

Project

Newtownmoyaghy SHD

Report Title

Site Specific Flood Risk Assessment

Client

McGarrell Reilly Homes

INFRASTRUCTURE



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1.0 INTRODUCTION

1.1 Background & Scope

As part of an application for a development at Millerstown, Newtownmoyaghy, Co. Meath, DBFL Consulting Engineers were commissioned to undertake a Site-Specific Flood Risk Assessment (SSFRA) to support the submission of an application for a residential scheme on the existing site.

The objective of this report is to assess flood risk to the existing site and the proposed development in accordance with “The Planning System and Flood Risk Management, Guidelines for Planning Authorities” (FRM Guidelines).

In August 2009 the subject site and adjoining lands were subject to a comprehensive Flood Risk Assessment and Management Study (FRAMS) of the River Rye Water in Kilcock. This study was completed by RPS Consulting Engineers under the direction of a Steering Group which included Meath County Council (MCC), Kildare County Council (KCC) and the Office of Public Works (OPW). The main objectives of this FRAMS were to identify existing and potential future flood risks and establish an approach to mitigate the flood risk within existing developments and proposed future development within Kilcock. The mitigation measures identified within the Kilcock FRAMS have now been constructed in full. The flood mitigation works were designed in compliance with planning permissions PL17. 238370, PL09. 238818 and ABP Ref PL 17.246141. The designs were validated by RPS, the consultants who prepared the Kilcock FRAMS, certified as complete by DBFL Consulting Engineers and confirmed as compliant by Meath County Council in November 2018. A drawing showing the extent of the overall flood mitigation works is included in Appendix A of this document.

The need for a site specific flood risk assessment was identified in the Flood Risk and Management Study (FRAMS) for River Rye Water, Kilcock and it is also required based on FR POL4 of the written statement for the Kilcock Environs contained in Volume 5 of the Meath County Development Plan 2013-2019.

This Site Specific Flood Risk Assessment includes identification and assessment of existing and potential flood risks to / from the site and proposed development and also a development management stage Justification Jest for same.

1.2 Location & Proposed Development

The site, of approximately 24.0 Ha, is located at Millerstown, Newtownmoyaghy, Co. Meath. Kilcock is situated on the Meath/Kildare border, approximately 6km northwest of Maynooth along the R148. It is a greenfield site.

The subject site is located to the north of the Royal Canal and the Rye Water River. The R148 regional road is located directly to the south of the subject site and is located next to the Royal Canal. Moyglare Road is located to the north of the site and the Millerstown Phase 1 is located to the west of the site. The site is primarily bounded by farmland, residential dwellings and the ongoing Millerstown Phase 1 development, which is currently under construction under *MCC REF RA 150205 and ABP Ref PL 17.246141*.



Figure 1.1: Site Location

It is proposed to construct 575 new residential units (388 houses, 121 duplex and 66 apartments), creche, street layout, access and associated site services on a greenfield site. Full details of the scheme layout are included on the architectural plans, elevations, sections etc.

The development will also comprise associated infrastructure works including access roads, new streets, roads, footpaths, driveways and associated site services.

2.0 PLANNING GUIDELINES & FLOOD RISK ASSESSMENT

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

The FRM Guidelines provide “mechanisms for the incorporation of flood risk identification, assessment and management into the planning process”. They ensure a consistent approach throughout the country requiring identification of flood risk and flood risk assessment to be key considerations when preparing development plans, local area plans and planned development.

“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;
- 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 for flood risk management.”

The key principles of The FRM Guidelines are to apply the Sequential Approach to the planning process i.e.;

- “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.”

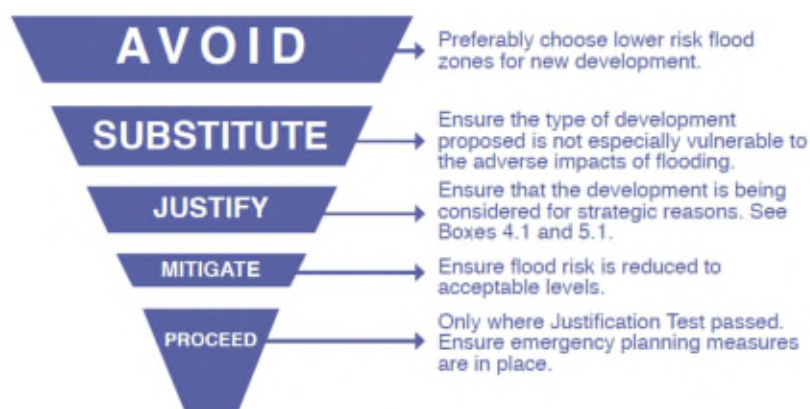


Figure 2.1 - Sequential Approach Principles in Flood Risk Management

Where the *Sequential Test's* **avoid** and **substitute** principals are not appropriate then the FRM Guidelines propose that a *Justification Test* be applied to assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk.

2.2 Flood Risk Assessment

The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways) and the people and assets affected by it (the receptors).

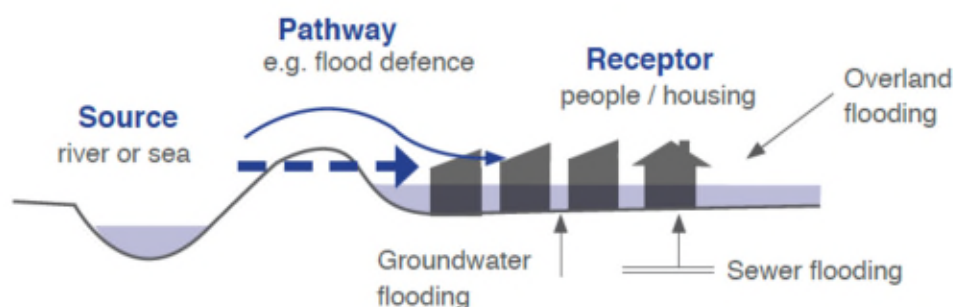


Figure 2.2 - Source-Pathway-Receptor Model

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences. Mitigation measures typically used in development management can then be used to reduce the impact of flooding on people and communities e.g. by blocking or impeding pathways. The planning process is primarily concerned with the location of receptors and potential sources and pathways that might put those receptors at risk.

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.

2.2.1 Sequential Approach

This site-specific flood risk assessment (SSFRA) will initially use existing flood risk information to determine the flood zone category of the Site i.e. to determine whether the development is considered appropriate or whether a justification test is required, see Figure 2.3 below for details.

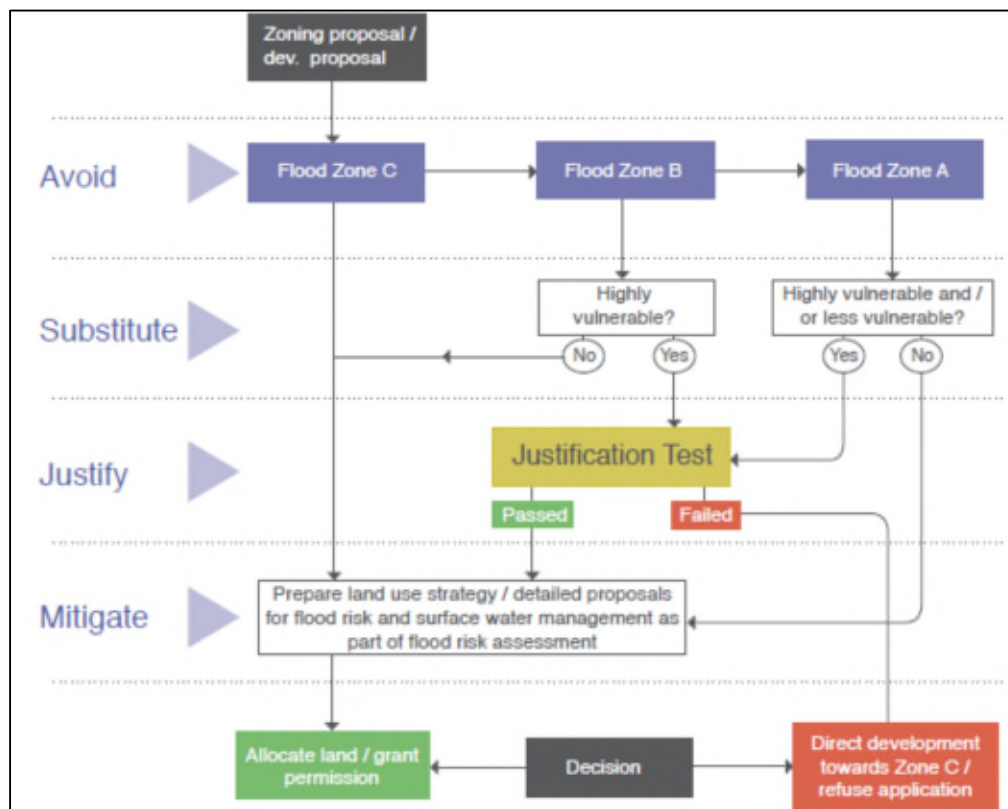


Figure 2.3 - Sequential Approach mechanism in the Planning Process (Figure 3.2 of The Planning System and Flood Risk Management Guidelines)

2.2.2 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*

2.3 Flood Zones

The FRM Guidelines use flood zones to determine the likelihood of flooding and for flood risk management within the planning process. The three flood zones levels are:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP (Annual Exceedance Probability) or 1 in 100 for river flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas outside zones A and B.

The FRM Guidelines categorises all types of development as either;

- Highly Vulnerable e.g. dwellings, hospitals, fire stations, essential infrastructure,
- Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure,
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

2.4 Vulnerability v Flood Zone

The Sequential Approach restricts development types to occur within the flood zone appropriate to their vulnerability class, see Table 3.1.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 2.1 – Matrix of Vulnerability versus Flood Zone to illustrate appropriate development and that required to meet the Justification Test

2.5 Proposed Development's Vulnerability

The proposed type of development is residential which is categorised by the Guidelines as highly vulnerable development and appropriate to be located within Flood Zone C. As per the Planning System and Flood Management Guidelines it is also highly vulnerable development is also permitted in Flood Zones A and B but subject to Justification Test being applied and satisfied.

2.6 Site Specific Flood Risk Assessment for Development

The FRM Guidelines require a Site-Specific Flood Risk Assessment to “gather relevant information sufficient to identify and assess all sources of flood risk and the impact of drainage from the proposal”. It should “quantify the risks and the effects of any necessary mitigation, together with the measures needed or proposed to manage residual risks”. It considers the nature of flood hazard, taking account of the presence of any flood risk management measures such as flood protection schemes and how development will reduce the flood risk to acceptable levels. A detailed assessment for a development application should conclude that the development is not at risk from core flood risk elements and that residual risks can be successfully managed with no unacceptable impacts on adjacent lands.

2.6.1 SSFRA Key Outputs

Key outputs of an SSFRA are:

- Plans showing the site and development proposals (including any relationship with watercourses and structures which may influence local hydraulics as required);
- Surveys of site levels and cross-sections as necessary to indicate development levels relative to sources of flooding and likely flood water levels;
- Assessments of;
 - Potential sources of flood risk;
 - Existing flood alleviation measures;
 - Potential impact of flooding on the site.
- How the layout and form of the development can reduce those impacts, including arrangements for safe access and egress.
- Proposals for surface water management and sustainable drainage.
- The effectiveness and impact of any mitigation measures.
- The residual risks to the site after the construction of any necessary measures and the means of managing those risks; and
- How flood risks are managed for occupants / employees of the site and its infrastructure.

3.0 STAGE 1 FLOOD RISK IDENTIFICATION

3.1 Available Flood Risk Information

To identify potential flood risks for the existing site a number of available data sources were consulted, these are listed in Table 3.1 below.

Information Source	Comments
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at www.floods.ie ;	Information obtained (and reviewed) from www.floods.ie (OPW website).
Flood Risk Assessment and Management Study (FRAMS)	Kilcock FRAMS dated August 2009 completed by RPS under steering group including MCC/KCC/OPW
Predictive flood maps produced under CFRAM Studies;	Eastern CFRAM Study – Kilcock Fluvial Flood Extents and Flood Depth Maps consulted.
Previous Strategic Flood Risk Assessments;	Eastern CFRAM Study consulted.
Previous Strategic Flood Risk Assessment;	Strategic Flood Risk Assessment carried out as Part of Variation No.2 to Meath CDP 2013 to 2019.
Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;	Site topographic survey undertaken (refer to Appendix B).
Information on flood defence condition and performance;	Flood mitigation works as per the Kilcock FRAMS now fully complete and approved.
Alluvial deposit maps of the Geological Survey of Ireland (which would allow the potential for the implementation of source control and	GSI maps consulted.

infiltration techniques and for groundwater and overland flood risk to be assessed).	
Walkover survey to assess potential sources of flooding, likely routes for flood waters and the site's key features, including flood defences, and their condition;	Walkover survey carried out. No additional sources of flooding identified
'Liable to flood' markings on the old '6 Inch' maps;	Historic OSI maps consulted.

Table 3.1 – Review of Available Flood Risk Information

3.1.1 OPW National Flood Hazard Mapping and Benefitting Lands Mapping

OPW's Summary Local Area Report is included in Appendix B (Flood Hazard Information). This report is sourced from the OPW website (www.floodmaps.ie) and summarises all flood events within 2.5 km of the site.

- The nearest flood event occurred on Moyglare road approximately 100m from the northern boundary of the site.
- No benefiting lands are identified in the vicinity of the site. *Note: Benefiting lands are defined as lands that might benefit from implementation of a major drainage scheme or lands subject to flooding or poor drainage.*

3.1.2 Eastern CFRAMS Study

Extracts from OPW's Eastern CFRAM Study are included in Appendix C (Flood Hazard Information) which indicates the extent of fluvial flooding in the vicinity of the site (Kilcock Fluvial Flood Extents Map E09KIK_EXFCD_F2_07). Appendix C also includes an overlay of the development layout onto the flood mapping to define the Eastern CFRAMS flood zones relative to the development proposed. An extract from same is shown in Figure 3.1 below from which the following can be noted;

- The predicted 1.0% AEP Flood Event Zone is shown generally outside the northern housing area, (ie between the housing layout and the Upper Ditch).
- In the southern housing area the predicted 1.0% AEP Flood Event Zone marginally bisects the south western corner of the site. The 1.0% AEP Flood Event Zone crosses the new access road to the GAA Facility and the northern corner of the apartment building beside the GAA Facility.

- The extent of the predicted 0.1% AEP Flood Event Zone is shown to encroach along the southern boundary of the northern housing area on its eastern and western side. At south eastern corner of the northern housing area does cross over the proposed apartment building.
- The 0.1% AEP Flood Event Zone is shown to be encroaching marginally on the southern edge of the southern housing areas. However the 0.1% AEP Flood Event Zone does encroach further into the northern end of the southern housing area.

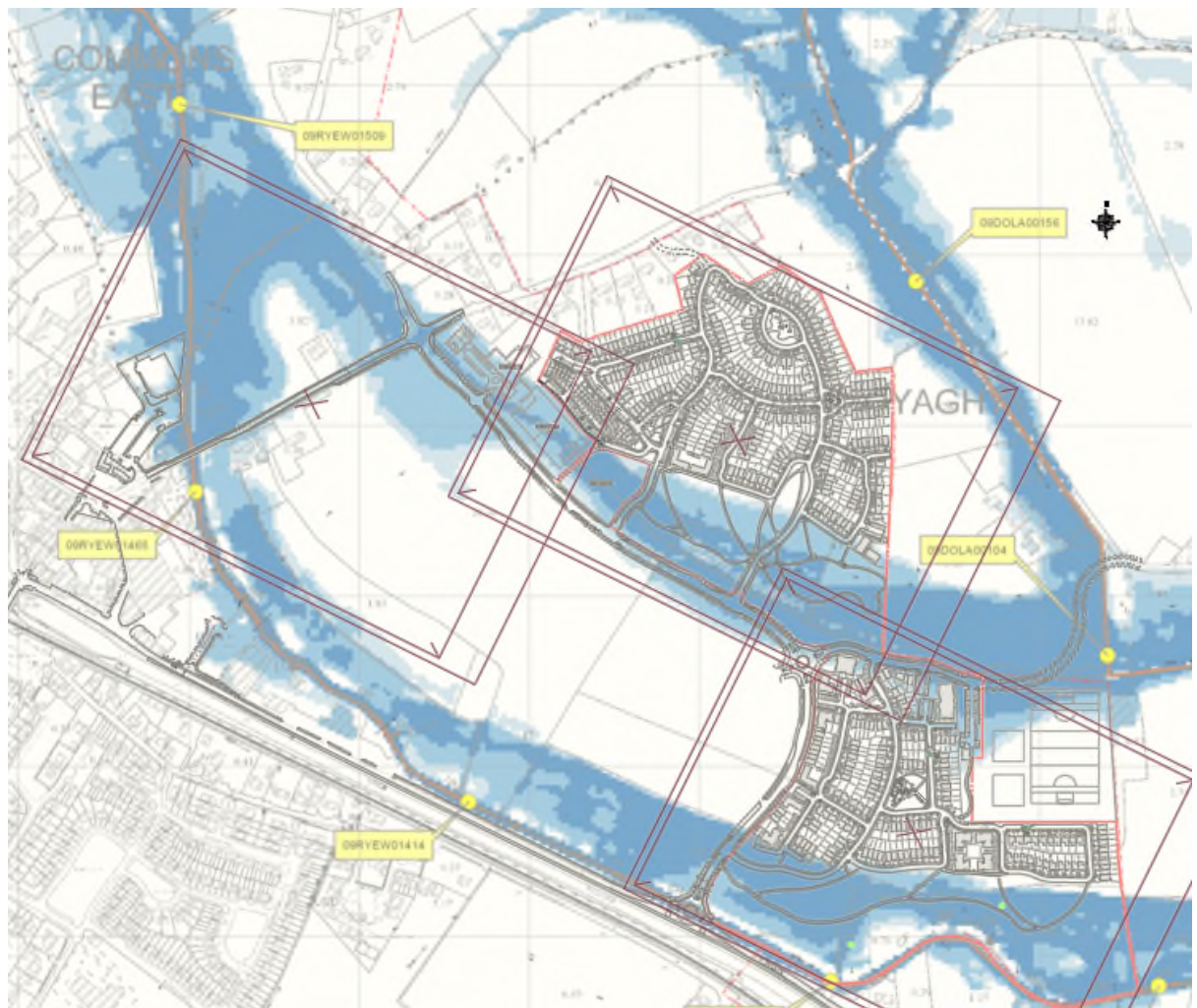


Figure 3.1: Extract from Kilcock Fluvial Flood Extents Map

Based on the overlay of flood zones defined within the Eastern CFRAMs we note that some minor parts of the edges of the southern housing area are within Flood Zone A. There are no areas of the northern housing area in Flood Zone A. In terms of development areas in Flood Zone B only the apartment building in the south eastern corner of the northern housing site is sited within this flood zone. The apartment block and 1 housing unit in the south western corner of the southern housing lands is located in Flood Zone B while a number of units along the GAA Complex access road are in Flood Zone B along with the apartment block

adjacent to the GAA, (north eastern corner. All other areas of the northern and southern housing lands are in Flood Zone C. We note again that the CFRAMs mapping does not take account of the now completed Kilcock FRAMs Flood Mitigation Works.

3.1.3 Kilcock FRAMS

In December 2008, following the An Bord Pleanála refusal for infrastructural works in Kilcock, RPS were commissioned to undertake a comprehensive flood risk assessment and management study of the River Rye Water catchment within the existing and proposed urban environment of Kilcock Co, Kildare. The study was guided by a steering group which included the OPW, Meath Co Co, Kildare Co Co and Landowner Representatives. The study assessed existing and future fluvial flooding risk and examined options to manage floodwaters in a manner that reduced the risk of flooding both to existing development, including Kilcock Town Centre, and to future proposed development, including approximately 190 acres of land in the administrative area of County Meath, whilst retaining existing levels of flood risk to lands upstream and downstream of Kilcock.

The primary objectives of this study are as follows:

- Establish existing flood levels and extent for the River Rye Water and tributaries in Kilcock;
- Provide a critical source of information to be considered during the design of infrastructure within the area, including new roads;
- Develop a mitigation strategy that can be implemented to offset existing and potential flood impacts. Existing development areas identified to be at risk include Kilcock Town Centre;
- Produce a flood mitigation proposal that would ensure that future planned development can take place in a sustainable manner that will satisfy the requirements noted above and address the requirements of Part 2 of the Justification Test as described within *The Planning System and Flood Risk Management Guidelines (Draft), DEHLG and OPW, September 2008*.
- Determine minimum floor levels for proposed developments;

The flood mitigation works proposal identified in the Kilcock FRAMS, which has now been implemented, involved maintaining existing predicted flood levels, flood storage volumes and pass forward flows for a range of storm return periods. The 1%AEP Event (1 in 100 year) Flood event design flood levels within the Kilcock FRAMs are shown on the detailed plans and sections presented in Appendix G.

3.1.4 Other Sources of Information

Other information sources were consulted to determine if there was any additional flood risk to the site including:

- Topographical surveys of the area

The majority of the site is above the predicted 1:100 year and 1:1000 year fluvial flood levels (Appendix C Kilcock Fluvial Flood Extents Map E09KIK_EXFCD_F2_07), with the exception of areas adjacent to the Rye Water and Upper Ditch where the flood mitigation works have been constructed, (ie the designated flood zones).

- SFRA –Variation No.2 Meath CDP 2013 - 2019

Section 5.17 of this document assesses flood risk indicators in relation to proposed land use (e.g. new residential, community & educational, open space & amenity etc.). The SFRA, which was based on available Eastern CFRAMs mapping at the time, notes that the majority of the subject site is located in Flood Zone C.

- Alluvial deposits are shown within the site on the Geological Survey of Ireland online mapping system (indicative of past flooding).
- Walkover survey carried out on 04/07/2019 – no additional sources of flooding identified (other than those outlined above).
- 6 inch OSI Map – no evidence of flooding or marsh areas shown within the site.

Review of the 'other sources' of information noted above indicate a level of flood risk consistent with that identified in the Eastern CFRAM Study.

3.2 Identified Flood Risks/Flood Sources

From consultation of the various information sources there has been fluvial flooding in lands zoned "F1 - Open Space" and minor areas of flooding within lands zoned "A2 – New Residential". There does not appear to be any existing identified tidal or groundwater flood risks to the site or local area. The OPW have recorded flood incidents along the Rye Water, refer to Appendix B for OPW flood hazard report. The site is within the Rye Water catchment which has a predicted 1% Fluvial AEP Event with levels ranging from 62.61m to 63.40m AoD. The predicted 1% Fluvial AEP Event levels for the Upper Ditch ranges from 64.60m to 64.70m AoD. All floor levels are set a minimum of 500mm above the predicted flood levels for the Rye Water and the Upper Ditch. Please note flood mitigation works based on Kilcock FRAM's have been completed and approved by Meath County Council, (as discussed in sections 6 and 7).

The nearest tidal flooding is over 30km away. The OPW's Eastern Catchment Flood Risk Assessment and Management Study maps for the area indicate that the majority of the site is in Flood Zone C, (i.e. low risk of flooding and outside the 1000-year (0.1%AEP) flood extents). Groundwater flooding is not a characteristic of the site or of the geology of the area.

As per Section 1.2 we note that the flood mitigation works identified in the Kilcock FRAMs are now complete effectively reducing the extents of Flood Zones A and B within the site. In the case of both the Rye Water and its tributary channel known as the 'Upper Ditch' the current Flood Zones A & B are effectively confined to the newly constructed designated flood zone areas. The updated flood zone mapping based on the now constructed mitigation works proposal by RPS is included in Appendix D.

3.2.1 Existing Drainage Network Flood Risk

The local public surface water drainage system in the area drains downstream to the south of the site to the existing Rye Water River which is located to the south of the site. The existing public surface water sewers in the vicinity of the site are a potential pluvial flood risk depending on the considered storm event.

The existing local drainage network is identified on DBFL drawings 190009-DBFL-XX-XX-DR-C-3000, 3001, 3002 and 3003 and was compiled from a combination of existing Meath County Council drainage records and details confirmed within the previous planning application for the site, *under MCC REF RA 150205 and ABP Ref PL 17.246141*.

The existing surface water network in the vicinity of the site comprises of the surface water network that was constructed as part of Phase 1, *under MCC REF RA 150205 and ABP Ref PL 17.246141*. The existing Upper Ditch, a tributary of the Rye Water, traverses through lands that have been zoned "Open Space" within the site in an easterly direction and the Rye Water is located to the south of the subject site.

3.3 Source Pathway Receptor Model

A Source-Pathway-Receptor model has been produced to summarize the possible sources of floodwater, the pathways by which flood water could reach receptors and the receptors that could be affected by potential flooding, see Table 3.2 below.

It outlines effects of various potential sources, the performance and response of pathways and the consequences to the receptors in the context of the proposed development.

These sources, pathways and receptors will be assessed further by the initial flood risk assessment stage.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Fluvial	Overbank from the Rye River Upper Ditch.	People and Property (the proposed development).	Possible	Medium	Low
Surface Water (Pluvial)	Blockage and / or surcharging of the proposed surface water drainage network	People and Property (the proposed development).	Possible	Medium	Low
Human / Mechanical Error (Pluvial)	Failure of proposed SuDS measures (e.g. Hydrobrake failure)	People and Property (the proposed development).	Possible	Medium	Low
Groundwater	Rising groundwater levels within the site	People and Property (the proposed development).	Remote	Medium	Low

Table 3.2 - Source-Pathway-Receptor Analysis

4.0 STAGE 2 INITIAL FLOOD RISK ASSESSMENT

Flood risks identified during Stage 1 – Flood Risk Identification, are outlined in Table 3.2 (Source Pathway Receptor Analysis) and noted below. These risks are assessed further in this section of the SSFRA. As

- Low risk of fluvial flooding
- Low risk of pluvial flooding (surface water and human / mechanical error)
- Low risk of groundwater flooding

The information sources identified in Section 3.2 are considered adequate for the purpose of an Initial Flood Risk Assessment for the site and no further technical studies are proposed

4.1 Sequential Approach & Justification Test Mechanism

The Eastern CFRAM flood extents mapping identifies the location of the predicated 1% AEP and 0.1% AEP fluvial flood events associated with the Rye Water prior to the now complete Kilcock FRAMS Flood Mitigation works, (refer to Appendix C). As noted in Section 3.1.3 of this report, areas along the site's southern boundary (fronting the Rye Water) and between the two sites (fronting the Upper Ditch) are subject to flood risk during the predicted 1% AEP and 0.1% AEP storm events.

1% AEP Flood Level Eastern CFRAMS

CFRAMS Node Label	1% AEP Water Level (m)	Proposed Building FFL (m) Adjacent to Node	Freeboard from 1% AEP Water Level (m)
09RYEW01364	63.20	64.0	0.80
09RYEW01323	62.39	64.0	1.61
09DOLA00104	64.22	64.9	0.68
09DOLA00156	66.32	68.80	2.48

- Min. freeboard from 1% AEP required by GSDSDS – 500mm.
- Refer to DBFL Drawings 190009-DBFL-XX-XX-DR-C-2000 to 2004 for proposed FFL's. CFRAMS Nodes and 1% AEP Water Levels are taken from the Kilcock Fluvial Flood Extents Map E09KIK_EXFCD_F2_07 (Appendix C).
- Refer to DBFL drawings 190009-DBFL-XX-XX-C-3040 to 3045 in Appendix G for site plans showing the completed flood mitigation works and cross sections indicating proposed finished floor levels and road levels relative to the 1% AEP Design Flood Level.

0.1% AEP Flood Level Eastern CFRAMS

CFRAMS Node Label	0.1% AEP Water Level (m)	Proposed Building FFL (m) Adjacent to Node	Freeboard from 0.1% AEP Water Level (m)
09RYEW01364	63.25	64.0	0.75
09RYEW01323	62.48	64.0	1.52
09DOLA00104	64.40	64.9	0.5
09DOLA00156	66.42	68.80	2.38

Proposed FFL's are elevated minimum of 500mm above 0.1% AEP Water Levels (as shown CFRAMS Map E09KIK_EXFCD_F2_07 in Appendix C).

We note that there is no recommended free board above the 0.1% AEP water level outlined in / required by the OPW's Flood Risk Management Guidelines or the GDSDS.

1% AEP Flood Extent (Flood Zone A)

Based on the Eastern CFRAMS mapping proposed dwellings are shown in the vicinity of the 1% AEP fluvial flood extents (Flood Zone A). The extent of the predicted 1% AEP Flood Event (Flood Zone A) is shown encroaching into northern eastern corner and south western corner of the southern housing area. In both cases the encroachment is relatively minor.

As part of the Kilcock FRAMS flood mitigation works now completed, Flood Zone A areas have now been contained within the designated flood zones as shown in the Post Flood Mitigation Works Overall Plan Drawing, please refer to Appendix D.

All finished floor levels proposed have a minimum freeboard of 500mm above the 1% AEP design flood levels for the flood mitigation works. Full details of the proposed developments completed flood mitigation works and cross sectional details demonstrating freeboard are included in Appendix G.

0.1% AEP Flood Extent (Flood Zone B)

Based on the Eastern CFRAMS mapping the 0.1% AEP fluvial flood extents (Flood Zone B) are predicted along the southern edge of the northern housing area and along the southern and northern edges of the southern housing area (as shown on the Kilcock Fluvial Flood Extents Map E09KIK_EXFCD_F2_07 in Appendix C). Proposed development areas are shown in the vicinity of / encroaching onto the 0.1% AEP fluvial flood extents (Flood Zone B).

As part of the Kilcock FRAMS flood mitigation works now completed, Flood Zone B areas have now been contained within the designated flood zones as shown in the Post Flood Mitigation Works Overall Plan Drawing, please refer to Appendix D.

All finished floor levels are to have a minimum freeboard of 500mm above the 0.1% AEP Flood Level although the Kilcock FRAMS or GDSDS does not specify a minimum freeboard requirement for the 0.1% AEP Event.

4.2 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a low risk of pluvial flooding relating to the proposed surface water drainage network and human / mechanical error. This risk can be mitigated by designing the surface water network in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) including attenuation of the 1:100 year storm event and implementation of SuDS methodologies.

Proper operation and maintenance of the drainage system should also be implemented to reduce the risk of human or mechanical error causing pluvial flood risk from blockages, fuel / oil interceptor operation problems, Hydrobrake failure etc.

4.3 Initial Groundwater Flood Risk Assessment

During the site walkover survey no marshy ground was observed.

No groundwater wells or marsh areas are located within the site (based on review of information available on the GSI and OSI websites).

7 No. Trial Pits were excavated at the site by GII Ltd. during April 2019, water strike was typically encountered at depths ranging from 1.8m to 2.7m below existing ground level or not encountered at all.

7 No. Infiltration Tests (in accordance with BRE Digest 365) were also carried out by GII Ltd. Excavation for Infiltration Tests which were undertaken in the same location as the trial pits.

Refer to Appendix F for relevant extracts from GII Ltd.'s Site Investigation Report.

Based on the information outlined above, the risk of groundwater flooding occurring at the site is considered negligible.

4.4 Flood Zone Category

On completion of Stage 2 – Initial Flood Risk Assessment, the substantial majority of the site / zoned developable area is considered to be located in **Flood Zone C** as defined by the requirements of “The Planning System and Flood Risk Management, Guidelines for Planning Authorities” and its Technical Appendices.

An extent of the predicted 1% AEP Flood Event (**Flood Zone A**) is shown encroaching into the northern and southern edges of the southern housing area.

Flood Zone B (0.1% AEP event) is shown to be encroaching into the southern eastern corner of the northern housing area. The encroachment is relatively minor and only effects the apartment unit in that corner. Minor encroachment is also evident in the south eastern and north western corner of the southern housing area. The apartment building and 1 housing unit is effected in the south western corner and housing fronting the GAA Complex Access Road plus the apartment building in the north eastern corner. As noted previously the Flood Zone B extent is based in this instance on the Eastern CFRAMs mapping and not the now completed Kilcock FRAMS Flood Mitigation Works.

On completion of this Stage 2 – Initial Flood Risk Assessment and in accordance with the Sequential Approach outlined in Section 2.2 of this report, a Justification Test is required as a relatively minor element of the proposed development is located in **Flood Zone A** and **Flood Zone B** based on the Eastern CFRAMs Flood Mapping.

A Justification Test for these areas of the Proposed Development is outlined in Section 6.0 of this report.

5.0 STAGE 3 DETAILED FLOOD RISK ASSESSMENT & MANAGEMENT

5.1 General

A detailed flood risk assessment follows, to consider **pluvial flood risk** to the proposed development in relation to the following;

- Proposed Surface Water Management measures.
- Flood Exceedance.
- Impact of proposals on flood risk to adjacent areas.
- Effects of climate change.
- Sustainable Urban Structure.
- Residual risks.
- Effectiveness of any flood mitigation measures.

5.2 Surface Water Management Policy

Policies of the Greater Dublin strategic Drainage Study (GDSDS) and the Meath County Development Plan 2013 - 2019 relating to management of surface water runoff, are implemented for the subject site to include the following:

- Sustainable Urban Drainage Systems

For future development, Meath County Council requires that all developments incorporate 'Sustainable Drainage Systems' (SuDS) as part of development proposals to reduce the rate and quantity of runoff.

The following SuDS features are proposed for the subject site:

- Permeable paving for the car park spaces of the development;
- Swales are proposed in open space areas where allowable;
- "Smart Manholes" (with internal weir) to ensure attenuation systems and hydrobrakes continue to up to and including the 1.0% AEP storm event;
- Hydrobrake flow controls to limit surface water runoff to greenfield runoff;
- Surface water storage facilities for storm events up to a 1 in 100-year return period event;
- Non return valves are provided at outlets to the surface water outfall to the Rye Water / Upper Ditch
- Petrol interceptors are proposed on the surface water outfalls, upstream of the hydrobrake flow controls;
- Attenuation storage included in the form of large infiltration / detention basins suitably landscaped / finished.

All new developments are to provide attenuation to limit the outflow to that which occurs prior to development. Compliance with the recommendations contained in Technical Guidance Document, Volume 2, Chapter 4 of the Greater Dublin Strategic Drainage Study shall be required in all instances.

Surface water runoff from the subject site is limited to greenfield runoff Q_{bar} , with surface water runoff exceeding the allowable outflow rate stored on site for up to a 1% AEP (Annual Event Probability), or 1 in 100-year return period. It is proposed to separate the subject site into two surface water catchments for the management of surface water runoff from the site. Refer to the DBFL "Infrastructure Design Report" for details of the surface water management system for the development including details of the surface water catchments including attenuation rates and storage volumes for each catchment.

Surface water runoff from the proposed development is managed in accordance with the recommendations of the GSDSDS and the requirements of the Local Authority. This is achieved through a mix of traditional drainage (i.e. a standard gully and pipe-work collection system) and Sustainable Urban Drainage Systems (SuDS) where appropriate. Surface water attenuation and storage is also included in the design. The total surface water storage volume for the overall application site comprises circa 3520m³ for storm events up to 1%AEP. It is proposed to accommodate surface water storage for the development in infiltration / detention basins suitably landscaped within the open space areas within the site.

In accordance with the recommendations of the GSDSDS, the surface water drainage system for the development is designed to accommodate runoff from a 20% AEP (1 in 5-year return period) storm event and runoff from a 1% AEP (1 in 100-year return period) rainfall event under surcharged conditions.

Also, in accordance with the recommendations of the GSDSDS, a minimum 500mm buffer is provided between the top water level in the surface water storage system in each surface water catchment (for a 1% AEP) and the lowest floor level in the relevant catchment.

5.3 Flood Exceedance

During storms greater than the 1% AEP pluvial event (1 in 100 year), the development's drainage network design will be exceeded in some areas. In the event that the drainage network is exceeded, overland flow routes will be provided. The overland flow routes for the north and south site will generally be directed towards the open space areas, refer to Figure 5.1 and 5.2 below.

Proposed road levels generally fall north to south. Overland flow routes are therefore generally directed towards open space areas (refer to Figure 5.1 for North Site and Figure 5.2 for South Site).

0.1% AEP fluvial flood events will be accommodated within the overland flow routes identified in Figure 5.1 and Figure 5.2.

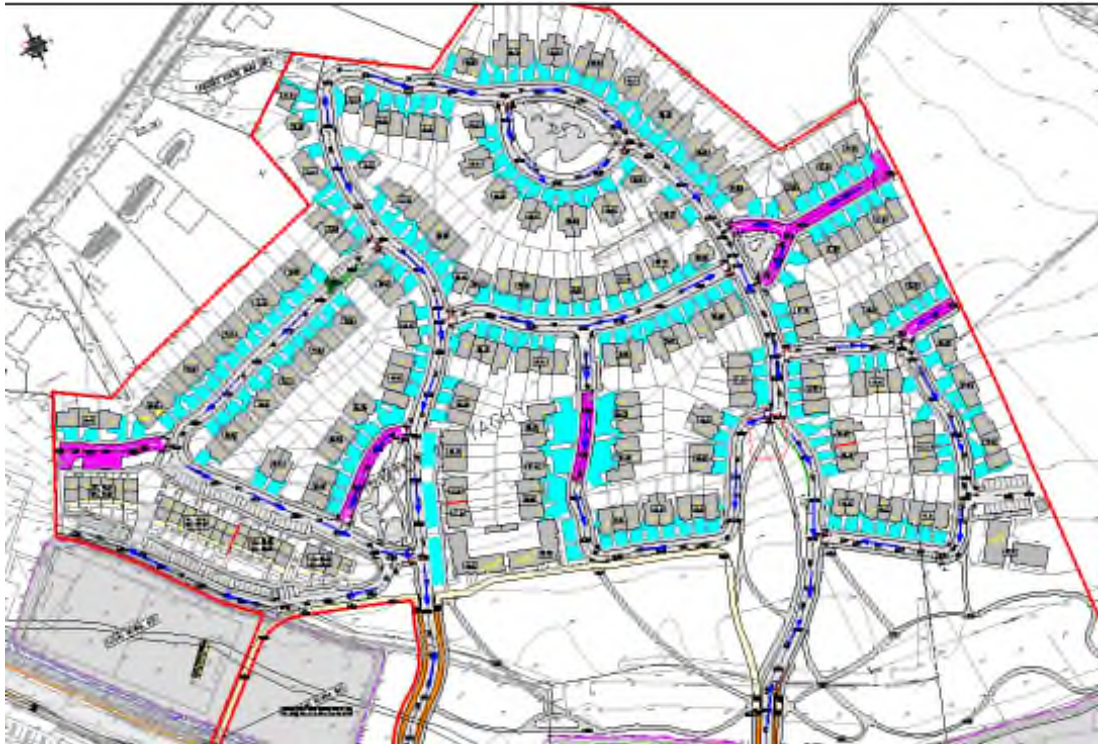


Figure 5.1 – Overland Flow Route (North Site)



Figure 5.2 – Overland Flow Route (South Site)

5.4 Climate Change

The potential impact of climate change has been allowed for in the design of the surface water drainage network and storage system, with an allowance for a 20% increase in rainfall intensities, as recommended by the GSDSDS. The provision of a minimum freeboard of 500mm from the 1% AEP Flood Event as required by the GSDSDS is also provided.

5.5 Impact on Adjacent Areas

Adjacent areas will not be impacted by the development up to the 1% AEP flood event.

Storms greater than the 1% AEP, (exceeding the design capacity of the site's drainage system), may result in overland flow being directed towards the open space areas located between the proposed development and the Rye Water / Upper Ditch. Note, these open space areas are all contained within the subject development site.

5.6 Access and Egress During Flood Events

The proposed development (including essential infrastructure such as roads), are located above the 1% and 0.1% AEP Flood Event Level(s). The recently constructed Link Street through the Millerstown site is located above the 1% and 0.1% AEP Flood Level(s) so emergency access is always possible via the new Link Street, the R148 and R125 local roads. If the capacity of the drainage system is exceeded for storm events exceeding a 1%AEP event, in general there would not be surface ponding of stormwater within the site as water would runoff towards open space areas, where controlled flooding would occur away from the residential development.

5.7 Residual Risks

Remaining residual flood risks, following the detailed assessment include the following;

- Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance.
- Pluvial flooding from the development's drainage system for storms exceeding the design capacity.

5.8 Flood Risk Mitigation

Proposed mitigation measures to address residual flood risks are summarized below;

1. Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance:
 - **Mitigating Measure M1:** The proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.
2. Pluvial flooding from the development's drainage system for storms exceeding the design capacity:

- **Mitigating Measure M2:** The drainage network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 1% AEP (1 in 100-year return period event). The drainage network for the site has been designed to ensure that it can accommodate the 1 in 100-year rainfall event in surcharged conditions. In events of storms exceeding the 1.0% capacity of the attenuation system, possible overland flow routes should not be blocked. At these locations, the sites boundaries should be permeable to facilitate flood routing onto adjacent public roads.

5.8.1 Effectiveness of Mitigation Measures

It is considered that the flood risk mitigation measures if implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur.

Should extreme pluvial flooding occur that is in excess of the development's attenuation capacity (i.e. greater than 1%AEP), then overland flow routes directed towards open space areas are provided in order to protect the proposed development.

6.0 JUSTIFICATION TEST

As noted above in Section 4.4, a Justification Test is required as a number of the proposed “dwelling houses” are located in **Flood Zone A** and **Flood Zone B**.

This Justification Test is outlined below (Table 6.1) and has been carried out in accordance with Section 5.15 of the OPW’s Guidelines for Planning Authorities (see extract below).

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
 - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
 - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
 - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
 - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Justification Test as per Section 5.15 of the OPW's Guidelines for Planning Authorities		
1.	The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.	Yes, the proposed development lands are zoned " <i>New Residential</i> " and " <i>Open Space</i> " in the Kilcock LAP 2015.
2(i)	The development has been subject to an appropriate FRA that demonstrates: <i>The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;</i>	<p>The subject site formed part of the study area for the Kilcock FRAMS dated 2009. This was a detailed flood risk assessment by RPS Consulting Engineers under a Steering Group which included Meath Co Co / Kildare Co Co / OPW. The study identified a series of flood mitigation works which have been constructed and operational since 2018 under planning ref ABP Ref PL17.246141. All works have been approved by Meath Co Co.</p> <p>The Kilcock FRAMS showed that the now implemented flood mitigation works would not increase flood risk elsewhere.</p> <p>All of the above are noted and have been referenced in this Site Specific Flood Risk Assessment which accompanies this application.</p> <p>A number of SuDS Methodologies are being proposed as part of the surface water drainage proposals for the development. These include attenuation of surface water runoff to greenfield runoff rates (ie 2.0 l/sec/ha). Also refer to Section 5.2.1 Surface Water Management Measures and SuDS.</p>
2(ii)	The development has been subject to an appropriate FRA that demonstrates:	As noted in 2(i) above the Kilcock FRAMS Flood Mitigation Works (which have now

	<p><i>The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;</i></p>	<p>been implemented) included measures which minimize risks to people, property, the economy and the environment as far as reasonably possible. The completed flood mitigation works were also subject to Environmental Assessment under the various infrastructure planning applications that were submitted for same.</p> <p>Please refer to Post Flood Mitigation Works Flood Extents Mapping by RPS in Appendix D, which indicates all dwellings post flood mitigations works are within Flood Zone C.</p> <p>The GSDSDS requires a minimum freeboard of 500mm above the 1% AEP flood level (in order to allow for future climate change). FFL's within the development are elevated 500mm above 1.0% AEP flood levels. Also refer to Section 4.1 Initial Fluvial Flood Risk Assessment. Risk of flooding to people, property and the environment is therefore considered to be very low.</p> <p>This level of protection now provided / implemented also ensures that future capital expenditure will not be required to alleviate future flooding of dwellings within the development</p>
2(iii)	<p>The development has been subject to an appropriate FRA that demonstrates:</p> <p><i>The development proposed includes measures to ensure that residual risks to the area and / or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any</i></p>	<p>Residual Risks are identified in Section 5.6 of this report (pluvial flooding due to pipe blockage and pluvial flooding from the development's drainage system for storms in excess of the 1% AEP).</p> <p>Proposed Mitigation Measures to address same are outlined in Section 5.8 of this report (maintenance of drainage system and provision of overland flow routes towards open spaces).</p>

	<p><i>future flood risk management measures and provisions for emergency access;</i></p>	<p>The recently constructed Flood Mitigation Works as per the Kilcock FRAMS will be monitored & maintained as per the inspection regime documented for same and as agreed with Meath Co Co. This includes annual and bi-annual inspections of flow controllers, structures and storage areas.</p> <p>All proposed access points to the development are located above the 1% AEP design Flood Level for the site as per the recommendations of the Kilcock FRAMS and Flood Risk Management Guidelines.</p>
2(iv)	<p>The development has been subject to an appropriate FRA that demonstrates:</p> <p>The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.</p>	<p>The recently constructed flood mitigation works under the Kilcock FRAMS have been incorporated into the development proposal by the Design Team which includes the landscape proposals for the designated flood zones. An example of this can be seen in Millerstown Phase 1 where landscaping of the flood storage zone has been integrated with the overall open space landscape works and new streets for the edge of same.</p> <p>Proposed surface water infrastructure, SuDS Methodologies and flood mitigation measures have been integrated with the overall site layout / open space areas and as such are considered compatible with the achievement of wider planning objectives in relation to development of good urban design</p>

On completion of the Justification Test outlined above, the proposed development is considered appropriate as each of the criteria from Section 5.15 (Box.5.1) of the OPW's Guidelines for Planning Authorities have been clearly demonstrated.

The identified Flood Mitigation Works as per the Kilcock FRAMS dated 18th August 2009 have now been constructed / implemented and same, in conjunction with the development now

proposed, redefines the extent of Flood Zones A and B, containing same within the newly constructed flood storage areas. All Flood Mitigation Works completed have been approved by Meath Co Co as per compliance with the relevant planning conditions of Millerstown Phase 1, infrastructure applications etc.

Post flood mitigation flood mapping is available in Appendix D which confirms that all proposed dwellings are now located in Flood Zone C.

7.0 CONCLUSION

Further to the recommendations of the Kilcock FRAMS for the River Rye Water Kilcock, the proposed development site at Millerstown, Kilcock is facilitated by the design & implementation of approved flood mitigation measures, (ie ABP Ref PL17.246141). All Flood Mitigation Works have been completed in 2018 and same have been confirmed as compliant with planning permission by Meath County Council. Please refer to Appendix D for post flood mitigation flood mapping.

As some small areas of the sites adjacent to the Rye Water and Upper Ditch are located in the Flood Zones A and B based on the historical Eastern CFRAMS flood mapping, the Development Management Stage Justification Test has been undertaken for the proposed development. The Justification Test presented in Section 6.0 of this Site Specific Flood Risk Assessment clearly shows that the development satisfies all criteria set out in Box 5.1 of the Planning System and Flood Risk Management Guidelines. The development is zoned for its subject use, has been subjected to a detailed flood risk assessment under this application and the Kilcock FRAMS, flood mitigation works have been designed / implemented and all flood mitigation works have been approved by Meath Co Co.

Finished floor levels within the proposed development have been set in excess of 500mm above the design 1% AEP (1 in 100 year) flood level at the relevant points on the Rye Water and Upper Ditch. This is in compliance with Policy FR POL 4 of the of the written statement for the Kilcock Environs contained in Volume 5 of the Meath County Development Plan 2013-2019. This is also as per the recommendations of the Kilcock FRAMS, the GSDSDS and Flood Risk Management Guidelines.

Sustainable Drainage Systems (SuDS) will be employed to serve the proposed development, ensuring that only clean attenuated surface water from the development will discharge to the Rye Water / Upper Ditch. Discharge will be restricted to greenfield runoff levels. Based on the sites underlying subsoil conditions significant opportunity for groundwater recharge exists.

The proposed development layout / design is in accordance with the required standards and will attenuate run-off by providing approximately 3520m³ of storm-water storage. It therefore does not impact or increase the risk of flooding elsewhere or in adjacent areas.

The development is designed such that new buildings will have freeboard substantially above predicted pluvial flood levels and above potential overland flow paths along roads etc. The development's drainage design provides a significant volume of underground attenuation storage for the 1% AEP return event and, together with various design mitigation measures, meets the drainage design requirements of the Greater Dublin Strategic Drainage Study.

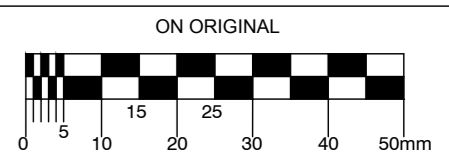
The development's layout and drainage design have been considered within the context of flood risk and mitigation measures have been recommended for the operation and maintenance of the surface water system. These together with provision of attenuated outlets, attenuation

storage volume, SUDS drainage features, building and road levels above expected drainage flood levels have been considered in the development's layout and drainage design. The development will not increase flood risk elsewhere and therefore it is concluded that the requirements of the Sequential Test as contained in The Planning System and Flood Risk Management, Guidelines for Planning Authorities are passed and the development layout can be provided on the Site.

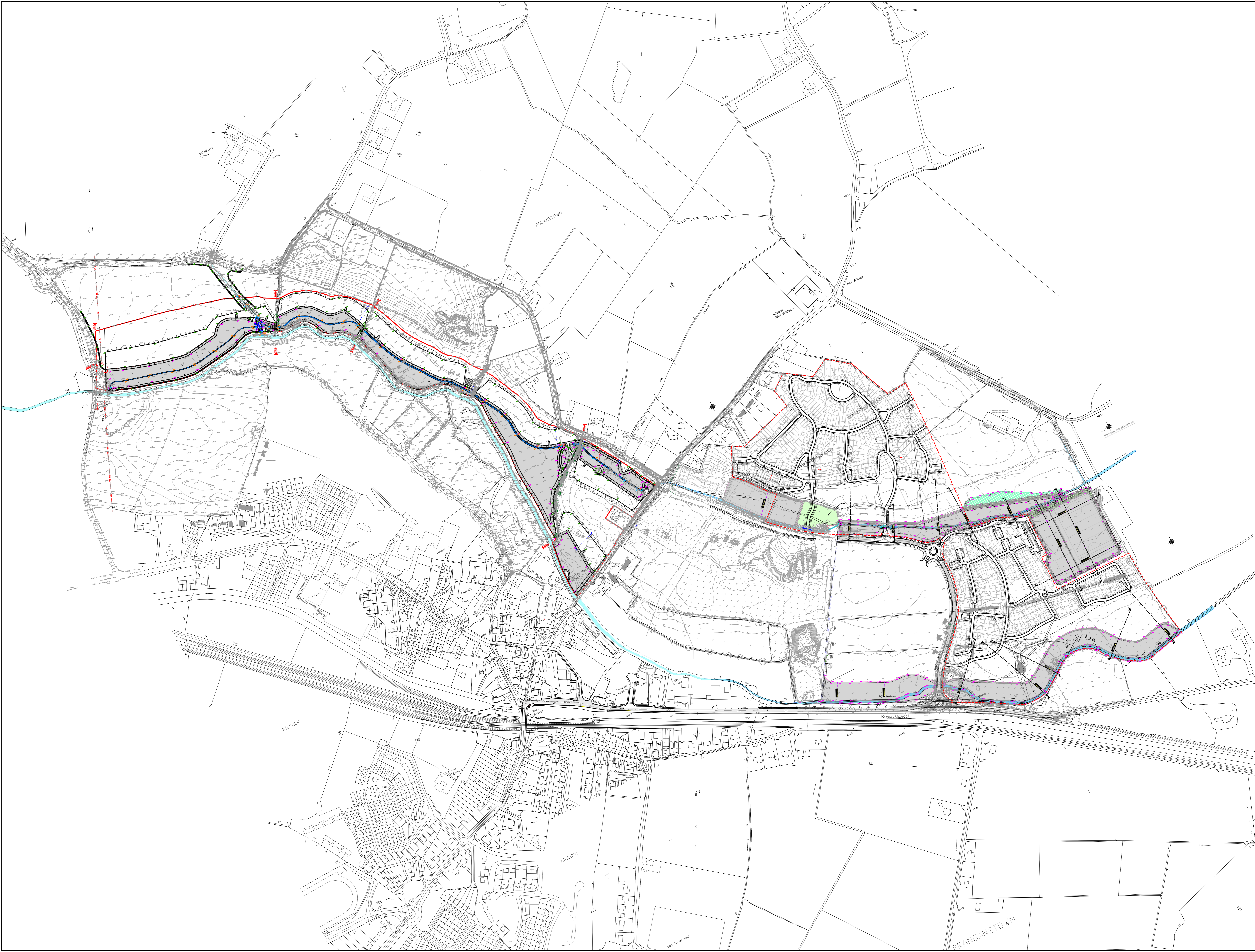
Appendix A

KILCOCK OVERALL FLOOD MITIGATION WORKS KEY PLAN

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NOTES:



- EXISTING FLOODWORKS MITIGATION LEGEND**
- DESIGN FLOOD TOP WATER LEVEL FROM KIRKES
 - CONSTRUCTED FLOOD STORAGE ZONE OR AP FLOOD EXTENS
 - EXISTING REINFORCED EARTH BERM/FILL AREA
 - EXISTING FLOW RETURN PIPES THROUGH REINFORCED EARTH BERM
 - 63.000 FLOODPLAIN GROUND LEVEL
 - EXISTING RIVER/STREAM
 - REINFORCED EARTH BERM/FILL AREA

REV	DATE	DESCRIPTION	BY	CHKD
STAGE 2 - PLANNING				
DESIGNED	BCM	PREPARED	PJC	
DATE	NOV 2010	CHECKED	ELW	

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 DBFL Consulting Engineers
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PROJECT
KILCOCK PHASE 2

DRWG TITLE
OVERALL COMPLETED FLOOD MITIGATION WORKS

CLIENT
MCGARRELL REILLY

SCALE 1:2000 (A4) FILE REF: 190009-9015
 DRG NO: 190009-9015

Appendix B

OPW Flood Hazard Report

Summary Local Area Report

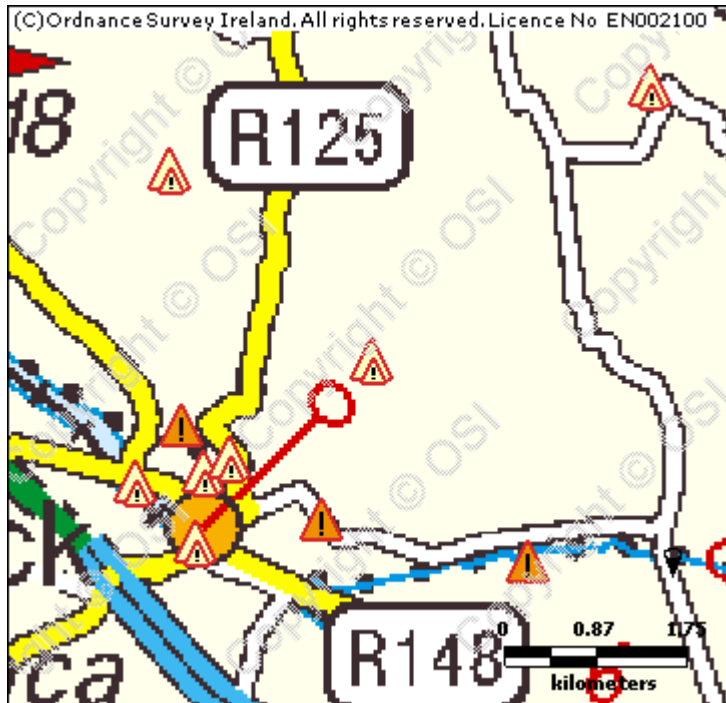
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Meath

NGR: N 902 414

This Flood Report has been downloaded from the Web site www.floodmaps.ie. The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Map Scale 1:72,425

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

8 Results

	1. Ryewater Kilcock Nov 2000 County: Kildare Additional Information: Photos (2) Reports (1) More Mapped Information	Start Date: 07/Nov/2000 Flood Quality Code:3
	2. Ryewater Maynooth Kilcock area Nov 2000 County: Kildare Additional Information: Reports (2) Press Archive (13) More Mapped Information	Start Date: 05/Nov/2000 Flood Quality Code:3
	3. Ryewater Balfeaghan Bridge Kilcock 18th August 2008 County: Meath Additional Information: Reports (2) More Mapped Information	Start Date: 16/Aug/2008 Flood Quality Code:3
	4. Rye Water Newtown Prospect Kilcock 8th Jan 2005 County: Meath Additional Information: Reports (1) More Mapped Information	Start Date: 08/Jan/2005 Flood Quality Code:3
	5. Ryewater, Kilcock Recurring County: Kildare	Start Date: Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



6. Ryewater Dolanstown Recurring

County: Meath

Start Date:

Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information



7. School Street, Kilcock Recurring

County: Kildare

Start Date:

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information



8. Rodanstown Recurring

County: Meath

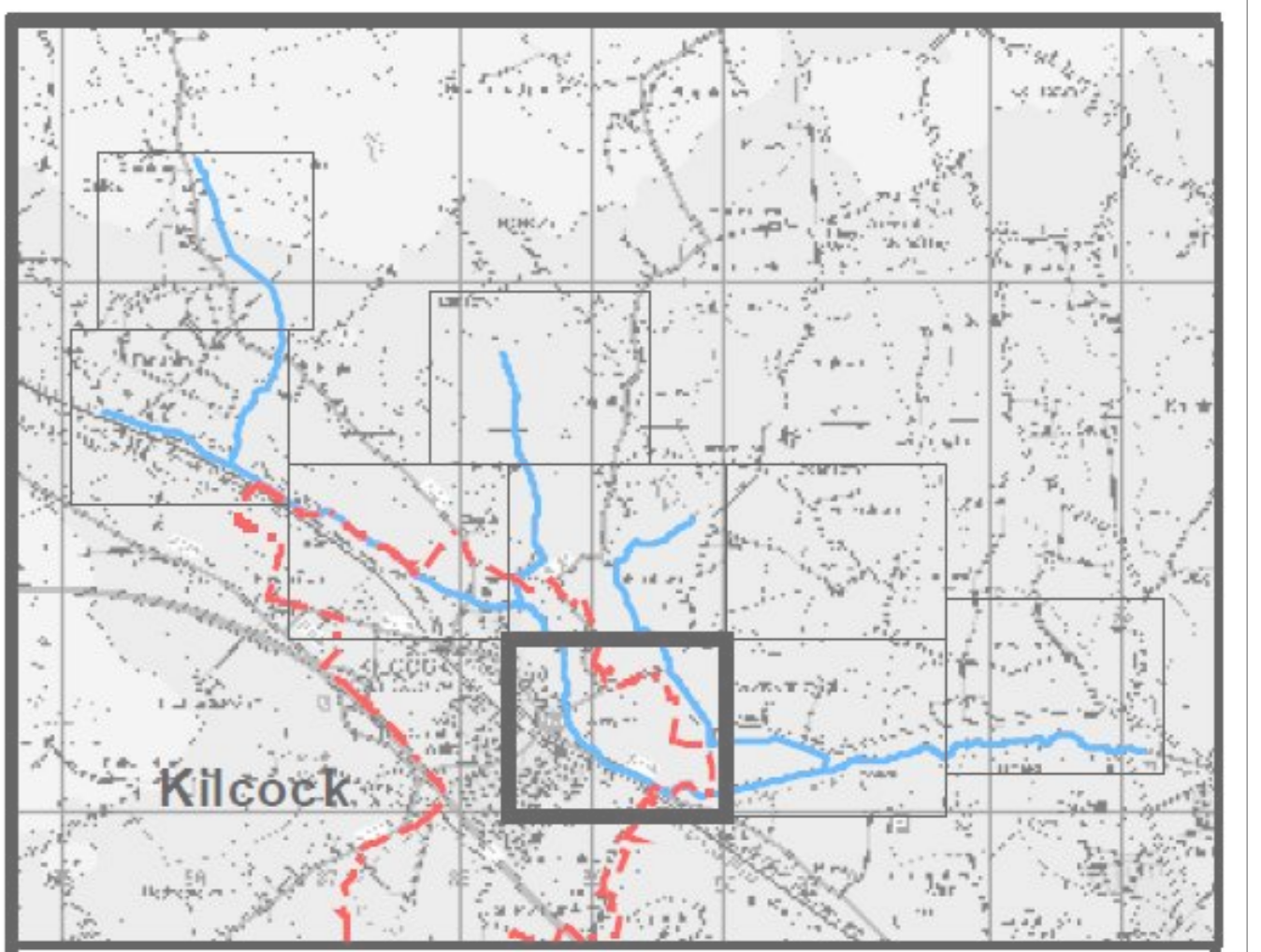
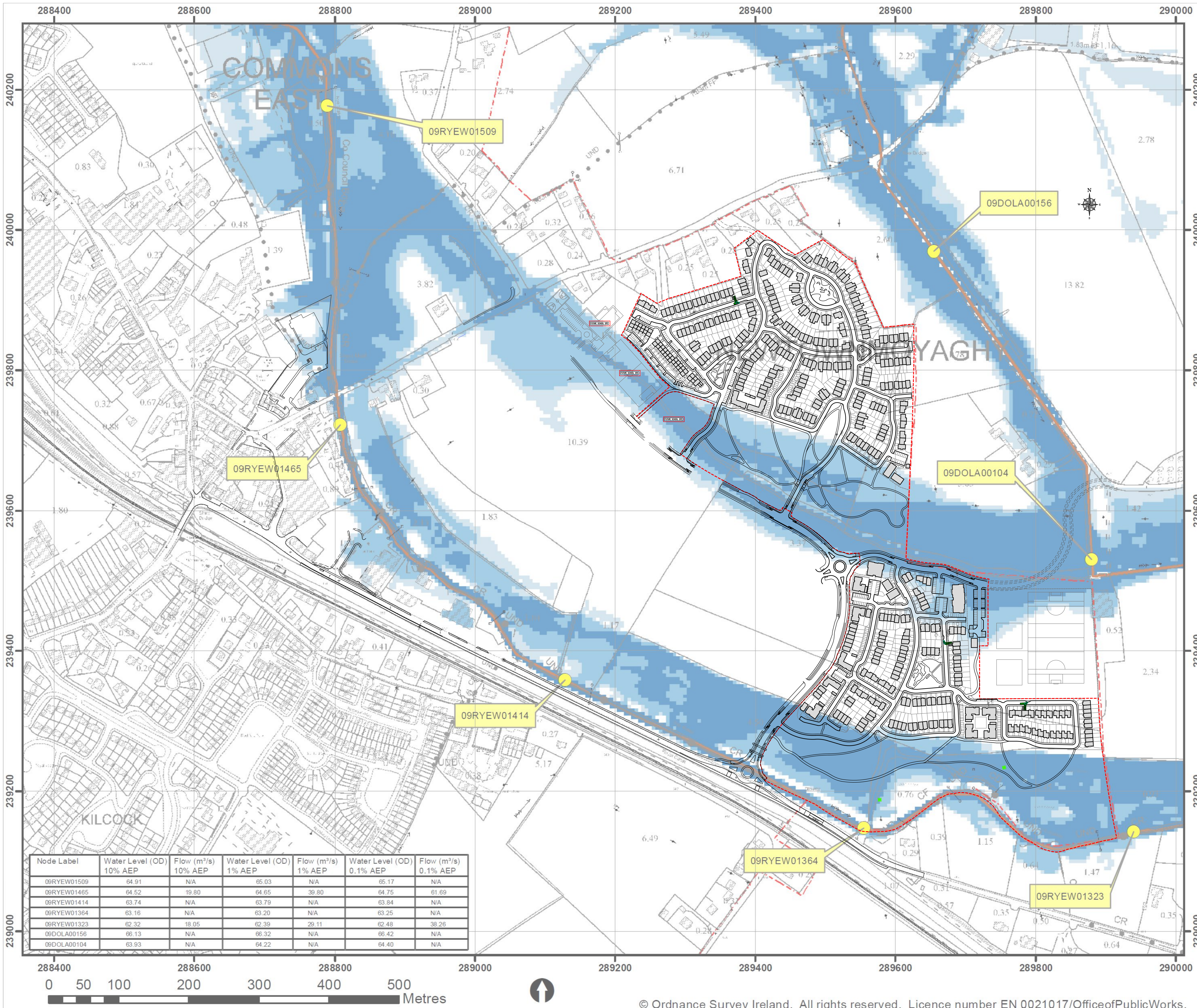
Start Date:

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

Appendix C

ECFRAM FLOOD MAPS PRIOR TO FLOOD MITIGATION WORKS



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
- Node Point
- Node ID
- Node Label

FINAL

REV:	NOTE:	DATE:
------	-------	-------



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Node Label	Water Level (OD)		Flow (m ³ /s)		Water Level (OD)		Flow (m ³ /s)	
	10% AEP	10% AEP	1% AEP	1% AEP	0.1% AEP	0.1% AEP	0.1% AEP	0.1% AEP
09RYEW01509	64.91	N/A	65.03	N/A	65.17	N/A	N/A	N/A
09RYEW01465	64.52	19.80	64.65	39.80	64.75	61.69		
09RYEW01414	63.74	N/A	63.79	N/A	63.84	N/A		
09RYEW01364	63.16	N/A	63.20	N/A	63.25	N/A		
09RYEW01323	62.32	18.05	62.39	29.11	62.48	38.28		
09DOLA00156	66.13	N/A	66.32	N/A	66.42	N/A		
09DOLA00104	63.93	N/A	64.22	N/A	64.40	N/A		



Map:
 Kilcock Fluvial Flood Extents

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

Drawn By: F.M.C. **Date:** 31 May 2017

Checked By: D.I. **Date:** 31 May 2017

Approved By: S.P. **Date:** 31 May 2017

Drawing No.: E09KIK_EXFCD_F2_07

Map Series: 7 of 9

Drawing Scale: 1:5,000 @A3

Appendix D

**POST FLOOD MITIGATION WORKS
FLOOD EXTENT MAP (RPS)**



Legend

- 1% AEP Flood Extents
- 0.1% AEP Flood Extents
- Embankments
- Flow Controllers
- Inlet Weir
- Watercourse
- Flood Diversion Channel
- Culvert



Project
Kilcock – Areas B to E

Title
Flood Extents Mapping

Figure 6.0
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West Pier Business Campus
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Issue Details			
Drawn:	BT	Project No.	MDW0807
Checked:	PM	File Ref:	
Approved:	PM		MDW0807QG0006F02
Scale:	1:8,000 @ A3	Map Projection:	
	1:16,000 @ A1		Irish National Grid (ING)
Date:	26/10/2018		

NOTES:
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The background mapping used in this map is from the Open Street Map which is not conclusive, ©OpenStreetMap

Appendix E

PHOTO'S OF COMPLETED FLOOD MITIGATION WORKS



Photo 1 – Completed 'Upper Ditch' Flood Plain Works



Photo 2 – Completed 'Upper Ditch' Flood Plain Works



Photo 3 – Completed 'Upper Ditch' Flood Plain Works



Photo 4 – Completed 'Upper Ditch' Flood Plain Works



Photo 5 – Completed 'Upper Ditch' Flood Plain Works



Photo 6 – Completed 'Upper Ditch' Flood Plain Works



Photo 7 – Completed 'Upper Ditch' Flood Plain Works



Photo 8 – Completed 'Upper Ditch' Flood Plain Works



Photo 9 – Completed 'Upper Ditch' Flood Plain Works



Photo 10 – Completed 'Upper Ditch' Flood Plain Works



Photo 11 – Completed 'Upper Ditch' Flood Plain Works



Photo 12 – Completed 'Upper Ditch' Flood Plain Works



Photo 13 – Completed ‘Upper Ditch’ Flood Plain Works



Photo 14 – Completed ‘Upper Ditch’ Flood Plain Works



Photo 15 – Completed 'Upper Ditch' Flood Plain Works



Photo 16 – Completed 'Upper Ditch' Flood Plain Works



Photo 17 – Completed ‘Upper Ditch’ Flood Plain Works



Photo 18 – Completed ‘Upper Ditch’ Flood Plain Works



Photo 19 – Completed 'Upper Ditch' Flood Plain Works



Photo 20 – Completed Lower/Rye Water Flood Plain Works



Photo 21 – Completed Lower/Rye Water Flood Plain Works



Photo 22 – Completed Lower/Rye Water Flood Plain Works



Photo 23 – Completed Lower/Rye Water Flood Plain Works



Photo 24 – Completed Lower/Rye Water Flood Plain Works

Appendix F

SITE INVESTIGATION REPORT EXTRACTS

SA01

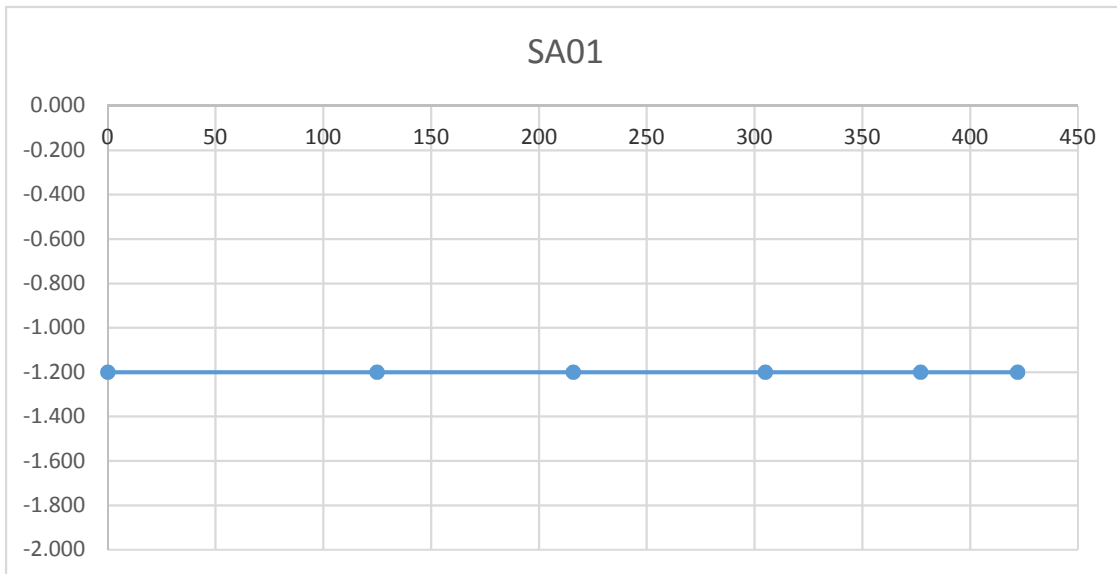
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.0m x 0.35m 2.65m (L x W x D)

Date	Time	Water level (m bgl)
25/03/2019	0	-1.200
25/03/2019	125	-1.200
25/03/2019	216	-1.200
25/03/2019	305	-1.200
25/03/2019	377	-1.200
25/03/2019	422	-1.200

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
1.20	2.650	1.450	1.5625	2.2875



SA02

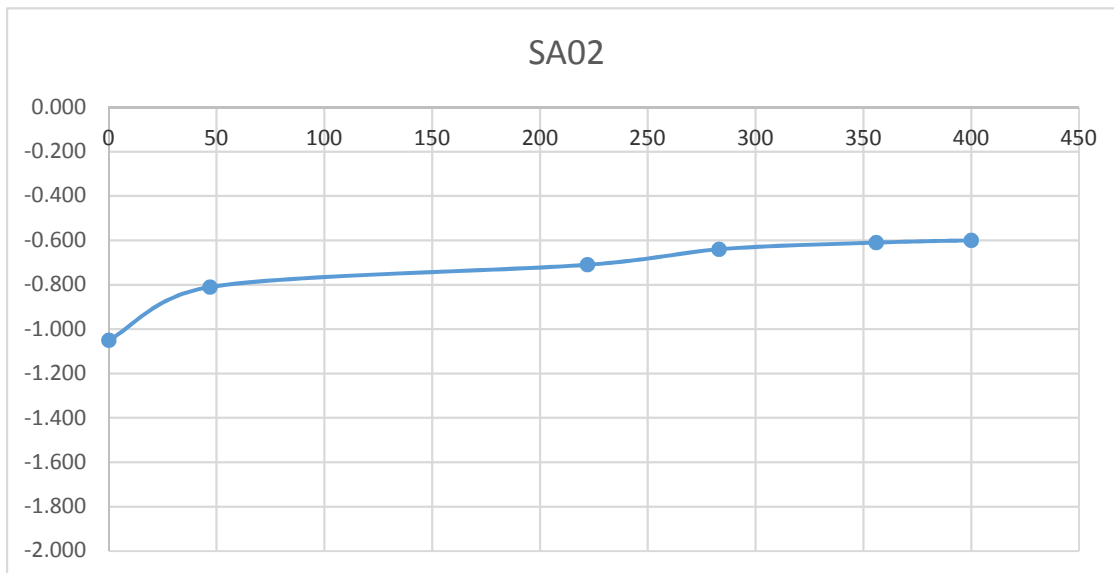
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.2m x 0.35m 3.0m (L x W x D)

Date	Time	Water level (m bgl)
25/03/2019	0	-1.050
25/03/2019	47	-0.810
25/03/2019	222	-0.710
25/03/2019	283	-0.640
25/03/2019	356	-0.610
25/03/2019	400	-0.600

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
1.05	3.000	1.950	1.5375	2.5125



SA03

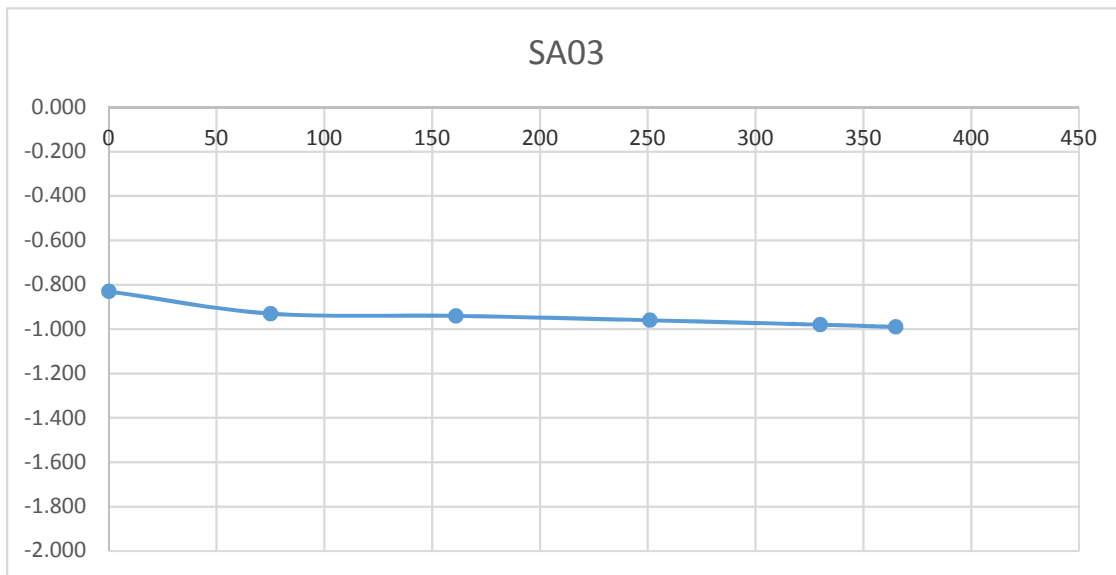
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.9m x 0.35m 2.25m (L x W x D)

Date	Time	Water level (m bgl)
25/03/2019	0	-0.830
25/03/2019	75	-0.930
25/03/2019	161	-0.940
25/03/2019	251	-0.960
25/03/2019	330	-0.980
25/03/2019	365	-0.990

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.83	2.250	1.420	1.185	1.895



SA04

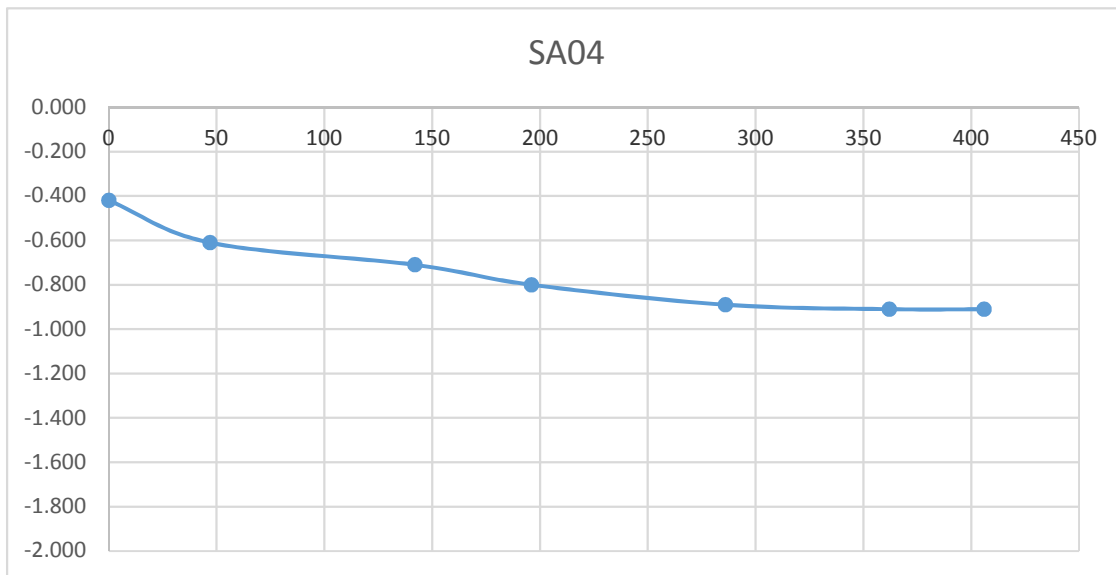
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.7m x 0.35m 1.10m (L x W x D)

Date	Time	Water level (m bgl)
25/03/2019	0	-0.420
25/03/2019	47	-0.610
25/03/2019	142	-0.710
25/03/2019	196	-0.800
25/03/2019	286	-0.890
25/03/2019	362	-0.910
25/03/2019	406	-0.910
25/03/2019		

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.42	1.100	0.680	0.59	0.93



SA06

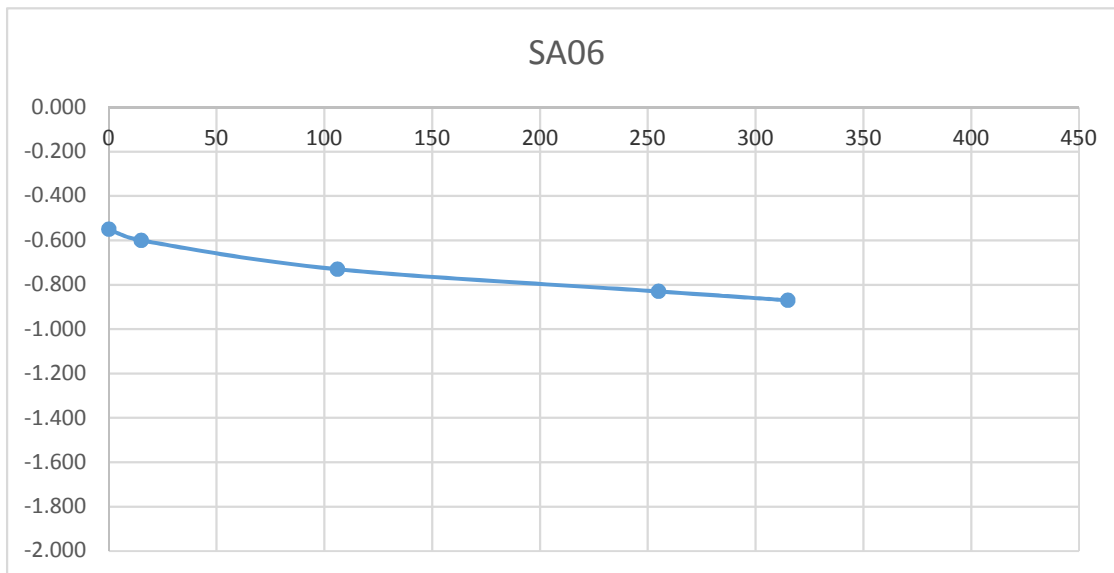
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.9m x 0.35m 1.20m (L x W x D)

Date	Time	Water level (m bgl)
26/03/2019	0	-0.550
26/03/2019	15	-0.600
26/03/2019	106	-0.730
26/03/2019	255	-0.830
26/03/2019	315	-0.870

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.55	1.200	0.650	0.7125	1.0375



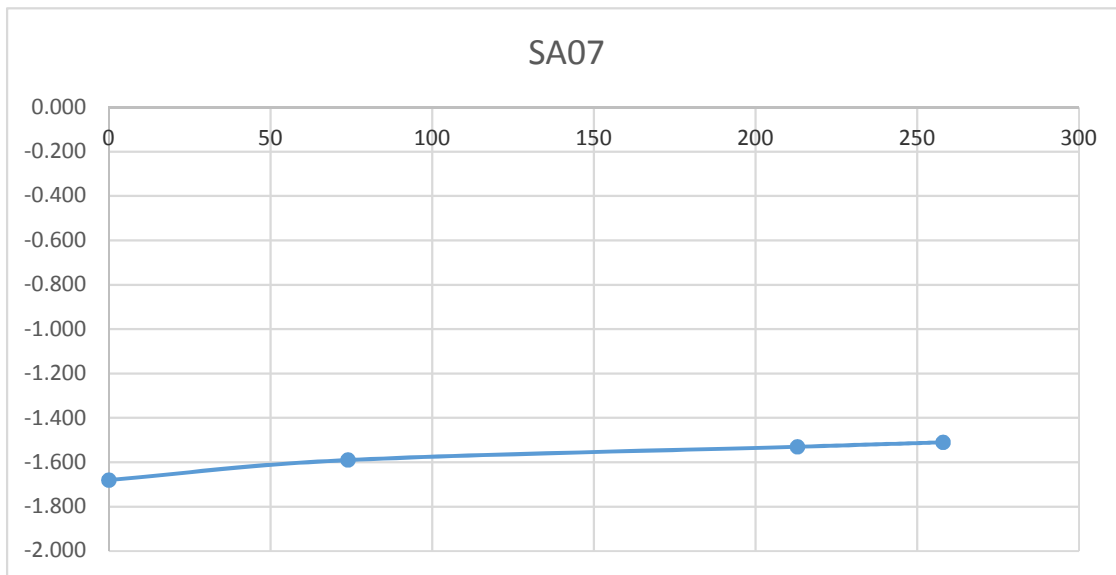
SA07

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.5m x 0.40m 2.7m (L x W x D)

Date	Time	Water level (m bgl)
26/03/2019	0	-1.680
26/03/2019	74	-1.590
26/03/2019	213	-1.530
26/03/2019	258	-1.510

*Soakaway failed - Pit backfilled				
Start depth	Depth of Pit	Diff	75% full	25%full
1.68	2.700	1.020	1.935	2.445



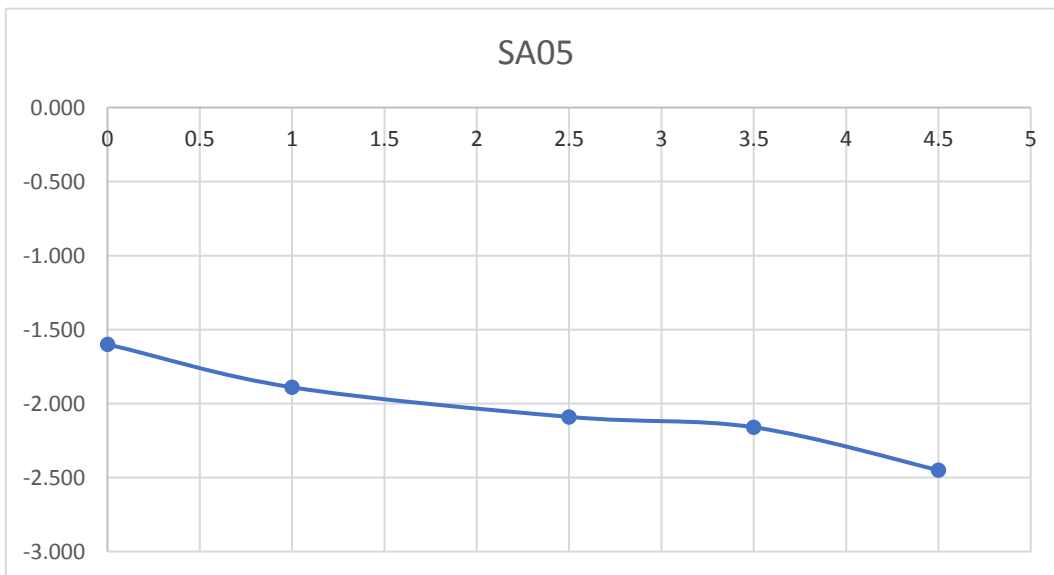
SA03 1st Fill

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.50m x 0.50m 2.70m (L x W x D)

Date	Time	Water level (m bgl)
26/03/2019	0	-1.600
26/03/2019	1	-1.890
26/03/2019	2.5	-2.090
26/03/2019	3.5	-2.160
26/03/2019	4.5	-2.450

Start depth 1.60	Depth of Pit 2.450	Diff 0.850	75% full 1.8125	25%full 2.2375
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.500	0.500		0.425	0.53
Tp75-25 (from graph) (s)		150	50% Eff Depth	ap50 (m2)
f =		9.320E-04	0.425	3.8
		m/s		



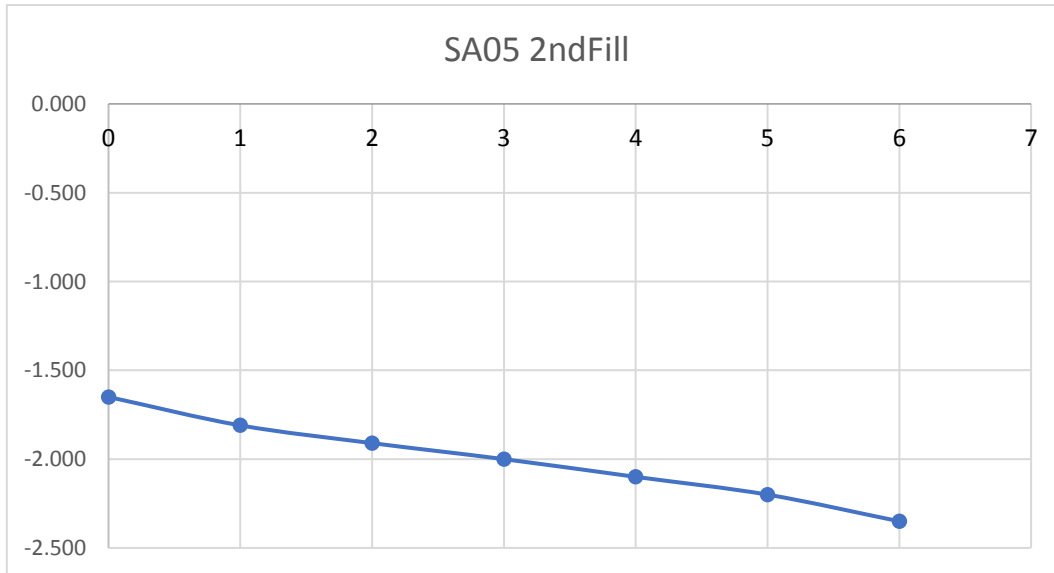
SA05 2nd Fill

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.50m x 0.50m 2.35m (L x W x D)

Date	Time	Water level (m bgl)
26/03/2019	0	-1.650
26/03/2019	1	-1.810
26/03/2019	2	-1.910
26/03/2019	3	-2.000
26/03/2019	4	-2.100
26/03/2019	5	-2.200
26/03/2019	6	-2.350

Start depth 1.65	Depth of Pit 2.350	Diff 0.700	75% full 1.825	25%full 2.175
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.500	0.500		0.350	0.44
Tp75-25 (from graph) (s)		191.5	50% Eff Depth	ap50 (m2)
			0.350	3.35
f =	6.820E-04	m/s		



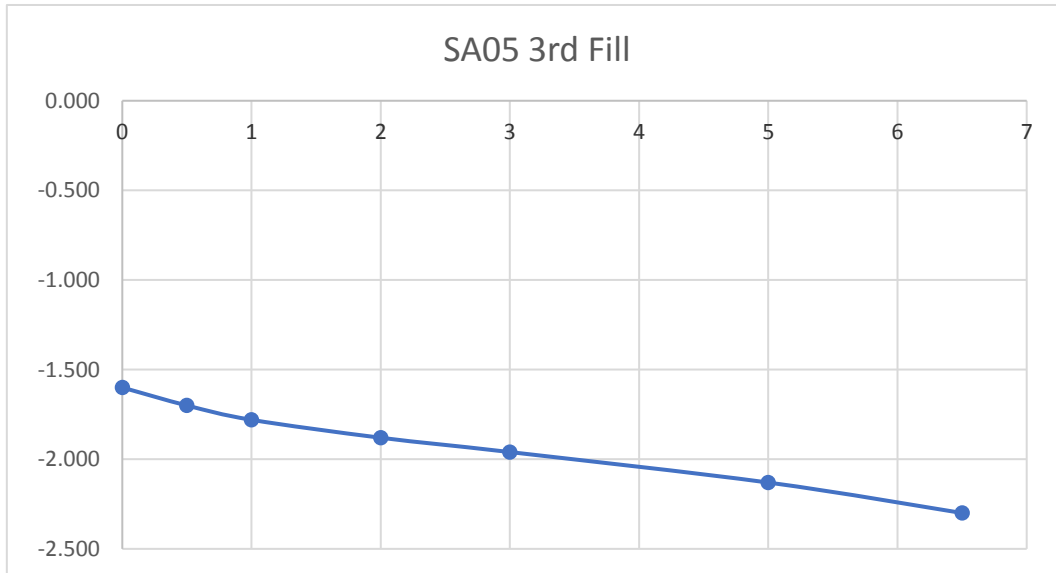
SA05 3rd Fill

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.50m x 0.50m 2.70m (L x W x D)

Date	Time	Water level (m bgl)
26/03/2019	0	-1.600
26/03/2019	0.5	-1.700
26/03/2019	1	-1.780
26/03/2019	2	-1.880
26/03/2019	3	-1.960
26/03/2019	5	-2.130
26/03/2019	6.5	-2.300

Start depth 1.60	Depth of Pit 2.300	Diff 0.700	75% full 1.775	25%full 2.125
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.500	0.500		0.350	0.44
Tp75-25 (from graph) (s)		300	50% Eff Depth	ap50 (m2)
			0.350	3.35
f =		4.353E-04	m/s	





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Site
Branganstown, Kilcock

Trial Pit Number
SA01

Machine : JCB 3CX
Method : Trial Pit

Dimensions
2.0m X 0.35m X 2.65m

Ground Level (mOD)

Client

Job Number
8559-03-19

Location

Dates
25/03/2019

Project Contractor
GII

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.30	B				(0.35)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.	[Cross-hatched pattern]	
					(0.45)	Firm brown slightly sandy slightly gravelly CLAY with occasional sub-angular to sub-rounded cobbles.	[Clay with cobbles pattern]	
					(1.85)	Firm to stiff brown mottled grey slightly sandy gravelly CLAY with rare sub-angular to sub-rounded cobbles.	[Clay with cobbles pattern]	
					2.65	Trial pit terminated due to encountering groundwater. Complete at 2.65m		

Plan

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Remarks

Trial pit stable.
Soakaway completed in trial pit.
Soakaway backfilled on completion.

Scale (approx) 1:25 Logged By Tmcl Figure No. 8559-03-19.SA01



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Site
Branganstown, Kilcock

Trial Pit Number
SA02

Machine : JCB 3CX
Method : Trial Pit

Dimensions
2.20m X 0.35m X 3.00m

Ground Level (mOD)

Client

Job Number
8559-03-19

Location

Dates
25/03/2019

Project Contractor
GII

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.20	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.20	Firm light greyish brown slightly sandy slightly gravelly CLAY.		
					0.45			
					0.65	Firm to stiff grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles.		
					1.05			
					1.70	Stiff brown/dark grey slightly sandy gravelly CLAY with occasional cobbles.		
					1.90	Stiff greyish brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles.		
					1.10			
					3.00	Complete at 3.00m		

Plan

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Remarks

No Groundwater encountered.
Trial pit stable.
Soakaway completed in trial pit.
Soakaway backfilled on completion.

Scale (approx) 1:25	Logged By Tmcl	Figure No. 8559-03-19.SA02
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Site
Branganstown, Kilcock

Trial Pit Number
TP03

Machine : JCB 3CX Method : Trial Pit		Dimensions		Ground Level (mOD)		Client		Job Number 8559-03-19	
		Location		Dates 25/03/2019		Project Contractor GII		Sheet 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.25 (0.25)	Soft to firm light greyish brown slightly sandy slightly gravelly CLAY.		
					0.50 (0.40)	Firm to stiff grey mottled brown slightly sandy gravelly CLAY with rare sub-angular to sub-rounded cobbles.		
					0.90 (0.70)	Grey gravelly clayey fine to coarse SAND with rare cobbles.		
					1.60 (0.40)	Grey sandy very gravelly CLAY with occasional sub-angular to sub-rounded cobbles.		
					2.00 (0.20)	Grey sandy sub-angular to sub-rounded fine to coarse GRAVEL with occasional sub-rounded to rounded cobbles.		∇1
			Fl(1) at 2.10m.		2.20	Trial pit terminated due to excessive groundwater and trial pit sidewall collapse. Complete at 2.20m		

Plan					Remarks					
.	Groundwater encountered at 2.10m BGL - Fast Ingress. Trial pit spalling from 1.0m BGL. Trial pit backfilled on completion.					
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					Scale (approx)		Logged By		Figure No.	
					1:25		Tmcl		8559-03-19.TP03	



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Site
Branganstown, Kilcock

Trial Pit Number
SA03

Machine : JCB 3CX
Method : Trial Pit

Dimensions
1.90m X 0.35m X 2.20m

Ground Level (mOD)

Client

Job Number
8559-03-19

Location

Dates
25/03/2019

Project Contractor
GII

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.25	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.75	Soft to firm light greyish brown slightly sandy slightly gravelly CLAY with rare sub-angular cobbles.		
					1.25	Dark grey slightly sandy very clayey sub-angular fine to coarse GRAVEL with occasional sub-angular cobbles.		
			SS(1) at 2.20m.		2.25	Trial pit terminated due to encountering groundwater. Complete at 2.25m		∇1

Plan

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Remarks

Groundwater encountered at 2.20m BGL - Slight seepage.
Trial pit sidewalls spalling below 1.0m BGL.
Soakaway completed in trial pit.
Soakaway backfilled on completion.

Scale (approx) 1:25	Logged By Tmcl	Figure No. 8559-03-19.SA03
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Site
Branganstown, Kilcock

Trial Pit Number
TP04

Machine : JCB 3CX	Dimensions 1.80m X 0.50m X 2.00m	Ground Level (mOD)	Client	Job Number 8559-03-19
Method : Trial Pit	Location	Dates 25/03/2019	Project Contractor GII	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	B				(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.25 (0.25)	Soft to firm light brown slightly sandy slightly gravelly CLAY.		
1.50	B				0.50 (0.40)	Soft to firm grey mottled brown slightly sandy gravelly CLAY with occasional cobbles.		
					0.90 (0.25)	Dark grey sandy very clayey sub-angular to rounded fine to coarse GRAVEL with frequent sub-rounded to rounded cobbles.		
					1.15 (0.85)	Grey very sandy slightly clayey sub-angular to rounded fine to coarse GRAVEL with frequent sub-rounded to rounded cobbles.		▼1
			MI(1) at 1.80m, rose to 1.20m in 20 mins.		2.00	Trial pit terminated due to sidewalls collapsing. Complete at 2.00m		▽1

Plan	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Remarks

Groundwater encountered at 1.80m BGL - Medium Ingress.
Trial pit sidewalls spalling below 1.0m BGL.
Trial pit backfilled on completion.

Scale (approx) 1:25	Logged By Tmcl	Figure No. 8559-03-19.SA04
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Site
Branganstown, Kilcock

Trial Pit Number
SA04

Machine : JCB 3CX Method : Trial Pit	Dimensions 1.70m X 0.35m X 1.10m	Ground Level (mOD)	Client	Job Number 8559-03-19
	Location	Dates 25/03/2019	Project Contractor GII	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.30 (0.20)	Firm light brown slightly sandy slightly gravelly CLAY.		
					0.50 (0.30)	Firm grey mottled brown slightly sandy slightly gravelly CLAY with rare sub-angular to sub-rounded cobbles.		
					0.80 (0.30)	Dark grey slightly sandy very clayey angular to sub-rounded fine to coarse GRAVEL.		
					1.10	Complete at 1.10m		

Plan	Remarks No Groundwater encountered. Trial pit stable. Soakaway completed in trial pit. Soakaway backfilled on completion.		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By Tmcl</td> <td>Figure No. 8559-03-19.SA04A</td> </tr> </table>	Scale (approx) 1:25	Logged By Tmcl
Scale (approx) 1:25	Logged By Tmcl	Figure No. 8559-03-19.SA04A	



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Site
Branganstown, Kilcock

Trial Pit Number
SA05

Machine : JCB 3CX Method : Trial Pit	Dimensions 2.50m X 0.50m X 2.70m	Ground Level (mOD)	Client	Job Number 8559-03-19
	Location	Dates 26/03/2019	Project Contractor GII	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.50	B				(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.30 (0.20)	Firm brown sandy gravelly CLAY with occasional cobbles.		
					0.50	Brown slightly clayey very sandy sub-rounded to rounded fine to coarse GRAVEL with occasional rounded cobbles.		
					(2.20)			
					2.70	Trial pit terminated due to sidewall collapse. Complete at 2.70m		

Plan	<p>Remarks</p> <p>No Groundwater encountered. Trial pit collapsing below 0.50m. Soakaway Test completed in trial pit. Trial pit backfilled on completion of soakaway test.</p>								
	Scale (approx)	Logged By	Figure No.						
	1:25	Tmcl	8559-03-19.SA05						



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Site
Branganstown, Kilcock

Trial Pit Number
SA06

Machine : JCB 3CX Method : Trial Pit	Dimensions 1.90m X 0.35m X 1.20m	Ground Level (mOD)	Client	Job Number 8559-03-19
	Location	Dates 26/03/2019	Project Contractor GII	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.20			
					(0.30)	Black slightly sandy slightly gravelly clayey PEAT.		
					0.50			
					(0.70)	Grey sandy clayey sub-rounded to rounded fine to coarse GRAVEL with rare sub-rounded to rounded cobbles.		
					1.20	Trial pit terminated above groundwater. Complete at 1.20m		

Plan	Remarks
.	No Groundwater encountered.
.	Trial pit collapsing below 0.50m.
.	Soakaway Test completed in trial pit.
.	Trial pit backfilled on completion of soakaway test.
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	Scale (approx) 1:25
	Logged By Tmcl
	Figure No. 8559-03-19.SA06



Ground Investigations Ireland Ltd
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Site
Branganstown, Kilcock

Trial Pit Number
SA07

Machine : JCB 3CX
Method : Trial Pit

Dimensions
2.50m X 0.40m X 2.70m

Ground Level (mOD)

Client

Job Number
8559-03-19

Location

Dates
26/03/2019

Project Contractor
GII

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.45)	MADE GROUND: Brownish grey slightly sandy slightly gravelly CLAY.		
					0.45 0.50	Dark brown slightly sandy slightly gravelly peaty CLAY. Soft to firm grey slightly sandy slightly gravelly silty CLAY.		
					(0.80)			
					1.30 (0.20) 1.50	Firm grey mottled light brown slightly sandy slightly gravelly silty CLAY.		
					(1.20)	Grey sandy clayey sub-rounded to rounded to rounded fine to coarse GRAVEL with rare sub-rounded cobbles.		
					2.70	Trial pit terminate due to sidewall collapse. Complete at 2.70m		

Plan
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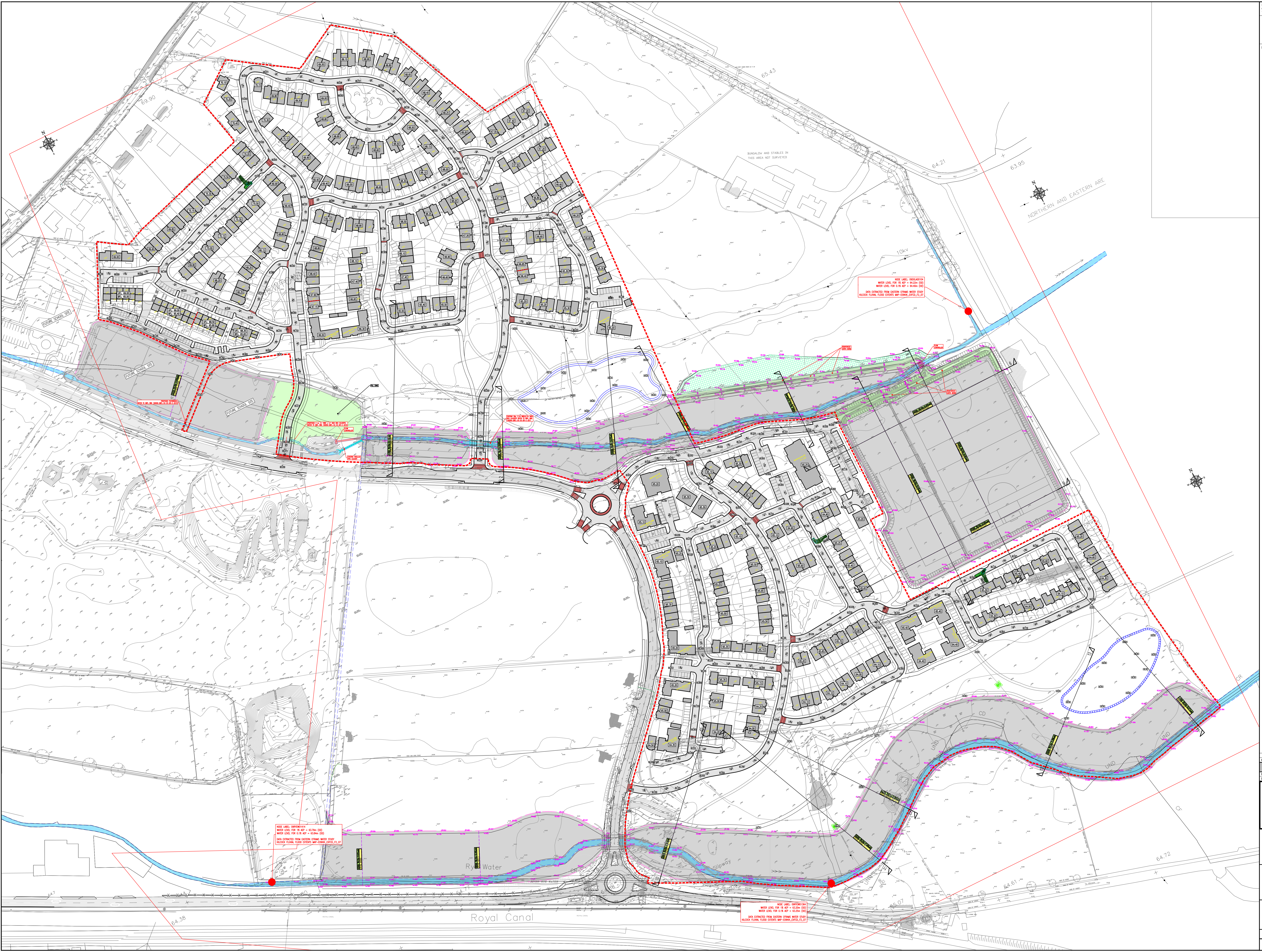
Remarks

No Groundwater encountered.
Trial pit collapsing below 1.50m.
Soakaway Test completed in trial pit.
Trial pit backfilled on completion of soakaway test.

Scale (approx) 1:25	Logged By Tmcl	Figure No. 8559-03-19.SA07
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Appendix G

SITE LEVELS AND CROSS SECTIONS THROUGH PROPOSED DEVELOPMENT



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ON ORIGINAL
 0 10 20 30 40 50mm

NOTES:

EXISTING FLOODWORKS MITIGATION LEGEND

- EXISTING FLOOD TOP WATER LEVEL FROM KRAS
- CONSTRUCTED FLOOD STORAGE ZONE 1% AEP FLOOD EXTENS
- EXISTING REINFORCED EARTH BERM/FILL AREA
- EXISTING FLOW RETURN PIPES THROUGH REINFORCED EARTH BERM
- 63.000 FLOODPLAIN GROUND LEVEL
- EXISTING RIVER/STREAM
- REINFORCED EARTH BERM/FILL AREA

PN	17/12/19	PLANNING ISSUE	BY	BCM
REV	DATE	DESCRIPTION	BY	CHKD
STAGE 2 - PLANNING				
DESIGNED	BCM	PREPARED	PJG	
DATE	APRIL 2019	CHECKED	DAV	

DBFL
 DBFL Consulting Engineers
 1400009-DBFL-XX-XX-DR-C-3040

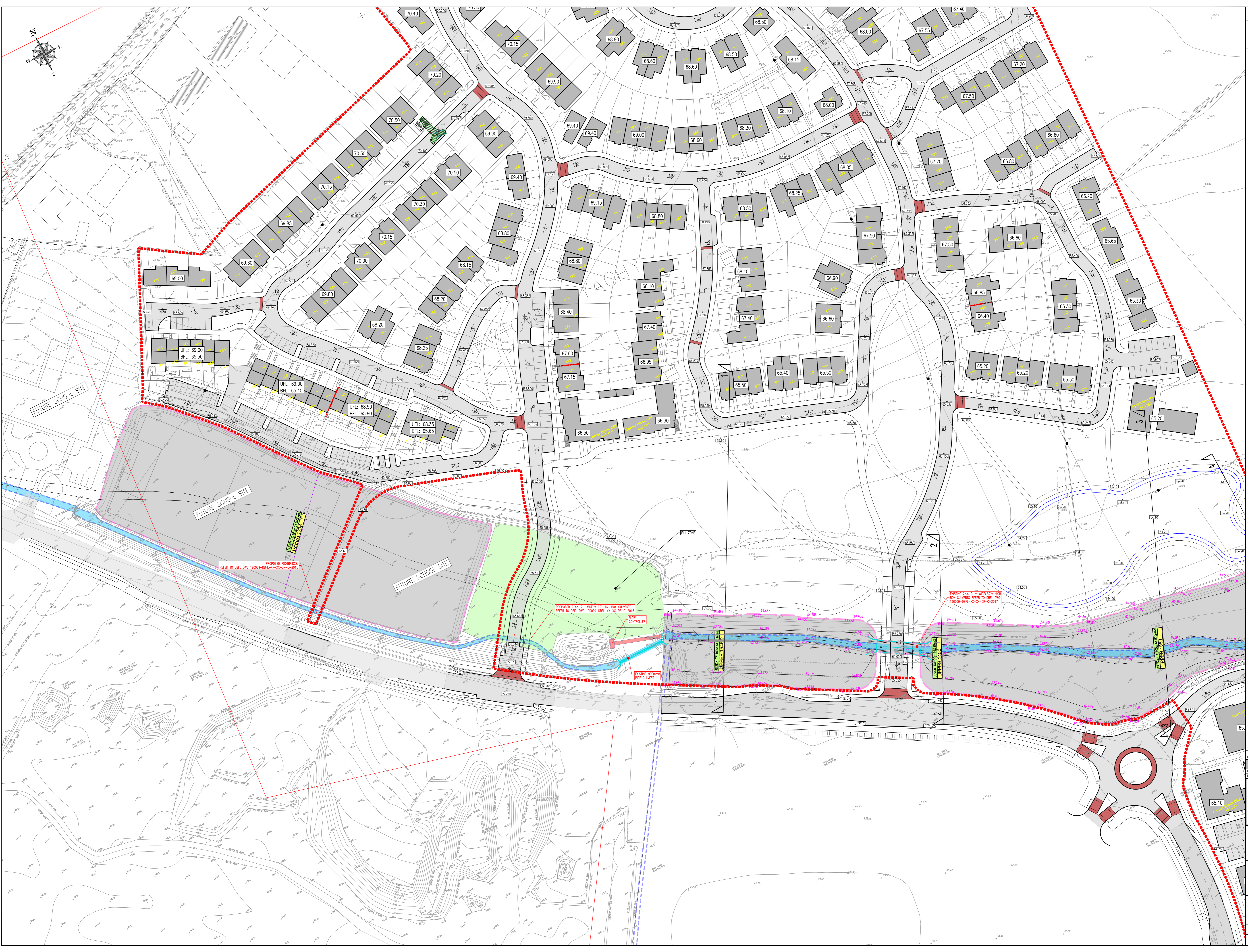
PROJECT
NEWTOWNMOYAGHY SHD

CLIENT
MCGARRELL REILLY

SCALE
 1:1000 @A4

FILE REF.
 1000009-DBFL-XX-XX-DR-C-3040

DRG NO.
190009-DBFL-XX-XX-DR-C-3040 P1



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ON ORIGINAL

SCALE: 1:500 @A4

FILE REF: 100009-DBFL-XX-XX-DR-C-3040

DRG NO: 190009-DBFL-XX-XX-DR-C-3041 P1

NOTES:

EXISTING FLOODWORKS MITIGATION LEGEND

- RESION FLOOD TOP WATER LEVEL FROM IRMS
- CONSTRUCTED FLOOD STORAGE ZONE 1% AEP FLOOD EXTENS
- EXISTING REINFORCED EARTH BEAM/FILL AREA
- EXISTING FLOW RETURN PIPES THROUGH REINFORCED EARTH BEAM
- FLOODPLAIN GROUND LEVEL
- EXISTING RIVER/STREAM
- REINFORCED EARTH BEAM/FILL AREA

REV.	DATE	DESCRIPTION	BY	CHKD
P1	17/12/19	PLANNING ISSUE	BCM	BCM

STAGE 2 - PLANNING

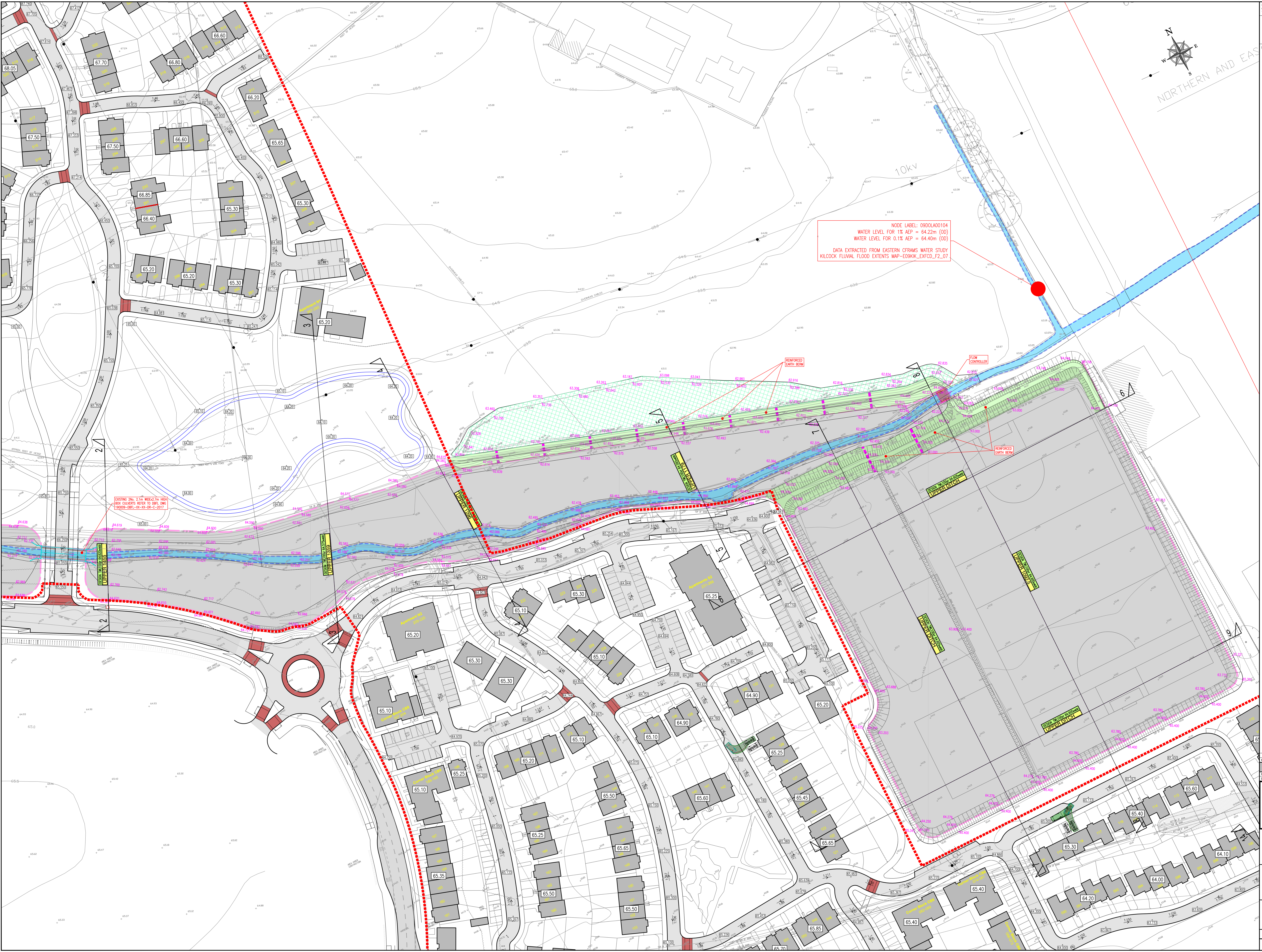
DESIGNED	BCM	PREPARED	BCM	CHECKED	DATE	DATE
					APRIL 2019	

DBFL Consulting Engineers

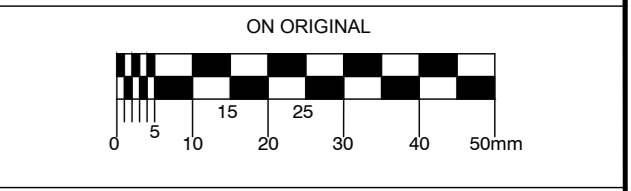
PROJECT: NEWTOWNMOYAGHY SHD

DRG TITLE: FLOOD MITIGATION WORKS - UPPER DITCH - SHEET 1

CLIENT: MCGARRELL REILLY



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NOTES:

EXISTING FLOODWORKS MITIGATION LEGEND

- DESIGN FLOOD TOP WATER LEVEL FROM KRAS
- CONSTRUCTED FLOOD STORAGE ZONE 1% AEP FLOOD EXTENTS
- EXISTING REINFORCED EARTH BERM/FILL AREA
- EXISTING FLOW RETURN PIPES THROUGH REINFORCED EARTH BERM
- FLOODPLAIN GROUND LEVEL
- EXISTING RIVER/STREAM
- REINFORCED EARTH BERM/FILL AREA

NODE LABEL: 0900LA00104
 WATER LEVEL FOR 1% AEP = 64.22m (OD)
 WATER LEVEL FOR 0.1% AEP = 64.40m (OD)
 DATA EXTRACTED FROM EASTERN CFRMS WATER STUDY
 KILCOCK FLUVIAL FLOOD EXTENTS MAP-E09K14_EXFC0_F2_07

DESIGNED BY	BCM	DATE	APRIL 2019
CHECKED BY	BCM	DATE	APRIL 2019
PROJECT	NEWTOWNMOYAGHY SHD		
CLIENT	MCGARRELL REILLY		
SCALE	1:500 (A4)	FILE REF.	100000 DEFL-XX-XX-DR-C-3042
DRG NO.	190009-DBFL-XX-XX-DR-C-3042	P1	

STAGE 2 - PLANNING

DEFL Consulting Engineers

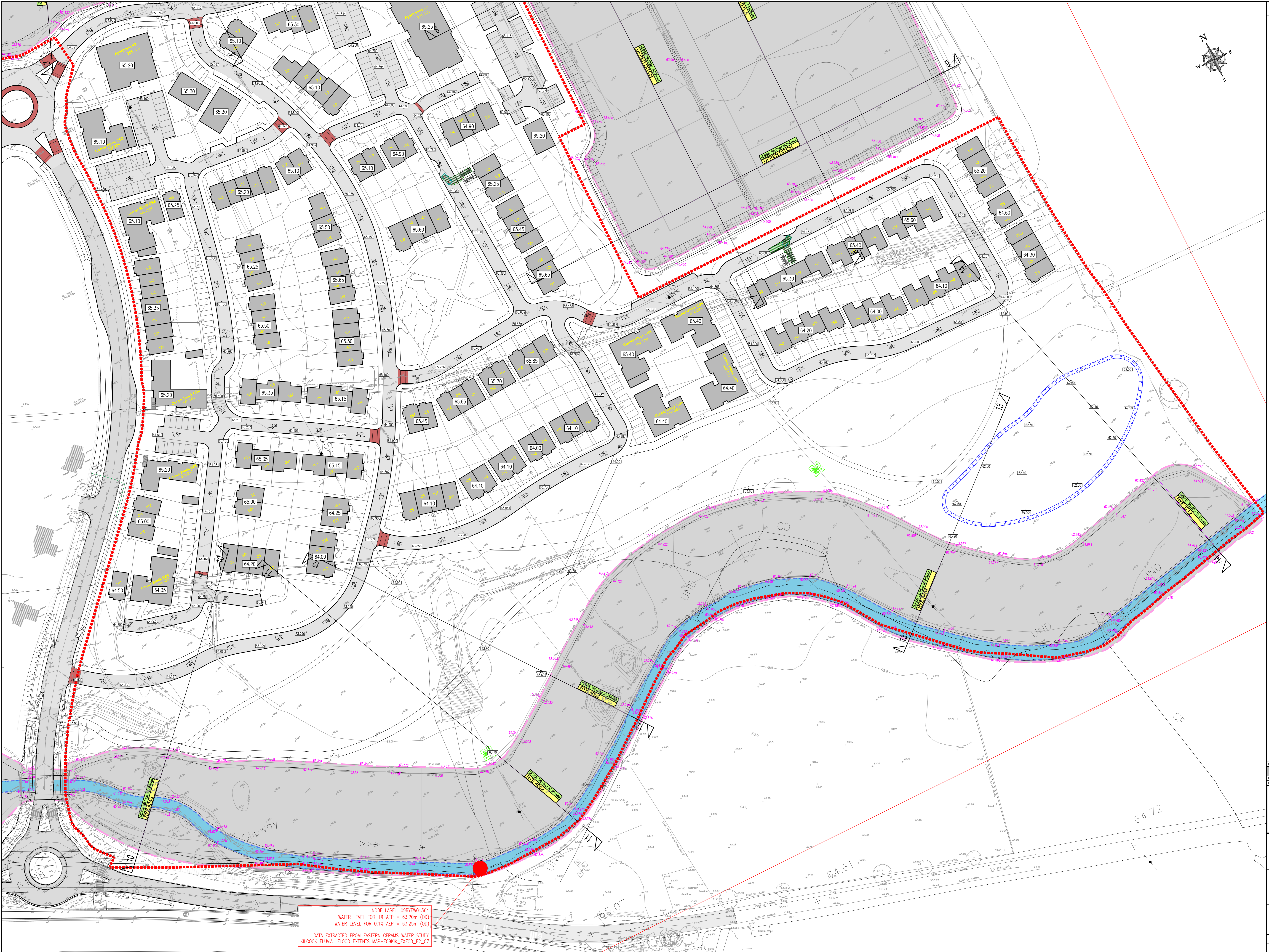
14 O'Connell Street, Marston Island, Dublin 15
 Phone: +353 1 800 900
 Fax: +353 1 800 913

PROJECT: NEWTOWNMOYAGHY SHD

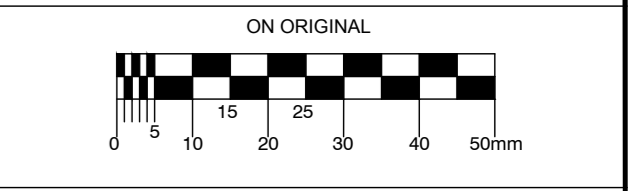
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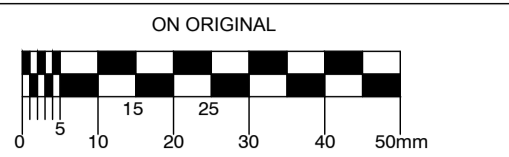
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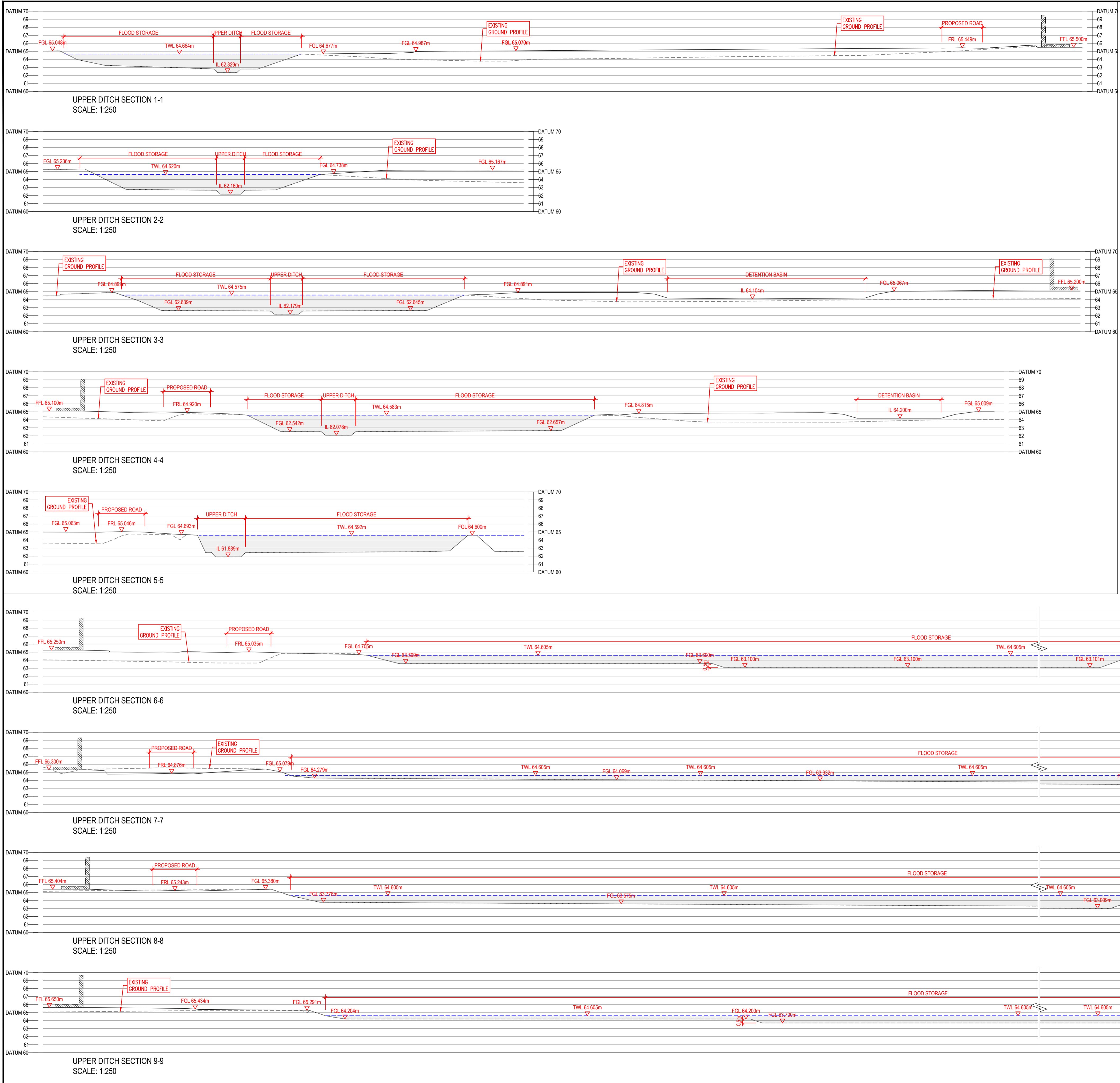
- NOTES:
- EXISTING FLOODWORKS MITIGATION LEGEND
 - REINFORCED EARTH BERM/FILL AREA DESIGN FLOOD TOP WATER LEVEL FROM KRMS
 - CONSTRUCTED FLOOD STORAGE ZONE 1% AEP FLOOD EXTENTS
 - EXISTING REINFORCED EARTH BERM/FILL AREA
 - EXISTING FLOW RETURN PIPES THROUGH REINFORCED EARTH BERM
 - FLOODPLAIN GROUND LEVEL
 - EXISTING RIVER/STREAM
 - REINFORCED EARTH BERM/FILL AREA

PLN	17/12/19	PLANNING ISSUE	BY	BC
REV		DATE	DESCRIPTION	BY
STAGE 2 - PLANNING				
DESIGNED	BCM	PREPARED	PJC	
DATE	APRIL 2019	CHECKED	ELW	
DBFL Consulting Engineers www.dbfl.ie info@dbfl.ie 01 855 844 913				
PROJECT				
NEWTOWNMOYAGHY SHD				
DWG TITLE				
FLOOD MITIGATION WORKS - RIVER RYE - SHEET 3				
CLIENT				
MCGARRELL REILLY				
SCALE	1:500 (A4)	FILE REF.	190009-DBFL-XX-XX-DR-C-3043	
DWG NO.	190009-DBFL-XX-XX-DR-C-3043	P1		

NODE LABEL: 09RYEW1364
 WATER LEVEL FOR 1% AEP = 63.20m (OD)
 WATER LEVEL FOR 0.1% AEP = 63.25m (OD)
 DATA EXTRACTED FROM EASTERN CFRMS WATER STUDY
 KILCOCK FLUMIAL FLOOD EXTENTS MAP-E09KIK_EXPCD_F2_07



NOTES:



P1	17/12/19	PLANNING ISSUE	PJC	BCM
REV	DATE	DESCRIPTION	BY	CHKD
STAGE 2 - PLANNING				
DESIGNED	BCM	PREPARED	PJC	
DATE	APRIL 2019	CHECKED	DJR	

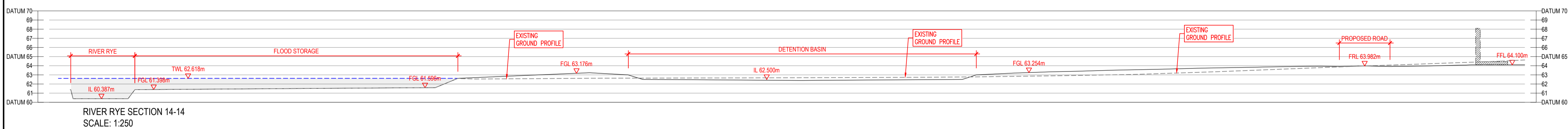
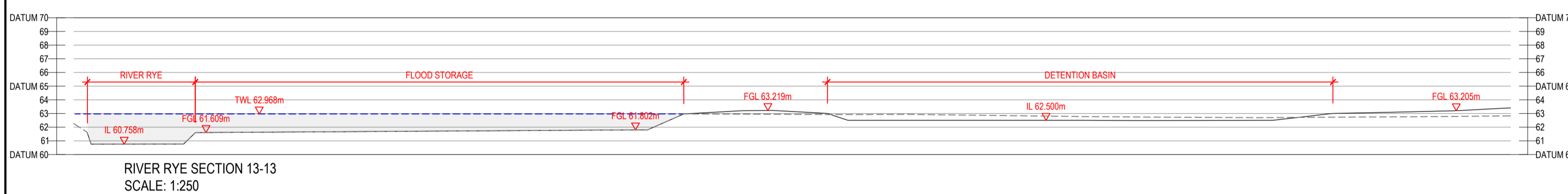
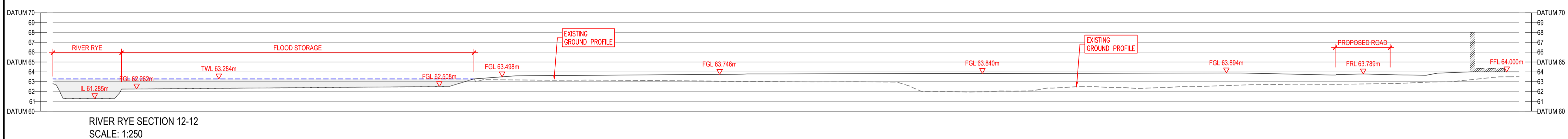
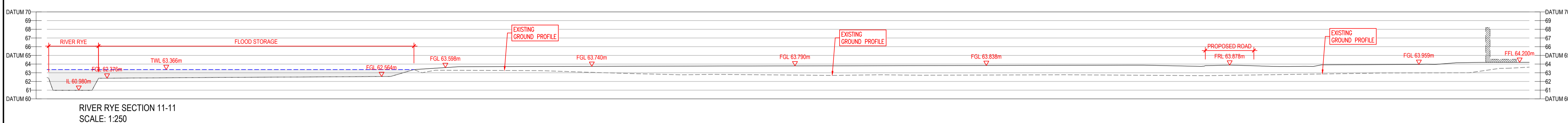
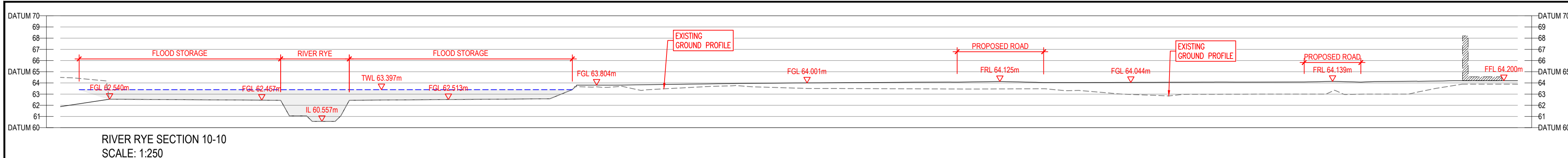
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PROJECT
NEWTOWNMOYAGHY SHD

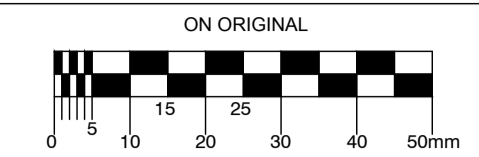
DRG. TITLE
FLOOD MITIGATION WORKS - UPPER DITCH - CROSS SECTIONS

CLIENT
MCGARRELL REILLY

SCALE	1:250 @A1	FILE REF.	190009-DBFL-XX-XX-DR-C-3040
DRG. NO.	190009-DBFL-XX-XX-DR-C-3044		P1



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NOTES:

P1	17/12/19	PLANNING ISSUE	PJC	BCM
REV	DATE	DESCRIPTION	BY	CHKD

STAGE 2 - PLANNING

DESIGNED	BCM	PREPARED	PJC
DATE	APRIL 2019	CHECKED	DJR

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PROJECT
NEWTOWNMOYAGHY SHD

DRG. TITLE
FLOOD MITIGATION WORKS - RIVER RYE - CROSS SECTIONS

CLIENT
MCGARRELL REILLY

SCALE	1:250 @A1	FILE REF.	190009-DBFL-XX-XX-DR-C-3040
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DRG. NO.
190009-DBFL-XX-XX-DR-C-3045 P1