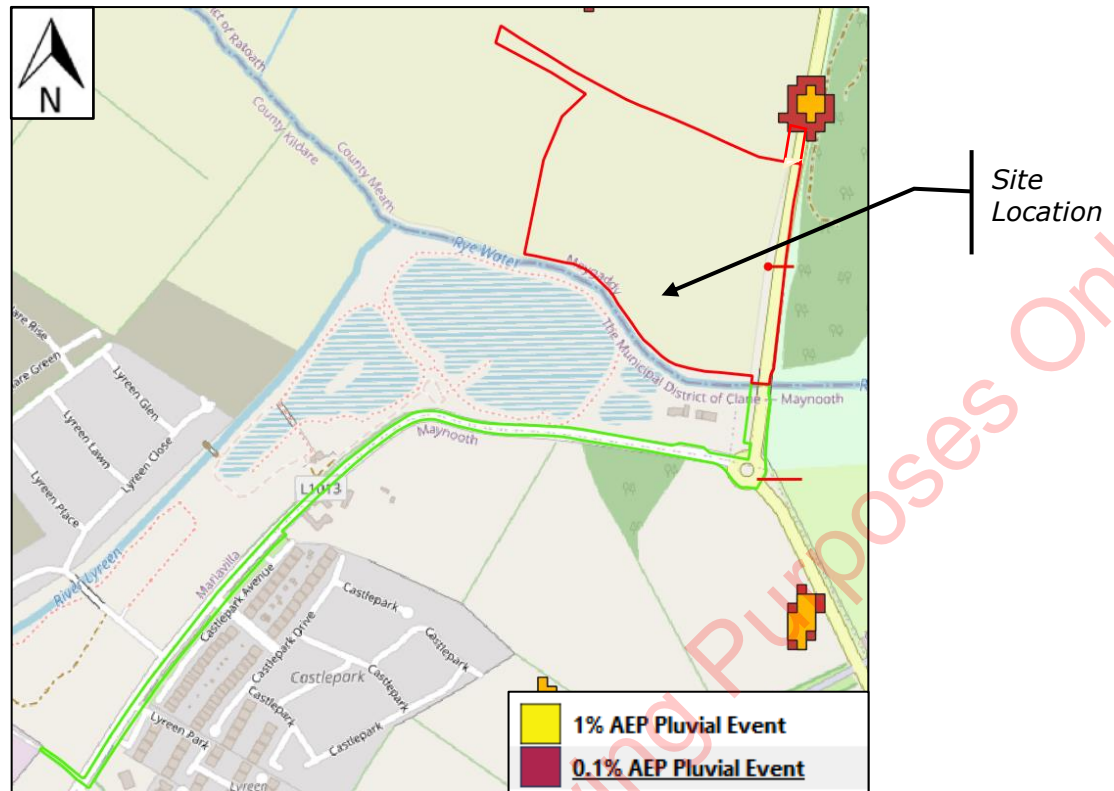


Figure 5.7 - Extract from the preliminary flood risk assessment maps which was carried out as part of the CFRAMS programme

5.10 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.

5.11 Estimate of Flood Zone and Levels

From the available information, it can be concluded that the site is located predominantly within Flood Zone C for pluvial, fluvial and tidal flooding. The Primary Care Centre and Nursing Home, and all associated infrastructure, will be constructed in Flood Zone C.

It is noted that part of the subject lands are located in Flood Zones A and B, however, with the exception of the new pedestrian and cycle bridge structure and new utility infrastructure that is to traverse the river Ryewater, no

development is to occur in this area, with all new buildings and paving to be located in Flood Zone C. the existing flood plain i.e., areas in Flood Zones A and B will not have their levels altered

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

5.12 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, which is less than the calculated greenfield runoff equivalent rate, as discussed and agreed with MCC Drainage Department.

The proposed surface water network consists of a single catchment.

The new development's surface water network is to discharge an attenuated flow rate to the existing drainage ditch along the eastern site boundary which discharge to the river Ryewater, further south. This drainage ditch is to be upgraded to include filter drains as part of the upgrade works to the local road network

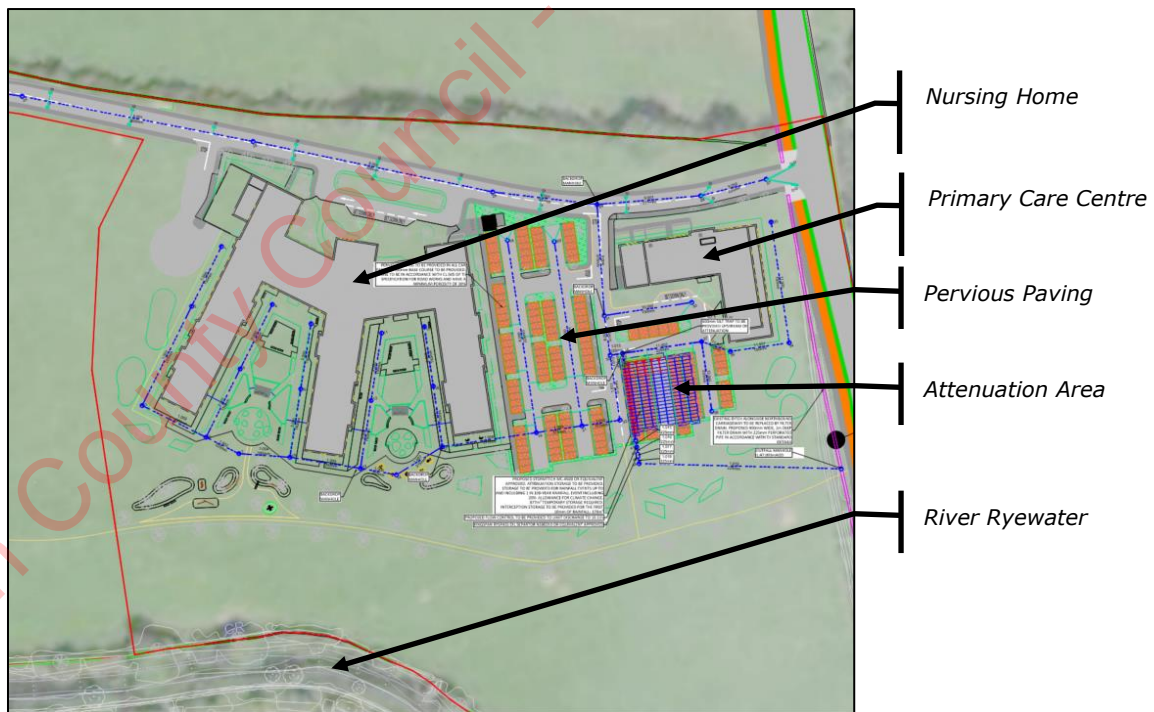


Figure 5.8 - Proposed Surface Water Drainage Layout

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:

- Pervious Paving;
- Trapped Gullies;
- Geocellular Attenuation Storage;
- Flow Control Chambers.

There is a new pedestrian and cycle bridge structure to be installed, on the upstream side to the west of the existing Kildare Bridge. This new bridge is to comprise a single span structure, which stretches beyond the existing bridge's archways, and is supported on a reinforced earth abutment on both sides, tying into the existing embankment. Refer **Figure 5.9** – excerpt from design drawing S665-OCSC-XX-XX-DR-S-1707 for details of proposed bridge structure.

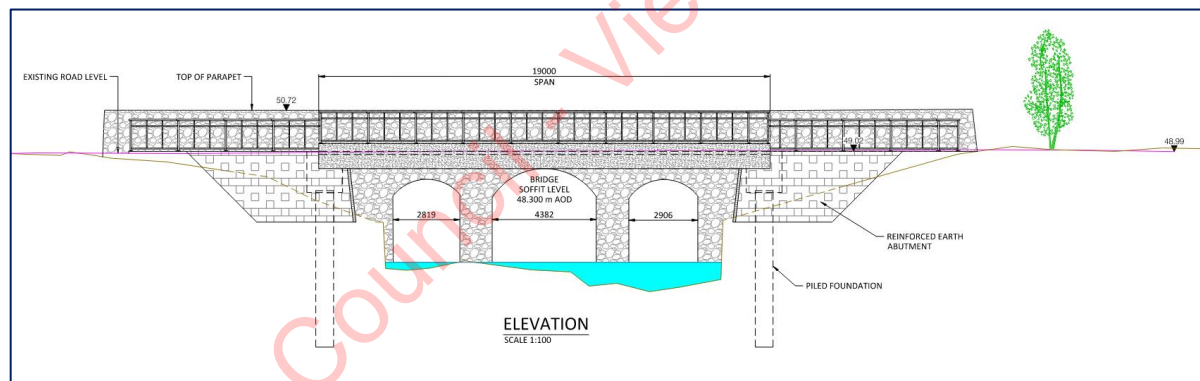


Figure 5.9 - Pedestrian / Cycle Bridge Structure

The impact of this proposed bridge structure was assessed by JBA Consulting, as part of a wider flood study of the Moygaddy Environs, with the conclusions indicating that the proposed bridge structure will have no impact on flood extent and levels.

Refer to JBA Consulting's Masterplan Flood Risk Assessment report for further details, which is submitted under separate cover as part of this application.

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 fluvial and coastal flood risk extent i.e., it is located outside the extent of 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.

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-1B-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 this proposed pedestrian / cycle bridge structure, which is to cross the river Ryewater adjacent and to the west of the Kildare Bridge, was assessed by JBA Consulting as part of a wider flood study of the Moygaddy Environs, with the conclusions indicating that the proposed bridge structure will have no impact on existing flood extent and levels.

Refer to JBA's Masterplan Flood Risk Assessment report, which is submitted under separate cover as part of this application for further details.



APPENDIX A. FLOODMAPS.IE REPORT

Meath County Council - Viewing Purposes Only!

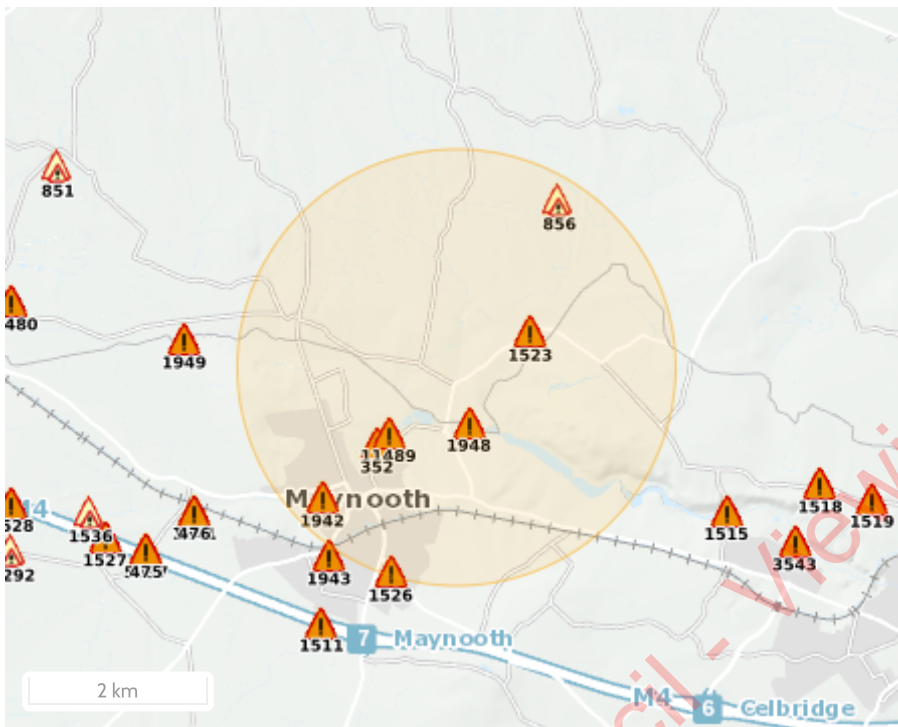
Appendix A
Floodmaps.ie Report



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 |

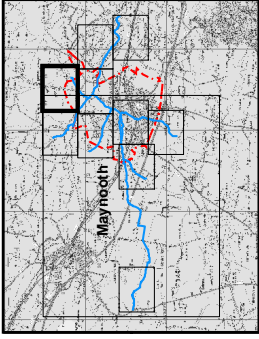
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APPENDIX B. CFRAM FLOOD EXTENT MAPPING

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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
 - 1% AEP
 - 0.1% AEP
 - Node Point
 - Node ID
 - Node Label

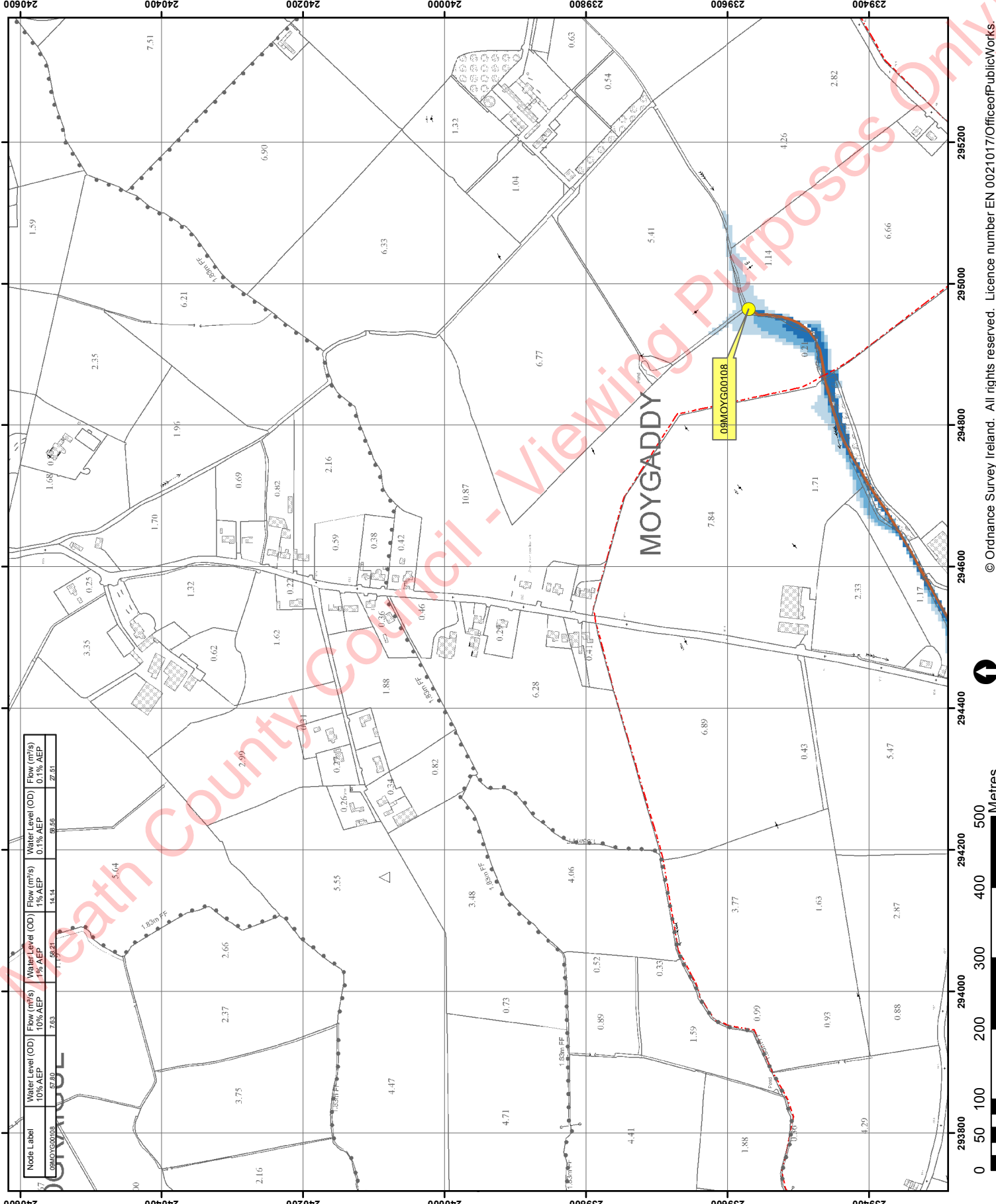
FINAL

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

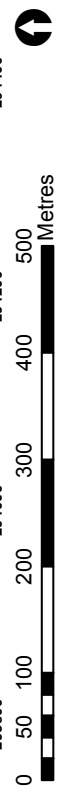


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 15, Boucher Road
 Co. Meath
 B17 6RZ
 E: eia@opw.gov.ie

| | |
|----------------|----------------------------|
| Map: | |
| 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 |

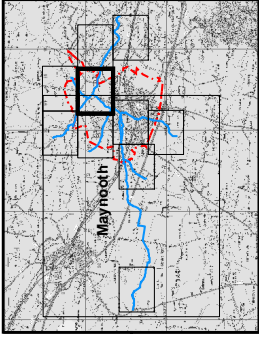


| Node Label | Water Level (OD) 10% AEP | Flow (m³/s) 10% AEP | Water Level (OD) 1% AEP | Flow (m³/s) 1% AEP | Water Level (OD) 0.1% AEP | Flow (m³/s) 0.1% AEP |
|-------------|--------------------------|---------------------|-------------------------|--------------------|---------------------------|----------------------|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



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- 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

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 15, Bowater Road
 Jonestown Swift Street
 Co. Wick
 B172,6RZ
 E: rps@opw.gov.ie

Map:
 Mainnooth Fluvial Flood Extents

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

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

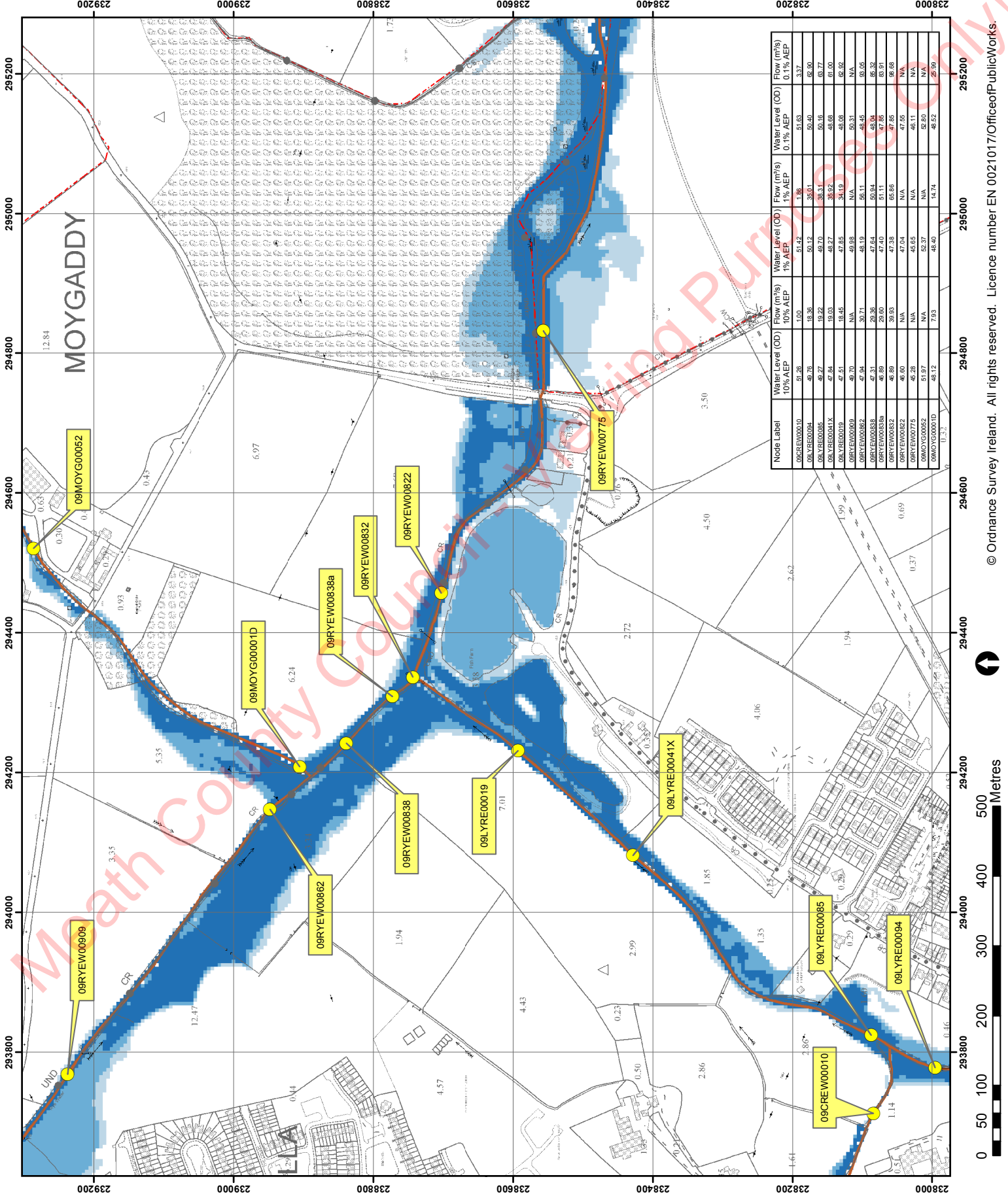
Checked By: D.I. Date: 1 December 2017

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



| 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 |
|--------------|--------------------------|---------------------|-------------------------|--------------------|---------------------------|----------------------|
| 09CREW00010 | 51.26 | 1.00 | 51.42 | 1.86 | 51.63 | 3.37 |
| 09LYRE00004 | 49.76 | 48.36 | 50.12 | 35.01 | 50.40 | 62.90 |
| 09LYRE00005 | 49.27 | 19.22 | 49.70 | 35.31 | 50.16 | 63.77 |
| 09LYRE00011X | 47.84 | 19.03 | 48.27 | 35.92 | 48.68 | 61.00 |
| 09LYRE00019 | 47.51 | 18.45 | 47.85 | 34.19 | 48.08 | 62.92 |
| 09LYRE00039 | 49.70 | N/A | 49.98 | N/A | 50.31 | N/A |
| 09LYRE00082 | 47.64 | 39.71 | 48.19 | 55.11 | 48.45 | 93.05 |
| 09LYRE00083B | 47.31 | 29.35 | 47.64 | 50.94 | 48.04 | 85.32 |
| 09LYRE00083A | 46.89 | 28.60 | 47.40 | 51.11 | 47.85 | 83.91 |
| 09LYRE00082 | 46.89 | 39.93 | 47.38 | 65.66 | 47.85 | 96.69 |
| 09LYRE00075 | 46.28 | N/A | 47.04 | N/A | 47.55 | N/A |
| 09MAYG00052 | 51.97 | N/A | 45.65 | N/A | 46.11 | N/A |
| 09MAYG00010D | 48.12 | 7.93 | 48.40 | 14.74 | 48.80 | 25.99 |

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APPENDIX C. RIVER RYEWATER FLOOD STUDY SCOPING DOCUMENT

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.

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