Environmental Impact Assessment Report (EIAR)

Volume 2 Appendices Addendum

Large Scale Residential Development at Ruanbeg, Kildare Town, Co. Kildare

September 2023

In association with

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MCGILL PLANNING

Table of Contents

Volume 2 Appendices

Appendix 5.1

Photo Log

No Change

Appendix 5.2

Full List of Recorded Flora

No Change

Appendix 5.3

Natura Impact Statement

Slight Change

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NATURA IMPACT STATEMENT

RUANBEG,
KILDARE TOWN,
CO. KILDARE

2023

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DATE:	6th September 2023	**REVIEWED:**	Mike Fraher, BSc.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

This report has been prepared by Panther Ecology Ltd. was commissioned by MRP Oakland Limited to prepare a Natura Impact Statement. The applicant is seeking permission for the construction of a Large-scale Residential Development of 285 no. units on 10.35a site to include site landscaping, boundary treatments and associated ancillary site works including foul and surface water drainage, internal roads and footpaths at Ruanbeg, Kildare, Co. Kildare.

This report identified the presence of European sites within the potential zone of influence of the proposed development and noted that the proposed development site is in the same Hydrological Catchment as Pollardstown Fen SAC (Site Code 000396) that is approximately 3.8km from the proposed development site. The potential for impacts to European sites as a result of the proposed development such as potential surface water & groundwater quality impacts, introduction of invasive species, habitat destruction and impacts from noise and dust were considered and the level of risk posed assessed.

During Stage 1 Screening for Appropriate Assessment, it was considered that there may be potential for an indirect impact upon the qualifying interests / special conservation interests of Pollardstown Fen SAC due to a potential deterioration in groundwater during the construction phase. Therefore, a Natura Impact Statement was prepared.

Due to the recommended control measures and standard practice during the construction phase, it is considered that there would be no adverse impact to the conservation objectives of the habitats and species for which the Pollardstown Fen SAC have been designated.

It is considered that there would be no significant risk of negative impact, either alone or in combination with other plans or projects, to the integrity of the Natura 2000 network.

This Natura Impact Statement has been updated in response to a Further Information Request on the 6th July 2023 – PL REF 23/510.

1.0 INTRODUCTION

MRP Oakland Limited is seeking planning permission is seeking permission for the construction of a residential development of comprising of 285 units on 10.3ha site to include a crèche and multifunctional space, site landscaping, boundary treatments and associated ancillary site works including foul and surface water drainage, internal roads and footpaths at Ruanbeg, Kildare, Co. Kildare.

The principal aim of this study is to assess whether significant effects to European sites (the Natura 2000 network) are likely to occur as a result of this project in accordance with Article 6(3) of the Habitats Directive and the Planning and Development (Amendment) Act, 2001, as amended. This report has been prepared with regards to the European Communities (Natural Habitats) Regulations 1997 (S.I. No. 94 of 1997), and the later amendment regulations (S.I. No. 233 of 1998; S.I. No. 237 of 2005; S.I. No. 477 of 2011).

A study was undertaken by Dr Ross Donnelly-Swift (BSc (Hons) Biology, MSc Environmental Science and PhD Biosystems Engineering) of Panther Ecology Limited. This comprised a review of the proposed development, a site visit on 10th June 2022 to examine the ecological context of the proposed development, a desk study of the information on European sites within the potential zone of influence of the site and an analysis of the information in the context of the guidance to determine if a Natura Impact Statement is required.

The Appropriate Assessment and Natura Impact Statement shall be undertaken in accordance with the guidance outlined in "*Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities*" (DoEHLG, Dec 2010) and "*Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites*" (EC, Nov 2001) and "*Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive*" (EC, 2018).

- DoEHLG (2010) "*Appropriate Assessment of Plans & Projects in Ireland*"
- Environment DG, European Commission (2002) "*Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*" Oxford Brookes University, 2001
- Department of the Environment Heritage and Local Government (DoEHLG) Circular Letter SEA 1/08 and NPWS 1/08.
- Department of the Environment Heritage and Local Government (DoEHLG) Circular letter NPWS 1/10 and PSSP 2/10

2.0 LEGISLATIVE CONTEXT

The EU Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora, as amended by council directive 97/62/EC, 2006/105/EC, and Regulation EC1882/2003 of September 2003, as transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/11), provides the framework for legal protection for habitats and species of European importance. The Natura 2000 network provides an ecological infrastructure for the protection of sites that are of particular importance for rare,

endangered or vulnerable habitats and species within the EU. The Natura 2000 network in Ireland is made up of European Sites which include:

- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs)

Article 6(3) of the Habitats Directive establishes the requirement for appropriate assessment when planning new developments that might affect a Natura 2000 site. Article 6(3) of the Habitats Directive states;

"*Any plan or project not directly connected with, or necessary to the management of the site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site, and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*"

Stage 1: Screening for Appropriate Assessment
This stage involves an initial screening assessment of the potential impacts of the project, either alone or in combination with other projects, upon a Natura 2000 site. If it can be concluded that there would be no significant impacts upon Natura 2000 sites, the assessment stops at this stage. If not, or if further assessment is required, the assessment proceeds to Stage 2.

Stage 2: Appropriate Assessment / Natura Impact Statement (NIS)
This stage assesses the impact of the project, alone or in combination with other projects or plans, on the integrity of the Natura 2000 site, with respect to the site's conservation objectives, the site's ecological structure and function and its overall integrity. The output of this stage is an NIS, which also includes any mitigation measures required to avoid, reduce or offset negative impacts of the project. If this stage determines that adverse effects on the Natura 2000 site cannot be excluded, then the plan or project should proceed to Stage 3 or be abandoned.

3.0 APPROPRIATE ASSESSMENT METHODOLOGY

Stage 1 - Screening

Screening is the first stage in the Appropriate Assessment process and is carried out to determine whether a Stage 2 Appropriate Assessment and a Natura Impact Statement (NIS) is required. Screening addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3);

1. Whether a plan or project is directly connected to or necessary for the management of the European (Natura 2000) site; and

2. Whether a plan or project, alone or in combination with other plans or projects, is likely to have significant effects on a European (Natura 2000) site, in view of its conservation objectives.

Screening should be undertaken without the inclusion of mitigation measures. If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 AA and a NIS.

The findings and conclusions of the screening process should be documented, with the necessary supporting evidence and objective criteria. This is of particular importance in the cases where the Appropriate Assessment process ends at the screening stage because the conclusion is that no significant effects are likely.

Following Stage 1 Screening, it was considered that there may be potential for an indirect impact upon the qualifying interests of a European site, therefore, the assessment progressed to Stage 2.

Stage 2 – Natura Impact Assessment

The scope of this assessment follows the appropriate assessment statement methodology as defined within the European Commission guidance document "*Assessment of plans and projects significantly affecting Natura 2000 sites"* (2002), Section 3, Part 2. Guidance from the Department of the Environment, Heritage and Local Government "*Appropriate Assessment of Plans and Projects in Ireland*" (2009) and "*Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive*" (2018) have also been used in the preparation of this report. In accordance with this guidance, the following methodology has been used to produce this Natura Impact Statement:

Step 1**:** Information Required
Identifying the conservation objectives of the Natura 2000 site and the aspects of the project, alone or in combination with other projects or plans, which have the potential to affect those conservation objectives.

This process involves gathering information for the Natura 2000 site, including the conservation objectives of the site, factors contributing to conservation value, aspects sensitive to change and the existing baseline condition of the site. The principal source of information used for Natura 2000 sites, their qualifying interests and conservation objectives is the National Parks and Wildlife Service (NPWS). Information is also required for the project including the size and scale of the project, the relationship (distance, connectivity etc.) of the project to the Natura 2000 site and the characteristics of existing, proposed or other projects which have the potential to affect the Natura 2000 site.

Step 2: Impact Prediction
This process predicts and identifies the likely impacts of the project on the Natura 2000 site. Potential impacts are identified as; direct and indirect; short or long-term duration; construction, operational or decommissioning; and isolated, interactive and cumulative effects.

Step 3: Conservation Objectives
Once the potential impacts of the project have been predicted and identified, it will be necessary to assess whether these impacts will adversely impact upon the integrity of the Natura 2000 site, as defined by the site's conservation objectives and status of the site. Where it cannot be demonstrated that there will be no adverse impacts upon the Natura 2000 site, mitigation measures must be proposed for the project.

Step 4: Mitigation Measures

Upon the identification of potential impacts, the project will have on the Natura 2000 site (alone or in combination with other projects or plans), mitigation measures will be proposed to eliminate, reduce or offset these negative impacts. Mitigation measures should be considered with preference to the hierarchy of preferred options outlined in the guidance document "*Assessment of plans and projects significantly affecting Natura 2000 sites"*.

3.1 METHODOLOGY GUIDELINES

This Appropriate Assessment has been carried with reference to the following guidelines:

- *Appropriate Assessment of Plans and Projects in Ireland. Guidelines for Planning Authorities*. DoEHLG, 2010.
- Appropriate Assessment Screening for Development Management OPR Practice Note PN01 March 2021
- Circular NPWS 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities
- *Managing Natura 2000 sites – The Provisions of Article 6 of The Habitats Directive 92/43/EEC.* European Commission, 2000.
- Circular L8/08 Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments 2 September 2008
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites. Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* European Commission, 2002.
- Commission Notice "Managing Natura 200 sites the provisions of Article 6 of the Habitats Directive 92/43/EEC. European Commission, 21.11.2018
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester.

3.2 DESKTOP RESEARCH

Desktop research was carried out to gather information on the ecology of the site and surrounding areas. The locations of the Natura 2000 sites within the zone of influence of the proposed development at Ruanbeg, Kildare, Co. Kildare were identified from National Parks and Wildlife Service (NPWS) online map viewer. Other Natura sites within the potential zone of influence were also reviewed and considered for the potential for the project to have a negative effect.

Water quality data from the EPA was reviewed for the assessment of biological and environmental data collected on waterbodies in Ireland as per the Water Framework Directive (WFD) Monitoring Programme of River Ecology Monitoring Results (2021).

Information on the characteristics of the Natura 2000 sites within the potential zone of influence was reviewed from the conservation objectives documents, site synopses and Standard Natura 2000 data forms available on the NPWS website.

3.3 SITE SURVEY

A site characterisation assessment was undertaken on the 10th June 2022 to examine the ecological context of the development site, by systematically walking the site and boundaries and determining the habitats present. The habitat survey was undertaken in accordance with the standard methodology outlined in Fossitt's "*A Guide to Habitats in Ireland*", a hierarchical classification scheme based upon the characteristics of vegetation present. The Fossitt system also indicates when there are potential links with Annex I habitats of the E.U. Habitats Directive (92/43/EEC). Cognisance was also taken of the Heritage Council guidelines, "*Best Practice Guidance for Habitat Survey and Mapping*", (Smith *et al.,* 2011).

Bird species and signs of fauna activity and dwellings were also noted. Particular attention was given to the possible presence of habitats and/or species, which are legally protected under Irish and European legislation and to assessing any potential ecological connectivity with Natura 2000 sites or supplementary or steppingstone habitats of relevance to Natura 200 sites.

4.0 DESCRIPTION OF PROPOSED DEVELOPMENT AND EXISTING SITE

4.1 PROPOSED DEVELOPMENT

The proposed development will consist of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche and multifunctional space along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development at Ruanbeg, Kildare Town, Co. Kildare [ITM Coordinates 674386, 712374], as shown in Figure 4.1 below. The total site area is approximately 10.3ha. The closest Natura 2000 sites are the Pollardstown Fen SAC (Site Code: 000396) located approximately 3.9km and Mouds Bog SAC (Site Code: 002331) located approximately 6.5km from the proposed development as shown in Figure 4.2 below.

The site is accessed via main entrance along the regional road R445 along the southern boundary of the site and with access to two entrance ways will be constructed along the western boundary of the proposed site of the proposed site connecting to the road network of the neighbouring residential estate. Pedestrian access points will made into the adjoining Coolaghknock Housing Estate and Ruanbeg Park. Water will be provided to the proposed dwellings via new connection to the nearby public mains located west of the proposed development site. Waste water will ultimately connect to a foul sewer rising main that will discharge at a point on the R445 road.

See accompanying Drainage Design by Punch Consulting Engineers (SuDS Strategy report, SUDS Drawings, and Engineering Planning Report). The drainage design has been

independently reviewed and minor amendments will be implemented with no significant impact on biodiversity. The drainage design will reference and take note of Chapter 12 Biodiversity and Green Infrastructure of the Kildare Development Plan 2023- 2029. The proposed surface water drainage system has been designed using Causeway Flow software in accordance with the Department of Environment and Local Government's guidance document "Recommendations for Site Development Works for Housing Areas", with guidance taken from the "Greater Dublin Strategic Drainage Study" (GDSDS) and the Kildare County Development Plan (2023-2029) and DRAFT Kildare Town Local Area Plan (2023-2029). A new surface water sewer network shall be provided for the proposed development which will be entirely separated from the foul water sewer network. All surface water run-off from roof areas and hardstanding areas are to be drained to SUDS on site in advance of collection by a gravity pipe network. The proposed drainage system will include bioretention areas. Throughout the site including in gardens located to the rear of each housing unit that will capture pavement and roof runoff. Bioretention areas and modified planters will incorporate drainage stone/subsoil within the bioretention areas/modified planters. Bioretention systems will allow stormwater to filter through a medium to remove finer contaminants. There will be 3 no. ponds are proposed for the site to provide for attenuation for the areas directly adjacent to the pond area drained. Controlled discharge from pond areas is set at a discharge rate to provide water levels at least 500mm below floor levels. Pond areas discharge to the infiltration tanks. Water levels are provided at least 500mm below floor levels for all areas. See Drainage Plans for infiltration rates and storage capacity. The apartments and crèche will have green roofs. All surface water is ultimately infiltrating to ground.

The proposed development will see the removal of 22 trees to facilitate the development and a further 3 due to poor health as per Arbor Care recommendations (See accompanying Arborist Report). The 25 trees are predominately Ash (*Fraxinus excelsior*), and the development will also require the removal of approximately 302 linear metres of hedgerow, this is predominately along the R445. The proposed landscape plan will include the planting of 146 street trees: Field maple (*Acer campestre*), Turkish hazel (*Corylus colurna*), Small-leaved lime (*Tilia cordata*), Ulmus 'Lobel'. 129 medium/small trees: Callery pear (*Pyrus 'Chanticleer*), Silver Birch (*Betula pendula*), Japanese flowering crab apple (*Malus floribunda*), Mayday tree (*Prunus padus*). 70 semi mature trees: Downy Birch (*Betula pubescens*), Spanish chestnut (*Casteanea sativa*), Rowan (*Sorbus aucuparia*), Scot's Pine (*Pinus sylvestris*) and Sessile Oak (*Quercus petraea*). There will also be 105 trees planted along the Curragh Buffer zone: Alder (*Alnus glutinosa*), Pedunculate Oak (*Quercus robur*), Scot's Pine (*Pinus sylvestris*), Elder (*Sambucus nigra*), Wild cherry (*Prunus avium*), Rowan (*Sorbus aucuparia*), Downy Birch (*Betula pubescens*) and Hazel (*Corylus avellana*). In addition, the landscape plan will include non-invasive ornamental species of shrubs for gardens, open areas and streetscape. Additional formal hedging and understory shrubs along the treelines. See accompany Landscape Design by Cunnane Stratton Reynolds (Drawing No 22178-1-101).

The proposed development site will also include large public open spaces in the upper middle section of the site with an area of 6435m^2 and toward the east boundary with an area of 6480m^2.The proposed development will include smaller open spaces for a total open space of 14,140m^2. See Appendix A for site layout.

The estimated construction timeframe, including landscaping activities, for the proposed development is approximately 36 months. The majority of construction works would be confined to the proposed development footprint and would not necessitate any works within

a watercourse or drainage ditch. During excavation works, soils would be temporarily stored onsite. Any excess soils would be used for landscaping or exported offsite via a licenced contractor. There is no hazardous material within the site boundary.

The following project elements of the proposed development have been examined for relevance to possible effects on the Natura 2000 sites;

- Earthworks & Excavation
- Sediment & Hydrocarbon Runnoff
- Stormwater & Waste Water
- Disturbance to Protected Species
- Impact on Protected Habitats
- Dust and Noise
- Invasive Species

Figure 4.1: Location of Proposed Site at Ruanbeg, Kildare Town, Co. Kildare

Figure 4.2: Location of Proposed Development and Natura 2000 Sites

4.2 EXISTING ENVIRONMENT

The proposed development site is comprised predominantly of agricultural grassland for livestock grazing. Hedgerow/treeline habitat aligns the site boundaries. The surrounding area is predominantly urban to the west and grassland to the east with residential and commercial premises located in the immediate vicinity of the site. Kildare Town centre is located approximately 1.6km to the west via the R445. The closest mapped watercourse to the proposed development site is the Tully Stream located approximately 1.6km south west.

According to the Preliminary Flood Risk Assessment (PFRA) Mapping tool by the OPW, the proposed development site is not located within an area of fluvial or pluvial flood, indicative of 10% AEP (10-yr) event, 1% AEP (100-yr) event or 0.1% AEP (1000-yr) event. However, it should be noted that this map is based on broad-scale simple analysis and may not be accurate for a specific location. A Site-Specific Flood Risk Assessment was carried out by PUNCH Consulting Engineers (Doc Ref: 222143-PUNCH-XX-XX-RP-C-0004). The conclusion of this report "*It was determined that the proposed development site is currently located in Flood Zone C for fluvial flooding. The proposed development is at a low risk of flooding and is deemed appropriate for the site*".

A site investigation has been prepared by Causeway Geotech on the 10th October 2022 (Doc Ref: 22-0819) and 27th January 2023 (Doc Ref: 22-1436). As part of this assessment three boreholes were dug by light cable percussive extended by rotary follow-on drilling. A standpipe installation in three boreholes, five machine dug trial pits and an infiltration test performed in five trial pits. Installation of automatic groundwater data loggers monitoring over a period of 6 months. No water strikes were encountered during drilling at any of the location.

An infiltration/soakaway test was carried out at five locations (PTP1- PTP5) in accordance with BRE Digest 365 - Soakaways (BRE, 2016). Topsoil was encountered across the site with a thickness of 200-300mm. Fluvioglacial deposits were interspersed layers of medium dense sands and gravels with firm to stiff sandy gravelly clay/silt and extends to at least 15mbgl. Groundwater was not noted during excavation of any of the trial pits. An additional site investigation was undertaken at the site by Ground Check Limited in August 2023. The works comprised the following: 4 No. light cable percussive boreholes with standpipe installations and hydraulic conductivity testing, 4 no. trial pits with infiltration tests. Additional automatic groundwater level monitoring with data loggers.

A Hydrogeological Site Assessment has been prepared by BlueRock Environmental Ltd. (Doc Ref: BRE22014Rp01F0) and revised in August 2023 as part of a Further Information. The site is underlain by the Regionally Important (Rg) Curragh Gravel Aquifer West Groundwater Body (GWB). This aquifer lies in a shallow trough, oriented NE-SW, at the surface of the limestone bedrock. The GWB is recharged from rainwater percolating through the topsoil and unsaturated sand and gravel deposits. Automated groundwater level monitoring was undertaken over a 6-month period with groundwater levels ranging between September and April 2023. Additional automated monitoring was undertaken between the 16th and 25th August 2023. Groundwater was interpreted to discharge to Pollardstown Fen in the north, while in the south groundwater discharges via a number of springs (including those in the Japanese Gardens) and provides baseflow to the Tully River. Surface water features are not considered at risk from the proposed development. Groundwater flow within the deeper dense gravel body is interpreted to be consistently flowing in a south to south-westerly direction across the site (in the opposite direction to Pollardstown Fen). The lowest groundwater levels were recorded in the southern region of the site. A groundwater divide located northeast of Kildare town is clearly evident. The risk posed to the Curragh Gravel Aquifer and Pollardstown Fen is considered to be low. The proposed Suds drainage system for the development incorporates measures to filter and settle contaminants of concern generated within stormwater runoff from the development that will ensure the risk posed to the underlying groundwater body is low. These measures also include sediment silt/retaining measures and a minimum of 1 metre of unsaturated depth of subsoil or aquifer material above the highest recorded groundwater level. Infiltration conditions in the vicinity of Attenuation Tanks B and C are deemed sufficiently permeable to facilitate the infiltration of stormwater to ground. The Punch Engineering design drainage drawings should be referred to. In addition, all infiltration tanks are provided with petrol interceptors upstream prior to infiltration.

The majority of the proposed development site is made up of improved agricultural grassland (GA1) habitat with flora present such as Ryegrasses (*Lolium* spp.), Bent grasses (*Agrostis* spp.), Meadow-grasses (*Poa* spp.), Meadow Foxtail (*Alopecurus pratensis*), Buttercup (*Ranunculus* spp.), White Clover (*Trifolium repens*), Spear Thistle (*Cirsium vulgare*), Shepherd's-purse (*Capsella bursa-pastoris*), Nettle (*Urtica dioica*), Broad-leaved Dock (*Rumex obtusifolius*) and Creeping Thistle (*Cirsium arvense*). The field boundaries are aligned with hedgerow (WL1) and treeline (WL2) habitats with tree species Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*), Elm (*Ulmus* sp.), Sycamore (*Acer pseudoplatanus*), Popular (*Populus* spp.), Blackthorn (*Prunus spinosa*), Hawthorn (*Crataegus monogyna*) and Elder (*Sambucus nigra*). With Dog-rose (*Rosa canina* agg.), Gorse (*Ulex europaeus*), Snowberry (*Symphoricarpos albus*), Hogweed (*Heracleum sphondylium*), Bindweed (*Calystegia* spp.), Cow Parsley (*Anthriscus sylvestris*), Dandelion (*Taraxacum* agg.), Primrose (*Primula vulgaris*), Speedwell (*Veronica* spp.) and Sow-thistle (*Sonchus* spp.). No Third Schedule invasive or protected flora

were noted during the site assessment. See Table 4.2 for summary for habitats located at and adjacent the proposed development. See Appendix B for photo log of the site.

Table 4.2: Summary of Habitats Identified at and Adjacent the Proposed Development Site

HABITAT CLASSIFICATION HIERARCHY		
LEVEL 1	**LEVEL 2**	**LEVEL 3**
B – Cultivated and built land	**BL** – Built Land	**BL3** – Buildings and artificial surfaces
E – Exposed rock and disturbed ground	**ED** – Disturbed ground	**ED2** – Spoil and bare ground
G – Grassland and marsh	**GA** – Improved grassland	**GA1** – Improved agricultural grassland
W – Woodland and scrub	**WL** – Linear woodland / scrub	**WL1** – Hedgerows
		WL2 – Treelines

See accompanying EIAR (Chapter 5 – Biodiversity) for complete ecological assessment of the fauna at the proposed site. None of the bird species recorded at the proposed development site are listed under Annex I of the E.U. Birds Directive. No other protected fauna (with the exception of bats) was recorded at the proposed development site.

4.3 WATER QUALITY

The proposed development is located within the Barrow_SC_060 sub-catchment which is part of the Barrow Catchment (ID:14). The closest watercourse to the proposed development is the Tully Stream (EPA Code: 14T02 – Order 1) located approximately 1.6km south west. See Figure 4.3. Continuing 1.6km (hydrologically) downstream this stream is joined by the Tully West Stream (EPA Code: 14T10 – Order 1). From this confluence point the stream continues as the Tully Stream (EPA Code: 14T02 – Order 2) for approximately 11km (hydrologically) before joining the Kildoon (EPA Code: 14K27 – Order 3) and continuing in a south west direction as the Tully Stream (EPA Code: 14T02 – Order 3). It should be noted that from this point the Kildoon River and the Tully Stream (Order 3) are designated as part of the River Barrow and River Nore SAC (Site Code: 002162). Other watercourses within the vicinity include Lenagorra (EPA Code: 14L34 – Order 1), the Harristown Lower (EPA Code: 14H03 – Order 1), the Walterstown Lower (EPA Code: 14W04 – Order 1) and the Kingsbog or Common (EPA Code: 14K31 – Order 1). The Cloncumber Stream (EPA Code: 14C17 – Order 2) is approximately 4.5km north east of the proposed development site. This stream continues north west for approximately 1.3km (hydrologically) and is joined by the Rosberry stream (EPA Code: 14R08 – Order 1). The Rosberry stream continues approximately 318m downstream and joins the Clongownagh (EPA Code: 14C34 – Order 1). The Environmental Protection Agency (EPA) undertake surface water monitoring along the Tully Stream, the Cloncumber Stream and the Slate River. The results for the nearest monitoring stations (as per Table 4.3) with available monitoring results for the period 2000-2020 are summarised in Figure 4.4 below for indicative purposes.

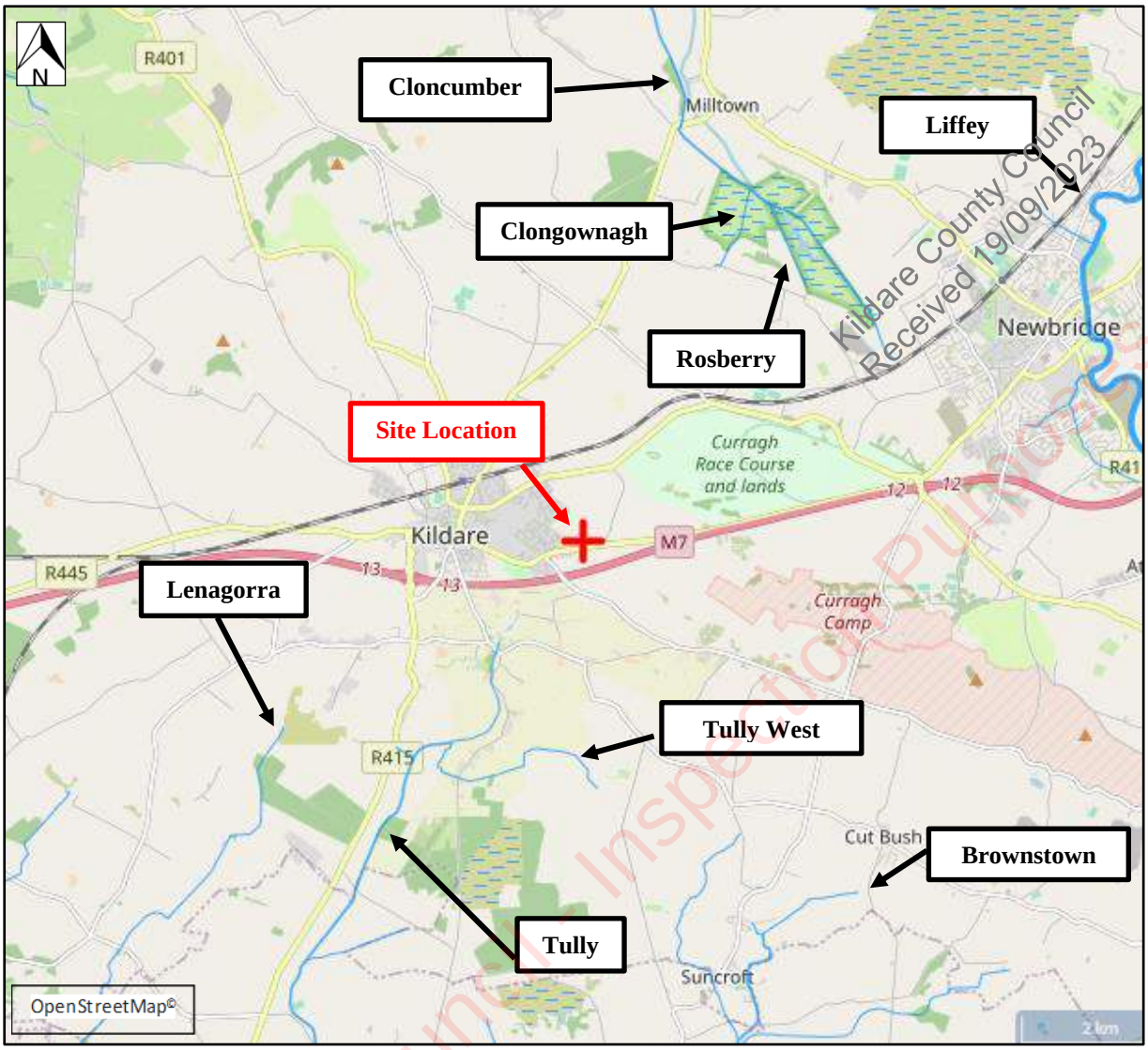

Figure 4.3: Watercourses surrounding the proposed development site

Table 4.3: Active Monitoring Stations of the Tully Stream, Cloncumber Stream & River Slate

STATION NO.	STATION LOCATION	EASTING	NORTHING	APPROX. DISTANCE FROM SITE
RS14T020200	500 m d/s Br near Tully House	273420	210441	2km SW on the Tully Stream
RS14T020300	Kilberrin Br	271739.22	207922.32	5.2km SW on the Tully Stream
RS14C170200	Old River Br (W)	274420	220919	8.5km N on the Cloncumber Stream
RS14S010100	Agar Bridge	270342	221685	10km N on the River Slate

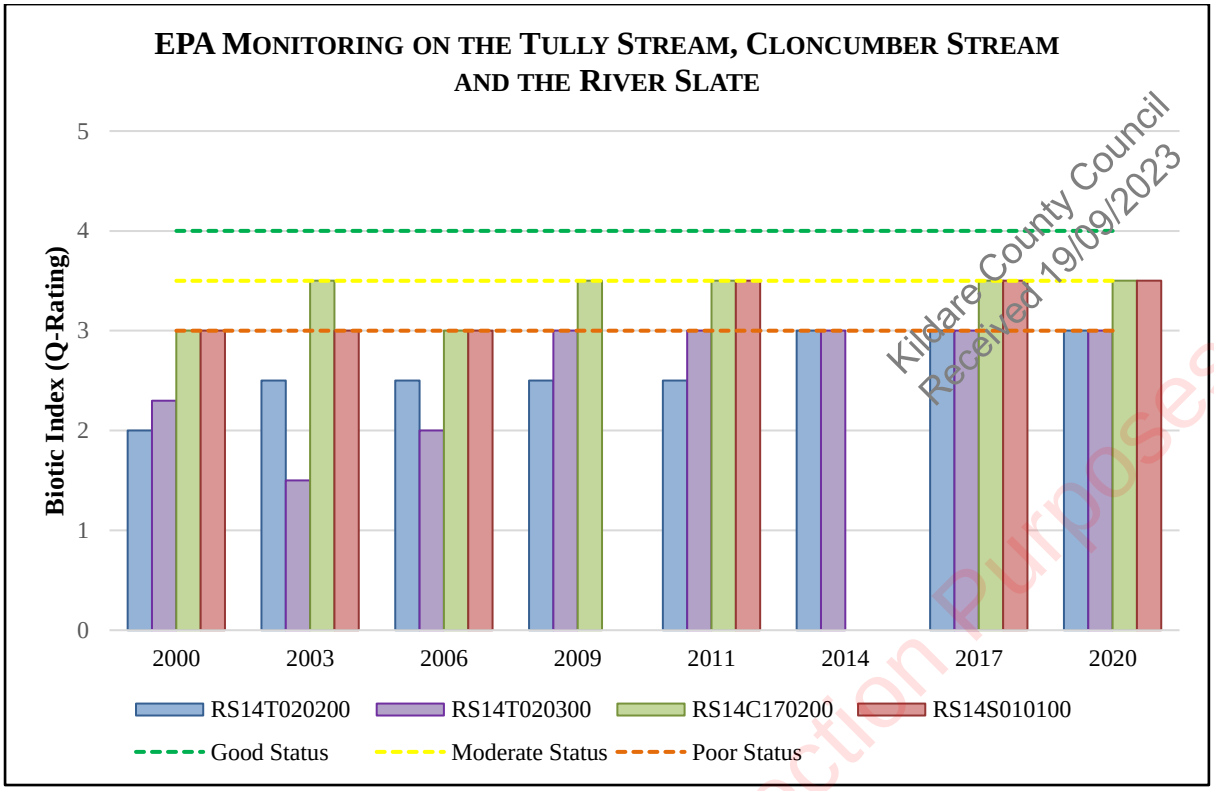

Figure 4.4: Monitoring of the tributaries of the Tully Stream, Cloncumber Stream and the River Slate

As can be seen in Figure 4.4 above, the Tully Stream is mainly achieving a water quality status of Q3 (poor) at the monitoring stations. The Cloncumber Stream and the River Slate are mainly achieving a water quality status of Q3-4 (Moderate) at each of the monitoring location (Table 4.3).

EPA comments on the most recent monitoring results for the Tully Stream as follows; *"The macroinvertebrate fauna indicated poor ecological conditions in the upper reaches of the Tully Stream (0200, 0300) when surveyed in August 2020. Ecological condition has improved to Moderate at 0390, but quality declined to Moderate at 0500 meaning the whole of the Tully Stream is in an unsatisfactory ecological condition."* EPA comments on the most recent monitoring results for the Cloncumber Stream as follows;*"The macroinvertebrate fauna continues to indicate unsatisfactory moderate ecological conditions on the Cloncumber Stream at Old River Bridge (0200) in August 2020".* EPA comments on the most recent monitoring results for the Slate River as follows;*" All of the six stations surveyed on the Slate River were in unsatisfactory ecological condition in August 2020. Poor ecological conditions persisted at the upstream sites (0020) and Allenwood (0050). Moderate quality was evident in the lower reaches".*

5.0 EUROPEAN SITES (NATURA 2000 SITES) WITHIN ZONE OF INFLUENCE

In assessing the zone of influence of this project upon European sites, the following factors must be considered:

- Potential impacts arising from the project,
- The location and nature of European sites,

- Pathways between the development and European sites.

The project impact sources, environmental pathways and protected site characteristics were screened to identify European sites potentially within the zone of influence of the project.

No Special Protection Area (SPA) sites occur within the potential zone of influence of the proposed development. Four Special Area of Conservation (SAC) sites occur within the potential zone of influence of the proposed development site and are shown in the following table

Table 5.1: Special Areas of Conservation and Special Protection Area potentially within the zone of influence

SITE NAME	DESIGNATION	SITE CODE	DISTANCE TO PROPOSED SITE
Pollardstown Fen	SAC	000396	3.9km NE
Mouds Bog	SAC	002331	6.5km NE
River Barrow and River Nore	SAC	002162	7.6km SW
Ballynafagh Lake	SAC	001387	14.4km NE

Maps detailing European sites within 2km and 15km of the proposed site are included as Appendix C below.

For this assessment, the sites considered to be within the zone of influence of the proposed development is Pollardstown Fen SAC (Site Code 000396) due to distance and potential link via groundwater.

The River Barrow and River Nore SAC (Site Code: 002162) is located approximately 7.6km from the proposed site and the Mouds Bog SAC (Site Code 002331) is located approximately 6.5km from the proposed site. Both SAC's do not have a direct hydrological connection to the development site. Surface water features are not considered at risk from the proposed development. Any deterioration in water quality during the construction and/or operational phase would not cause a significant impact on the qualifying interests of these Natura 2000 sites. Given the distances from the development, these SACs have been screened out.

The proposed development is not directly hydrologically connected to Ballynafagh Bog SAC (Site Code 000391). The proposed development site does not contain any of the habitats associated with this SAC.

Therefore, in the absence of a source-pathway-receptor relationship and given the distances from the development, these three SACs have been screened out.

5.1 POLLARDSTOWN FEN SAC (SITE CODE 000396)

Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise

chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I/ II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

ANNEX I HABITATS	
CODE	**DESCRIPTION**
7210	Cladium Fens*
7220	Petrifying Springs*
1016	Alkaline Fens

ANNEX II SPECIES		
CODE	**COMMON NAME**	**SCIENTIFIC NAME**
1016	Desmoulin's Whorl Snail	*Vertigo moulinsiana*
1014	Narrow-mouthed Whorl Snail	*Vertigo angustior*
1013	Geyer's Whorl Snail	*Vertigo geyeri*

The conservation objectives for the SAC are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected. An excerpt from the site synopsis for Pollardstown Fen SAC is included below.

The fen has ornithological importance for both breeding and wintering birds. Little Grebe, Coot, Moorhen, Teal, Mallard, Mute Swan, Water Rail, Snipe, Sedge Warbler and Reed Bunting all breed annually within the fen vegetation. Reed Warbler and Garganey, both rare breeding species in Ireland, have been recorded at Pollardstown and may have bred. In recent years two very specialised bird species associated with fens, Marsh Harrier and Savi's Warbler, have been seen at Pollardstown. Otter and Brook Lamprey (*Lampetra planeri*), two species listed in Annex II of the E.U. Habitats Directive, occur at Pollardstown. Various groups of the invertebrate fauna have been studied and the system has been shown to support a true fen fauna. The species complexes represented are often rare in Ireland, with the sub-aquatic organisms are particularly well-represented. A number of internationally important invertebrates (mostly Order Diptera, i.e. two winged flies) have been recorded from the site. Of particular conservation importance, however, is the occurrence of all three of the Whorl Snails (*Vertigo spp.*) that are listed on Annex II of the E.U. Habitats Directive. Pollardstown is the only known site in Ireland (or Europe) to support all three species (*Vertigo geyeri*, *V. angustio*r and *V. moulinsiana*), and it therefore provides a unique opportunity to study their different habitat and hydrological requirements. Much of the site with fen vegetation is now owned by the Office of Public Works and is a Statutory Nature Reserve. Pollardstown fen is the largest spring-fed fen in Ireland and has a well-developed and specialised flora and fauna. Owing to the rarity of this habitat and the numbers of rare organisms found there, the site is rated of international importance.

Figure 5.1 Pollardstown Fen SAC

Pollardstown Fen SAC Conservation Objectives

The Habitats Directive requires the Appropriate Assessment process to assess the potential impacts of the development "in *view of the site's conservation objectives*". Site specific conservation objectives (SSCOs) for the qualifying interests of the Pollardstown Fen SAC are provided in the table below, where available from the NPWS document "*Conservation Objectives: Pollardstown Fen SAC* 000396" (NPWS, 2022).

ATTRIBUTE	MEASURE	TARGET
[7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae**		
Habitat area	Hectares	Area stable or increasing, subject to natural processes
Community distribution	Occurrence	No decline, subject to natural processes
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients; water supply	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions
Ecosystem function: water quality	Various	Maintain, or where necessary restore, appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat
Vegetation composition: cover of *Cladium mariscu*	Percentage cover at a representative number of monitoring stops	Cover of *Cladium mariscus* at least 25%
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species
Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%

ATTRIBUTE	MEASURE	TARGET
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%
Vegetation structure: vegetation height	Percentage cover at a representative number of monitoring stops	At least 10% of live shoots more than 1m high
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%
Physical structure: tufa formations	tufa formations Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes
Transitional areas between fen and adjacent habitats	Hectares; distribution	Maintain/restore adequate transitional areas to support/protect the Cladium fen habitat and the services it provides
[7220] Petrifying Springs		
Habitat area	Square metres	Area stable or increasing, subject to natural processes
Habitat distribution	Occurrence	No decline, subject to natural processes
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes
Physical structure: tufa formations	Seepage rate to the spring and groundwater quality (saturated calcium carbonate, pH, temperature and alkalinity conditions)	Maintain appropriate levels of tufa formation

ATTRIBUTE	MEASURE	TARGET
Ecosystem function: water quality - nitrate level	mg/l	Maintain/restore nitrate levels to less than 10mg/l
Ecosystem function: water quality - phosphate level	µg/l	Maintain/restore phosphate levels to less than 15µg/l
Vegetation composition: community diversity	Variety of vegetation communities	Maintain/restore variety of vegetation communities, subject to natural processes
Vegetation composition: positive indicator species	Number per spring	At least three positive/high quality indicator species as listed in Lyons and Kelly (2016) and no loss from baseline number
Vegetation composition: negative indicator species	Cover (DAFOR scale)	Potentially negative indicator species should not be Dominant or Abundant; woody species should be absent in unwooded springs; invasive
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%
Vegetation structure: sward height	Centimetres	Field layer height between 10cm and 50cm (except for bryophyte-dominated ground
Physical structure: trampling/dung	Cover (DAFOR scale)	Cover should not be Dominant or Abundant
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes
[7230] Alkaline fens		
Habitat area	Hectares	Area stable or increasing, subject to natural processes
Community distribution	Occurrence	No decline, subject to natural processes
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients; water supply	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat

ATTRIBUTE	MEASURE	TARGET
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions
Ecosystem function: water quality	Various	Maintain, or where necessary restore, appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat
Vegetation composition: community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes
Vegetation composition: typical brown mosses	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical brown moss species
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species
Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%
Vegetation structure: vegetation height	Percentage cover at a representative number of monitoring stops	At least 50% of the live leaves/flowering shoots are more than either 5cm or 15cm above ground surface depending on community type
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%

ATTRIBUTE	MEASURE	TARGET
Physical structure: tufa formations	tufa formations Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes
Transitional areas between fen and adjacent habitats	Hectares; distribution	Restore adequate transitional areas to support/protect the alkaline fen habitat and the services it provides
[1013] Geyer's Whorl Snail *Vertigo geyeri*		
Distribution	Number of occupied 1km square	No decline, subject to natural processes. There is one known site for this species in the SAC within the 1km grid squares N7615, N7616, N7715 and N7716.
Occurrence in suitable habitat	Percentage positive records in a representative number of samples	No decline, subject to natural processes. A baseline figure of 50% positive samples is set
Habitat area	Hectares	Area of suitable habitat stable or increasing, subject to natural processes; no less than 2ha of at least suboptimal habitat, with at least 50% in optimal condition
Habitat quality	Percentage of samples classified as suitable habitat	No decline, subject to natural processes
Habitat quality: soil wetness	Soil wetness criteria	No decline, subject to natural processes
[1014] Narrow-mouthed Whorl Snail *Vertigo angustior*		
Distribution	Number of occupied 1km square	No decline, subject to natural processes. There is one known site for this species in the SAC within the 1km grid squares N7615, N7616, N7715 and N7716.
Occurrence in suitable habitat	Percentage positive records in a representative number of samples	No decline, subject to natural processes. A baseline figure of 50% positive samples is set
Habitat area	Hectares	Area of suitable habitat stable or increasing, subject to natural processes; no less than 2ha of at least suboptimal habitat, with at least 50% in optimal condition
Habitat quality	Percentage of samples classified as suitable habitat	No decline, subject to natural processes

ATTRIBUTE	MEASURE	TARGET
Habitat quality: soil wetness	Soil wetness criteria	No decline, subject to natural processes
[1016] Desmoulin's Whorl Snail *Vertigo moulinsiana*		
Distribution	Number of occupied 1km square	No decline, subject to natural processes. There is one known site for this species in the SAC within the 1km grid squares N7615, N7616, N7715 and N7716.
Population size: adults	Percentage positive records in a representative number of samples	No decline, subject to natural processes. A baseline figure of 75% positive samples is set
Density within habitat	Number of individuals per sample	No decline, subject to natural processes; at least 50% of samples should have at least 20 individuals
Habitat area	Hectares	Area of suitable habitat stable or increasing, subject to natural processes; no less than 10ha of at least suboptimal habitat
Habitat quality	Percentage of samples classified as suitable habitat	No decline, subject to natural processes
Habitat quality: soil wetness	Soil wetness criteria	No decline, subject to natural processes

Pollardstown Fen SAC Conservation Status

According to the Habitat's Directive, favourable conservation status of a habitat is achieved when:

- Its natural range and areas it covers within that range are stable or increasing, and
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- The conservation status of its typical species is favourable as defined below.

According to the Habitat's Directive, favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The conservation status for the qualifying interests of the Pollardstown Fen SAC are outlined below.

CODE	QUALIFYING INTEREST	NATIONAL CONSERVATION STATUS*
7210	Cladium fens	Inadequate
7220	Petrifying springs	Inadequate
7230	Alkaline fens	Bad
1013	Geyer's Whorl Snail	Bad
1014	Narrow-mouthed Whorl Snail	Inadequate
1016	Desmoulin's Whorl Snail	Inadequate

**Sourced from the Status of EU Protected Habitats and Species in Ireland (NPWS, 2019a)*

6. ASSESSMENT OF LIKELY EFFECTS: STAGE 1 SCREENING

6.1 DISTURBANCE TO PROTECTED HABITATS AND SPECIES

The proposed development does not directly impinge on any part of a European site, and as such would not be expected to have any in-situ effects upon a protected site through loss or destruction of habitat, fragmentation of habitat, disturbance of habitat or direct reduction in species density. The Pollardstown Fen SAC boundary is located approximately 3.9km from the proposed development site. Given the proposed site's proximity to this site, potential ex-situ impacts must also be considered.

It is not considered that the proposed development site would contain the habitats or species for which the Pollardstown Fen SAC has been designated. No areas of fens or springs exist on the development site; therefore, the site does not contain any habitat which would have potential links to Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210], Alkaline fens [7230] or Petrifying springs with tufa formation

(*Cratoneurion*) [7220]. The closest of these habitats are found within the Pollardstown Fen SAC approximately 3.9km north east of the proposed site. The only grassland habitats identified at the proposed development site is improved agricultural grassland which do not have any potential links to the Qualifying Interests of the SAC within the zone of influence.

During the operational phase there would be no significant impact as stormwater will ultimately be directed to the proposed attenuation tanks located within the site boundary prior to being discharged to ground. The drainage system has been designed with cognizance of the Kildare County development Plan 2023-2029 and the UK SUDS Manual with nature-based solutions incorporated into the design.

During the site assessment, no Geyer's Whorl Snail (*Vertigo geyeri*), Narrow-mouthed Whorl Snail (*Vertigo angustior*) or Desmoulin's Whorl Snail (*Vertigo moulinsiana*) were present with the closest records approximately 3.9km to the north east within the Pollardstown Fen SAC. In the absence of fen habitat at the site, and in the absence of historic records, it is not considered that the proposed development site would be suitable to support populations of Desmoulin's Whorl Snail, Geyer's Whorl Snail or Narrow-mouthed Whorl Snail.

It is not envisaged that protected species would be adversely impacted upon by the development due to noise generated by the proposed development as the surrounding area is located within an urban setting. Fauna in the area would be accustomed to human generated noise from residential and commercial activities commonly audible within urban areas. While there would be increased noise emissions during the construction phase of the development, these would not be considered to pose a significant risk owing to the transient nature of works and the distance to the Natura 2000 network. Construction works will be mainly carried out during daylight hours away from Pollardstown Fen SAC, therefore would not cause significant disturbance to species foraging at Pollardstown Fen SAC. Fauna in the area would also be accustomed to noise from general vehicular traffic during the operational phase of the development. Earthworks would be confined to the site with the main activities being the foundations, drainage network and site levelling. Topsoil at the proposed site will be reused for landscaping or removed by a licenced contractor.

The potential disturbance on protected habitats and species due to dust during the construction phase would not be considered significant, given the transient nature of construction works and the scale of the proposed development. It is not considered that the operational phase of the development would have the potential to adversely impact upon designated sites due to air emissions given the nature of the development.

It is therefore considered that the proposed development would not result in any significant risk to the protected habitats and species of the Pollardstown Fen SAC due to habitat fragmentation or loss, disturbance or reduction in species density.

6.2 INVASIVE SPECIES

Under Regulation 49(2) of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), save in accordance with a licence granted under paragraph (7), any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to any plant which is included in Part 1 of the Third Schedule shall be guilty of an offence. Materials containing invasive species such as Japanese Knotweed are considered "controlled waste", and, as such, there are legal

restrictions on their handling and disposal. Under Regulation 49(7) of the European Communities (Birds and Natural Habitats) Regulations 2011, it is a legal requirement to obtain a license to move "vector materials" listed in the Third Schedule, Part 3.

Table 6.1: National Biodiversity Data Centre records of Third Schedule invasive species within 10km square (Hectad – N71) of the proposed development.

INVASIVE FLORA SPECIES	
Giant Hogweed (*Heracleum mantegazzianum*)	Japanese Knotweed (*Fallopia japonica*)
Fringed Water-lily (*Nymphoides peltata*)	

The spread of invasive plant and animal species can negatively impact on the conservation objectives of certain Annex I habitats and species designated within SACs. There are no high impact invasive species within or adjacent the site boundary. The risk of invasive species being introduced onto the site during the operational phase of the project is considered to be low, with no import of materials with the potential to contain invasive flora species. Any topsoil will be thoroughly checked and screened before being imported into the site. The landscape plan will use native and non-invasive ornamental species in its design. Therefore, it is considered that there would be no significant risk to protected habitats and species as a result of invasive species from the site.

6.3 POTENTIAL IMPACTS ON WATER QUALITY

The proposed development is located within the Barrow Catchment, thus the proposed development would be hydrologically linked to Pollardstown Fen SAC. However, the proposed development would not be considered to impact upon the listed habitats and species of this SAC sites during the operational phase due to the design of the drainage system that will include attenuation tanks, ponds and takes cognizance of the Kildare County development Plan 2023-2029 and the UK SUDS Manual.

During the construction phase of projects, a deterioration in water quality can arise through the release of suspended solids during soil disturbance works, the release of uncured concrete and the release of hydrocarbons (fuels and oils). A deterioration in water quality has the potential to have an adverse impact upon the qualifying interests of Pollarstown Fen SAC. The potential impact on groundwater that would reach Pollardstown Fen is considered to be low as per the Hydrogeological Site Assessment. Given the distance and size of the proposed development precautionary measures will be taken during the construction phase to ensure there is no adverse impact on groundwater.

6.4 SCREENING CONCLUSION

In order for an effect to occur, there must be a pathway between the source and the receptor (the SAC or SPA). Where a pathway does not exist, an impact cannot occur.The proposed development site is hydrologically connected to Pollardstown Fen SAC (Site Code: 000396). As detailed above, it is considered that the proposed development would not result in any significant risk to the protected habitats and species of the Pollardstown Fen SAC due to habitat fragmentation or loss, disturbance, reduction in species density or species diversity, or due to the potential introduction of invasive species. However, the assessment has determined that during construction works, the proposed development has the potential to impact the qualifying interests / special conservation interests of the Pollardstown Fen SAC

due to a potential deterioration in groundwater quality during the construction phase therefore, a Natura Impact Statement is required.

7. ASSESSMENT OF LIKELY EFFECTS: STAGE 2 APPROPRIATE ASSESSMENT

Describe the significant effects, if any, on the relevant European site which have occurred, which are occurring or which can reasonably be expected to occur as a result of the project or plan (alone or in combination).

The proposed development has the potential to impact upon the qualifying interests of the Pollardstown Fen SAC, due to a potential deterioration in groundwater during the construction phase.

During construction works, there is potential for water quality deterioration through the release of suspended solids during soil disturbance works. Suspended solids could become entrained in water run-off. Nutrients can be bound in suspended solids, therefore, a significant increase in suspended solids can result in excessive eutrophication, leading to the deoxygenation of waters and subsequent asphyxia of aquatic species. An increase in suspended solids also has the potential to reduce water clarity, which can impact the light penetration of water and may also affect certain behaviours of aquatic fauna such as foraging success.

A potential source of chemical contamination would be from the release of hydrocarbons (oils, fuels) from construction plant and equipment. During the construction phase would be associated with accidental spillage of potentially polluting substances including oils, paints and liquid wastes and any additional substances associated with the construction activities.

Hydrocarbons can affect water quality, potentially resulting in toxic conditions to groundwater. Oil films on the water surface can disrupt oxygen diffusion from the atmosphere, resulting in de-oxygen of waters.

Another potential source of contamination would be the release of uncured concrete. The percolation of cement wash-water into the underlying aquifer would have a negative moderate short-term impact on groundwater water quality in the underlying aquifer. In the event of uncured concrete entering a waterbody, the pH would be altered locally.

The tables below briefly outline the occurrence of the qualifying interests of the River Pollardstown Fen SAC in relation to the proposed development site, taking cognisance of the NPWS "*Conservation Objectives: Pollardstown Fen SAC 000396* in addition to Volumes 1, 2 and 3 of the 2019 NPWS Reports, "The *Status of EU Protected Habitats and Species in Ireland*".

The following Table 7.1 outlines which of the qualifying interests and special conservation interests may be impacted upon by a potential deterioration in groundwater quality from the proposed development.

POLLARDSTOWN FEN SAC		
QUALIFYING INTEREST	**OCCURRENCE / ASSESSMENT**	**POTENTIAL IMPACT**
[7210] *Cladium* fens	The proposed development is located within the current known distribution, current range and favourable reference range of this qualifying interest (NPWS, 2019b). The habitat is characterised by waterlogged peat soils, a high-water table (at or above the surface), and near neutral to alkaline oligotrophic to mesotrophic water. *Cladium* fens are found throughout Ireland, most commonly in lowland areas in the midlands, west and south-east. They are occasional elsewhere. A threat and pressure to this habitat is mixed source pollution to surface and ground waters. Therefore, there is potential for the proposed development to have an impact upon this qualifying interest due to a potential deterioration in water quality.	Yes
[7220] Petrifying springs	The proposed development is located within the current known distribution, current range and favourable reference range of this qualifying interest (NPWS, 2019b). Species associated with petrifying springs are highly specialised. The ecological significance of petrifying springs is seldom confined to a point source; rather, there is often a continuum of intergrading hydrological conditions from the spring head, through a flushed slope and into small streams. The nearest example of this qualifying interest is located within Pollardstown Fen approximately 3.9km from the proposed development site. The Petrifying Springs at Pollardstown Fen are noted as Unfavourable Bad with Nitrate level and Phosphate level failing (Lyons & Kelly, 2016). A threat and pressure to this habitat is mixed source pollution to surface and ground waters. Therefore, there is potential for the proposed development to have an impact upon this qualifying interest due to a potential deterioration in water quality.	Yes
[7230] Alkaline fens	The proposed development is located within the current known distribution, current range and favourable reference range of this qualifying interest (NPWS, 2019b). Alkaline fens are groundwater-fed, generally peat-forming systems with extensive areas of species-rich small sedge and brown moss communities. They occur in areas where there is a high-water table and a base-rich, often calcareous water supply. The nearest example of this qualifying interest is located within Pollardstown Fen approximately 3.9km from the proposed development site. A threat and pressure to this habitat is mixed source pollution to surface and ground waters. Therefore, there is potential for the proposed development to have an impact upon this qualifying interest due to a potential deterioration in water quality.	Yes
[1013] Geyer's Whorl Snail (*Vertigo geyeri*)	The Geyer's Whorl Snail is a whorl snail species occurring in wetlands in Ireland. It is stringent in its requirement for saturated water conditions in calcareous, groundwater-fed flushes. It is particularly sensitive to changes in hydrology. It is considered to be under threat in Ireland and was assessed as	No

POLLARDSTOWN FEN SAC		
QUALIFYING INTEREST	**OCCURRENCE / ASSESSMENT**	**POTENTIAL IMPACT**
	Vulnerable on the Irish Red List. The proposed development is located within the current known distribution, current range and the favourable reference range of this qualifying interest (NPWS, 2019c). According to the SAC Conservation Objectives report, the nearest record of Geyer's Whorl Snail is located approximately 3.9km of the proposed development site. The nearest records on the NBDC for Geyer's Whorl Snail are located within Pollardstown Fen. Change in hydrology is a threat to this species however water quality/air are not listed as a threat to this species, it is not anticipated that the proposed development would have the potential to adversely impact upon the Geyer's Whorl Snail.	
[1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*)	The Narrow-mouthed Whorl Snail is a whorl snail species occurring in wetlands in Ireland. It favours damp or wet habitats, where they live mostly in moss, leaves and decaying vegetation, and feeds on bacterial films and decaying vegetation. It is particularly sensitive to changes in vegetation. It is considered to be under threat in Ireland and was assessed as Vulnerable on the Irish Red List. The proposed development is located within the current known distribution, current range and the favourable reference range of this qualifying interest (NPWS, 2019c). According to the SAC Conservation Objectives report, the nearest record of Geyer's Whorl Snail is located approximately 3.9km of the proposed development site. The nearest records on the NBDC for Geyer's Whorl Snail are located within Pollardstown Fen. Changes in water/air quality are not listed as a threat to this species, it is not anticipated that the proposed development would have the potential to adversely impact upon the Narrow-mouthed Whorl Snail..	No
[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	The Desmoulin's Whorl Snail is the largest of the whorl snail species occurring in wetlands in Ireland. It favours damp or wet habitats such as swamps, fens and marshes, where it lives mostly in moss, leaves and decaying vegetation (NPWS, 2019c). Desmoulin's Whorl Snails feed on living and dead stems and leaves of tall plants in wetland habitats. The proposed development is located within the current known distribution, current range and the favourable reference range of this qualifying interest (NPWS, 2019c). According to the SAC Conservation Objectives report, the nearest record of Desmoulin's whorl snail is located approximately 3.9km of the proposed development site. The nearest records on the NBDC for Desmoulin's Whorl Snail are located within Pollardstown Fen. Given that water/air quality are not listed as a conservation objective for this qualifying interest, it is not anticipated that the proposed development would have the potential to adversely impact upon the Desmoulin's whorl snail.	No

8. MITIGATION MEASURES

This assessment has determined that the proposed development has the potential to impact upon the Pollardstown Fen SAC due to a potential deterioration in ground water quality during the construction phase.

As discussed in Section 7, it is considered that the proposed development has the potential to impact upon the following qualifying interests of the Pollardstown Fen SAC:

- [7220] Petrifying springs
- [7210] Cladium fens
- [7230] Alkaline fens

See accompany CEMP (Doc Ref: PE_CEMP_ 10024) for all construction activities. The CEMP describes how construction work would be undertaken in an environmentally sensitive manner and would include measures for the protection of water quality.

8.1 WATER QUALITY

Measures that would be employed to ensure that there would be no significant impacts to the listed habitats or species, as listed above, of the Pollardstown Fen SAC due to a potential deterioration in groundwater quality:

- Daily visual inspections would be undertaken of the R445 road during construction works;
- Provision of silt control features where appropriate, such as silt fencing;
- Silt fencing would be placed adjacent to storage areas of stockpiled soil, until such time as the excavated soil has been used in landscaping / re-instatement works;
- Topsoil stockpiles will also be located so as not to necessitate double handling;
- Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter any drainage system;
- Silt control features would be inspected on a daily basis and maintained as appropriate;
- Manhole covers and stormwater gullies along the R445 will be protected by silt blankets;
- Excavations and earth-moving activities would be planned outside periods of heavy rainfall, to limit the potential for suspended solids to become entrained within surface water run-off;
- Ensure that all surface water run-off discharged to groundwater via soakaways is passed through systems for settlement or filtration of suspended solids with the parallel effect of removing contaminants (certain heavy metals and hydrocarbons) associated with the suspended solid;
- Stripping of topsoil will be coordinated with the proposed staging for the development;
- Should water be encountered during excavation works, water would be pumped to a constructed silt control feature, such as a settlement pond or detention pond. A filter would be provided at the pump inlet and, where required, dewatering bags or silt fences

would be used at the outlet to retain any potential silt entrained in the water. Pumping operations would be supervised at all times;

- All construction plant machinery and equipment would be maintained in good working order and regularly inspected;
- Any fuels, oils or chemicals would be stored in accordance with the EPA guidance on the storage of materials, in designated bunded areas with adequate bund provision to contain 110% of the largest drum volume or 25% of the total volume of containers;
- Deliveries of fuels and oils to the site would be supervised;
- Fuels / oils would be handled and stored with care to avoid spillage or leakage;
- Where appropriate, small construction plant equipment would be placed on drip trays;
- Any waste fuel / oils would be collected in bunded containers at a designated area and properly disposed of to an authorised waste contractor;
- Spill kits, adequately stocked with spill clean-up materials such as booms and absorbent pads, would be readily available onsite;
- In the unlikely event of a hydrocarbon spillage, contaminated spill clean-up material would be properly disposed of to an authorised waste contractor;
- Where re-fuelling of construction plant is required to take place onsite, re-fuelling would take place within a bunded area. Under no circumstances would re-fuelling take place within the vicinity of a treeline/ hedgerow or on exposed soil;
- Where construction plant shows signs of hydrocarbon leakage, site personnel would cease the operation of the item in plant in question. Any defective plant would be kept out of service until the necessary repairs are undertaken;
- The use of pre-cast concrete where possible;
- The delivery and pouring of concrete would be supervised at all times;
- Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site;
- The pouring of concrete would be avoided during periods of expected heavy rainfall;
- Concrete would be poured directly into the shuttered formwork from the Ready-Mix Truck, reducing the risk of spillage;
- The wash-out of Ready-Mix Truck drums would not be permitted onsite, in the environs of the site, or at a location which could result in a discharge to water;
- Surplus uncured concrete would be returned to the batching plant where possible;
- A wheel wash facility would be required in particularly dry weather, additional dust control measures may be required, including the provision of a wheel wash facility. Should a wheel wash facility be required, it would be located at an area isolated from any drainage network;
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds;

- There would be no discharge of effluent to groundwater during the construction phase. All wastewater from the construction facilities would be stored for removal off site for disposal and treatment;

The construction works contractor would be obliged to ensure no deleterious discharges would be released from the site to groundwater during excavation and construction activities. Throughout the works the Contractor would also take account of relevant legislation and best practice guidance including but not limited to the following:

- CIRIA, 2001: *Control of Water Pollution from Construction Sites; guidance for consultants and contractors*;
- CIRIA, 2002: *Control of Water Pollution from Construction Sites – Guide to Good Practice*;
- IFI, 2016: *Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters*.

It is therefore considered that, due to the proposed design and proposed mitigation measures, there would be no adverse impact to groundwater quality and the protected habitats and species of the Pollardstown Fen SAC during the construction phase of the proposed development.

9.0 IN COMBINATION EFFECTS

The following plans and projects were reviewed and considered for in-combination effects with the proposed development:

- Kildare County Development Plan 2023-2029;
- Proposed and permitted developments in the area available on Kildare County Council planning system.

The proposed development site is located approximately 1.5km south east of Kildare Town centre via the R445. Residential developments and estates are located within the vicinity of the site. The site is accessed by the entrance along the R445 adjacent to the site's south boundary. The R445 gives access between Kildare Town and Newbridge. The M7 is approximately 350m from the proposed site. The following plans and projects were reviewed and considered for in-combination effects with the proposed development. See Figure 9.1 for map of the below developments.

APPLICATION NO.	DEVELOPMENT TYPE	OUTCOME	APPROXIMATE DISTANCE
17935	The construction of a single storey extension to rear of existing dwelling, single storey family flat and connecting corridor from rear of proposed extension, minor alterations to existing elevations, Velux rooflights to existing roof and all ancillary site works	Granted - Conditional	300m SW
201191	The construction 2 No. single storey/storey and a half type detached dwellings with new shared recessed vehicular access and driveway,	Granted - Conditional	322m SW

APPLICATION NO.	DEVELOPMENT TYPE	OUTCOME	APPROXIMATE DISTANCE
	connection to existing services and all ancillary works		
18848	For construction of a bungalow using existing entrance, connection to existing sewage & water services and ancillary works	Granted - Conditional	330m SW
22244	For a change of design to previously granted extension to rear of dwelling and alterations to existing dwelling under Planning Ref. No. 20/1433, consisting of 1. Alterations to floor layouts and elevations 2. Positioning of doors and windows and 3. All associated site works	Granted - Conditional	340m SW
181441	Construction of steel framed storage building to side/rear of existing commercial premises, erection of advertising totem pole to front of site, erection of advertising signage over existing retail unit and all ancillary works	Granted - Conditional	450 SW
19424	The subdivision of existing site, construction of a part single storey part storey and a half type dwelling, connection to existing services, new double recessed entrance and all associated site works	Granted - Conditional	490m SW
18149	The demolition of 6 No. existing buildings (with a GFA of c. 2,180m^2) and the removal of hard surfacing on the subject site, and the construction of a part 1, part 2 and part 3 No. storey Health Care Facility for a Cancer Treatment Clinic (Proton Therapy) with a GFA of c. 3,555 m^2, including a terrace and plant areas at roof level, on a site area of approximately 2.5 ha. The proposal includes a service yard which also contains a substation, switch room, transformer, waste storage area and 2 No. chillers. The proposal includes landscaped areas of open space, including a variety of gardens, and all associated boundary treatments. A new signalised road junction providing access to the proposed development, and future development proposals from Hospital Street (R445) is proposed. Additional road improvement works to Hospital Street are also proposed, including pedestrian crossings, upgrades to footpaths, road markings and traffic signalling. The proposal includes internal access roads, including connections to future development lands, new pedestrian access points and footpaths. The associated site and infrastructural works include foul and surface water drainage, 80 No. surface car parking spaces and cycle parking. Revised by significant further information consisting of; •Amended red line boundary, amended access	Granted - Conditional	950m W

APPLICATION NO.	DEVELOPMENT TYPE	OUTCOME	APPROXIMATE DISTANCE
	arrangements for the development, amended internal road network, amended cycle lanes and amended car parking arrangement and associated landscaping; •Extension of red line boundary along the frontage of Magee Barracks site to incorporate segregated cycling facilities on Hospital Street/R445, pedestrian crossings, upgrades to footpaths, road markings and traffic signalling on the R445/Hospital Street;•Revised elevation treatment of the Cancer Treatment Clinic building to include a variety of brickwork and concrete elevational treatment;•Revised boundary treatment; •Omission of pedestrian connection at South Eastern boundary and relocation further West along Hospital Street; •Increase in floor space of the proposed Cancer Treatment Clinic to include a larger vault and associated alterations to the service yard area; •All site development works		
13635	A new 2 storey national school comprising of 16 classrooms, general purpose hall, servery, library/resource room, special education tuition rooms, offices, staff areas, sanitary, 2 class base special needs unit, central activities space, multi-sensory room and ancillary accommodation with an additional floor area of c.3293m^2. Proposed site works to include provision for 33 No. car parking spaces including accessible parking, via proposed new vehicular and pedestrian access off Melitta Road, new access road to include bus turning circle and drop-off and pick-up facilities designed to facilitate for future school on this site. External works to include bicycle racks, formation of 2 No. ballcourts, 1 No. junior play, SNU play area, external bin store, ESB sub-station and ancillary site engineering works. The foul drainage shall include the construction of a foul pump station and associated rising main to convey foul waste from site through the Magee Barracks land block along the Curragh Road to a public main south of the Curragh Road. The storm drainage shall consist of a gravity fed attenuation system discharging by means of controlled flow to an existing surface water drainage system in the Ruanbeg Estate. The overall site area will be landscaped with grass/planted areas and complete with new boundary treatment	Granted - Conditional	1.5kmW

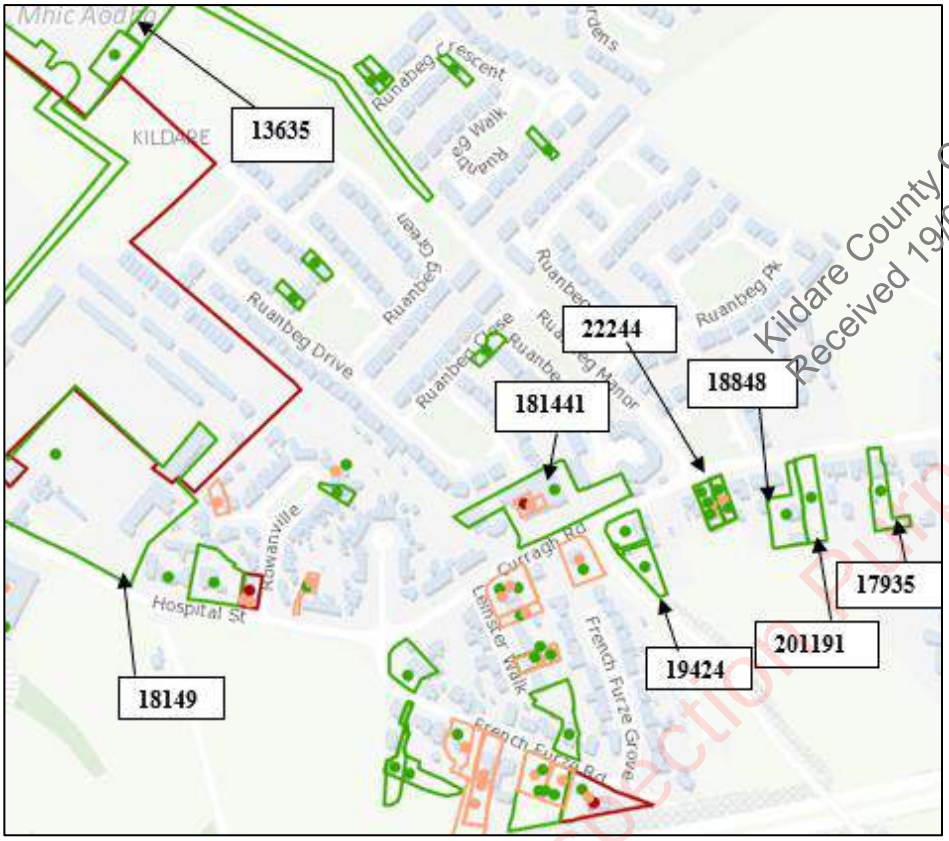

Figure 9.1: Surrounding planning applications

9.1 HABITAT LOSS / FRAGMENTATION

As discussed in Section 6.1, the proposed development does not directly impinge on any part of a European site, and as such would not be expected to have any in-situ effects upon a protected site through loss or destruction of habitat or fragmentation of habitat. With regards ex-situ effects, it is not considered that the proposed development site would contain the habitats or species for which the Pollardstown Fen SAC have been designated.

The surrounding land-use of the proposed development site is agricultural pasture to the west and urban to the east. The agricultural land which can be considered modified and of low biodiversity value. Further away are areas of open grassland (the Curragh) that also in use for recreational activities. Proposed developments were identified on the Kildare County Council planning site within the vicinity of the applicants proposed site, which are for residential dwellings and small-scale commercial developments. Should future planning applications be submitted for the area, it is likely that they would also be located on agricultural land or within the urban centre of Kildare. Therefore, it is unlikely that future proposed developments would result in the loss or fragmentation of designated habitats of the Pollardstown Fen SAC, within the vicinity of the proposed site. Therefore, no in-combination effects on habitat loss / fragmentation are anticipated.

9.2 DISTURBANCE TO SPECIES

Disturbance to species may arise through noise emissions and human activity. The main in-combination noise and human activity effects would be from any commercial activities within

the area. Pollardstown Fen SAC is 3.9km from the proposed development however fauna within the SAC and the general area around the proposed development site would be accustomed to human and urban noise. This SAC is partly accessible to the public as it also designated a nature reserve.

During site clearance works, the top layer of vegetation of the proposed development footprint would be removed and would be either stored for re-use in landscaping activities at the development site upon completion of construction works, or, in the instances of larger vegetation (i.e. trees/shrubs) would be removed from the development site and appropriately disposed of to a licenced waste contractor. Where possible, no hedgerow / tree removal works would be undertaken during the bird nesting season, from the 1st of March to the 31st of August.

Therefore, owing to the urban land use and the recent developments detailed in the table above, and given the nature of activity at the proposed development (residential), it is considered that there would be no cumulative noise impacts, or other disturbance effects due to human activity, which would pose a significant risk to designated sites or species.

9.3 AIR QUALITY

From mapping websites, including the EPA's Envision mapping system, there is one commercial/industrial enterprises located within the vicinity of the proposed development site. The nearest EPA licenced sites are located approximately 15m south (IEL - P0170) and approximately 5.5km east (IPC - P0297) from the proposed development site. These facilities are obliged to operate their site in compliance with their IE / IPC licences, and therefore would be obliged to ensure air emissions are in compliance with any emission limit values outlined within their EPA licences. Traynor Environmental Ltd. identified and assessed the potential air quality associated with the proposed development both the construction and operational phases of the development. No mitigation measures are required as the operational phase of the proposed development as it is predicted to have an imperceptible impact on ambient air quality and climate.

The proposed development with the proposed heating system to be Air to Water heat pumps, it is considered that there would be no cumulative air quality impacts which would pose a significant risk to designated sites. Air emissions would be typical of residential dwellings, being primarily from heating and therefore low impact in-and-of-itself. In-combination residential impacts would be controlled by national energy policies and grant schemes.

In the event a future development is proposed within the general vicinity of the applicants' proposed development, no cumulative air quality impacts would be anticipated, given the residential nature of the development.

9.4 DETERIORATION IN WATER QUALITY

Continued implementation of the Water Framework Directive would result in achieving, or maintaining, improvements to water quality in the Barrow Catchment. Developments such as this proposed development could act in combination with existing environmental pressures on the Barrow Catchments, including agriculture, anthropogenic, domestic and urban wastewater, urban run-off, industry and forestry. In particular, the proposed development could act in combination with other similar projects that generate wastewater to cause a deterioration in the water quality of Urban Wastewater Treatment Plant receiving watercourses. These could

be from point or diffuse sources and could include licenced wastewater discharges, unsewered properties and agricultural run-off.

The proposed development is located within the Curragh Aquifer. The EPA monitor boreholes and record the groundwater level within the Curragh Aquifer. The Curragh Aquifer is measured for recharge and the flow of groundwater to Pollardstown Fen after the significant impact of the M7 bypass of Kildare Town on the Curragh. The analysis concluded Pollardstown Fen is actively recharging (Misstear et al., 2009). The proposed development would not alter the flow of groundwater to Pollardstown Fen as the flow of groundwater at the proposed development is in the opposite direction to Pollardstown Fen. All stormwater from the proposed site will pass through a drainage system that will include hydrocarbons interceptors and attenuation tanks (with ponds) that will discharge to groundwater. A Stormwater Drainage Maintenance Plan has been submitted for this development (Doc Ref: 222143-PUNCH-XX-XX-RP-C-0008). This document sets out the maintenance requirements for the different surface water/ SuDS features proposed as part of the surface water management strategy for the development. Therefore, there will be no cumulative impact on groundwater from the proposed development given the proposed drainage system and mitigation measures to be implemented during the construction phase.

In addition, the proposed development is in a Flood Risk Zone C and would not increase the flood risk to other third parties or lands. Therefore, there would be no significant cumulative impacts due to flooding.

Waste water from the proposed development will be discharged to the public foul line into Kildare Town Wastewater Treatment Plant (D0178-01) which is not compliant with the ELV's set in the Wastewater Discharge Licence. A deterioration in water quality has been identified, however it is not known if it or is not caused by the WWTP. The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status (Irish Water, 2021). Kildare WWTP has Available Capacity (Status Green) (Irish Water, 2022). Irish Water has confirmed feasibility of connection (Reference Number CDS22003306).

It is not anticipated that the operational phase or construction phase of the proposed development has the potential to impact upon the listed habitats and species of the Pollardstown Fen SAC due to deleterious effects on water quality. No significant impact on water quality would take place due to drainage from the site, given the proposed drainage design.

10.0 CONCLUSION

It is not anticipated that the proposed development, subject to recommended mitigation measures, by itself or in combination with other developments, would impact negatively upon the Natura 2000 network during the site preparation or operational phases of the project.

The proposed development site is located approximately 3.9km from the Pollardstown Fen SAC (Site Code 000396). It is considered that there would be no potential risk of adverse effect upon the qualifying interests / special conservation interests of the Pollardstown Fen SAC due to the proposed mitigation measures to be employed.

It is the conclusion of this Natura Impact Statement that, subject to recommended mitigation measures, there would be no potential for an adverse effect on European sites as a result of the proposed development and mitigation measures to be employed. This conclusion refers to the development by itself or in combination with other developments.

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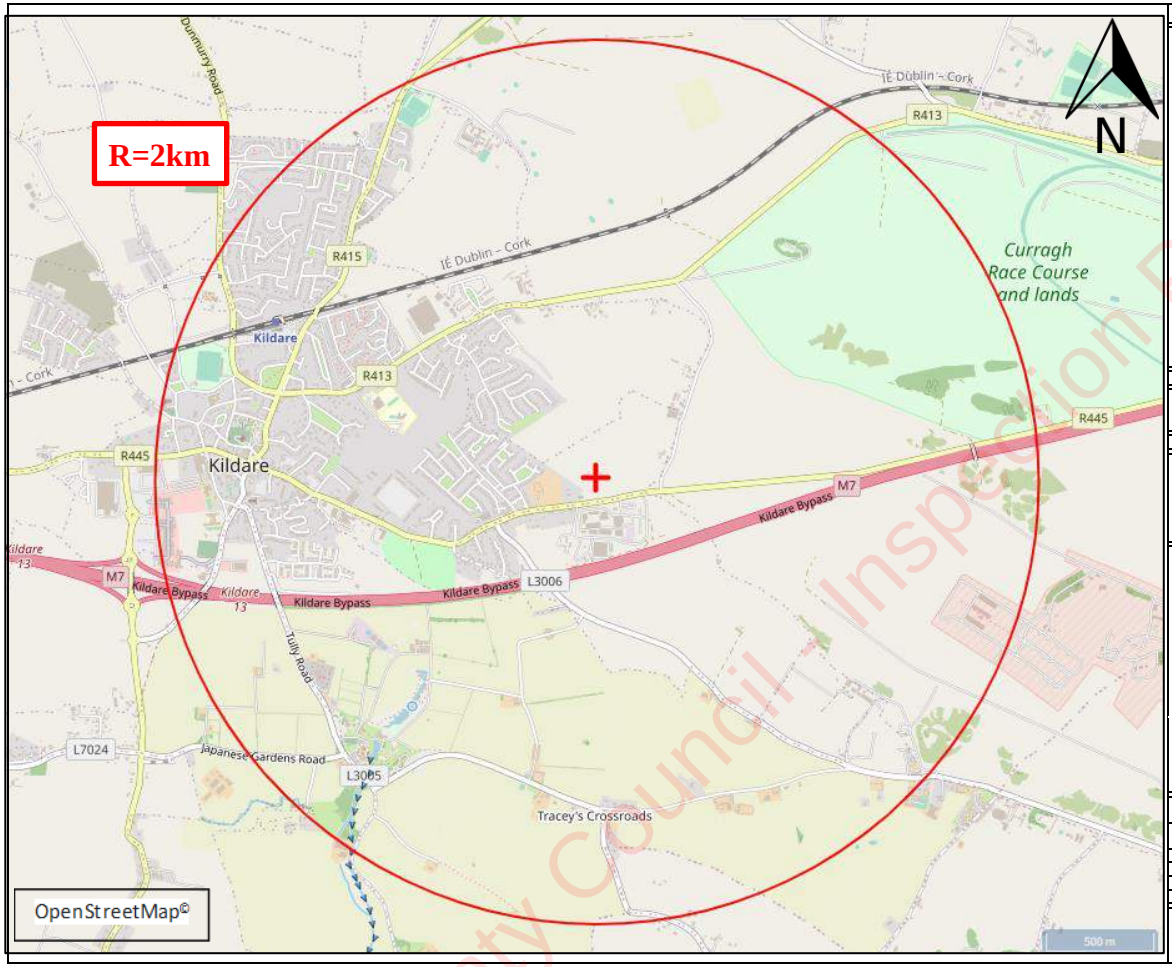
APPENDIX A

PROTECTED SITES
AND
PROPOSED SITE LAYOUT



Notes

– Location of Development

- SAC

- SPA

Kildare County Council
Received 19/09/2023

Project Title:

Protected Sites Map

Client Name:

PANTHER ECOLOGY LTD

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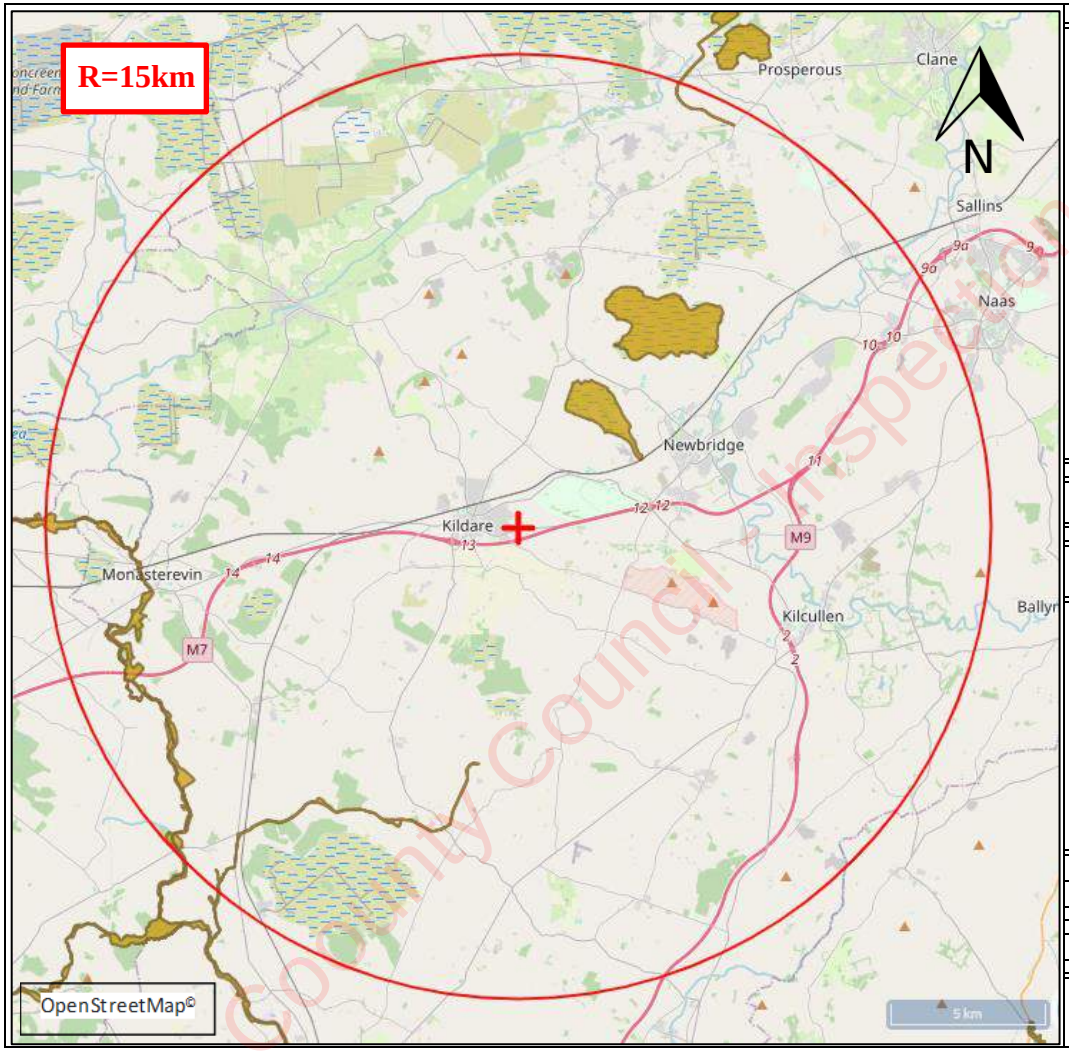
Drawing Status:	**Scale:**	NTS	A4
Report	**Datum:**		EPA Maps
Drawing Number:	**Drawn:**		PES
NIS_10024	**Checked:**		MF
Revision:	**Approved:**		-
	Date:		09/06/22



Notes

– Location of Development

- SAC

- SPA

Project Title:

Protected Sites Map

Client Name:

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Drawing Status:	Scale:	N TS	A4
Report	Datum:	EPA Maps	
Drawing Number:	Drawn:	PES	
AA_21591	Checked:	MF	
Revision:	Approved:	-	
	Date:	09/06/22	

APPENDIX B

PHOTO LOG

Plate 1: Improved agricultural grassland (GA1) habitat

Plate 2: Improved agricultural grassland (GA1) habitat

Plate 3: Site entrance from R445 road

Plate 4: Treeline (WL2) habitat along field boundaries

Notes:

APPENDIX B
PHOTO LOG

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file location:		scale: N/A	A4
drawing status:	REPORT	datum:	N/A
		drawn:	PES
drawing no.	rev	checked:	MF
NIS_10024	A	approved:	-
		date:	10/06/2022

Plate 5: View of site facing south east

Plate 6: View of site facing west

Plate 7: Hedgerow (WL1) habitat along field boundaries

Plate 8: View of site facing north west

Notes:

APPENDIX B
PHOTO LOG

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GREEN ROAD
CARLOW

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file location:		scale: N/A	A4
drawing status:	REPORT	datum:	N/A
		drawn:	PES
drawing no.	rev	checked:	MF
NIS_10024	A	approved:	-
		date:	10 /06/2022

Appendix 5.4

Construction and Environmental Management Plan

Slight Change

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CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

RUANBEG,
KILDARE TOWN,
CO. KILDARE

2023

REPORT NO:	PE_CEMP_ 10024	**AUTHOR:**	Ross Donnelly-Swift, PhD
DATE:	4th May 2023	**REVIEWED:**	Mike Fraher, BSc.

TABLE OF CONTENTS

1.0 INTRODUCTION

Panther Ecology Ltd was commissioned by MRP Oakland Limited to prepare a Construction Environmental Management Plan. The applicant is seeking permission of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche and multifunctional space along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development at Ruanbeg, Kildare Town, Co. Kildare.

1.1 PURPOSE OF THE CEMP

The purpose of this CEMP is to communicate key environmental obligations that apply to all site personnel, sub-contractors and visitors to the site, while carrying out construction activities as part of the proposed development. The CEMP defines the approach to environmental management at the proposed development site, outlining the work practices, construction procedures and responsibilities to be undertaken during the construction phase. Compliance with the CEMP, the procedures, work practices and controls would be mandatory and must be adhered to by all personnel and sub-contractors employed during the construction phase. The CEMP outlines, where necessary, the control measures that are required to avoid, minimise or mitigate potential effects on the environment and surrounding area.

This document has been prepared based upon the information provided during the planning stage, supplied by the applicants and their representatives, with respect to the proposed development.

1.2 LIVE DOCUMENT

The CEMP is a “live” document and would be reviewed and updated as necessary throughout the construction phase.

1.3 COMMUNICATION

Upon planning approval, the applicants would appoint a construction works contractor to the proposed development. This CEMP would be communicated to all site personnel during site inductions and briefings. All site personnel would be responsible for undertaking their work in an environmentally sustainable manner and would be encouraged to provide feedback and comments on environmental performance at the site and suggestions for improvement.

The construction works contractor would appoint a Project Manager to the proposed development. Any environmental issues, accidents or incidents would be reported to the Project Manager as soon as possible, who in turn would inform the applicants.

2.0 PROJECT DESCRIPTION

2.1 LOCATION

The proposed development is located within at Ruanbeg, Kildare, Co. Kildare [ITM Coordinates 674386, 712374] as shown in Figure 2.1. The site is accessed via main entrance along the regional road R445. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development.

Water will be provided to the proposed dwellings via new connection to the public mains. Surface water runoff from roads, areas of hardstanding and roof areas will be discharged to a drainage network that will include hydrocarbon interceptors, attenuation tanks and ponds. Waste water connection will to the municipal sewer line.

The proposed development site will also include large and small public open spaces for a total open space of 14,140m^2. The proposed development will also include a private and communal open space, car parking and cycle parking. The proposed development site will also include a crèche with play area.

The landscape design consists of proposed trees aligning the sites internal road network. With some existing mature trees to be maintained along the site boundary. Each dwelling throughout the site will have some tree clusters within private garden areas. See Appendix C for site plans. Hedgerows along the north and north-eastern boundaries will be retained.

Figure 2.1: Location of Proposed Site at Ruanbeg, Kildare Town, Co. Kildare

2.2 PLANNING CONTEXT

The proposed development will provide modern residential housing to Kildare Town and its environs. The buildings will be used for residential purposes. As good environmental practice, this CEMP has been prepared, to ensure construction works would be undertaken in an environmentally sensitive manner.

The following sections outline the planning policies relevant to the proposed development and the protection of the environment.

National Policies

A number of documents have been published in relation to the Government's commitment to sustainable development, including the - *Project Ireland 2040 National Planning Framework and the Climate Action Plan 2019 and Climate Action Plan 2021*.

Regional Policies

The *Regional Spatial and Economic Strategy 2019-2031*, which includes the counties of the Eastern and Midland Regions outlines the long-term spatial and economic planning strategy for the area. As part of the guidelines, a number of policies relating to the protection of the environment were outlined, as per Table 2.1 below.

Table 2.1: Regional Policies Relevant to the Protection of the Environment and the Proposed Development

POLICY REFERENCE	POLICY
RPO 7.7:	To reduce harmful emissions and achieve and maintain good air quality for all urban and rural areas in the Region and to work with local authorities and the relevant agencies to support local data collection in the development of air quality monitoring and to inform a regional air quality and greenhouse gas emissions inventory.
RPO 7.8:	Local authorities shall incorporate the objectives of the EU Environmental Noise Directive in the preparation of strategic noise maps and action plans that support proactive measures to avoid, mitigate, and minimise noise, in cases where it is likely to have harmful effects
RPO 7.9:	Local authorities shall consider measures to minimise the harmful effects of light pollution in the future provision of outdoor lighting, including improving their approach to street lighting and ensuring that new developments are lit appropriately and to ensure that environmentally sensitive areas are protected.
RPO 7.10:	Support the implementation of the Water Framework Directive in achieving and maintaining at least good environmental status for all water bodies in the Region and to ensure alignment between the core objectives of the Water Framework Directive and other relevant Directives, River Basin Management plans and local authority land use plans.
RPO: 7.11:	For water bodies with 'high ecological status' objectives in the Region, local authorities shall incorporate measures for both their continued protection and to restore those water bodies that have fallen below high ecological status and areas 'At Risk' into the development of local planning policy and decision making any measures for the continued protection of areas with high ecological status in the Region and for mitigation of threats to waterbodies identified as 'At Risk' as part of a catchment based approach in consultation with the relevant agencies. This shall include recognition of the need to deliver efficient wastewater facilities with sufficient capacity and thus contribute to improved water quality in the Region.
RPO 7.14	Local authorities shall take account of and incorporate into the development of local planning policy and decision making the recommendations of the Flood Risk Management Plans (FRMPs), including planned investment measures for managing and reducing flood risk.
RPO 7.15:	Local authorities shall take opportunities to enhance biodiversity and amenities and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned.
RPO 7.16:	Support the implementation of the Habitats Directives in achieving an improvement in the conservation status of protected species and habitats in the Region and to ensure alignment between the core objectives of the EU Birds and Habitats Directives and local authority development plans
RPO 7.27:	Following the adoption of a national landscape character assessment, the Assembly will prepare a Regional Landscape Character Assessment to promote better landscape management and planning in the Region
RPO 10.1:	Local authorities shall include proposals in development plans to ensure the efficient and sustainable use and development of water resources and water services infrastructure in order to manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment.
RPO 10.10:	Support Irish Water and the relevant local authorities in the Region to eliminate untreated discharges from settlements in the short term, while planning strategically for long term growth in tandem with Project Ireland 2040 and in increasing compliance with the requirements of the Urban Waste Water Treatment Directive from 39% today to 90% by the end of 2021, to 99% by 2027 and to 100% by 2040.

POLICY REFERENCE	POLICY
RPO 10.15:	Support the relevant local authorities (and Irish Water where relevant) in the Region to improve storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban environment and in the development and provision at a local level of Sustainable Urban Drainage solutions.
RPO 10.16:	Implement policies contained in the Greater Dublin Strategic Drainage Study (GDSDS), including SuDS.

Local planning policies are detailed in the Kildare County Development Plan, 2023-2029. A number of policies relate to the protection of the environment and are relevant to the proposed development, summarised as follows:

Table 2.2: Summary of Local Policies and Objectives Relevant to the Protection of the Environment and the Proposed Development

POLICY REFERENCE	POLICY
BI P1	Integrate in the development management process the protection and enhancement of biodiversity and landscape features by applying the mitigation hierarchy to potential adverse impacts on important ecological features (whether designated or not), i.e. avoiding impacts where possible, minimising adverse impacts, and if significant effects are unavoidable by including mitigation and/or compensation measures, as appropriate. Opportunities for biodiversity net gain are encouraged.
BI P2	Seek to contribute to maintaining or restoring the conservation status of all sites designated for nature conservation or proposed for designation in accordance with European and national legislation and agreements. These include Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs), Ramsar Sites and Statutory Nature Reserves.
BI P3	Ensure that any proposal for development within or adjacent to a Natural Heritage Area (NHA), Ramsar Sites and Nature Reserves is designed and sited to minimise its impact on the biodiversity, ecological, geological and landscape value of the site, particularly plant and animal species listed under the Wildlife Acts and the Habitats and Birds Directive including their habitats.
BI P4	Ensure that any new development proposal does not have a significant adverse impact, incapable of satisfactory mitigation on plant, animal or bird species which are protected by law.
BI P5	Identify and conserve locally important biodiversity sites in the county which contribute to the overall ecological network of County Kildare.
BI P7	Recognise and promote inland waters, natural environmental assets and to protect rivers, streams and other watercourses and, wherever possible, maintain them in an open state capable of providing suitable habitats for fauna and flora while discouraging culverting or realignment.
BI P9	Implement and support measures for the prevention and/or eradication of invasive species within the county and the control of noxious weeds.
BI O3	Actively support the implementation of national biodiversity initiatives such as the All-Ireland Pollinator Plan 2021-2026.
BI O9	Avoid development that would adversely affect the integrity of any Natura 2000 site and promote favourable conservation status of habitats and protected species including those listed under the Birds Directive, the Wildlife Acts and the Habitats Directive, to support the conservation and enhancement of Natura 2000 Sites including any additional sites that may be proposed for designation during the period of this Plan and protect the Natura 2000 network from any plans and projects that are likely to have a significant effect on the coherence or integrity of a Natura 2000 Site.

POLICY REFERENCE	POLICY
BI O10	Ensure an Appropriate Assessment Screening, in accordance with Article 6(3) and Article 6(4) of the Habitats Directive, Section 177A of the Planning and Development Act (2001-2022) or any superseding legislation and with DEHLG guidance (2009), is carried out in respect of any plan or project not directly connected with or necessary to the management of a Natura 2000 site to determine the likelihood of the plan or project having a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects and to ensure that projects which may give rise to significant cumulative, direct, indirect or secondary impacts on Natura 2000 sites will not be permitted (either individually or in combination with other plans or projects) unless for reasons of overriding public interest.
BI O26	Prevent, in the first instance, the removal of hedgerows to facilitate development. Where their removal is unavoidable, same must be clearly and satisfactorily demonstrated to the Planning Authority. In any event, removal shall be kept to an absolute minimum and there shall be a requirement for mitigation planting comprising a hedge of similar length and species composition to the original, established as close as is practicable to the original and where possible linking to existing adjacent hedges. Ideally, native plants of a local provenance and origin should be used for any such planting. Removal of hedgerows and trees prior to submitting a planning application will be viewed negatively by the planning authority and may result in an outright refusal.
BI O28	Promote the integration of boundary hedges within and along development sites into development design so as to avoid "trapped hedges" located to the boundary of houses within the development layout. Encourage the planting of woodlands, trees and hedgerows as part of new developments and as part of the Council's own landscaping works ideally using native plants of local provenance and origin.
IN P2	Ensure the protection and enhancement of water quality throughout Kildare in accordance with the EU WFD and facilitate the implementation of the associated programme of measures in the River Basin Management Plan 2018-2021 (and subsequent updates).

Biodiversity Plans

Following on from Ireland's third National Biodiversity Plan 2017–2021, Ireland's fourth National Biodiversity Action Plan 2023-2027 has been drafted for public consultation and "*is set against a backdrop of unprecedented challenges for nature in Ireland and globally*". It aims to build on from the successes of previous NBAP's. It sets out 6 objectives which include for a whole government approach to biodiversity, to meet conservation and restoration needs, to secure nature's contribution to people, embed biodiversity at the heart of climate action, enhance the evidence base for action on biodiversity and to strengthen Ireland's contribution to international biodiversity initiatives. The new plan also includes a set of targets and actions for each objective.

Biodiversity Action Strategy 2022-2026

This strategy sets out OPW's intention for protecting, promoting and enhancing biodiversity across its operations. It identifies strategic actions to help to deliver Government policy through contribution to the delivery of the National Biodiversity Action Plan.

All-Ireland Pollinator Plan

In 2015, Ireland joined a number of other European countries in developing a strategy to address pollinator decline and protect pollination services. 68 governmental and non-governmental organisations agreed a shared plan, the "*All-Ireland Pollinator Plan 2015-2020*". The new version "*All-Ireland Pollinator Plan 2021-2025*" seeks to build on from the success of the previous plan and identifies 186 actions to make Ireland pollinator friendly. The plan provides a total of 37 targets for six different objectives which include, farmland, public land, private land, All-Ireland Honeybee Strategy, conserving rare pollinators and strategic coordination of the plan.

2.3 ENVIRONMENTAL BASELINE

The proposed development site, measuring approximately 10.3ha is located on the eastern fringes of Kildare Town. The land use of the area is a combination of urban fabric to the west, south and north, where a mixture of residential housing estates and commercial premises are located. Lands to the east of the site are predominantly used for one-off residential housing which is linearly aligned to the local road network and for agricultural/equestrian purposes. There are no historic sites within the vicinity of the proposed site.

2.3.1 Biodiversity

Part of the site assessments was to examine the ecological context of the development site, by systematically walking the site and boundaries and determining the habitats present. The habitat survey was undertaken in accordance with the standard methodologies outlined in Fossitt's "A Guide to Habitats in Ireland", and the Heritage Council guidelines, "Best Practice Guidance for Habitat Survey and Mapping", (Smith et al., 2011).

Bird species and any signs of fauna activity and dwellings were also noted. Particular attention was given to the possible presence of habitats and/or species, which are legally protected under Irish and European legislation. There was no evidence of protected terrestrial or aquatic fauna, nor were any observed within the site boundary.

See accompanying EIAR (Chapter 5 – Biodiversity) for complete ecological assessment of the site. The identified habitats at the proposed development site and within the vicinity of the site, as per the Fossitt habitat classification scheme, are summarised in Table 2.3 below.

The majority of the development site, comprising of agricultural grassland can be considered as modified and of low biodiversity value. No plant species of conservation significance or invasive plant species of concern were noted during the site assessment.

Table 2.3: Summary of Habitats Identified at the Proposed Development Site

HABITAT CLASSIFICATION HIERARCHY		
LEVEL 1	**LEVEL 2**	**LEVEL 3**
B – Cultivated and built land	**BL** – Built Land	**BL3** – Buildings and artificial surfaces
E – Exposed rock and disturbed ground	**ED** – Disturbed ground	**ED2** – Spoil and bare ground
G – Grassland and marsh	**GA** – Improved grassland	**GA1** – Improved agricultural grassland
W – Woodland and scrub	**WL** – Linear woodland / scrub	**WL1** – Hedgerows
		WL2 – Treelines

Invasive Species

Under Regulation 49(2) of the European Communities (Birds and Natural Habitats) Regulations 2011, save in accordance with a licence granted under paragraph (7), any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to any plant which is included in Part 1 of the Third Schedule shall be guilty of an offence. Materials containing invasive species such as Japanese Knotweed are considered "controlled waste" and, as such, there are legal restrictions on their handling and disposal. Under Regulation 49(7) of the European Communities (Birds and Natural Habitats) Regulations 2011, it is a legal requirement to obtain a license to move "vector materials" listed in the Third Schedule, Part 3.

Three invasive plant species listed in the Third Schedule of the European Communities Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) were recorded within the 10km square N71: Giant Hogweed (*Heracleum mantegazzianum*), Japanese Knotweed (*Fallopia japonica*) and Fringed Water-lily (*Nymphoides peltata*). However, no invasive species of concern were noted as present during the site assessments. The risk of invasive species being introduced onto the site during the construction phase of the project is considered to be low, with no import of materials with the potential to contain invasive flora species. Soils excavated during construction works would be stockpiled and re-used for site levelling, therefore no importation of topsoil or subsoil would be required as part of the development works. Therefore, it is considered that there would be no significant risk to protected habitats and species as a result of invasive species from the site.

Fauna

See accompanying EIAR (Chapter 5 – Biodiversity) for complete assessment of the fauna at the proposed site.

Designated Sites

See accompanying Natura Impact Statement has been prepared for complete assessment of the Natura 2000 Sites within the zone of influence (Doc Ref. PE_NIS_10024) and see accompanying EIAR (Chapter 5 – Biodiversity) for complete assessment of the Natural Heritage Areas within the zone of influence.

The protected sites within the zone in influence are Pollardstown Fen SAC/pNHA and the Curragh pNHA due to distance and potential hydrological connection via groundwater.

2.4 CONSTRUCTION PROJECT DESCRIPTION

The construction of proposed development would be undertaken on behalf of developer, hereafter referred to as "the construction works contractor".

A designated waste area and designated area of any waste materials located away from any manholes or drainage systems would be established by the construction works contractor within the development site boundary, appropriate measures must be taken to prevent any potential runoff into nearby watercourse during construction works.

2.4.1 Construction Schedule

The expected construction timeframe would be approximately 36 months, with hours of operation from 8am to 6pm Monday to Friday, and 8am to 1pm on Saturdays. Upon approval of the CEMP by development authority, the construction schedule would be finalised at a detailed design stage. The proposed development would include the following main construction activities:

General

- Completion of archaeological testing prior to construction;
- Mobilisation of personnel and equipment to site;
- Site inductions and relevant training;
- Erection of health and safety / construction works signage;
- Installation of external lighting if required;
- Site clearance, including any vegetation removal.

Remediation Works at Proposed Site and Associated Works

- Excavations and earth moving activity;
- Stockpiling of material for use in site reinstatement activities;
- Installation of silt control features where appropriate, such as silt fencing;
- Cover of drainage network along R445 with silt mats;
- Works to facilitate access to the site;
- Pouring of concrete.

Reinstatement

- Finishing of proposed development site;
- Removal from site of any excess materials remaining following reinstatement works;
- Removal of any control features once stabilisation has taken place
- Removal of temporary storage of excavated materials has been removed;

2.4.2 Main Stages of Construction

Site Clearance and Excavations

During site clearance works, any excess material at the site will be either stored for re-use in construction activities at the development site or removed to a licenced waste facility. During excavation works, subsoil and topsoil would be temporarily stored for re-use in reinstatement where possible. Any excess materials would be transported offsite by a licenced contractor for disposal at a suitably licenced facility. Alternatively, should excess excavated materials/soils be classified as a by-product under Article 27 of the Waste Directive Regulations, 2011, and if the proposed end use meets the requirements of the Article 27 regulations, excavated soils could be directed for local use. The storage of excavated material on site would be temporary, until the completion of site reinstatement activities.

Provision / Upgrade of Services & Drainage

Following site clearance and excavations, works would commence on the installation / upgrade of underground utilities to the site required for water supply, wastewater, electricity and telecommunications.

Waste water from the proposed development will be discharged to the proposed foul waste drainage into the existing sewer line with proposed foul sewer drainage upgrades taking place within the proposed site and off site within the existing residential estate west of the proposed development site. The drainage system has been designed with cognizance of the Kildare County development Plan 2023-2029 and the UK SUDS Manual. The proposed drainage system will include bioretention areas. Throughout the site including in gardens located to the rear of each housing unit that will capture pavement and roof runoff. Bioretention areas and modified planters will incorporate drainage stone/subsoil within the bioretention areas/modified planters. Bioretention systems will allow stormwater to filter through a medium to remove finer contaminants. The proposed drainage system will include bioretention areas. Throughout the site including in gardens located to the rear of each housing unit that will capture pavement and roof runoff. There will be 3 no. ponds are proposed for the site to provide for attenuation for the areas directly adjacent to the pond area drained. Controlled discharge from pond areas is set at a discharge rate to provide water levels at least 500mm below floor levels. Pond areas discharge to the infiltration tanks. Water levels are provided at least 500mm below floor levels for all areas. The apartments and crèche will have green roofs. All surface water is ultimately infiltrating to ground. See accompanying Drainage Design by Punch Consulting Engineers (SuDS Strategy report, SUDS Drawings, and Engineering Planning Report).

Construction of Development

Following site clearance, excavations and works for the provision of services, works would commence on the construction of the development. The pouring of concrete foundations would be supervised at all times.

Site Reinstatement and Landscaping

Landscaping works will take place at the proposed site would include the removal of any hardcore surfaces, removal of any stockpiled material from excavations, the removal of

construction plant, equipment and signage, the reseeding/replanting of exposed soil where required and the planting of trees and ornamental flora as per the Landscape Design by Cunnane Stratton Reynolds.

2.4.3 Construction Working Hours

It is anticipated that construction works would be undertaken during standard construction hours, as follows:

Start	Finish	Days
8am	6pm	Monday – Friday
8am	1pm	Saturday

No works would take place on Sundays or Bank Holidays. It should be noted that there may be times where it is necessary to undertake construction works outside of the times mentioned above, for example concrete pours. In such cases, notification would be given where necessary to the relevant bodies (i.e. Kildare County Council) and any potentially effected local residents in good time and prior to specified works commencing.

2.4.4 Construction Plant and Equipment

The construction plant and equipment likely to be used during the construction phase of the project are included in the table below. It should be noted that this list is not exhaustive.

Table 2.6: Likely Construction Plant and Equipment Required

ACTIVITY	POSSIBLE PLANT / EQUIPMENT REQUIRED
Site Clearance and Excavations	Excavator Dumper trucks Bulldozer Graders Rollers
Construction of Building	Tracked Excavator JCB Site Dumper Cement Mixer Mobile Crane
Site Reinstatement and Landscaping	Tracked Excavator Site Dumper Bulldozer

2.4.5 Security Arrangements

The construction works contractor would ensure the proposed development site is secured, so as to provide the safety of all potentially affected parties, including staff, contractors, traffic, pedestrians and wildlife. Only authorised personnel would be allowed onto the development site. The site would be secured by the existing stone wall along with fencing, hoarding or another suitable site barrier system to protect against unauthorised entry. The construction

works contractor would implement the appropriate security arrangements, including signing in / out procedures, signage and out-of-hours security.

2.4.6 Health and Safety

All activities undertaken at the proposed development site during the construction phase shall be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005, as amended, and the Safety, Health and Welfare at Work (Construction) Regulations, 2013. As required by the 2013 regulations, a Health and Safety Plan would be prepared by the construction works contractor, which would address health and safety issues from the design stages through to the completion of construction works. This plan would be updated and reviewed as required as the proposed development progresses.
Prior to works commencing onsite, all site personnel, including sub-contractors, would receive induction training that would incorporate health and safety requirements and good practice. Site induction would be mandatory for all employees, sub-contractors and visitors to the development site. Specific training would be provided, where necessary.

All construction personnel, contractors and visitors to the site would wear the following appropriate Personnel Protective Equipment as a minimum at all times:

- Safety helmet;
- Hi-visibility clothing (coat or vest);
- Safety boots;
- Eye protection where identified for specific activities.

Regular site safety audits would be undertaken throughout the construction phase to ensure the rules and regulations established for the site are complied with at all times.

2.4.7 Construction Signage and Labelling

Environmental signage and labelling would be used to inform site personnel of environmental requirements and restrictions with regards construction activities, in addition to promoting environmental good practice at the development site. The construction works contractor would erect the appropriate signage and label all relevant areas and receptacles. Examples would include designated storage areas for potentially polluting materials and waste and site environmental rules.

The construction works contractor would erect the appropriate signage and label all relevant areas and receptacles.

2.4.8 Construction Method Statement

Prior to works commencing, the construction works contractor would prepare and provide to the clients a detailed Construction Method Statement, which would address all construction works required for the proposed development. The construction works contractor would maintain a register of all method statements for the project, in addition to a register of all site personnel trained on the method statements.

2.4.9 Potential for Historic Contamination

As the proposed development site is currently in a state of agricultural grassland and bare soil, it is considered unlikely that the site would contain contaminated material. However, in the unlikely event contaminated material is encountered during construction works, appropriate measures would be undertaken in compliance with relevant waste legislation. The relevant authorities would be notified where required.

2.5 Pest Control

The construction works contractor would ensure the prevention of pests or vermin including arrangements for regular disposal of food and material attractive to pests. If infestation occurs the contractor will take appropriate action to eliminate and prevent further occurrence, including the contracting of a pest control contractor and the establishment of a pest baiting programme, where required.

3.0 ENVIRONMENTAL MANAGEMENT

3.1 ENVIRONMENTAL MANAGEMENT SYSTEMS

An Environmental Management System (EMS) would be put in place by the construction works contractor. The EMS would take into account any planning conditions imposed on the site for the construction phase and, in accordance with the relevant guidelines, would be appropriate to the scale of the operation. The construction works contractor would implement a number of environmental management procedures, including but not limited to the following:

- Awareness and Training;
- Environmental Emergency Response;

- Record Keeping, Auditing and Monitoring;
- Environmental Complaints Procedure;
- Protection of Flora and Fauna;
- Protection of Soil, Groundwater and Surface Water Quality;
- Chemical and Hazardous Material Management;
- Noise Management;
- Dust Management;
- Waste Management.

The CEMP would be updated as necessary to ensure that all measures detailed within the environmental management procedures have been addressed within the CEMP.

3.2 ROLES AND RESPONSIBILITIES

The construction works contractor (CWC) would put an experienced construction management team in place. The Project Manager would have overall responsibility for environmental management at the proposed development site. The indicative roles and responsibilities for the relevant site personnel are detailed below.

Project Manager

The Project Manager's responsibilities are as follows:

- Management of the project;
- Implementing the Construction Environmental Management Plan;
- Monitoring the performance of the CEMP and maintaining records to demonstrate compliance with the CEMP and Construction Method Statement;
- Updating the Construction Environmental Management Plan as required;
- Ensuring no deterioration of the environment occurs as a result of the project;
- Co-ordinating the construction team;
- Implementing the Health and Safety Plan and associated responsibilities;
- Production of construction programmes;
- Maintaining of relevant records and registers;
- Ensuring site personnel receive induction and are provided with the relevant information relating to the protection of the environment during works;
- Dealing with any queries or complaints from the public.
- Maintaining a project diary.

Quality Manager

The Quality Manager would report to the Project Manager. Their responsibilities are as follows:

- Implementing the Construction Environmental Management Plan;
- Management of quality issues relating to the project;
- Co-ordinating the construction teams;
- Ensuring that method statements are in place;
- Implementing the Health and Safety Plan.

Site Engineer

The Site Engineer would report to the Project Manager. Their responsibilities are as follows:

- Ensuring that all aspects of the project comply with the Construction Environmental Management Plan;
- Materials procurement;
- Design of Temporary Works;
- Administration;
- Programming and planning;
- Implementing the Health and Safety Plan;
- Maintaining a project diary.

EHS Officer

The EHS Officer would report to the Project Manager. Their responsibilities are as follows:

- Ensuring the Health and Safety Plan is implemented;
- Ensuring the Construction Environmental Management Plan is being implemented and followed at all times;
- Updating the Construction Environmental Management Plan as required;
- Ensuring all personnel have received safety inductions;
- Investigating any accidents, incidents or near misses;
- Ensuring relevant personnel have received training in environmental issues;
- Undertaking site audits on a regular basis.

All Staff and Sub-contractors

All site personnel and sub-contractors have the following responsibilities:

- Ensuring the requirements of the Construction Environmental Management Plan are followed;
- Co-operate with the Project Manager and EHS Officer in the implementation and development of the CEMP;
- Co-operate as required with site inspections and audits;
- Report all incidents, accidents and near misses to the Project Manager and/or EHS Officer.

3.3 REGULATIONS AND REQUIREMENTS

3.3.1 Legislative Context

The following list of acts and regulations, which is not exhaustive, would be complied with by the construction works contractor throughout the proposed project:

- The Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000;
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011) and (Amendment) Regulations, 2015 (S.I. No. 355 of 2015), transposing the Habitats Directive 92/43/EEC (as amended) and Birds Directive 2009/147/EC;
- The Flora (Protection) (S.I. No. 235 of 2022);
- Planning and Development Regulations, 2001 to 2022;
- The Local Government (Water Pollution) Act, 1977, as amended;
- The Fisheries (Consolidation) Act, 1959, as amended;
- Fisheries (Amendment) Act, 1999;
- European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- Water Framework Directive (2000/60/EC);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) and 2016 (S.I. No. 366 of 2016);
- Air Pollution Act, 1987;
- Air Quality Standards Regulations, 2011 (S.I. No. 180 of 2011), transposing the Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC);
- Planning and Development Act 2000 (S.I. No. 30 of 2000), as amended;
- The EPA Act (Noise) Regulations 1994 (S.I. No. 179 of 1994);
- European Communities (Construction Plant and Equipment) Permissible Noise Levels Regulations, 1988 (S.I. No. 320 of 1988), as amended;
- European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001 (S.I. No. 632 of 2001);
- Council Directive 1999/31/EC on the Landfilling of Waste and Council Directive 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills;
- Waste Framework Directive 2008/98/EC;
- WEEE Directive 2012/19/EU;
- Waste Management Act 1996 as amended;
- Waste Management (Hazardous Waste) Regulations 1998 (S.I. 163 of 1998) and (Amendment) Regulations 2000 (S.I. 73 of 2000);

- Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009);
- European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (WEEE) (S.I. 149 of 2014);
- Litter Pollution Act 1997 and Litter Pollution Regulations 1999 (S.I. 359 of 1999);
- Waste Management (Prohibition of Waste Disposal by Burning) Regulations 2009 (S.I. 286 of 2009), as amended;
- European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011), (Amendment) Regulations 2016 (S.I. 315 of 2016), and European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. 223 of 2015), European Union (Waste Directive) (Recovery Operations) Regulations 2016 (S.I. 372 of 2016).

3.3.2 Relevant Guidelines

The following list guidance documents, which is not exhaustive, would be consulted as relevant by the construction works contractor throughout the proposed project:

- *Environmental Good Practice on Site* (CIRIA, 2015);
- *Control of Water Pollution from Construction Sites; guidance for consultants and contractors* (CIRIA, 2001);
- *Control of Water Pollution from Construction Sites – Guide to Good Practice* (CIRIA, 2002);
- *The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (National Roads Authority (NRA), 2010);
- *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes* (NRA, 2006a);
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2006c);
- *Bat Mitigation Guidelines for Ireland* (Kelleher and Marnell, 2006);
- *Bats & Lighting: Guidance Notes for Planners, Engineers, Architects and Developers* (Bat Conservation Ireland, 2010);
- *Assessment of dust from demolition and construction 2014* (Institute of Air Quality Management, 2014);
- *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (NRA, 2004);
- *Code of practice for noise and vibration control on construction and open sites* (British Standard 5228-1, 2009);
- *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (DoEHLG, 2006);

3.4 ENVIRONMENTAL AWARENESS AND TRAINING

Prior to works commencing onsite, this CEMP and its contents would be communicated to all site personnel, including sub-contractors, as part of induction training. Site induction would be mandatory for all employees, sub-contractors and visitors to the development site. The site induction would include the following aspects:

- Organisational structure of the construction team;
- Key environmental roles and responsibilities;
- Communications and contacts;
- Sensitive environmental receptors;
- Incident and emergency response;
- General good environmental practices.

Specific training would be provided, where necessary, to nominated personnel to address any incidents or emergencies that could have a potential to cause environmental pollution. This training would be provided to staff via toolbox talks, and may address issues such as the following:

- Water Pollution;
- Spill Control;
- Noise Pollution;
- Dust Pollution;
- Waste Management.

3.5 DOCUMENT REVIEW AND UPDATES

To ensure the CEMP remains "fit for purpose", it would be reviewed and updated as necessary throughout the construction phase to ensure that it continues to facilitate efficient and effective delivery of the project environmental commitments for the protection of the environment.

The CEMP would be reviewed to address, for example, the following;

- Any recommendations, comments or observations received by Kildare County Council following the submission of the CEMP for approval;
- Any requirements or issues highlighted by prescribed bodies such as the NPWS;
- To ensure it reflects best practice at the time of construction;
- To ensure it incorporates findings from previous inspections and audits undertaken by the construction works contractor;
- To ensure it incorporates findings and/or recommendations arising from the site meetings between the construction works contractor and clients.

The Project Manager and EHS Officer would be responsible for the review of the CEMP and would ensure that any revisions to the CEMP are effectively communicated as appropriate to onsite personnel and sub-contractors.

3.6 ENVIRONMENTAL COMMITMENTS

The clients recognise that construction works have the potential to adversely impact upon the environment and would therefore ensure that the construction works contractor is committed to the effective implementation of the CEMP. Compliance with the CEMP, including all procedures, work practices and controls, would be mandatory by all personnel and sub-contractors employed during the construction phase. The CEMP outlines the necessary control measures that are required to avoid, minimise or mitigate potential effects on the environment.

The construction works contractor would be committed to the implementation of the controls measures specified within the following sections:

- Dust Management – Section 5.1;
- Surface Water, Groundwater and Soil Contamination Control – Section 5.2;
- Terrestrial Biodiversity Protection Protocol – Section 5.3;
- Invasive Species Control – Section 5.4;
- Noise and Vibration Control – Section 5.5;
- General Traffic Control – Section 5.6;
- Waste Management Control – Section 5.7;
- Chemicals and Hazardous Materials Management – Section 5.8.

The Project Manager, Quality Manager and EHS Officer would be responsible for the implementation of the CEMP throughout construction works. The Project Manager would be responsible for monitoring the performance of the CEMP and maintaining records to demonstrate compliance with the CEMP and would be assisted by the EHS Officer.

3.7 COORDINATION WITH EXTERNAL ENTITIES

In the event of an environmental incident at the site, the construction works contractor would follow the Emergency Management Plan as appropriate. The construction works contractor would liaise with the relevant third parties as appropriate, which may include the following:

- Emergency Services;
- Kildare County Council;
- National Parks and Wildlife Service;
- Environmental Protection Agency

4.0 ENVIRONMENTAL IMPACTS

4.1 AIR QUALITY IMPACTS

Generally, the primary potential air quality impact or nuisance associated with construction activities is dust. Excavations and earth moving operations may generate quantities of construction dust, particularly in drier weather conditions. The extent of any construction dust generation depends on the nature of the construction dust (soils, sands, gravels, silts etc.) and the construction activity. The potential for construction dust dispersion depends on the local meteorological conditions such as rainfall, wind speed and wind direction.

Particulate Matter (PM10 and PM2.5) is measured at Naas Town Air Monitoring Site approximately 16km to the north-east of the proposed development and has a Current Index: 1 (Good). The proposed development is located in the Air Zone D (Rural Ireland) and has a current Air Quality Index status of "3-Good".

The issue of construction dust dispersion may be exaggerated with vehicles transporting sand/gravels/concrete/etc. to and from the site, having the potential to cause an environmental nuisance to use of the local road.

Dust is normally defined as particulate matter in the size range of 1 - 75µm in diameter, with particles less than 1µm being classified as smoke or fumes. Particles greater than 10µm are associated with public perception and nuisance. Dusts are normally present in the atmosphere at varying levels of concentration and can have a wide variety of man-made and natural origins including:

- Products of combustion from e.g. fires, power stations and motor vehicles;
- Mechanical handling of minerals and allied materials;
- Industrial activities.

Dust particles are dispersed by their suspension and entrainment in airflow. Dispersal is affected by the particle size, shape and density, as well as wind speed and other climatic effects. Smaller dust particles remain airborne for longer, dispersing widely and depositing more slowly over a wider area.

The main potential sources of air borne dust from construction activities are as follows:

- Construction vehicles, construction traffic and haulage routes;
- Excavation works and earth-moving activities;
- Materials (particularly excavated soils) handling, storage and stockpiling.

Construction dust control is a common part of construction management practices. The effect of construction activities on air quality, in particular construction dust, would not be significant following the implementation of standard working practices and the proposed environmental control measures outlined in Section 5.1.

4.2 SURFACE WATER, GROUNDWATER AND SOIL IMPACTS

During construction works, the main potential impacts upon surface water quality, groundwater quality and soils would be the release of suspended solids during soil disturbance works and

the release of potentially polluting substances, such as hydrocarbons (fuels and oils) and uncured concrete.

Suspended solids could become entrained in surface water run-off and could affect aquatic habitats through deposition. An increase in sediments has the potential to impact upon fish by damaging gravel beds required for spawning, smothering fish eggs and in extreme cases, by interfering with the gills of fish. An increase in suspended solids has the potential to reduce water clarity, which can impact the light penetration of water and may also affect certain behaviours of aquatic fauna such as foraging success. Aquatic flora and fauna could also be impacted upon by an increase in nutrients which are bound to suspended solids. A significant increase in nutrients can result in excessive eutrophication, leading to deoxygenation of waters and subsequent asphyxia of aquatic species.

Another potential source of contamination to surface water quality during construction works would be the potential release of uncured concrete. In the event of uncured concrete entering surface water, the pH would be altered locally, potentially causing an adverse impact upon aquatic flora and fauna and causing an alteration to the waterbody substrate.

As there are no watercourses or drainage ditches within the development site, the potential for construction works to impact upon water quality will be reduced. The Tully Stream is located approximately 1.6km to the south-west, respectively. Any potential run-off will percolate to ground or will be captured by the existing surface and stormwater drainage infrastructure within the urban environs of proposed development site. Measures to protect groundwater will be implemented during the construction phase.

A potential source of chemical contamination would be from the release of hydrocarbons from construction plant and equipment. Hydrocarbons can affect water quality, potentially resulting in toxic and / or de-oxygenating conditions for aquatic flora and fauna. Pollution could occur in a number of ways, such as neglected spillages, the storage handling and transfer of oil and chemicals and refuelling of vehicles.

With regards the stripping of soils and subsoils at the development site, excavated subsoils and soils would be reused in the reinstatement process where possible. Therefore, there would be no significant impact upon soils due to excavation activities. Specialist machinery would be used during construction works to minimise the potential compaction of soils and subsoils. Control measures would be put in place to ensure that no deterioration in watercourses would arises as a result of the construction of the proposed development.

4.3 TERRESTRIAL BIODIVERSITY IMPACTS

Construction activities have the potential to impact upon terrestrial biodiversity through destruction and loss of habitat, disturbance due to noise and dust, the potential introduction of invasive species and light pollution. The construction phase of the development would not result in a direct and permanent loss of any habitat of significance. The main development site is comprised of improved agricultural grassland (GA1). This habitat would be considered as having been modified and of low ecological value. Therefore, the loss of this habitat would not be considered significant. The construction phase of the development would not result in a direct and permanent loss of ecologically valuable habitats. The majority of the flora found within the site are agricultural grassland species and are not of conservation status or of high

ecological value. The majority of the existing hedgerows and treelines will be maintained with additional planting as per the landscape plan. Some sections of hedgerow will be removed (approx. 302m) and mature trees as per the Landscape Plan and Arborist Assessment of tree health.

Dust emissions may arise during construction activities, in particular during earth-moving works, which may have the potential to impact upon photosynthesis, respiration and transpiration processes of flora due to the blocking of leaf stomata and have the potential to cause nuisance to fauna. Given the transient nature of construction works, and the scale of the development, the potential impact to flora and fauna would not be considered significant. Construction work has the potential to disturb fauna due to the generation of construction noise. However, construction noise would not be considered to pose a significant risk to fauna owing to the transient nature of works and given that all vehicles where possible would be equipped with mufflers to suppress noise, as is standard practice. As the site is located beside a built-up area with residences and commercial enterprises nearby, any fauna in the vicinity would be accustomed to elevated noise levels which are typical of urban settings. Where possible, no construction works would be conducted outside of normal working hours, therefore there would be no significant disturbance to nocturnal species.

During construction works, there is potential for invasive species to be introduced to the site through the movement of materials, such as soil and stone, and the arrival of construction plant and equipment from an area with invasive species. Materials containing invasive species such as Japanese Knotweed (*Fallopia japonica*) or Indian Balsam (*Impatiens glandulifera*) are considered "controlled waste" and, as such, there are legal restrictions on their handling and disposal. Under Regulation 49(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), it is a legal requirement to obtain a license to move "vector materials" listed in the Third Schedule, Part 3. Under Regulation 49(2) of the aforementioned regulations, it is an offence to plant, disperse, allow or cause to disperse, spread or otherwise cause to grow in any place any plant which is included in Part 1 of the Third Schedule.

Artificial lighting has the potential to negatively impact upon nocturnal species, particularly bat species, as illumination can impact upon their roosting sites, commuting routes and foraging areas. While some bat species, such as Leisler's bats (*Nyctalus leisleri*), may take advantage of prey concentrating around light sources, other bat species are sensitive to lighting and will avoid artificially lit up areas. Measures, as outlined in Section 5.3, would therefore be implemented by the construction works contractor to reduce the potential impact of light pollution. The potential impact of construction works upon aquatic flora and fauna due to a potential deterioration in water quality are discussed in Section 4.2 above.

4.4 NOISE IMPACTS

Construction noise, while inherently noisy and disruptive, is temporary in duration. It is anticipated that the construction of the proposed development would take approximately 36 months to complete. The works involving heavy machinery for the purposes of excavation, the preparation of building foundations and passing construction traffic usually cause the most disturbances to nearby residents.

Generally, the type of works involved at this development site would include the following:

- Excavation/Levelling: Excavator, dump truck & dozer.
- Foundations: Excavations, cement mixers & concrete vibrators and piling.
- General Construction: Masonry construction, services, drainage and surfacing etc.

There are currently no published Irish guidance documents relating to permissible noise levels that may be generated during the construction phase of a project. However, the National Road Authority (NRA) has published the document "Guidelines for the Treatment of Noise and Vibration in National Road Schemes", 2004. This document provides a useful reference for assessing construction noise of the proposed development. The NRA considers that the noise levels provided in the table below are typically deemed acceptable.

Table 4.1: NRA Acceptable Noise Levels

DAYS / TIMES	LAEQ (1HR) DB	LPA (MAX)SLOW DB
Monday to Friday (07:00 to 19:00hrs)	70	80
Monday to Friday (07:00 to 22:00hrs)	60	65
Saturday (08:00 to 16:30hrs)	65	75
Sundays and Bank Holidays (08:00 to 16:30hrs)	60	65

4.5 TRAFFIC IMPACTS

The site is accessed by the entrance which is located along the R445 Regional Road which is adjacent to the site's southern boundary. The M7 motorway is located approximately 4.3km to the west. Construction works have the potential to impact upon traffic volumes in the area, which may subsequently impact upon the generation of noise and dust emissions.

Traffic impacts may arise via the following:

- Delivery of construction plant and equipment to the site;
- Delivery of raw materials to the site;
- Vehicle movements from staff, sub-contractors and site visitors travelling to and from the site;
- Vehicle movements associated with waste removal at the site.

4.6 WASTE MANAGEMENT IMPACTS

It is anticipated that the following categories of waste may be generated during the construction of the project:

Table 4.2: Categories of Waste Generated During Construction

WASTE TYPE	EWC CODE	ORIGIN
Concrete	17 01 01	Waste concrete may arise due to surplus concrete from pouring activities.
Wood	17 02 01	Wood waste may arise during construction works, including building and shuttering works, due to damaged / defected wood, off-cuts and surplus wood.
Glass	17 02 02	Glass waste may arise due to damaged / defected glass and accidental breakages.
Plastic	17 02 03	Plastic waste may arise due to damaged / defected products.
Metals (including alloys)	17 04 01 - 07	Waste metal may arise due to damaged / defected metal, off-cuts and surplus metal.
Soils and Stones	17 05 04	Excavated soils and stones waste would arise during site excavations and earth-moving activities.
Insulation materials and asbestos containing construction materials	17 06	Waste may arise due to damaged / defected insulation panels and off-cuts.
Biodegradable waste	20 02 01	Green waste would arise during site clearance works, with the removal of existing vegetation at the site.

Other waste materials which may arise during construction works in small volumes include:

- Waste Oils and Liquid Fuels – EWC 13 02 and EWC 13 07;
- Waste from Electrical and Electronic Equipment – EWC 16 02;
- Cables – EWC 17 04 11;
- Paints – EWC 20 01 28;
- Wood Preservatives – EWC 03 02;
- Batteries – EWC 16 06.

Wastes from EWC fractions EWC 03 02, EWC 13 02, EWC 13 07, EWC 16 02 and EWC 16 06 may be hazardous.

Throughout the construction phase, wastes generated would be managed by the construction works contractor in order of priority in accordance with Section 21A of the Waste Management Act 1996, as amended, as per the waste hierarchy below.

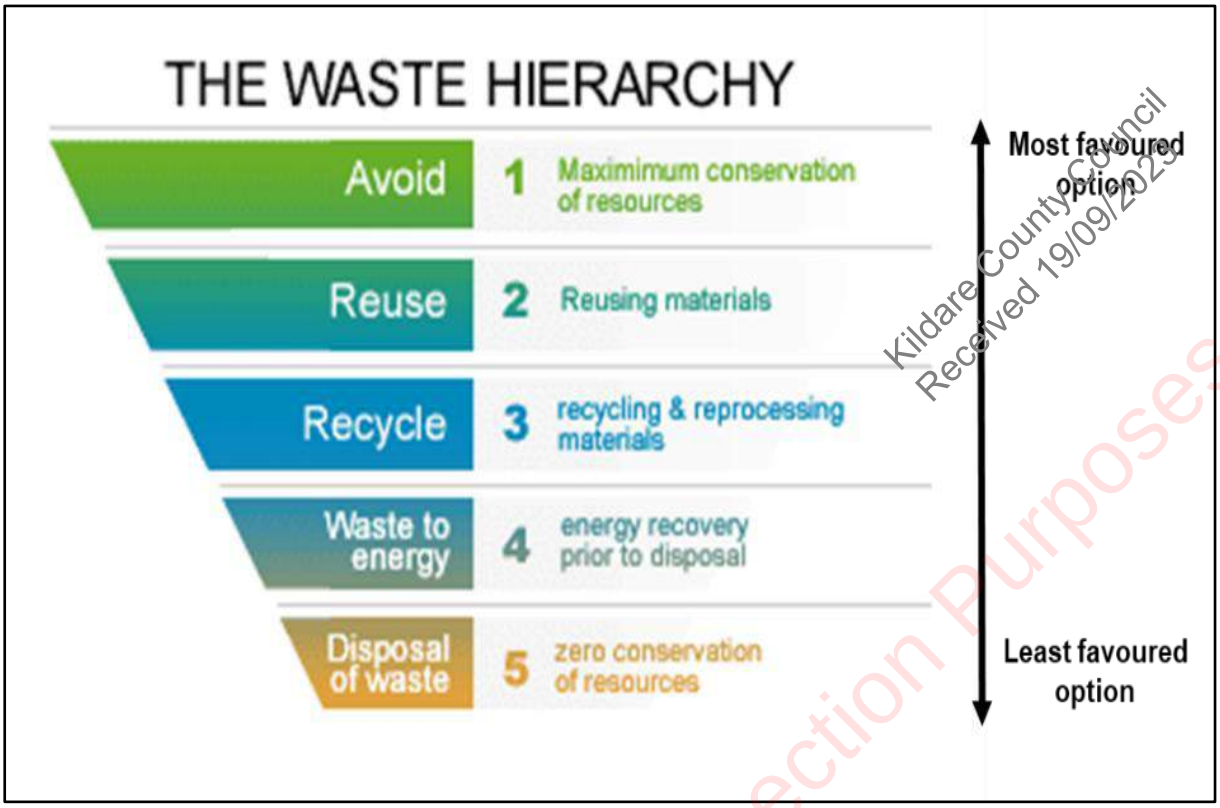

Figure 4.1: The Waste Hierarchy

4.6.1 WASTE STORAGE

A designated waste storage area would be established within the proposed development footprint at Ruanbeg, Kildare Town, Co. Kildare, which must be kept away from any drainage network, by the construction works contractor.

Suitable waste receptacles / skips would be provided by the appointed waste contractor(s) during the construction phase, with skips / bins allocated to specific waste streams to avoid contamination. Waste receptacles would be appropriately labelled. Waste receptacles will be located the front open area of the site.

Where waste fuels and oils are generated, they would be stored within a bunded container within the designated waste storage area.

Any hazardous materials would be stored separately from non-hazardous waste and would be stored within bunded containers / upon a bund where appropriate.

The removal of waste from the site would be undertaken on a regular basis, preventing large volumes of waste accumulating onsite.

4.6.2 WASTE CONTRACTORS

The waste contractor(s) appointed for the project would have experience in construction waste management and would be appropriately licenced, holding the relevant waste collection permit and/or waste licences for the types of waste anticipated to be generated during construction works. Wastes from the site would be recycled / recovered or disposed of at suitably licenced waste facilities.

All waste removed off site will be recorded on the waste dispatch log.

A copy of all waste permits and licences should be provided to the Resource Manager before works commence and held throughout the construction phase.

The resource manger would ensure that copies of all waste contractors' collection permits and licences would be available for inspection, as discussed in the "Record Keeping" section below.

4.6.3 RECORDS

For each waste movement and for each type of waste, the construction works contractor would obtain a signed waste docket from the waste contractor.

The following information shall be recorded for each load of waste exported off-site:

- Time and date of transfer,
- Waste Type LoW Code and description.
- Tonnage of waste collected.
- Haulage contractor's name, address Waste Collection Permit Number, truck registration and haulage ticket /docket number.
- Disposal contractor / facility name, address and Waste Permit / Licence number.
- Description of how waste at facility shall be treated i.e. disposal / recovery / export
- Confirmation of waste acceptance letter received int eh case of soil and stones.

5.0 ENVIRONMENTAL CONTROL MEASURES

5.1 DUST MANAGEMENT

The following dust control measures would be implemented by the construction works contractor for the duration of the construction of the proposed development:

- Cognisance would be taken of the guidelines published by the Institute of Air Quality Management (IAQM), "Assessment of dust from demolition and construction 2014";
- Material handling systems and site stockpiling of materials would be designed and laid out to minimise exposure to wind;
- Prolonged storage of materials onsite would be avoided;
- When transporting materials to and from the site, vehicles would be fitted with covers where possible to prevent material loss;
- Public roads outside the site would be regularly inspected for cleanliness and cleaned as necessary. A road sweeper would be used if required;
- Re-seeding would be undertaken where required to promote the rapid stabilisation of soils;
- Regular visual inspections would be undertaken around the proposed site boundary to monitor the effectiveness of dust control measures;
- Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed phasing of the development. At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas;
- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust management plan will be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

Should additional dust control measures be required, for instance during particularly dry weather, dust suppression measures would be undertaken, including the following:

- Water misting plant, such as bowsers and sprays would be used as required and where necessary;
- Where practicable, stockpiles of excavated soils and exposed surfaces would be dampened down via misting plant.

Air Quality

- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds on site so as to minimise the generation of airborne dust.
- A 3m high solid wooden hoarding with a 3m high dust net shall be erected around the entire construction site perimeter giving a total dust barrier height of 6m.
- Use of rubble chutes and receptor skips during construction activities.
- During dry periods, dust emissions from heavily trafficked locations (on and off site) will be controlled by spraying surfaces with water and wetting agents.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only.
- A road sweeper vehicle shall be on-site at all times to clean soiled public roads in the vicinity of the site.
- A mobile wheel wash unit shall be installed at the site exit to wash down the wheels of all trucks exiting the site.
- An independent environmental consultant shall be appointed by the contractor to prepare a dust control and monitoring method statement prior to the commencement of site activities.
- A weekly inspection of each dust gauge will ensure that the site manager identifies at the earliest instance if dust suppression techniques shall be implemented at the project site areas.
- Re-suspension in the air of spillages material from trucks entering or leaving the site will be prevented by limiting the speed of vehicles within the site to 10kmh and by use of a mechanical road sweeper.
- The overloading of tipper trucks exiting the site shall not be permitted.
- Aggregates will be transported to and from the site in covered trucks.
- Where the likelihood of windblown fugitive dust emissions is high and during dry weather conditions, dusty site surfaces will be sprayed by a mobile tanker bowser.
- Wetting agents shall be utilised to provide a more effective surface wetting procedure.
- Exhaust emissions from vehicles operating within the construction site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised by routine servicing of vehicles and plant, rather than just following breakdowns; the positioning of exhausts at a height to ensure adequate local dispersal of emissions, the avoidance of engines running unnecessarily and the use of low emission fuels.
- All plant not in operation shall be turned off and idling engines shall not be permitted for excessive periods.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Material stockpiles containing fine or dusty elements including top soils shall be covered with tarpaulins.
- Where drilling or pavement cutting, grinding or similar types of stone finishing operations are taking place, measures to control dust emissions will be used to prevent unnecessary dust emissions by the erection of wind breaks or barriers. All concrete cutting equipment shall be fitted with a water dampening system.
- A programme of air quality monitoring shall be implemented at the site boundaries for the duration of construction phase activities to ensure that the air quality standards relating to dust deposition and PM_{10} are not exceeded. Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

5.2 SURFACE WATER, GROUNDWATER AND SOIL CONTAMINATION CONTROL

- The construction works contractor would adhere to standard construction best practice, taking cognisance of the Construction Industry Research and Information Association (CIRIA) guidelines "*Control of Water Pollution from Construction Sites; guidance for consultants and contractors*" 2001 and "*Control of Water Pollution from Construction Sites – Guide to Good Practice*", 2002;
- Cognisance would be taken of the 2016 guidelines published by Inland Fisheries Ireland, "*Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters*";
- Daily visual inspections would be undertaken of the site access road to ensure no silt-laden surface water runoff leaves the site, with the potential to either join with any adjacent surface water drainage systems within the vicinity.
- Where spoil is generated, this would only be stored temporarily. A designated spoil area would be established by the construction works contractor within site footprint at the site. Where possible, spoil would be covered or alternatively, graded to avoid ponding or water saturation;
- Manhole covers and stormwater gullies along the R445 will be protected by silt blankets/mats;
- Should water be encountered during excavation works, water would be pumped to a constructed silt control feature, such as a tanker. A filter would be provided at the pump inlet and, where required, dewatering bags or silt traps would be used at the outlet to retain any potential silt entrained in the water. Pumping operations would be supervised at all times;
- Water would not be discharged directly to any watercourse, drainage ditch or drainage network;

- Excavations and earth-moving activities would be planned outside periods of heavy rainfall, to limit the potential for suspended solids to become entrained within surface water run-off;
- Ensure that all surface water run-off discharged to groundwater via soakaways is passed through systems for settlement or filtration of suspended solids with the parallel effect of removing contaminants (certain heavy metals and hydrocarbons) associated with the suspended solid;
- On-site settlement ponds are to include geotextile liners and riprapped inlets and outlets to prevent scour and erosion.
- All construction plant machinery and equipment would be maintained in good working order and regularly inspected;
- All hazardous substances on-site shall be controlled within enclosed storage compounds that shall be fenced-off and locked when not in use to prevent theft and vandalism;
- A designated area for the storage of hydrocarbons would be established by the construction works contractor and inspected on a regular basis;
- Spill kits, adequately stocked with spill clean-up materials such as booms and absorbent pads, would be readily available onsite;
- The construction works contractor would ensure the relevant site personnel are trained in spillage control;
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds;
- There would be no discharge of effluent to groundwater during the construction phase. All wastewater from the construction facilities would be stored for removal off site for disposal and treatment;
- In the unlikely event of a suspected deterioration in water quality within nearby watercourse or drainage ditch due to construction works at the development site, works would immediately cease, an investigation into the cause undertaken and the relevant NPWS and Inland Fisheries Ireland personnel informed;
- Surface water runoff from areas stripped of topsoil will be directed to temporary on-site settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate;
- Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains.

Additional controls to reduce the potential impact upon soils include the following:

- Specialist machinery (such as tracked machinery) would be used to minimise the potential compaction of soils;
- Excavated materials would be stockpiled onsite, segregated into topsoil and subsoils, and reused in reinstatement activities where possible;
- Any fill and aggregate material required onsite would be sourced from reputable, local quarries.

5.3 BIODIVERSITY PROTECTION PROTOCOL

It is considered that the implementation of the controls and measures outlined in Sections 5.1 – 5.8 would reduce any potential adverse impacts upon the biodiversity in the area. The following control measures are also recommended to ensure that the proposed construction works would not have any significant impact upon biodiversity:

- If works should take place beside any trees that will remain as part of the landscape plan, then a root protection zone will be established to ensure no construction works will disturb the root zone;
- The Tree Protection Plan has been prepared with regard to the British standard BS 5837:2012 Trees in relation to design and construction recommendations this standard gives recommendations and guidance on the principles to be applied to achieve a satisfactory juxtaposition of trees, including shrubs, hedges and hedgerows, with structures;
- The construction works contractor would take cognisance of the NRA's document "*Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes*", 2006. In particular, the construction works contractor would take cognisance of the guidelines with regards soakaway, sewage system and drainage ponds area and the determination of the root protection area of the existing trees to be retained within the development site;
- All construction works would be confined as far as possible to the development footprint;
- Where possible, no construction works would be conducted outside of normal working hours, to reduce potential noise disturbance to nocturnal species;
- Should a protected fauna species such Badger or roosting Bat be found during the construction works, an officer of the NPWS would be notified prior to the resumption of construction works;
- Where possible, any vegetation removal works would be scheduled outside of the 1st of March to the 31st of August period, so as not to disturb nesting bird species;
- Felling of moderate roost potential trees should be only undertaken in the period late August to late October/early November;
- Felled trees should be left for 48 hours, to allow for any potential bats to escape;
- A preconstruction survey of the site for protected species such as Badger must be done prior to any site clearance works;

Construction works have the potential to impact upon bat species due to lighting disturbance on commuting and foraging habitat. Therefore, the following measures would be implemented by the construction works contractor:

- Construction works in the hours of darkness, when bats are active (April – October), would be kept to a minimum;
- Should lighting be required during construction works, it would be of a low height (without compromising safe working conditions) to ensure minimal light spill. Where possible and where practicable to do so, timers or motion sensors would be used;
- Directional lighting would be used where possible, by use of louvres or shields fitted to the lighting;

- White light emitting diode (LED) would be used where possible, which is considered to be a low impact in comparison to other lighting types.

5.4 INVASIVE SPECIES CONTROL

The following controls for the prevention / treatment of invasive flora species would be implemented throughout the construction phase of the development:

- Regular site inspections would be undertaken to ensure that no growth of invasive species has taken place;
- All relevant construction personnel would be trained in invasive flora species (main species of concern) identification and control measures;
- If an invasive species of flora is found growing at the site, then an invasive species management plan must be put in place such as Best Practice Management Guidelines on Indian Balsam (Kelly, Maguire, and Cosgrove, 2008);
- The construction works contractor would ensure that all equipment and plant is inspected for the presence of invasive species and thoroughly washed prior to arriving to, and leaving from, the development site;
- In the event of an invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 appearing onsite, works within the immediate vicinity would cease until the invasive plant has been appropriately treated and disposed of to a suitably licenced facility, in accordance with Regulation 49 of the 2011 Regulations;
- Only suitably licenced and trained personnel should use herbicides, following guidelines and instructions on correct use;
- Cognisance would be taken of National Roads Authority's Guidelines on "The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads".

5.5 NOISE AND VIBRATION CONTROL

The following noise control measures would be implemented by the construction works contractor for the duration of the construction of the proposed development:

- Cognisance would be taken of the National Roads Authority's "Guidelines for the Treatment of Noise and Vibration in National Road Schemes", the British Standard 5228: Part 1 "Code of practice for Noise Control on Construction and Open Sites" and the CIRIA 2015 "Environmental Good Practice on Site";
- Plant and machinery used on-site would comply with the EC (Construction Plant and Equipment) Permissible Noise Levels Regulations, 1988 (S.I. No. 320 of 1988). All noise producing equipment would comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001;
- All construction activities would take place between 8:00am and 6:00pm, Monday to Friday, and 8:00am to 1:00pm on Saturdays. Any works which, by necessity, are required to be carried out outside of these times would be notified to the relevant bodies and any potentially effected local residents in good time and prior to specified works commencing;
- No plant used on site would be permitted to cause an ongoing public nuisance due to noise;

- Where required, screens or barriers would be installed to shield particularly noisy activities;
- Deliveries would be organised to arrive during daytime hours (between 8:00am and 6:00pm, Monday to Friday, and 8:00am to 1:00pm on Saturdays);
- Care would be taken when unloading vehicles to minimise noise disturbance. Materials should be lowered, not dropped, insofar as practicable and safe;
- Regular maintenance would be carried out on all construction equipment, machinery and vehicles;
- Construction plant would be operated in accordance with the operator's instructions;
- Engine and machinery covers would be maintained in good working order and would remain closed whenever machinery is in use;
- Where practicable, all mechanical plant would be fitted with effective exhaust silences and pneumatic tools fitted with mufflers or silencers;
- Any compressors required would be silenced or sound reduced models fitted with acoustic enclosures would be utilised;
- Construction plant would be selected, where possible, with low inherent potential for the generation of noise;
- Construction plant would be switched off or throttled back to a minimum when not in use;
- Staff personnel would be instructed to avoid unnecessary revving of machinery;
- Site personnel would notify the Project Manager in the event equipment or plant becomes defective, resulting in high noise emissions. Any defective plant would be kept out of service until the necessary repairs are undertaken.

5.6 IMPORTED FILL

- The source of aggregate, fill material and topsoil imported to site will be carefully selected and vetted in order to ensure that it is of a reputable origin and that it is "clean" (i.e. will not contaminate the environment);
- Project contract and procurement procedures will be developed to ensure that aggregate, fill material and topsoil are acquired from reputable sources with suitable environmental management systems as well as regulatory and legal compliance;
- No large or long-term stockpiles of fill material will be held on the site. At any time, the extent of fill material held on site will be limited to that needed in the immediate vicinity of the active work area;
- Smaller stockpiles of fill, where required, will be suitably protected to ensure no sediment laden runoff enters existing surface water drains. Such stockpiles are to be located in order to avoid double handling.

5.7 EXCAVATION OF SUBSOIL LAYERS

Excavation of existing subsoil layers has been minimised as far as reasonably practicable. Cut type earthwork operations will be required to achieve designed site levels. Cut material is considered likely to be suitable to be reused as non-structural fill elsewhere on site. Confirmation of general suitability will be determined at detailed design stage, and individual loads will undergo sporadic testing to confirm uncontaminated status prior to widespread use on site. Dependent on the results of the detailed site investigation, any subsoil proposed for structural fill will undergo soil improvement work required at the direction of an appointed geologist.

- Disturbed subsoil layers will be stabilized as soon as practicable (e.g. backfill of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping).
- The duration that subsoil layers are exposed is to be minimised in order to mitigate against weather effects.
- Stockpiles of excavated subsoil material will be protected for the duration of the works. Stockpiles of subsoil material will be located separately from topsoil stockpiles.
- Measures will be implemented to capture and treat sediment laden surface water runoff (e.g. sediment retention ponds, surface water inlet protection and earth bunding adjacent to open drainage ditches).
- Mitigation of soil volumes could be undertaken by soil stabilisation and reuse of excavated subsoil layers and reuse in proposed pavement and building areas.

5.8 TRAFFIC CONTROL

A construction traffic management plan will be developed and implemented in order to minimise the disturbance caused by large vehicles. This management plan shall include and detail:

- Predetermined haul routes for earthworks plant and vehicles delivering construction materials to site.
- Vehicle wheel wash facilities in the vicinity of any site entrances and road sweeping to maintain the road network in the immediate vicinity of the site.
- Dust suppression measures (e.g. dampening down).

General construction traffic measures are outlined below;
The construction works contractor would undertake site entrance works to facilitate the access of traffic associated with the proposed development. The construction works contractor would ensure the following:

- Deliveries to the site would be via suitably contained vehicles, with sheeting and covers where required;
- Deliveries to the site would be scheduled during the construction hours of 8:00am to 6:00pm Monday to Friday, and 8:00am to 1:00pm on Saturdays;
- Deliveries and removals would be coordinated and scheduled to the site to avoid congestion on R445 and local road network.
- Where possible, large-scale vehicle movements would be timed outside peak hours on the local road network.
- The contractor shall provide for the safe passage of pedestrian and vehicular traffic and measures to keep the impact of the works on local roads, and local communities to a minimum;
- Local roads would be inspected and cleaned as necessary to ensure that access roads are kept clear of mud and debris;
- Advise haulage contractors on the appropriate routes to and from the site and to adhere to good traffic management principles;
- Materials would not be delivered to the site until required.

5.9 WASTE MANAGEMENT CONTROL

5.7.1 Waste Storage Area

A designated waste storage area located away from any drainage channels or manholes, would be established by the construction works contractor. Suitable waste receptacles / skips would be provided by the appointed waste contractor(s) during the construction phase, with skips / bins allocated to specific waste streams to avoid contamination. The number and size of waste receptacles / skips would be determined following the appointment of the waste contractor(s). Waste receptacles would be appropriately labelled.

Where waste fuels and oils are generated, they would be stored within a bunded container within the designated waste storage area. Any hazardous materials would be stored separately from non-hazardous waste and would be stored within bunded containers / upon a bund where appropriate. The removal of waste from the site would be undertaken on a regular basis, preventing large volumes of waste accumulating onsite.

5.7.2 Waste Contractors

The collection of wastes from the site would be undertaken by suitably authorised waste hauliers and would only be recycled / recovered or disposed of at suitably licenced waste facilities.

The construction works contractor would appoint a waste contractor(s) for the construction phase. The waste contractor(s) appointed for the project would have experience in construction waste management and would be appropriately licenced, holding the relevant waste collection permit and/or waste licences for the types of waste anticipated to be generated during construction works.

The waste contractor(s) would be appropriately licenced in compliance with the following regulations:

- Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007);
- Waste Management (Collection Permit) Amendment Regulations 2008 (S.I. No. 87 of 2008);
- Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007);
- Waste Management (Facility Permit and Regulations) Amendment Regulations 2008 (S.I. No. 86 of 2008).

The construction works contractor would ensure that copies of all waste contractors' collection permits and licences would be available for inspection, as discussed in the "Record Keeping" section below.

5.7.3 Waste Minimisation

Waste minimisation and prevention would be the responsibility of the construction works contractor, who would ensure the following:

- The efficient ordering and purchasing of materials to reduce surplus materials;

- Materials would be ordered in appropriate sequence to minimise materials stored on site;
- The correct storage of materials to minimise the generation of damaged materials, for example keeping materials packaged until they are ready to be used and storing materials which are vulnerable to water damage via precipitation under cover and raised above the ground;
- The handling of materials with care, to avoid undue damage;
- The return of uncured concrete to the batching plant where possible;
- The re-use of shutters for concrete works;
- Where possible, excavated subsoil and topsoil would be reused for the reinstatement of the development site.

The construction works contractor would reuse materials onsite where possible. In particular, inert wastes (such as concrete (EWC 17 01 01), bricks (EWC 17 01 02) and soils and stones (EWC 17 05 04)) would be used for infilling activities where suitable (and where required).

5.7.4 Management of Waste Streams

As mentioned in Section 4.6 above, wastes generated would be managed by the construction works contractor in order of priority in accordance with Section 21A of the Waste Management Act 1996, as amended.

Soils and stones arising from excavations would be reused in the reinstatement where possible. This would be investigated by the construction works contractor and would be subject to appropriate testing to ensure the material is suitable for its proposed end use.

Any excess excavated soils would be collected by a licenced waste contractor and either reused for reinstatement activities at other sites if suitable or disposed of as appropriate. Alternatively, the construction works contractor would investigate if excavated soils can be classified as a by-product under Article 27 of the Waste Directive Regulations, 2011. If a local use for the material is identified, and if the proposed end use meets the requirements of the Article 27 regulations, there would be no requirement to send this material to a waste facility.

In the event of any evidence of soil contamination being found during work on site, the appropriate remediation measures would be employed. Areas of potentially contaminated soil would be isolated and tested for contamination in accordance with the 2002 Landfill Directive (2003/33/EC). Any work of this nature would be carried out in consultation with, and with the approval of, the EPA and the Environmental Department of Kildare County Council. Pending the results of laboratory testing, this material would be excavated and exported off-site, by an appropriately Permitted Waste Contractor holding an appropriate Waste Collection permit for this hazardous material and would be sent for appropriate treatment / disposal to an appropriately Permitted / Licenced Waste Facility.

Concrete, Bricks, Tiles and Ceramics:
Surplus concrete would be returned to the batching plant where possible. Where concrete, blocks and bricks arise from construction activities, they would be crushed and used for ground-fill material were deemed suitable (should infill activities be required). Where these materials cannot be reused onsite, they would be diverted for recycling if possible.

Wood:
Waste wood would be reused for shuttering where suitable. Wood that is uncontaminated (free from preservatives and paints) would be segregated and recycled. Any wood not deemed suitable for recycling would be disposed of as appropriate.

Metal:
Metal is highly recyclable and has a considerable rebate value. Where metal cannot be reused onsite, the majority would be recycled.

Other Recyclables:
These include plastic, cardboard and paper. Where possible, the different recyclables would be segregated onsite and sent for recycling. With regards packaging waste, the construction works contractor would investigate the possibility of returning the packaging to the supplier.

Mixed Municipal Waste and Other Non-Recyclable Waste:
Wastes not suitable for reuse or recycling would be stored in separate waste receptacles. Prior to removal from site, the construction works contractor would inspect the receptacles / skips to ensure they contain no recyclable material or materials which can be reused.

Glass:
Small volumes of waste glass may be generated during the construction phase. As glass can contaminate other segregated waste streams, it would be collected separately where possible. The majority of glass would be recycled.

Green Waste:
Green waste may be sent for composting if not possible to reuse onsite during landscaping / re-instatement activities, or for disposal as deemed appropriate by the waste contractor.

Hazardous Materials:
Hazardous waste would be managed in accordance with the Waste Management (Hazardous Waste) Regulations 1998 and 2000. Small quantities of hazardous waste may be generated onsite. Examples of potentially hazardous wastes include fuels and oils, batteries, paints, adhesives and sealants. Hazardous waste would be stored separately from non-hazardous waste, would be appropriately labelled and would be stored upon bunds where appropriate. The construction works contractor would ensure that the appointed waste contractor is licenced to transport / accept hazardous waste prior to the waste leaving the site. Depending on the type of hazardous material, the waste may be recovered, recycled or disposed of appropriately.

Waste Electrical and Electronic Equipment (WEEE):
This waste, if generated, would be stored separately from other waste streams and would be covered pending collection. WEEE can contain hazardous components such as batteries. All hazardous wastes would be stored in appropriate secure bunded containers prior to removal from site. Some hazardous wastes may not be stored with other wastes. This would be determined by the contractor and appropriate precautions taken.

5.7.5 Records

For each waste movement and for each type of waste, the construction works contractor would obtain a signed waste docket from the waste contractor, detailing the weight, type of material, destination of material and whether the material is going for recycling, recovery or disposal.

The construction works contractor would retain copies of the waste contractors' relevant waste collection permits and waste licences on file throughout the construction phase.

5.10 CHEMICAL AND HAZARDOUS MATERIALS MANAGEMENT

5.8.1 Concrete

The following controls would be implemented throughout the construction phase:

- The use of pre-cast concrete where possible;
- The delivery and pouring of concrete would be supervised at all times;
- The pouring of concrete would be avoided during periods of expected heavy rainfall;
- Concrete would be poured directly into the shuttered formwork from the Ready-Mix Truck, reducing the risk of spillage;
- The wash-out of Ready-Mix Truck drums would not be permitted onsite, in the environs of the site, or at a location which could result in a discharge to surface water;
- Surplus uncured concrete would be returned to the batching plant where possible.

5.8.2 Hydrocarbons

The following controls for the handling and storage of hydrocarbons would be implemented throughout the construction phase:

- All construction plant machinery and equipment would be maintained in good working order and regularly inspected;
- Any fuels, oils or chemicals would be stored in accordance with the EPA guidance on the storage of materials, in a designated bunded area, with adequate bund provision to contain 110% of the largest drum volume or 25% of the total volume of containers;
- A designated area for the storage of hydrocarbons would be established by the construction works contractor and inspected on a regular basis;
- Deliveries of fuels and oils to the site would be supervised;
- Fuels / oils would be handled and stored with care to avoid spillage or leakage;
- Where appropriate, small construction plant equipment would be placed on drip trays;
- Any waste fuel / oils would be collected in bunded containers at the designated waste area and properly disposed of to an authorised waste contractor;
- Spill kits, adequately stocked with spill clean-up materials such as booms and absorbent pads, would be readily available onsite;
- In the unlikely event of a hydrocarbon spillage, contaminated spill clean-up material would be properly disposed of to an authorised waste contractor;
- The construction works contractor would ensure the relevant site personnel are trained in spillage control;
- Where construction plant shows signs of hydrocarbon leakage, site personnel would cease the operation of the item in plant in question and notify the Project Manager. Any defective plant would be kept out of service until the necessary repairs are undertaken.

5.8.3 Excavated Materials

This section should be read in conjunction with the dust control measures relating to the storage and handling of spoil outlined in Section 5.1. The following controls for the handling and storage of excavated materials would be implemented throughout the construction phase:

- Spoil would only be stored at the proposed development site temporarily. A designated spoil area would be established by the construction works contractor away from nearby drainage systems or manholes.
- Spoil would be covered or alternatively, graded, to avoid ponding and water saturation, in addition to minimising exposure to wind;
- Where required, silt fencing would be placed around spoil areas until such time as the excavated soil has been used in re-instatement works or removed offsite by a licenced waste contractor;
- Spoil would be used in the reinstatement process where possible;
- Reinstatement would be undertaken as soon as possible after excavation and earth-moving works.
- All imported fill material shall be sourced from approved sources and appropriately certified and fit for purpose. All fill material will be confirmed to be inert prior to importation to the site including confirmation of the chemical testing and a visual assessment. Fill sourced from non-licenced/non-permitted facilities will require prior authorisation under Article 27 legislation.

5.11 EMERGENCY MANAGEMENT PLAN

An Emergency Response Plan would be prepared for the proposed development by the construction works contractor, which would cover all potential risks, including environmental risks, such as fire, explosion, accidents, spillage and leaks. Designated site personnel would be trained as first aiders and fire marshals, with additional site personnel trained in environmental emergencies such as spill response procedures.

6.0 MONITORING AND AUDITING

6.1 REPORTING AND RECORD KEEPING

The Project Manager, in conjunction with the EHS Officer, would ensure that appropriate, detailed records are maintained during the construction phase of the development. Records of all works associated with the proposed development would be completed by the construction works contractor throughout the construction phase. Environmental records would include waste and site inspection records and where relevant, environmental incident and complaints records. Other records may include Safety Data Sheet records and a copy of the Safety File. Where relevant to the associated works, statutory inspection records would be maintained for such activities as excavations and lifting gear.

Where necessary and as requested by the local authority, copies of relevant construction activity records can be made available.

In the event of an environmental incident occurring at the site with the potential to cause environmental pollution, the Project Manager would notify the clients and the relevant third parties, as outlined in Section 3.7, as soon as practicable. Such environmental incidents may include:

- Fire;
- Water pollution event;
- Hydrocarbon or chemical spill;
- Excessive noise;
- Excessive dust.

Any complaints and/or incidents would be reported to the Project Manager. The Project Manager would be responsible for developing and maintaining a register of complaints and a register of incidents, with details on follow-up actions. The Project Manager would notify the clients as soon as practicable of any environmental complaint or incident.

6.2 ENVIRONMENTAL PERFORMANCE MONITORING

6.2.1 Safety Monitoring

The EHS Officer would be present at the development site during working hours, to ensure activities are undertaken in a safe manner.

6.2.2 Environmental Monitoring

The EHS Officer would be present at the development site during working hours, to ensure activities are undertaken in an environmentally sensitive manner. The EHS Officer would undertake regular site inspections and audits, at least weekly, to monitor the environmental performance of the site and address any potential environmental issues such as dust, litter and noise. Site inspections and audits would include the following:

- Assessment of public access roads;
- Assessment of neighbouring properties;
- Chemical and hydrocarbon storage area;
- Waste storage area;
- Spoil area.

The EHS Officer would be responsible for maintaining a register of all environmental monitoring and would communicate the site's environmental performance during site meetings.

6.3 MONITORING COMPLIANCE REPORTS

As noted in Section 6.2 above, site inspections and audits would be undertaken by the EHS Officer on a regular basis, at least weekly. These site inspections and audits would monitor the environmental performance of the site.

Where works are determined to be in breach of any specifications outlined within the CEMP, the EHS Officer shall notify the Project Manager, who would raise a non-compliance report

and notify the clients as soon as practicable. Non-compliance reports may also be raised as a result of an incident or potential incident, the receipt of a complaint or as a result of a regulatory inspection or audit.

The non-compliance report would include details on the nature of the non-compliance, the proposed corrective action required, action taken to prevent recurrence and verification that the corrective actions have been undertaken and the non-compliance has been closed out. Any non-compliances would be discussed at the fortnightly meetings between the construction works contractor and clients.

6.4 PROCEDURES TO REVIEW INSPECTIONS AND STEPS TO ADDRESS NON-COMPLIANCE

The Project Manager would be responsible for reviewing inspections, audits and any arising non-compliances. A review schedule would be decided upon between the construction contractors and the clients upon the approval of the CEMP by Kildare County Council.

The Project Manager would notify the clients as soon as practicable of any non-compliances arising during the construction of the proposed development. The Project Manager would be responsible for notifying the relevant third parties where required of non-compliances at the site and would liaise with third parties as necessary as to the outcome of the non-compliance. All non-compliances would be investigated immediately, and the construction works contractor would aim to close out non-compliances as soon as possible. As discussed in Section 6.3, the statuses of any non-compliances would be discussed at the fortnightly meetings between the construction works contractor and clients.

Where it has been determined that revisions to the CEMP are required to ensure recurrence of a non-compliance does not take place, the Project Manager and EHS Officer would make the necessary changes to the CEMP and would ensure that the revisions are effectively communicated as appropriate to onsite personnel and sub-contractors.

7.0 CONCLUSION

This CEMP has been prepared to demonstrate the commitment of the clients to environmental management at the proposed development site and outlines the work practices and control measures that would be implemented by the construction works contractor throughout the construction period to ensure that potential environmental impacts are effectively managed, reduced or eliminated.

The CEMP is considered a “live” document and would be reviewed and updated as appropriate upon approval by Kildare County Council and as necessary as construction works progress.

8.0 REFERENCES

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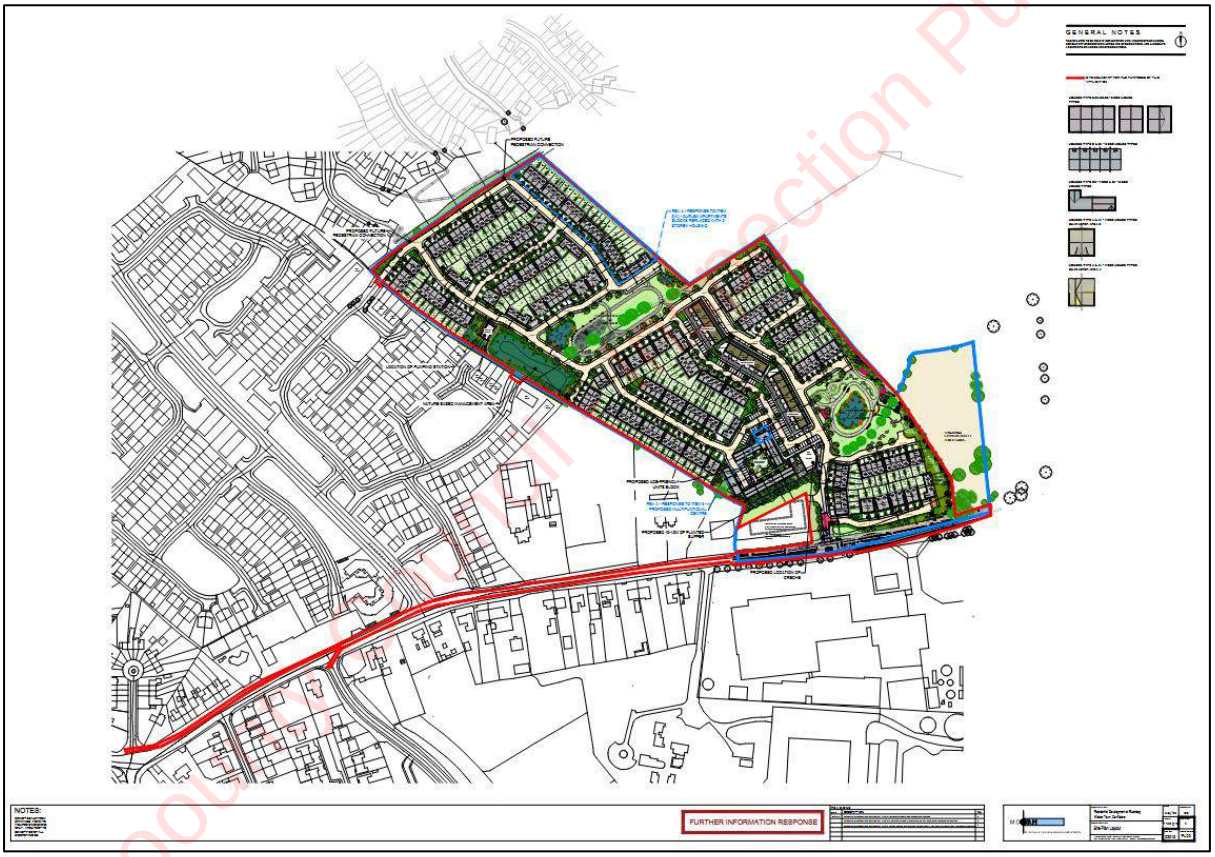
APPENDIX A

PROPOSED SITE LAYOUT



Appendix 5.5

Arboricultural Impact Assessment

No Change

Appendix 5.6

Tree Protection Plan

No Change

Appendix 5.7

Landscape Masterplan

Slight Change

KEY

PLANTING LEGEND

Existing Hedgerows to be Retained
- outside of developable area
(See Arborist's report for details)

Existing Hedgerows to be Retained
(See Arborist's report for details)

Existing Hedgerows to be Removed
(See Arborist's report for details)

Existing Trees to be Retained
(See Arborist's report for details)

Existing Trees to be Removed
(See arborist's report for details)

Proposed StreetTrees - 146no. TOTAL
Planted in same species groups or lines on individual streets

Medium / Small Trees
Acer campestre 'Elsrijk' 14-16cmg, 4-6m ht
Corylus colurna 14-16cmg, 5-6m ht
Tilia cordata 'Greenspire' 16-18cmg, 5-6m ht
Ulmus 'Lobel' 16-18cmg, 5-6m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Trees in garden frontagesof smaller spaces - 129no. TOTAL
Planted in same species groups or lines on individual streets

Medium / Small Trees
Pyrus 'Chanticleer', 14-16cm, 3-4m ht
Betula pendula 8-10cm, 3-4m h
Malus floribunda 12-14cm, 2.5-3.5m ht
Prunus padus 12-14cm, 2.5-3.5m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed PublicOpen Space Trees - 70no. TOTAL
Planted in same species groups or lines on individual streets

Semi-Mature Trees
Betula pubescens – semi-mature, 18-20cmg, 3.5-5m ht
Castaenea sativa extra heavy- 18-20cmg, 5-7m ht
Sorbus aucuparia – semi-mature, 18-20cmg, 4-5m ht
Pinus sylvestris –250 – 300cm high, RB
Quercus petraea – semi-mature, 18-20cmg, 4-6m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Curragh Buffer Native Woodland - 105no. TOTAL
Planted in same species groups or lines on individual streets

Large Trees
Alnus glutinosa 14-16cm, 4-6m ht
Quercus robur 14-16cm, 4-6m ht
Pinus sylvestris, 14-16cm, 4-6m ht
Salix alba 14-16cm, 4-6m ht

Small Trees / Shrubs
Sambucus nigra, 12-14cm, 3-4m ht
Prunus avium, 12-14cm, 3-4m ht
Sorbus aucuparia, 12-14cm, 2.5-3.5m ht
Betula pubescens, 12-14cm, 3-4m ht
Corylus avellana
Cornus sanguinea
Viburnum opulus

Proposed MixedNative Hedgerows Planting
Planted in doublestaggered row at 0.5m c/c
Prunus spinosa, 1+2, B, 80-100cm height - 30%
Crataegus monogyna, 1+1, B, 80-100cm height - 30%
Corylus avellana, 1+2, B, 60-80cm height - 10%
Ilex aquifolium, 2L C, 40-60cm height - 20%
Sambucus nigra, 1+2, B, 60-80cm height - 10%

Proposed Roadside Mixed Native Hedgerows Planting
Planted in doublestaggered row at 0.4m c/c
Prunus spinosa, 1+2, B, 80-100cm height - 20%
Crataegus monogyna, 1+1, B, 80-100cm height - 50%
Corylus avellana, 1+2, B, 60-80cm height - 10%
Ilex aquifolium, 2L C, 40-60cm height - 5%
Sambucus nigra, 1+2, B, 60-80cm height - 5%
Viburnum opulus, 1+2, B, 60-80cm height-10%

Proposed Formal Hedge Planting
Planted in staggered rows of single species 60-90cm at 3/lin. m

Carpinus betulus
Ilex crenata
Ilex aquifolium "Alaska"
Prunus lusitanica
Taxus baccata
Eleagnus ebbingei
Griselinia littoralis

Proposed Shrubs & Perennials Ornamental Planting (indicative planting list)
Planting also to be used for bioretention areas
Low to medium height ornamental shrubs/plants, max ht 40-150cm, 2L min. pot size and planted at 3/m2

Low to medium shrubs
Viburnum tinus *
Philadelphus coronarius *
Pachysandra terminalis *
Lonicera pileata *
Lavandula angustifolia *
Hebe 'Mrs Winder' *

Perennial Planting
Verbena bonariensis *
Sedum 'Brilliant' *
Agastache 'Black Adder'
Knautia macedonica *
Echinacea purpurea *
Achillea sp. (deep reds/whites) *

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Meadow Planting
Sowing 1.5 gr / metre
Recomended product
Sandro's Irish Wildflower Conservation Grade Seed Mixture:
Range: DesignerWild Flower Mixtures (Code DW)
Product Name: Short Cut Floral Lawn
Product Code: DW01

Indicative species list
Birdsfoot Trefoil, Black Meddick, Burne Saxifrage, Century, Wild Chamomile, Cowslip, Eyebright, Meadow Buttercup Marjoram, Red Bartsia, Mallow, Forget-me-not, Hoary Plantain, Kidney Vetch, Lady's Bedstraw, Ox-eye Daisy, Red Clover, Ribwort Plantain, Rough Hawkbit, St Johnswort, Wild Carrot, Sorrel, Yarrow, Quaking Grass, Lady's Smock White Bedstraw, Selfheal, Smooth Hawksbit, Corn Marigold, Corn Poppy, Cornflower, Corncockle, Scented Mayweed

Proposed Wildflower Meadow Planting
Recomended product:
Sandro's Irish Wildflower Conservation Grade Seed Mixture:
Range: Designer Wild Flower Mixtures(Code DW)
Product Name: Medium Height Wildflower
Meadow Mixture Product Code: DW02

Indicative species list
Birdsfoot Trefoil, Black Meddick, Devil's Bit Scabious, Corn Marigold, Corn Poppy, Corncockle, Cornflower, Cowslip, Eyebright, Fleabane, Kidney Vetch, Lady's Bedstraw, Lesser Knapweed, Marjoram, Scented Mayweed, Ox-eye Daisy, Ribwort Plantain, Red Campion, Red Clover, Red Bartsia, Rough Hawksbit, Selfheal, Sorrel, St Johnswort, White Campion, Wild Carrot, White Clover, Yarrow

Proposed Bioretention Area Planting
For shrubs - see Proposed Shrub Ornamental Planting Mix

Perennial Planting
Low height ornamental plants, max.ht. 40-150cm, 2L min. pot size andplanted at 6-10/m2
Rudbeckia fulgida var. deamii *
Gaura lindheimeri *
Veronicastrum virginicum 'Album' *
Achillea filipendulina 'Coronation Gold' *
Echinops 'Veitch's Blue' *

Ornamental Grasses
Low height ornamental plants, max.ht. 40-150cm, 2L min. pot size and planted at 6-10/m2
Molinia 'Poul Petersen'
Deschampsia cespitosa 'Goldtau'
Stipa barbata *
Deschmapsia cespitosa

Underplanted with selected bulbs - Anemone nemorosa 'Robinsonia' and Hyacinthoides non - scripta

Proposed Wetland Wildflower Planting List
Wetland wildflower seed mixture(Irish provenance), 1.5g/m2

Devils Bit Scabious, Common Sorrel, Cowslip, Fleabane, Greater Trefoil, Hemp Agrimony, Lesser Knapweed, Marsh Cinquefoil, Marsh Marigold, Meadow Buttercup, Meadowsweet, Meadow Rue, Oxeye ,Daisy, Purple Loosestrife, Ragged Robin, Red Clover, Red Rattle, Ribwort Plantain, Selfheal, Sneezewort, Tufted Vetch, Water Avens, Wild Angelica, Wild Valerian, Yarrow, Yellow Flag Iris, Yellow Rattle, Red Rattle, Corn Marigold, Corn Poppy, Corncockle, Cornflower, Scentless Mayweed, Redshank

***Species selected for their pollinator qualities.**

Proposed Wet Pond Planting List
Low height ornamental and native plants, max.ht. 40-150cm, Aq 9cm pot and 2L min. pot sizes and planted at 6-10/m2
To include mix of marginal, submeged and floating plants
Molinia caerulea*
Polystichum setiferum *
Dryopteris filix-mas *
Eupatorium maculatum
Thalictrum flavum
Trollius Europaeus
Iris sibirica 'Perfect Vision'
Iris laevigata
Ranunculus aquatilis (oxygenator)
Caltha palustris
Myosotis scorpioides
Veronica beccabunga

Amenity Grass Seeding - Rear Gardens
Following grading and cultivation above level and rake seed bed to fine tilth. Remove stones greater than 75mm dia.
Sow lawn seed mix No 2 to specification.

Amenity Grass Seeding - Public Grass
Following grading and cultivation above level and rake seed bed to fine tilth. Remove stones gnater than 75mm dia.
Sow lawn seed mix No 3 to specification.

SURFACE LEGEND

Paving Type 1
- Permeable Concrete Pavers/Slabs Mixed Sizes
- To private threshold paved areas

Paving Type 2
- Permeable Concrete Paving Blocks 200x100/150mm
- Semi-private threshold paved areas

Permeable Parking Bays
- Permeable Concrete Paving Blocks, 200x100mm
- To private and semi-private threshold paved areas

Impermeable Parking Bays
- PCC Concrete Paving Blocks,200x100mm
- To southeast end of site

Asphalt Surface Road
- To Engineers' Detail

Homezone
- To Engineers' Detail

Footpath
- Brushed concrete footpath / To Engineers' Detail

Park Footpath
- Self Binding Gravel/ To Engineers' Detail

Informal Footpath
- Stepping stones

Play Surface/Safety Surface
- To internal creche play area
- Wet pour safety play surface

Play Surface/Safety Surface
- Grass with rubber matt to re-inforce

Grasscrete

Dry Pond

Wet Pond

Seating
- Recycled composite timber seates

Bollards

Selected Play Equipment

Selected Fitness Equipment

Selected Nature Play Equipment
- willow tunnels, logs, boulders, insect hotels

Retaining walls

Low mound to roadside hedgerow

Outline of Attenuation tank-refer to engineers drawing

LIGHTING LEGEND

6m high fixed column & base.

8m high fixed column & base.

REV	DATE	AMENDMENT
D	06/09/23	RFI
C	05/09/23	RFI
B	30/08/23	RFI
A	22/08/23	DUPLEX & BOUNDARY UPDATE

CUNNANE STRATTON REYNOLDS
LAND PLANNING & DESIGN

DUBLIN OFFICE
3 MOLESWORTH PLACE DUBLIN 2
TEL 01 661 0419 FAX 01 661 0431
EMAIL info@csrlandplan.ie

N

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE	DATE: JUNE 2022
	SCALE: 1:1000@A1
DRAWING: LANDSCAPE MASTERPLAN	DRAWN: ES/TS
	CHECKED: MS
	DRAWING NO: 22178-1-101

Appendix 6.1

Ground Investigation, October 2022

No Change

Appendix 6.2

Ground Investigation, January 2023

No Change

Appendix 6.3

Ground Investigation, September 2023

Additional Information

GroundCheck
SITE INVESTIGATION SPECIALISTS

PROPOSED RESIDENTIAL DEVELOPMENT,
RUANBEG,
KILDARE.

GROUND INVESTIGATION REPORT

CLIENT: MRP Oakland
JOB REF: 23-3281
ISSUED: September 2023




CONTENTS

1.0 INTRODUCTION

1.1 Terms of Reference

Ground Check Ltd was commissioned by MRP Oakland, to undertake a ground investigation for a proposed residential development at Ruanbeg, Kildare. The location of the site is shown by Figure 1.

1.2 Method

The ground investigation was undertaken in accordance with the guidelines set out in BS5930 Code of Practice for Site Investigations, 4th Edition (2015); UK Specification for Ground Investigation, 2nd edition (2011); BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006) and related standards. The scope of works comprised of the following elements:

- **Exploratory Holes**

  The locations of exploratory holes are shown by Figure 2 and logs and trial pit photographs, are included in Appendix A:

  - ***Trial Pits:*** Four trial pits were opened using a 13Tonne tracked mechanical excavator fitted with a 600mm toothed bucket.
  - ***Boreholes:*** Three boreholes were sunk using a Dando 2000 cable percussive drilling rig, equipped with 200mm casing and tools, where water was added to the borehole casing to assist boring operations when required.

- **Sampling & In-situ Testing**

  - ***Disturbed samples:*** comprising ~1kg of soil sealed in a grip-seal polythene bag were recovered at intervals shown on the exploratory hole logs; generally being taken at 1m depth increments and from each stratum.
  - ***Percolation Test:*** were conducted in four trial pits, where the tests were performed in accordance with BRE 365, with water being added from a towed bowser with capacity of 1m3. Test results are included in Appendix B.
  - ***Variable Head Permeability Tests:*** were undertaken in the completed borehole standpipe, where installations shown on the borehole logs, where infiltration occurred through the slotted well screen section. The fall in water level monitored over a minimum 60-minute period. Soil permeability values were calculated using the Hvorslev Method and test results are presented in Appendix B.

- **Instrumentation & Monitoring**

  - ***Standpipe Installations:*** Three boreholes were installed with a 50mm HDPE slotted standpipe on completion of drilling operations, where the installation records are attached to the relevant borehole logs, which are presented in Appendix A.

- **Geotechnical Laboratory Testing**

  Selected soil samples were scheduled for the following laboratory tests, which were conducted in accordance with procedures outlined in BS1377. Test results are included in Appendix C:

  - Particle Size Distribution (Wet Sieve & Sedimentation Stages)

2.0 SITE DESCRIPTION

The ground investigation was undertaken to inform the design of an attenuation tank that will serve a proposed housing development on a site located at Ruanbeg, Kildare, Co. Kildare; and is centred over ITM Grid Co-ordinates E674360 N712390. It is located 4.2km from the junction with the M7 Motorway and is bounded by the existing residential properties of Collaghknock to the north, agricultural grazing lands to the east, the initial phases of the Ruanbeg development to the west and the R445 Dublin Road to the south. Plate 1 provides an aerial overview of the site.

Plate 1: Overview of Site

3.0 GROUND CONDITIONS

3.1 Geology

The geological maps of the area indicate the site is underlain by the following strata:

- **Glacio-Fluvial Deposits (Gravels)**
- **Bedrock – Rickardstown Formation Limestone**

3.2 Ground Investigation

The findings of the ground investigation are listed in Table 1 and summarised below:

- **Made Ground:** Not encountered.

- **Recent Deposits:** Not encountered.

- **Glacial Deposits:** were encountered at shallow depth below the topsoil layer, where the deposits were mostly composed of layers of firm to stiff, becoming stiff, greyish brown to grey, gravelly, sandy, clayey silt/clayey silt with cobbles and occasional boulders, locally containing bands/lenses of silty, gravelly, fine to coarse sand; locally transitioning (TP104) into glacio-fluvial deposits composed of layers of grey, silty, sandy, fine to coarse gravel with cobbles & grey, gravelly, silty, fine to coarse sand locally with bands of very sandy, clayey silt.

  It should be noted that due to the requirement to add water to the borehole casing to assist with shelling operations, this may have caused a washing out of fines (silt/clay fraction) from the recovered samples. Therefore, we would advise that the soil descriptions on the borehole logs should be verified by sinking trial pits or rotary boreholes.

- **Bedrock:** The depth to bedrock was not proven during drilling operations as virtual refusal to boring was met in the overlying glacial deposits. Therefore, if necessary, the rock head level will require to be confirmed by rotary drilling methods.

3.3 Groundwater

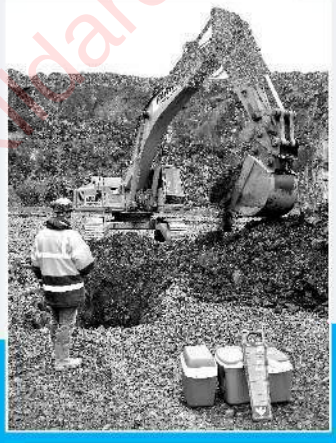
No apparent groundwater strikes were observed in the trial pits, which were recorded as dry on completion. However, it is possible that discrete inflows of groundwater may have been masked during drilling operations as it was necessary to add water to the borehole casing to assist with shelling operations, where standing water levels in borehole standpipes ranged between 3.2 and 7.0m upon completion of the installations. It should also be noted, that as groundwater levels and inflow rates may vary seasonally and relative to rainfall intensity, the reported short-term observations should be verified by the excavation of inspection pits prior to commencement of construction work.

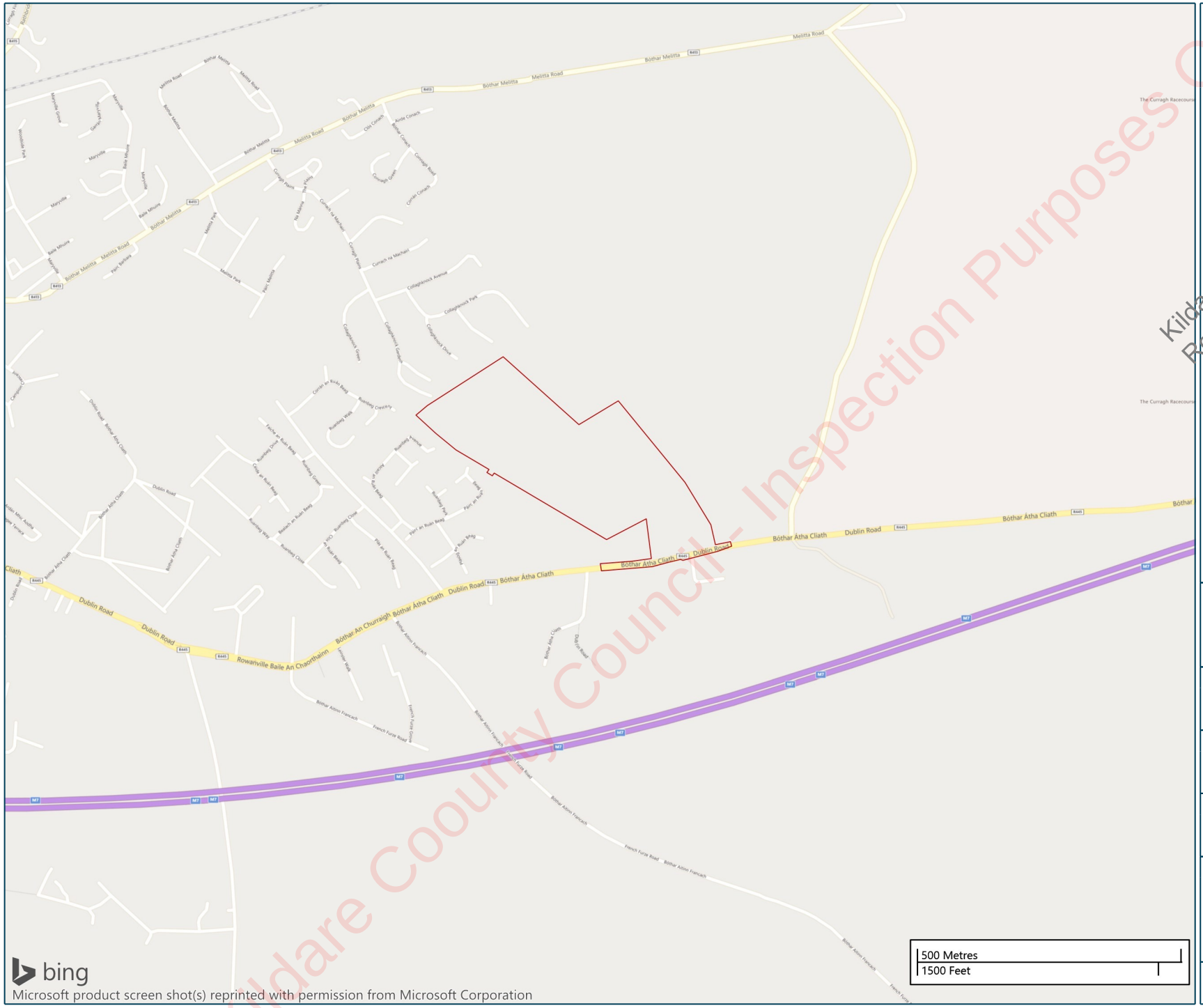
Table 1: Ground Conditions Summary

Exploratory Hole Reference	Completion Depth (m)	Stratum Base Depth (m)			Bedrock Top (m)
		Made Ground	Recent Deposits	Glacial Deposits	
BH101	4.0	-	-	>4.0* (Refusal)	Not proven
BH102	7.5	-	-	>7.5* (Refusal)	Not proven
BH103	7.0	-	-	>7.0* (Refusal)	Not proven
BH104	3.2	-	-	>3.2* (Refusal)	Not proven
TP101	4.4	-	-	4.4	
TP102	4.5	-	-	4.5	
TP103	4.5	-	-	4.5	
TP104	3.8	-	-	3.8	

Note * Virtual refusal to boring met on possible boulder obstructions/bedrock would require to be verified by rotary drilling methods.

Figures



Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

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Legend Key

Project Bounds - Project Bounds

GroundCheck
SITE INVESTIGATION SPECIALISTS

Drawing Title

Figure 1 - Site Location

Project ID

23-3281

Project Title

Proposed Residential Development

Project Location

Ruanbeg, Kildare.

Scale: 1:10000

N

Legend Key

- Locations By Type - RO
- Locations By Type - TP

GroundCheck
SITE INVESTIGATION SPECIALISTS

Drawing Title

Figure 2 - Site Plan

Project ID

23-3281

Project Title

Proposed Residential Development

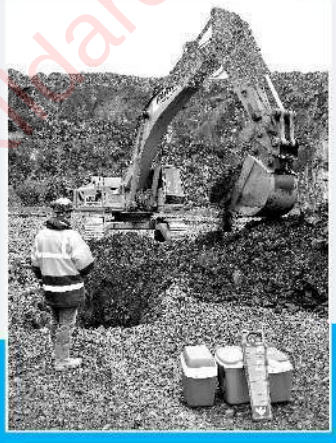
Project Location

Ruanbeg, Kildare.

Scale: 1:1500

Appendix A:

Borehole & Trial Pit Logs and Photographs




Borehole Log

GroundCheck
SITE INVESTIGATION SPECIALISTS

Location ID: **BH101**

Page1/1

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
07/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674192	712437

Date Finish:	Logged By:	Site Location:	Elevation:
07/08/2023	S. Thompson	Ruanbeg, Kildare.	93.46(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
						[TOPSOIL]		0.10	93.36
D	0.50					Stiff, light greyish brown, gravelly, slightly sandy, fissured, clayey SILT with occasional cobbles. Sand is fine to medium. Gravel is fine to coarse, sub-rounded. [GLACIAL]			
D	1.00						1.0		
						Light greyish brown, silty, gravelly, fine to coarse SAND with occasional cobbles and bands of greyish brown, sightly gravelly, sandy, clayey silt. [GLACIAL]		1.20	92.26
						Dark greyish brown, slightly silty, gravelly, fine to coarse SAND with low cobble content and occasional boulders. Gravel is fine to coarse, sub-rounded. [GLACIAL]		1.80	91.66
D	2.00						2.0		
D	3.00						3.0		
						Very stiff, reddish brown, gravelly, slightly sandy, fissured, clayey SILT with low to medium cobble content and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]		3.10	90.36
D	4.00					End of Borehole at 4.00m	4.0	4.00	89.46

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					4.00			07/08/2023 16:30	1.80	3.10	Obstruction time - Hard strata.	0.00	0.20	
									3.50	4.00	Obstruction time - Hard strata.	0.20	2.00	
												2.00	4.00	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 2.0m to 4.0m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH102**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
03/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674237	712450

Date Finish:	Logged By:	Site Location:	Elevation:
07/08/2023	S. Thompson	Ruanbeg, Kildare.	94.04(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
						[TOPSOIL]		0.10	93.94
						Firm, greyish brown, gravelly, sandy, clayey SILT with low cobble content. Sand is fine to medium. Gravel is fine to coarse, sub-rounded. [GLACIAL?]			
D	0.50								
D	1.00						1.0		
D	2.00					Greyish brown, slightly clayey, silty, gravelly, fine to coarse SAND with low cobble content and bands of gravelly, sandy, clayey silt. Gravel is fine to coarse, sub-rounded. [GLACIAL]	2.0	2.00	92.04
						Dark greyish brown, slightly silty, very sandy, fine to coarse, sub-rounded gravel with low to medium cobble content, occasional boulders and occasional bands of brown, gravelly, sandy, clayey silt. Sand is fine to coarse. [GLACIAL]		2.70	91.34
D	3.00						3.0		
D	4.00						4.0		

Continued on Next Page

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.50			07/08/2023 16:30				0.00 0.20 3.00	0.20 3.00 7.50	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 2.0m to 7.5m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH102**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
03/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674237	712450

Date Finish:	Logged By:	Site Location:	Elevation:
07/08/2023	S. Thompson	Ruanbeg, Kildare.	94.04(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
D	5.00					Dark greyish brown, slightly silty, very sandy, fine to coarse, sub-rounded gravel with low to medium cobble content, occasional boulders and occasional bands of brown, gravelly, sandy, clayey silt. Sand is fine to coarse. [GLACIAL]	5.0		
D	6.00						6.0		
D	7.00						7.0		
						End of Borehole at 7.50m		7.50	86.54
							8.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.50			07/08/2023 16:30				0.00 0.20 3.00	0.20 3.00 7.50	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 2.0m to 7.5m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID:
BH103
Page1/2

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
02/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674398	712486

Date Finish:	Logged By:	Site Location:	Elevation:
02/08/2023	S. Thompson	Ruanbeg, Kildare.	94.34(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
						[TOPSOIL]		0.20	94.14
D	0.50					Firm, becoming stiff, light greyish brown, gravelly slightly sandy, fissured, clayey SILT with low cobble content and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-rounded. [GLACIAL]			
D	1.00						1.0		
D	2.00						2.0		
D	3.00						3.0		
D	4.00						4.0		

Continued on Next Page

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00			02/08/2023 16:30				0.00 0.20 3.00	0.20 3.00 7.00	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 2.0m to 7.0m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH103**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
02/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674398	712486

Date Finish:	Logged By:	Site Location:	Elevation:
02/08/2023	S. Thompson	Ruanbeg, Kildare.	94.34(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
						Firm, becoming stiff, light greyish brown, gravelly, slightly sandy, fissured, clayey SILT with low cobble content and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-rounded. [GLACIAL]			
D	5.00						5.0	5.00	89.34
						Greyish brown, slightly clayey, silty, very gravelly, fine to coarse SAND with low to medium cobble content and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]			
D	6.00						6.0		
D	7.00					End of Borehole at 7.00m	7.0	7.00	87.34
							8.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00			02/08/2023 16:30				0.00 0.20 3.00	0.20 3.00 7.00	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 2.0m to 7.0m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID:
BH104
Page1/1

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
08/08/2023	Cable Percussion	23-3281	Proposed Residential Development	674464	712380

Date Finish:	Logged By:	Site Location:	Elevation:
08/08/2023	S. Thompson	Ruanbeg, Kildare.	98.14(m) OD

Samples & In-situ Testing		Results & Information	Wells	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type	Depth (m)								
						[TOPSOIL]		0.10	98.04
D	0.50					Light greyish brown, gravelly to very gravelly sandy clayey SILT containing cobbles and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]			
D	1.00						1.0		
D	2.00						2.0		
D	3.00						3.0		
						End of Borehole at 3.20m		3.20	94.94
							4.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					3.20			03/08/2023 16:30				0.00 0.20 0.50	0.20 0.50 3.20	

Termination Reason:
Virtual refusal to boring.

General Remarks:
Water added from 0.4m to 3.2m - This may have resulted in washing out of fines.

AGS

Scale:
1:25

GroundCheck
SITE INVESTIGATION SPECIALISTS

Trial Pit Log

Location ID:
TP101
Page1/1

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
08/08/2023	Trial Pit	23-3281	Proposed Residential Development	674446	712377

Date Finish:	Logged By:	Site Location:	Elevation:
08/08/2023	S. Thompson	Ruanbeg, Kildare.	98.49(m) OD

Samples & In-situ Testing		Results & Information	Water	Scale	Legend	Stratum Description	Depth (m)	Reduced Level (m)
Type	Depth (m)							
						[TOPSOIL]		
							0.20	98.29
						Firm, greyish brown, gravelly, sandy, silty CLAY containing rootlets. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL?]		
B	0.50							
							0.80	97.69
B	1.00			1.0		Firm to stiff, becoming stiff, light grey, gravelly to very gravelly, sandy, fissured, clayey SILT containing cobbles, occasional boulders with pockets of silty, gravelly, fine to coarse sand, and occasional bands of very sandy, clayey silt. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]		
B	2.00			2.0				
B	3.00			3.0				
B	4.00			4.0				
						End of Trial Pit at 4.40m	4.40	94.09

Trial Pit Dimensions
Length - 3.6m
Width - 0.8m

Shift Information

Depth	Water	Remarks	Date Time
4.40		DRY	08/08/2023 16:30

Depth Related Remarks

Top	Base	Remarks

Water Strikes

Depth Strike	Flow

Termination:
Trial pit terminated at 4.4m at reach of excavator.

Pit Stabilty:
Trial pit sidewalls stable on completion of excavation.

Scale:
1:25

General Remarks:
Trial pit excavated using a 13tonne excavator fitted with a 600mm toothed bucket.

TP101

TP101

GroundCheck
SITE INVESTIGATION SPECIALISTS

Trial Pit Log

Location ID:
TP102
Page1/1

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
08/08/2023	Trial Pit	23-3281	Proposed Residential Development	674458	712354

Date Finish:	Logged By:	Site Location:	Elevation:
08/08/2023	S. Thompson	Ruanbeg, Kildare.	98.04(m) OD

Samples & In-situ Testing		Results & Information	Water	Scale	Legend	Stratum Description	Depth (m)	Reduced Level (m)
Type	Depth (m)							
						[TOPSOIL]		
							0.20	97.84
						Firm, greyish brown, gravelly, sandy, silty CLAY containing rootlets. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL?]		
B	0.50							
B	1.00			1.0				
							1.10	96.94
						Firm to stiff, becoming stiff, light grey, gravelly to very gravelly, sandy, fissured, clayey SILT containing cobbles, occasional boulders with pockets of silty, gravelly, fine to coarse sand, and occasional bands of very sandy, clayey silt. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]		
B	2.00			2.0				
B	3.00			3.0				
B	4.00			4.0				
						End of Trial Pit at 4.50m	4.50	93.54

Trial Pit Dimensions
Length - 3.8m
Width - 0.8m

Shift Information

Depth	Water	Remarks	Date Time
4.50		DRY	08/08/2023 16:30

Depth Related Remarks

Top	Base	Remarks

Water Strikes

Depth Strike	Flow

Termination:
Trial pit terminated at 4.5m at reach of excavator.

Pit Stabilty:
Trial pit sidewalls stable on completion of excavation.

Scale:
1:25

General Remarks:
Trial pit excavated using a 13tonne excavator fitted with a 600mm toothed bucket.

TP102

TP102

GroundCheck
SITE INVESTIGATION SPECIALISTS

Trial Pit Log

Location ID:
TP103
Page1/1

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
08/08/2023	Trial Pit	23-3281	Proposed Residential Development	674479	712368

Date Finish:	Logged By:	Site Location:	Elevation:
08/08/2023	S. Thompson	Ruanbeg, Kildare.	98.06(m) OD

Samples & In-situ Testing		Results & Information	Water	Scale	Legend	Stratum Description	Depth (m)	Reduced Level (m)
Type	Depth (m)							
						[TOPSOIL]	0.30	97.76
B	0.50			1.0		Firm, greyish brown, gravelly, sandy, silty CLAY containing rootlets. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]		
B	1.20						1.20	96.86
B	2.00			2.0		Firm to stiff, becoming stiff, light grey, gravelly to very gravelly, sandy, fissured, clayey SILT containing cobbles, occasional boulders with pockets of silty, fine to medium sand, and occasional thin bands of sandy, very silty clay. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]		
B	3.00			3.0				
B	4.00			4.0				
						End of Trial Pit at 4.50m	4.50	93.56

Trial Pit Dimensions
Length - 3.8m
Width - 0.8m

Shift Information

Depth	Water	Remarks	Date Time
4.50		DRY	08/08/2023 16:30

Depth Related Remarks

Top	Base	Remarks

Water Strikes

Depth Strike	Flow

Termination:
Trial pit terminated at 4.5m at reach of excavator.

Pit Stabilty:
Trial pit sidewalls stable on completion of excavation.

Scale:
1:25

General Remarks:
Trial pit excavated using a 13tonne excavator fitted with a 600mm toothed bucket.

TP103

TP103

GroundCheck
SITE INVESTIGATION SPECIALISTS

Trial Pit Log

Location ID: **TP104**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
08/08/2023	Trial Pit	23-3281	Proposed Residential Development	674492	712352

Date Finish:	Logged By:	Site Location:	Elevation:
08/08/2023	S. Thompson	Ruanbeg, Kildare.	97.23(m) OD

Samples & In-situ Testing		Results & Information	Water	Scale	Legend	Stratum Description	Depth (m)	Reduced Level (m)
Type	Depth (m)							
						[TOPSOIL]	0.25	96.98
B	0.50					Firm, greyish brown, gravelly, sandy, silty CLAY containing rootlets. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL?]	0.60	96.63
B	1.00			1.0		Grey, silty, sandy, fine to coarse, sub-angular to sub-rounded GRAVEL containing cobbles. Sand is fine to coarse. [GLACIAL]	1.70	95.53
B	2.00			2.0		Grey, silty, gravelly, fine to coarse SAND. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]	2.40	94.83
B	3.00			3.0		Grey, silty, gravelly, fine to coarse SAND with bands of greyish brown, very sandy, clayey silt. Gravel is fine to coarse, sub-angular to sub-rounded. [GLACIAL]	3.80	93.43
				4.0		End of Trial Pit at 3.80m		

Trial Pit Dimensions

Length - 3.7m

Width - 0.8m

Shift Information

Depth	Water	Remarks	Date Time
3.80		DRY	08/08/2023 16:30

Depth Related Remarks

Top	Base	Remarks

Water Strikes

Depth Strike	Flow

Termination:
Trial pit terminated at 3.8m due to repeated spalling of sidewalls.

Pit Stabilty:
Trial pit sidewalls collapsing between 0.9 and 3.8m as excavated.

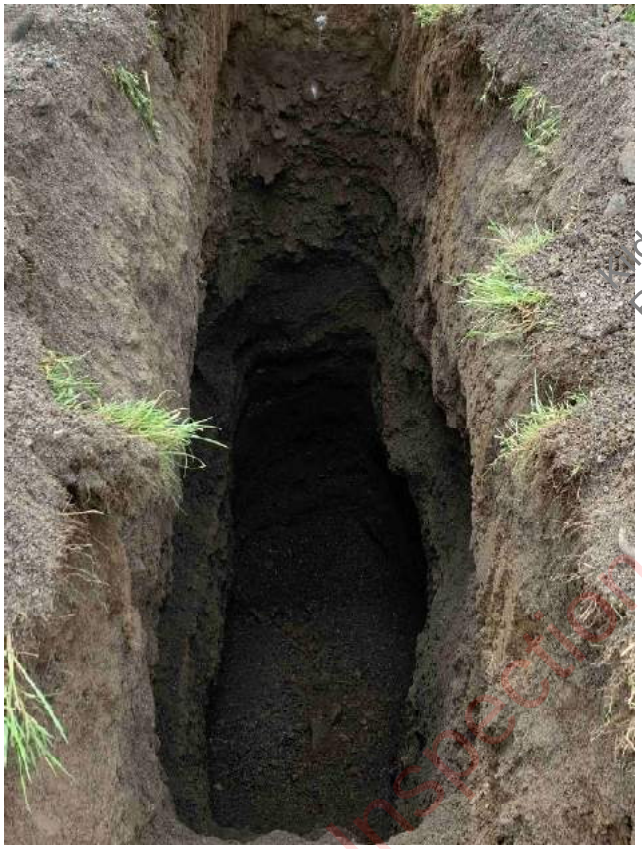
General Remarks:
Trial pit excavated using a 13tonne excavator fitted with a 600mm toothed bucket.

AGS

Scale: 1:25

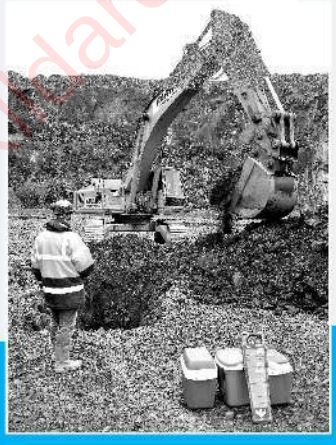
TP104

TP104



Appendix B:

In-Situ Test Results




BRE 365 SOIL INFILTRATION TEST

GroundCheck

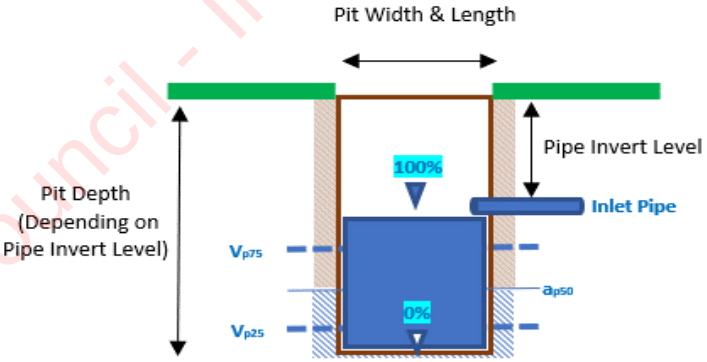
JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.	TP101
INFILTRATION TEST No.	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	WEATHER CONDITIONS	DRY
TEST PIT WIDTH (m)	0.70	TEST PIT LENGTH (m)	2.00	TEST PIT DEPTH (m)	4.40
WATER SURFACE LEVEL (m)	3.74	GROUNDWATER DEPTH (m)	Dry	HEAD OF WATER IN PIT (m)	0.62
BASE SURFACE AREA (m2)	1.40	SIDEWALL SURFACE AREA (m2)	23.76	$a_{(p50)}$ Internal Surface Area @ 50% Effective Depth (m2)	13.28
75% Effective Water Depth (m)	0.495	25% Effective Water Depth (m)	0.165	V(p75-25) Volume of Hole Between 75 & 25% Effective Water Depth (m3)	0.462
t(p75) Time for Water Level to Drain to 75% Effective Depth (mins)	1150	t(p25) Time for Water Level to Drain to 25% Effective Depth (mins)	3725	t(p75-25) Time for Water Level to Drain from 75to 25% Effective Depth (mins)	2575

SOIL INFILTRATION RATE

2.25E-07 m/sec

24 Hr Clock Time hh:mm	Time Elapsed (mins)	Depth of Water in Pit (m)
11:01	0	0.660
11:02	1	0.660
11:03	2	0.655
11:04	3	0.650
11:05	4	0.655
11:06	5	0.645
11:07	6	0.645
11:08	7	0.645
11:09	8	0.645
11:13	12	0.640
11:15	14	0.640
11:19	18	0.640
11:21	20	0.640
11:31	30	0.655
11:36	35	0.635
11:46	45	0.635
11:56	55	0.645
12:01	60	0.635
12:31	90	0.630
13:01	120	0.630
Interpolated	5000	0.000

BRE 365 Soil Infiltration Test



Soil Infiltration Rate:

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

V_{p75-25} = Effective Storage Volume of Pit between 75% & 25% Effective Depths

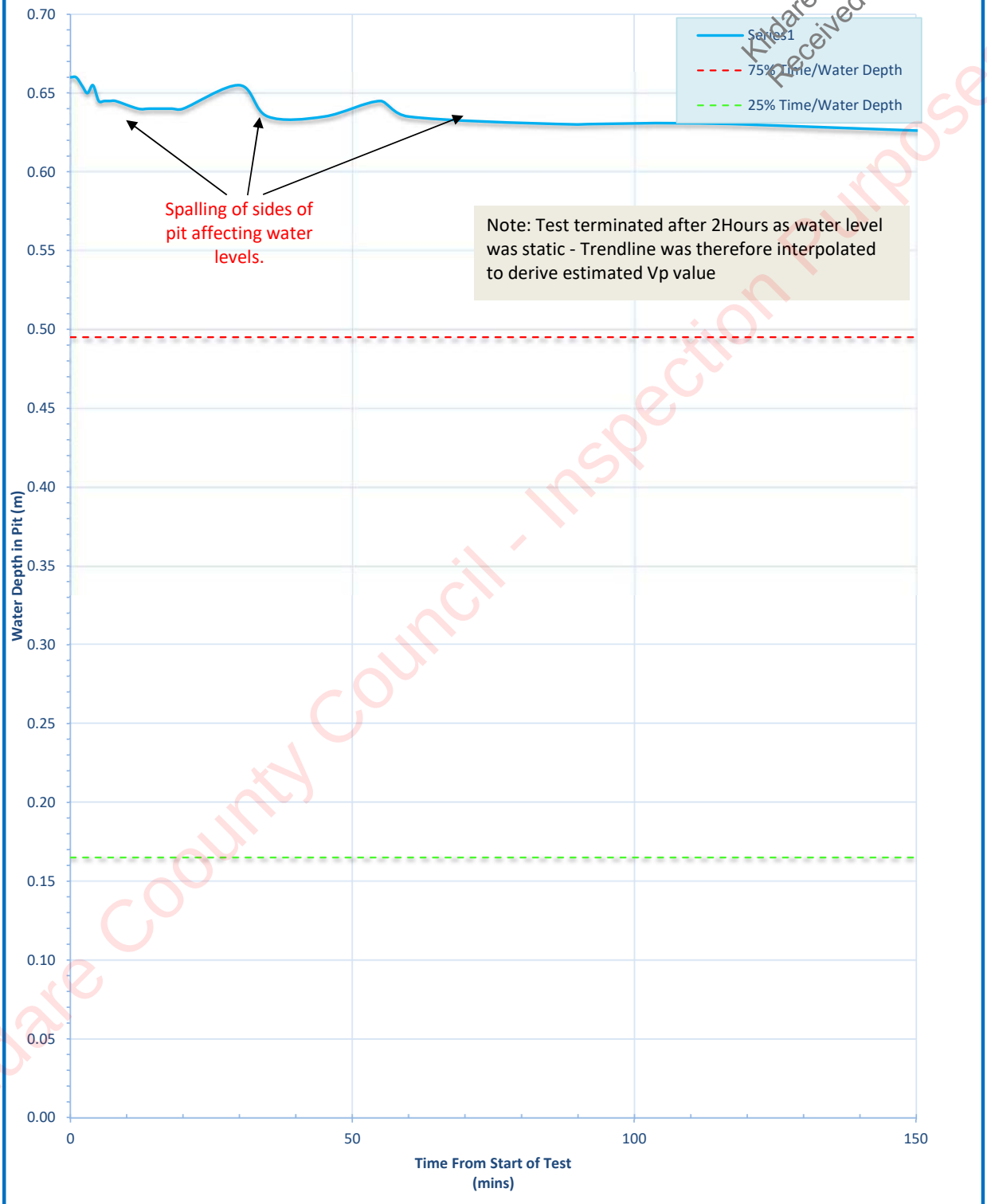
a_{p50} = Internal Surface Area of Trial Pit up to 50% Effective Depth

t_{p75-25} = Time for Water Level to Fall between 75% & 25% Effective Depths

BRE 365 SOIL INFILTRATION TEST

GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.
TEST PIT DEPTH (m)	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	TP101



BRE 365 SOIL INFILTRATION TEST

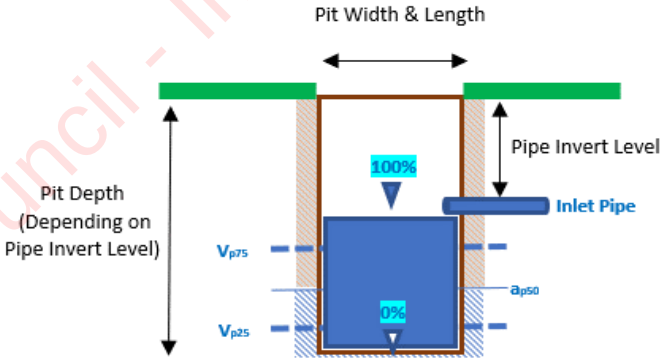
GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.	TP102
INFILTRATION TEST No.	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	WEATHER CONDITIONS	DRY
TEST PIT WIDTH (m)	0.70	TEST PIT LENGTH (m)	2.00	TEST PIT DEPTH (m)	4.50
WATER SURFACE LEVEL (m)	3.90	GROUNDWATER DEPTH (m)	Dry	HEAD OF WATER IN PIT (m)	0.60
BASE SURFACE AREA (m2)	1.40	SIDEWALL SURFACE AREA (m2)	24.30	a(p50) Internal Surface Area @ 50% Effective Depth (m2)	13.55
75% Effective Water Depth (m)	0.45	25% Effective Water Depth (m)	0.15	V(p75-25) Volume of Hole Between 75 & 25% Effective Water Depth (m3)	0.42
t(p75) Time for Water Level to Drain to 75% Effective Depth (mins)	2650	t(p25) Time for Water Level to Drain to 25% Effective Depth (mins)	7500	t(p75-25) Time for Water Level to Drain from 75to 25% Effective Depth (mins)	4850

SOIL INFILTRATION RATE	1.07E-07	m/sec

24 Hr Clock Time hh:mm	Time Elapsed (mins)	Depth of Water in Pit (m)
09:35	0	0.600
09:36	1	0.600
09:37	2	0.620
09:38	3	0.630
09:39	4	0.620
09:40	5	0.620
09:41	6	0.620
09:42	7	0.620
09:43	8	0.620
09:44	9	0.615
09:45	10	0.615
09:47	12	0.615
09:49	14	0.615
09:51	16	0.615
09:53	18	0.615
09:55	20	0.615
10:00	25	0.615
10:05	30	0.615
10:10	35	0.610
10:15	40	0.610
10:25	50	0.610
10:35	60	0.610
10:55	80	0.605
11:35	120	0.605
Interpolated	10000	0.000

BRE 365 Soil Infiltration Test



Soil Infiltration Rate:

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

V_{p75-25} = Effective Storage Volume of Pit between 75% & 25% Effective Depths

a_{p50} = Internal Surface Area of Trial Pit up to 50% Effective Depth

t_{p75-25} = Time for Water Level to Fall between 75% & 25% Effective Depths

BRE 365 SOIL INFILTRATION TEST

GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.
TEST PIT DEPTH (m)	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	TP102

BRE 365 SOIL INFILTRATION TEST

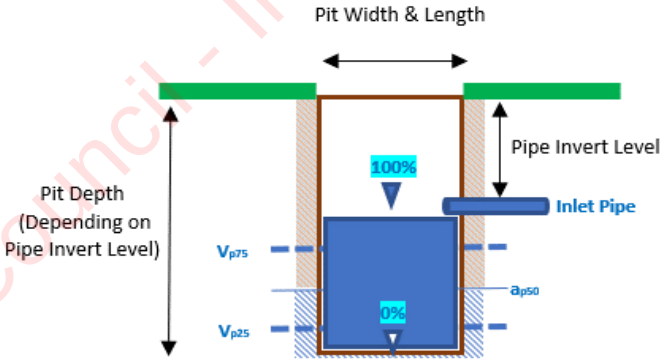
GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.	TP103
INFILTRATION TEST No.	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	WEATHER CONDITIONS	DRY
TEST PIT WIDTH (m)	0.70	TEST PIT LENGTH (m)	2.00	TEST PIT DEPTH (m)	4.50
WATER SURFACE LEVEL (m)	4.09	GROUNDWATER DEPTH (m)	Dry	HEAD OF WATER IN PIT (m)	0.41
BASE SURFACE AREA (m2)	1.40	SIDEWALL SURFACE AREA (m2)	24.30	a(p50) Internal Surface Area @ 50% Effective Depth (m2)	13.55
75% Effective Water Depth (m)	0.3075	25% Effective Water Depth (m)	0.1025	V(p75-25) Volume of Hole Between 75 & 25% Effective Water Depth (m3)	0.287
t(p75) Time for Water Level to Drain to 75% Effective Depth (mins)	1750	t(p25) Time for Water Level to Drain to 25% Effective Depth (mins)	5900	t(p75-25) Time for Water Level to Drain from 75to 25% Effective Depth (mins)	4150

SOIL INFILTRATION RATE	8.51E-08	m/sec

24 Hr Clock Time hh:mm	Time Elapsed (mins)	Depth of Water in Pit (m)
09:35	0	0.410
09:36	1	0.410
09:37	2	0.410
09:38	3	0.410
09:39	4	0.410
09:40	5	0.405
09:41	6	0.400
09:42	7	0.400
09:43	8	0.400
09:44	9	0.400
09:45	10	0.400
09:47	12	0.400
09:49	14	0.400
09:51	16	0.400
09:53	18	0.400
09:55	20	0.400
10:00	25	0.400
10:05	30	0.400
10:10	35	0.400
10:15	40	0.400
10:25	50	0.395
10:35	60	0.395
10:55	80	0.395
11:35	120	0.390
Interpolated	8000	0.000

BRE 365 Soil Infiltration Test



Soil Infiltration Rate:

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

V_{p75-25} = Effective Storage Volume of Pit between 75% & 25% Effective Depths

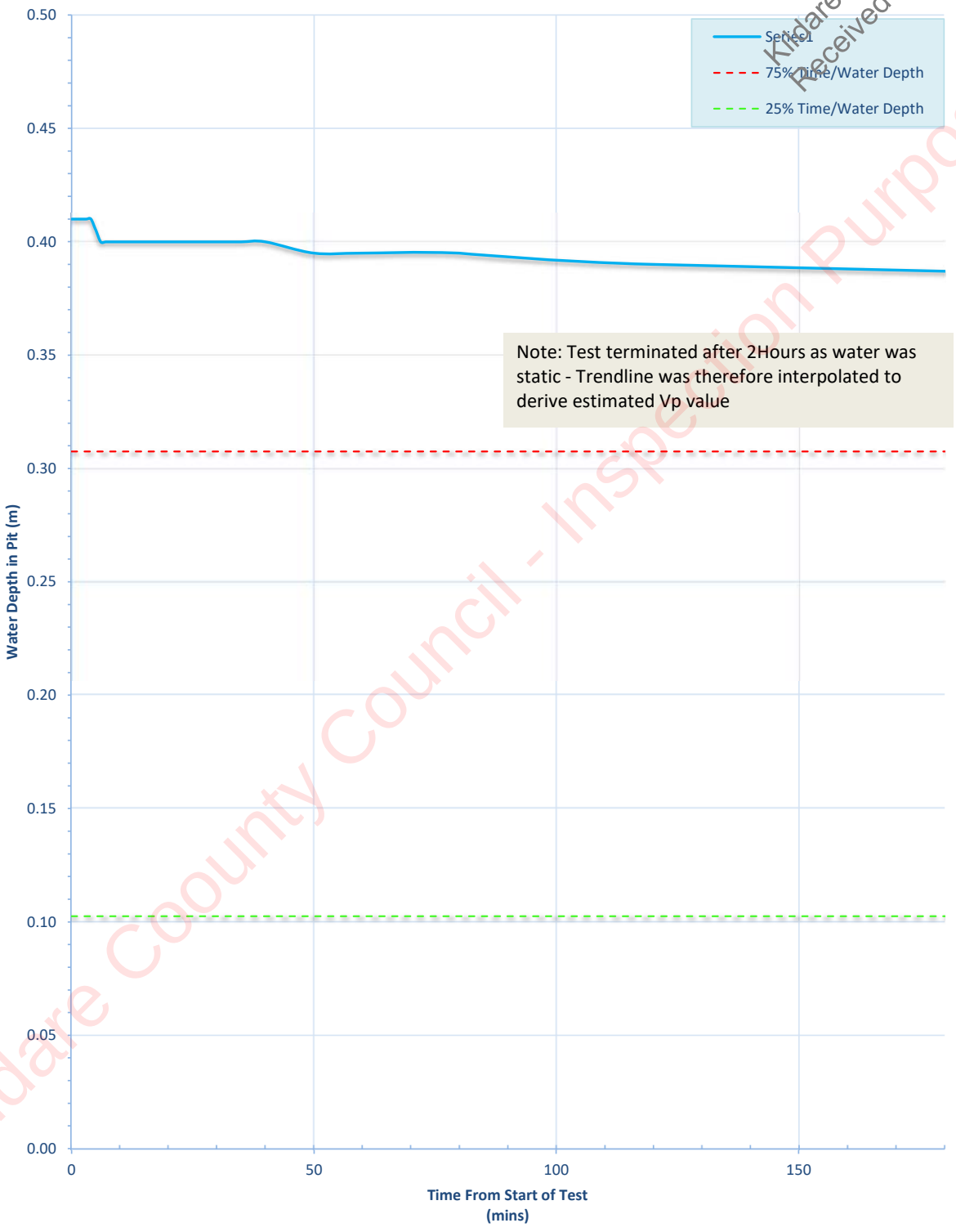
a_{p50} = Internal Surface Area of Trial Pit up to 50% Effective Depth

t_{p75-25} = Time for Water Level to Fall between 75% & 25% Effective Depths

BRE 365 SOIL INFILTRATION TEST

GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.
TEST PIT DEPTH (m)	1	SOIL TYPE	Light grey, very gravelly, sandy, clayey SILT.	TP103



BRE 365 SOIL INFILTRATION TEST

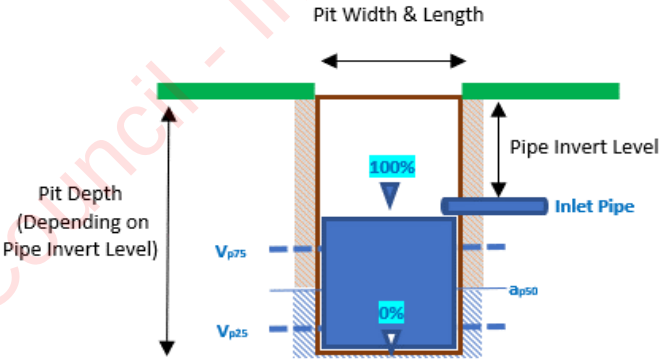
GroundCheck

JOB No.	23-3281	SITE	Ruanbeg, Kildare	TRIAL PIT No.	TP104
INFILTRATION TEST No.	1	SOIL TYPE	Grey, silty, gravelly, fine to coarse SAND	WEATHER CONDITIONS	DRY
TEST PIT WIDTH (m)	0.80	TEST PIT LENGTH (m)	2.20	TEST PIT DEPTH (m)	3.80
WATER SURFACE LEVEL (m)	0.00	GROUNDWATER DEPTH (m)	Dry	HEAD OF WATER IN PIT (m)	0.10
BASE SURFACE AREA (m2)	1.76	SIDEWALL SURFACE AREA (m2)	22.80	a(p50) Internal Surface Area @ 50% Effective Depth (m2)	13.16
75% Effective Water Depth (m)	2.85	25% Effective Water Depth (m)	0.95	V(p75-25) Volume of Hole Between 75 & 25% Effective Water Depth (m3)	3.344
t(p75) Time for Water Level to Drain to 75% Effective Depth (mins)	0.1	t(p25) Time for Water Level to Drain to 25% Effective Depth (mins)	0.29	t(p75-25) Time for Water Level to Drain from 75to 25% Effective Depth (mins)	0.19

SOIL INFILTRATION RATE	2.23E-02	m/sec

24 Hr Clock Time hh:mm	Time Elapsed (mins)	Depth of Water in Pit (m)
12:00	0	0.100
12:00	0.16	0.060
12:00	0.32	0.020
12:00	0.48	0.005
12:00	0.64	0.000
12:00	0.8	0.000
12:01	1	0.000

BRE 365 Soil Infiltration Test



Soil Infiltration Rate:

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

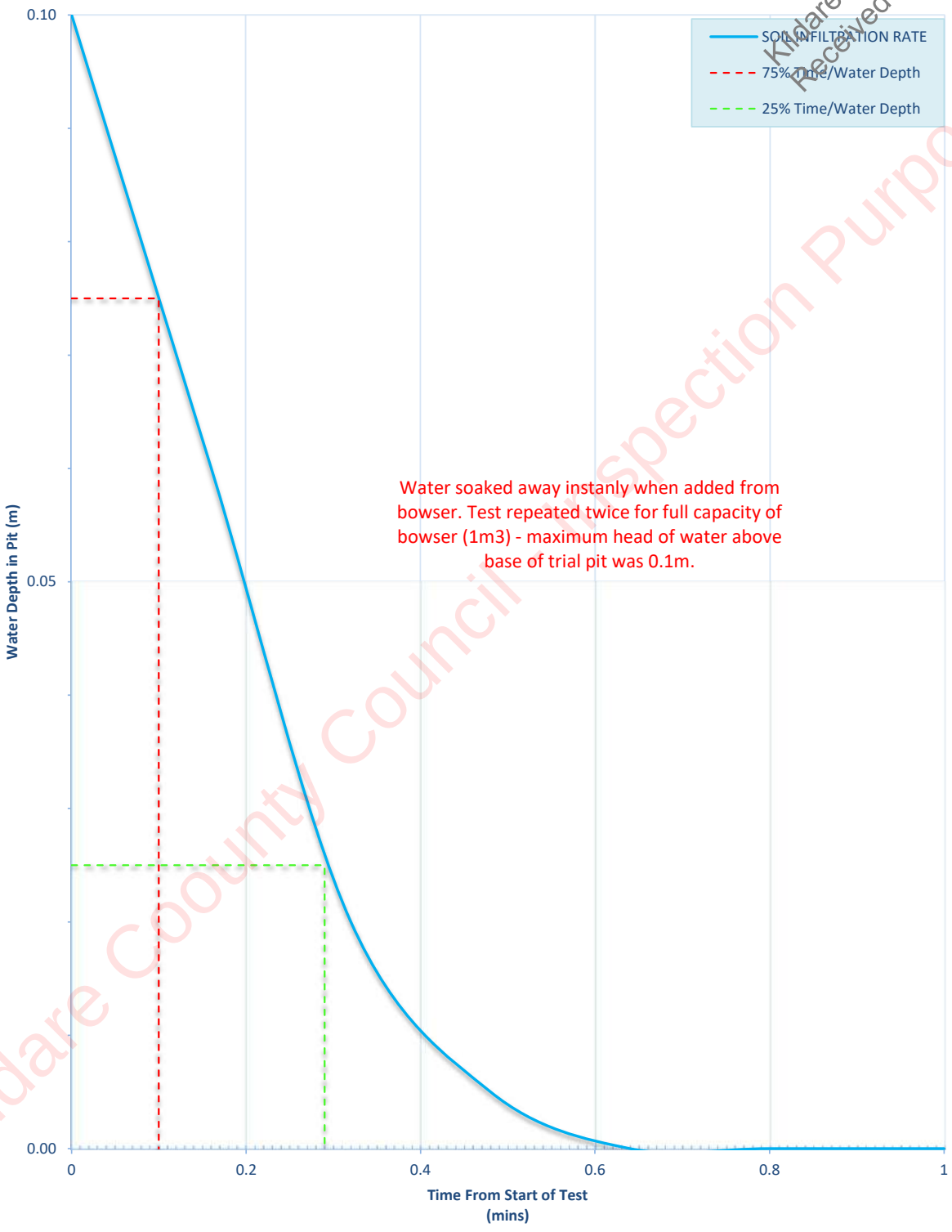
V_{p75-25} = Effective Storage Volume of Pit between 75% & 25% Effective Depths

a_{p50} = Internal Surface Area of Trial Pit up to 50% Effective Depth

t_{p75-25} = Time for Water Level to Fall between 75% & 25% Effective Depths

BRE 365 SOIL INFILTRATION TEST

JOB No.	23-3281	**SITE**	Ruanbeg, Kildare	**TRIAL PIT No.**
TEST PIT DEPTH (m)	1	**SOIL TYPE**	Grey, silty, gravelly, fine to coarse SAND	**TP104**



Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH101	**Date**	08/08/2023
Test	1	**BH Diameter (mm)**	200
Geologist	ST	**Top of R Zone (mbgl)**	2.00
SWL (m below datum)	4	**Base of R Zone (mbgl)**	4.00
Datum (magl)	0.5	**Head of water (H_o)**	2.03

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	2.03	1.97	0.97
1	60	2.035	1.965	0.97
2	120	2.04	1.96	0.97
3	180	2.035	1.965	0.97
4	240	2.035	1.965	0.97
5	300	2.037	1.963	0.97
6	360	2.038	1.962	0.97
7	420	2.04	1.962	0.97
8	480	2.041	1.959	0.97
9	540	2.042	1.958	0.96
10	600	2.043	1.957	0.96
12	720	2.045	1.955	0.96
14	840	2.047	1.953	0.96
16	960	2.05	1.95	0.96
18	1080	2.053	1.947	0.96
20	1200	2.057	1.943	0.96
25	1500	2.064	1.936	0.95
30	1800	2.073	1.927	0.95
35	2100	2.08	1.919	0.95
40	2400	2.09	1.91	0.94
50	3000	2.109	1.891	0.93
60	3600	2.12	1.88	0.93
		General Expression	**5.85E-06**	**m/sec**

Notes: Test undertaken as Falling Head Test in Standpipe Installation

Variable head permeability test

Ground Check Ltd

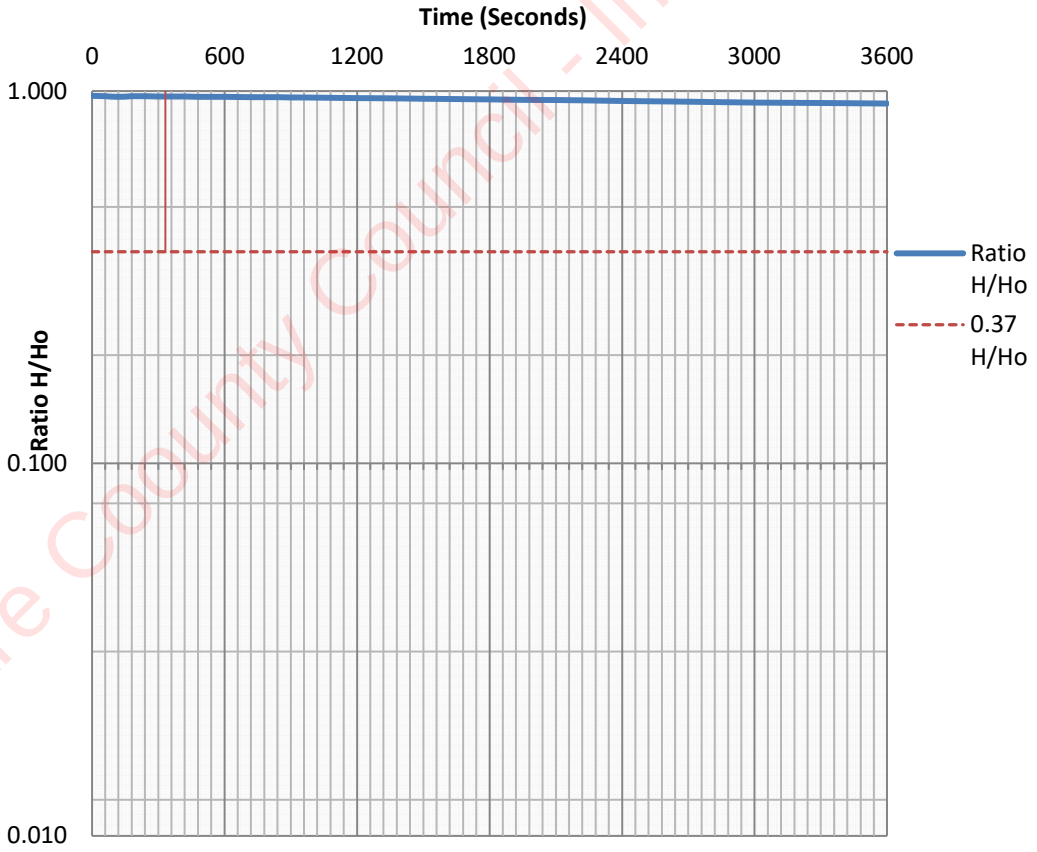
Proj / Site Ruanbeg, Kildare

BH No. BH101 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for $H/H_o = 0.37$
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= 5.85E-06 m/sec

Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH102	**Date**	08/08/2023
Test	1	**BH Diameter (mm)**	200
Geologist	JE	**Top of R Zone (mbgl)**	0.00
SWL (m below datum)	4.51	**Base of R Zone (mbgl)**	5.07
Datum (magl)	0.3	**Head of water (H_o)**	5.07

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	1.17	3.34	0.66
1	60	1.26	3.25	0.64
2	120	1.29	3.22	0.64
3	180	1.35	3.16	0.62
4	240	1.4	3.11	0.61
5	300	1.43	3.08	0.61
6	360	1.45	3.06	0.60
7	420	1.47	3.04	0.60
8	480	1.51	3	0.59
9	540	1.54	2.97	0.59
10	600	1.55	2.96	0.58
12	720	1.58	2.93	0.58
14	840	1.6	2.91	0.57
16	960	1.62	2.89	0.57
18	1080	1.63	2.88	0.57
20	1200	1.64	2.87	0.57
25	1500	1.65	2.86	0.56
30	1800	1.65	2.86	0.56
35	2100	1.65	2.86	0.56
40	2400	1.65	2.86	0.56
50	3000	1.65	2.86	0.56
60	3600	1.66	2.85	0.56
		General Expression	**1.02E-05**	**m/sec**

Notes: Test undertaken as Falling Head Test in Borehole Standpipe Installation

Variable head permeability test

Ground Check Ltd

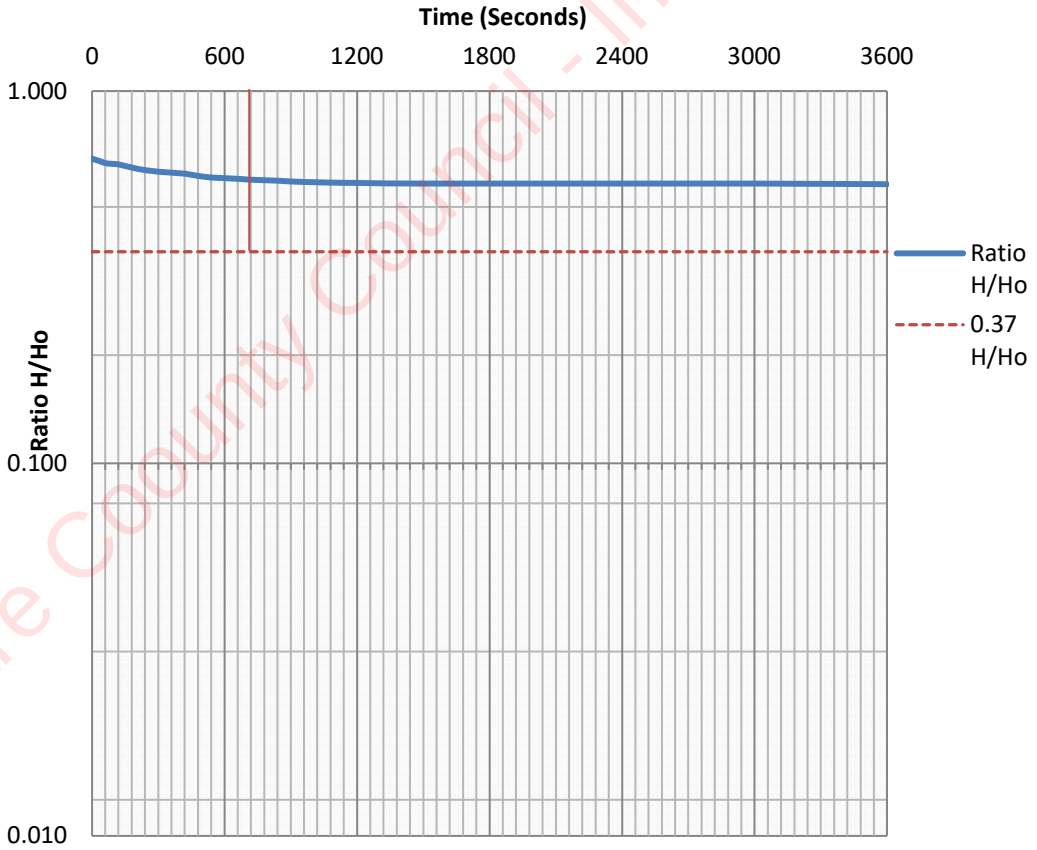
Proj / Site Ruanbeg, Kildare

BH No. BH102 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for $H/H_o = 0.37$
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= 1.02E-05 m/sec

Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH103	**Date**	08/08/2023
Test	1	**BH Diameter (mm)**	200
Geologist	JE	**Top of R Zone (mbgl)**	3.00
SWL (m below datum)	4.87	**Base of R Zone (mbgl)**	6.90
Datum (magl)	0.32	**Head of water (H_o)**	3.9

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	3	1.87	0.48
0.5	30	3.31	1.56	0.40
1	60	3.32	1.55	0.40
1.5	90	3.33	1.54	0.39
2	120	3.33	1.54	0.39
2.5	150	3.335	1.535	0.39
3	180	3.335	1.535	0.39
3.5	210	3.335	1.535	0.39
4	240	3.335	1.535	0.39
4.5	270	3.335	1.535	0.39
5	300	3.335	1.535	0.39
6	360	3.335	1.535	0.39
7	420	3.335	1.535	0.39
8	480	3.335	1.535	0.39
9	540	3.335	1.535	0.39
10	600	3.335	1.535	0.39
12	720	3.335	1.535	0.39
14	840	3.335	1.535	0.39
16	960	3.34	1.535	0.39
18	1080	3.34	1.535	0.39
20	1200	3.335	1.535	0.39
		Heneral Expression =	**4.45E-04**	**m/sec**

Notes: Test undertaken as Falling Head Test in Standpipe Installation. Infiltration rate based on initial fall in head between 1.87 & 1.535m depth - after which water levels remained static

Variable head permeability test

Ground Check Ltd

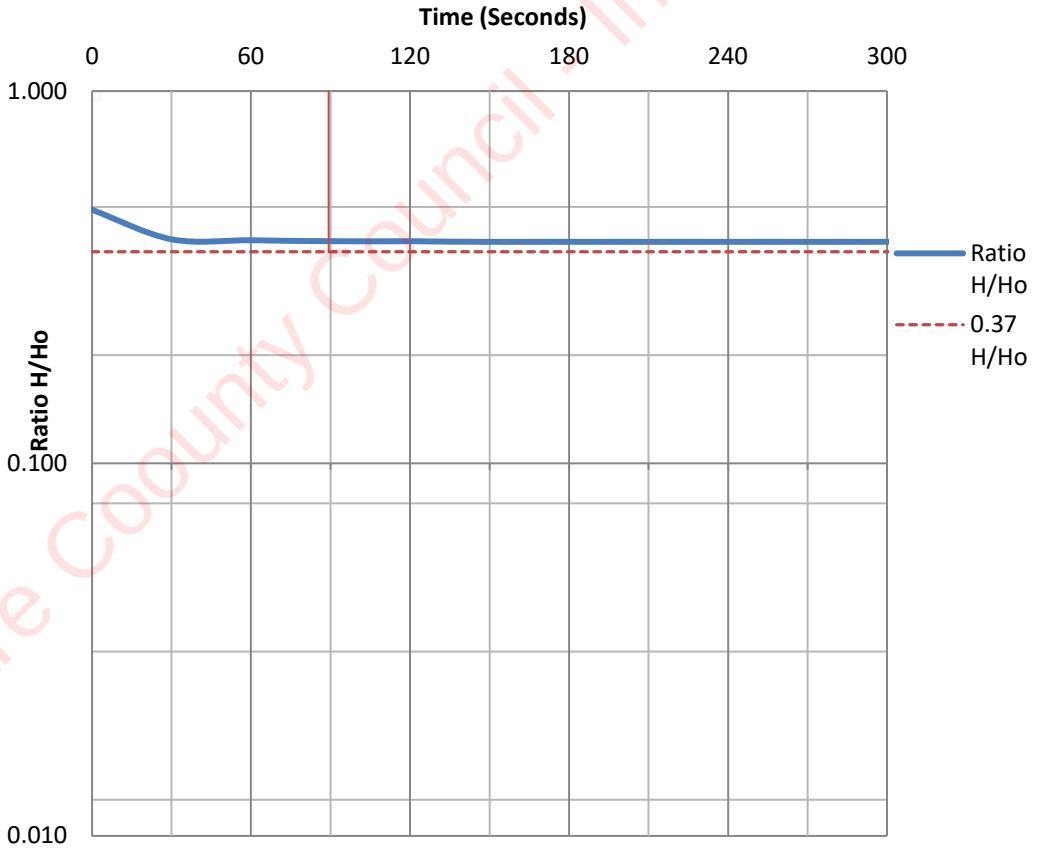
Proj / Site Ruanbeg, Kildare

BH No. BH103 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for H/H_o = 0.37
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= 4.45E-04 m/sec

Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH104	**Date**	08/08/2023
Test	1	**BH Diameter (mm)**	200
Geologist	PC	**Top of R Zone (mbgl)**	0.50
SWL (m below datum)	0.61	**Base of R Zone (mbgl)**	3.20
Datum (magl)	0.52	**Head of water (H_o)**	0.61

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	0.52	0.09	0.15
1	60	0.52	0.09	0.15
2	120	0.535	0.075	0.12
3	180	0.535	0.075	0.12
4	240	0.535	0.075	0.12
5	300	0.535	0.075	0.12
6	360	0.535	0.075	0.12
7	420	0.535	0.075	0.12
8	480	0.535	0.075	0.12
9	540	0.535	0.075	0.12
10	600	0.535	0.075	0.12
12	720	0.535	0.075	0.12
14	840	0.535	0.075	0.12
16	960	0.54	0.07	0.11
18	1080	0.54	0.07	0.11
20	1200	0.54	0.07	0.11
25	1500	0.55	0.06	0.10
30	1800	0.55	0.06	0.10
35	2100	0.55	0.06	0.10
40	2400	0.55	0.06	0.10
50	3000	0.555	0.055	0.09
60	3600	0.555	0.055	0.09
		General Expression	**4.76E-06**	**m/sec**

Notes: Test undertaken as Falling Head Test in Borehole Casing

Variable head permeability test

Ground Check Ltd

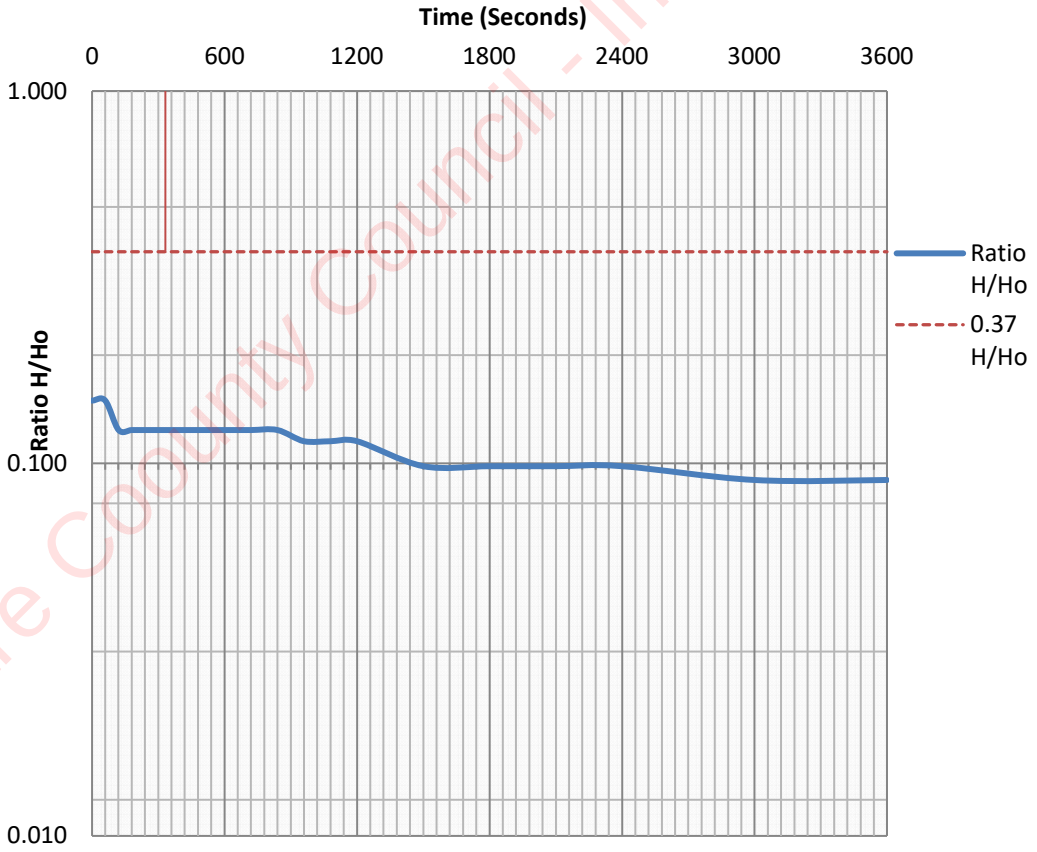
Proj / Site Ruanbeg, Kildare

BH No. BH104 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for $H/H_o = 0.37$
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= 4.76E-06 m/sec

Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH102	**Date**	08/08/2023
Test	2	**BH Diameter (mm)**	200
Geologist	PC	**Top of R Zone (mbgl)**	3.00
SWL (m below datum)	5.6	**Base of R Zone (mbgl)**	7.50
Datum (magl)	0	**Head of water (H_o)**	1.9

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	5.6	0	0.00
1	60	5.6	0	0.00
2	120	5.6	0	0.00
3	180	5.6	0	0.00
4	240	5.6	0	0.00
5	300	5.6	0	0.00
6	360	5.6	0	0.00
7	420	5.6	0	0.00
8	480	5.6	0	0.00
9	540	5.6	0	0.00
10	600	5.6	0	0.00
12	720	5.6	0	0.00
14	840	5.6	0	0.00
		General Expression	**#DIV/0!**	**m/sec**

Notes: Test undertaken as Falling Head Test in Standpipe Installation. Test terminated after 18minutes as water levels remained static. Infiltration rate could not be calculated as no change in potential head recorded during test.

Variable head permeability test

Ground Check Ltd

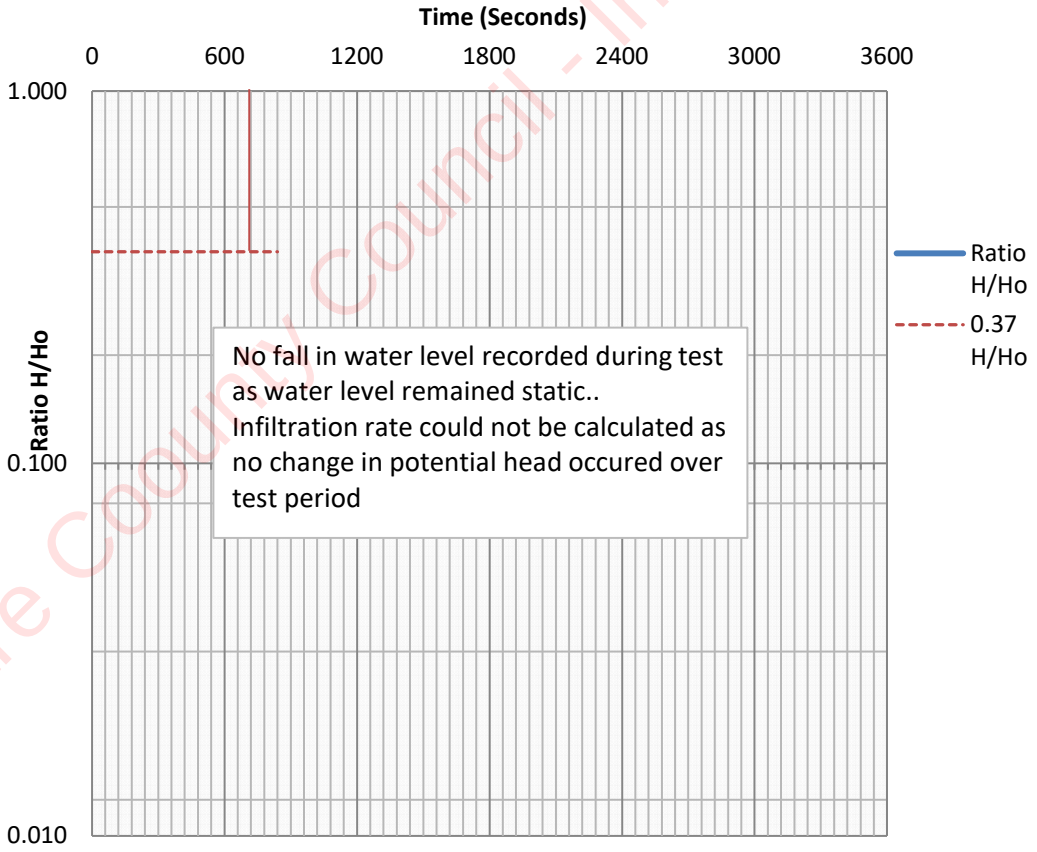
Proj / Site Ruanbeg, Kildare

BH No. BH102 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for $H/H_o = 0.37$
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= #DIV/0! m/sec

Variable head permeability test

Ground Check Ltd

Project / Site	Ruanbeg, Kildare		
BH No.	BH102	**Date**	08/08/2023
Test	2	**BH Diameter (mm)**	200
Geologist	PC	**Top of R Zone (mbgl)**	3.00
SWL (m below datum)	5.6	**Base of R Zone (mbgl)**	7.50
Datum (magl)	0	**Head of water (H_o)**	1.9

Time (Minutes / Seconds)		SWL below datum	Head of water (H)	Ratio H/H_o
0	0	5.6	0	0.00
1	60	5.6	0	0.00
2	120	5.6	0	0.00
3	180	5.6	0	0.00
4	240	5.6	0	0.00
5	300	5.6	0	0.00
6	360	5.6	0	0.00
7	420	5.6	0	0.00
8	480	5.6	0	0.00
9	540	5.6	0	0.00
10	600	5.6	0	0.00
12	720	5.6	0	0.00
14	840	5.6	0	0.00
16	960	5.6	0	0.00
18	1080	5.6	0	0.00
		General Expression	**#DIV/0!**	**m/sec**

Notes: Test undertaken as Falling Head Test in Standpipe Installation. Test terminated after 18minutes as water levels remained static. Infiltration rate could not be calculated as no change in potential head recorded during test.

Variable head permeability test

Ground Check Ltd

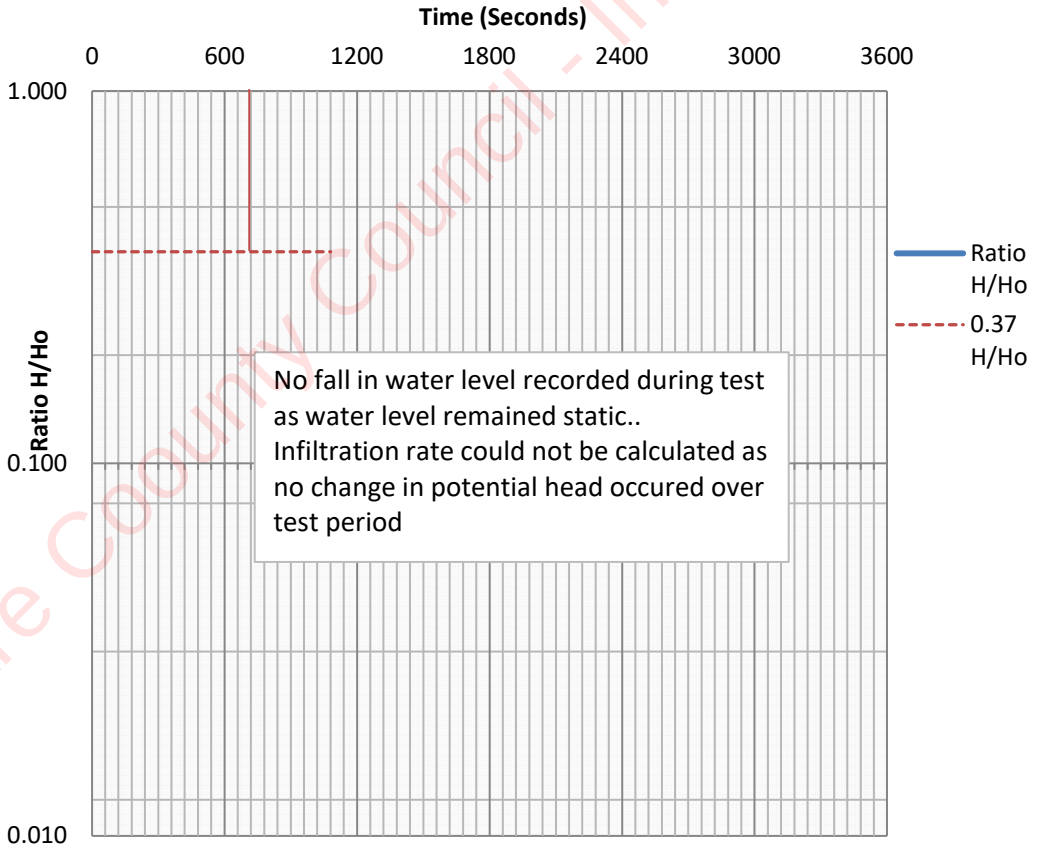
Proj / Site Ruanbeg, Kildare

BH No. BH102 **Date** 08/08/2023

Time Lag Method (Horslev)	General Expression (Horslev)
$k = \frac{A}{FT}$	$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

D= Diameter of RZ	T= basic time lag for $H/H_o = 0.37$
L= Length of test section	$t_{(x)}$= time at reading $H_{(x)}$
A= Area of well tested	$H_{(x)}$= head of water
F= Intake Factor	All readings in metres.

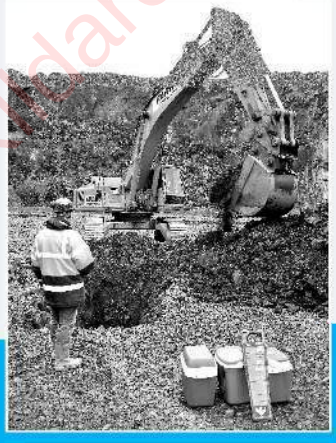
Ratio (H/Ho) to (t)



Time Lag Method (Horslev)	General Expression (Horslev)
K= #DIV/0! m/sec	k= #DIV/0! m/sec

Appendix C:

Geotechnical Laboratory Test Results




GroundCheck
SITE INVESTIGATION SPECIALISTS

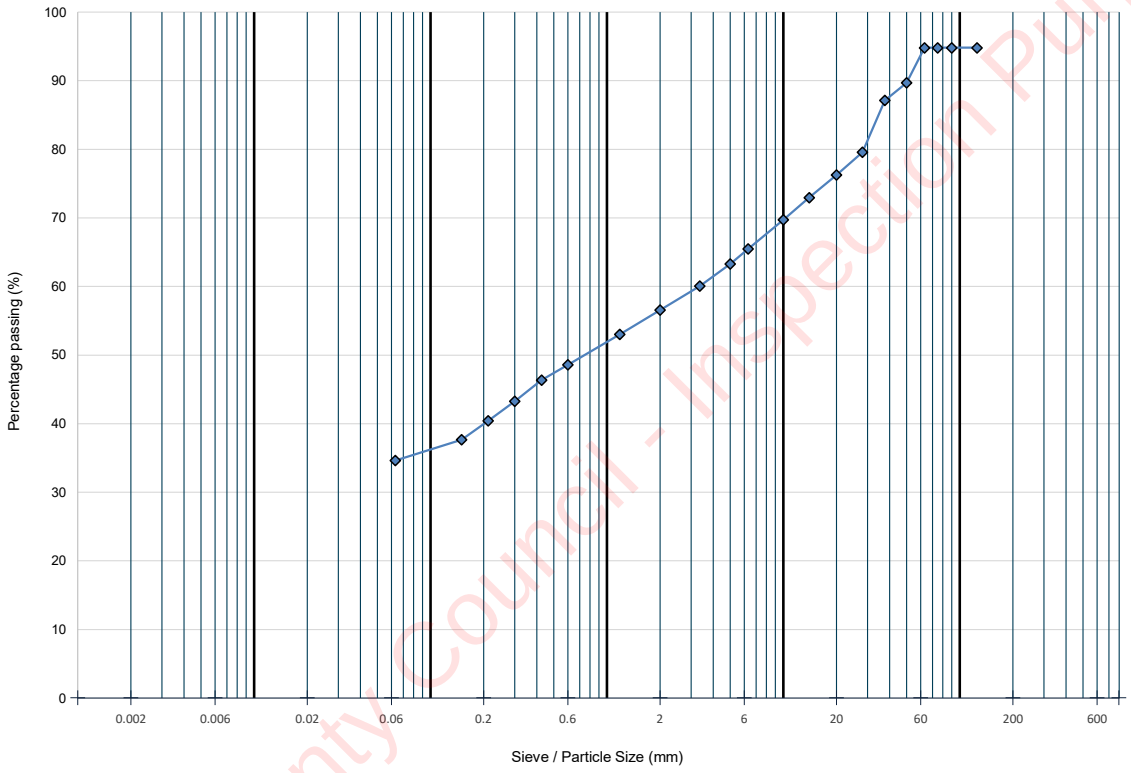
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP101	B	3.00	04	3.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
34.6	22.0	38.2	0.0

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	94.8
90	94.8
75	94.8
63	94.8
50	89.7
37.5	87.1
28	79.6
20	76.2
14	73.0
10	69.7
6.3	65.5
5	63.3
3.35	60.1
2	56.6
1.18	53.0
0.6	48.6
0.425	46.3
0.3	43.3
0.212	40.4
0.15	37.7
0.063	34.6

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

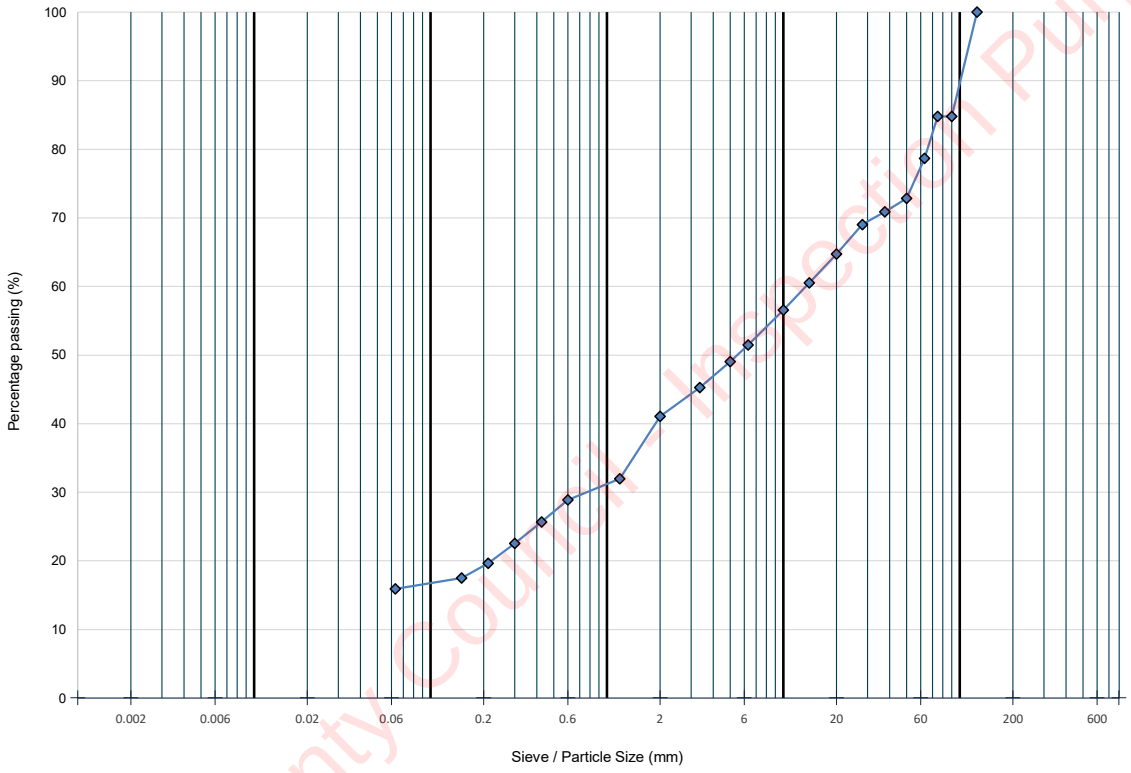
Project ID:
23-3281
Project Name:
Proposed Residential Development
Project Location:
Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	**Type:**	**Depth Top (m):**	**Reference:**	**Depth Top (m):**	**Reference:**	**Description:**
TP101	B	4.00	05	4.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	**Sand**	**Gravel**	**Cobbles**
15.9	25.2	37.6	21.3

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	84.8
75	84.8
63	78.7
50	72.8
37.5	70.9
28	69.0
20	64.7
14	60.5
10	56.6
6.3	51.5
5	49.0
3.35	45.3
2	41.1
1.18	32.0
0.6	28.9
0.425	25.7
0.3	22.6
0.212	19.6
0.15	17.5
0.063	15.9

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

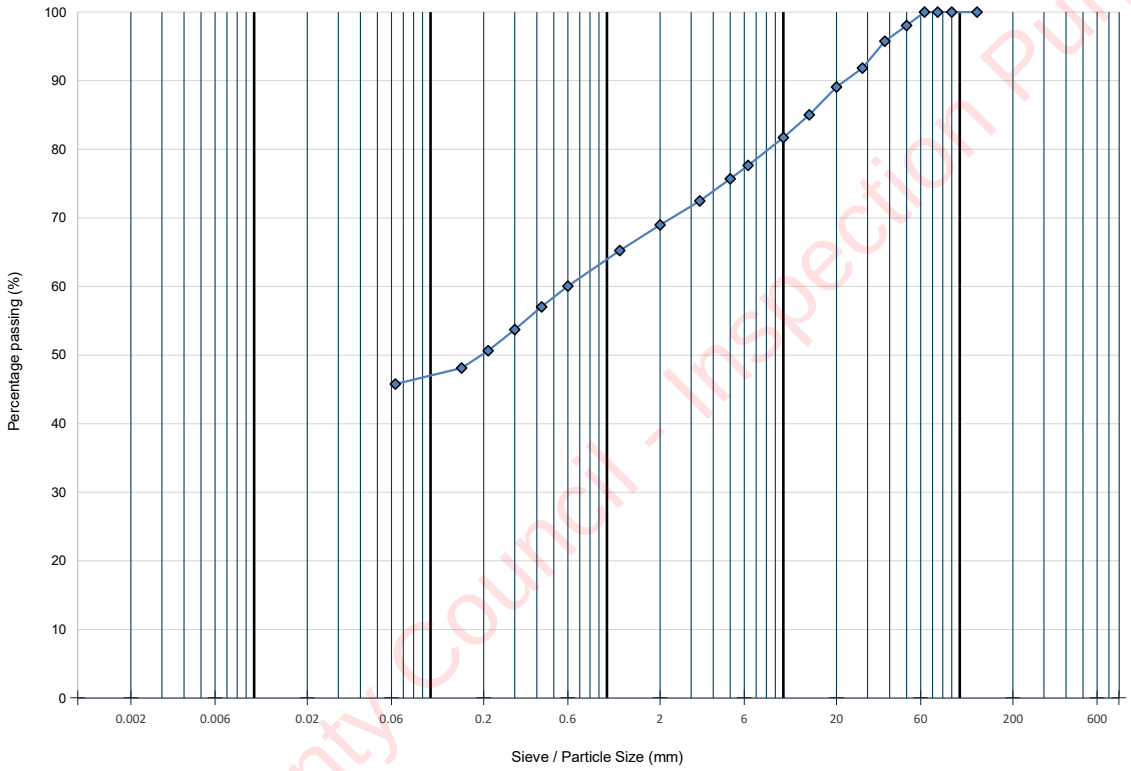
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP102	B	3.00	04	3.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
45.8	23.2	31.0	0.0

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	98.1
37.5	95.8
28	91.8
20	89.1
14	85.0
10	81.7
6.3	77.6
5	75.7
3.35	72.5
2	69.0
1.18	65.2
0.6	60.1
0.425	57.0
0.3	53.7
0.212	50.6
0.15	48.1
0.063	45.8

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

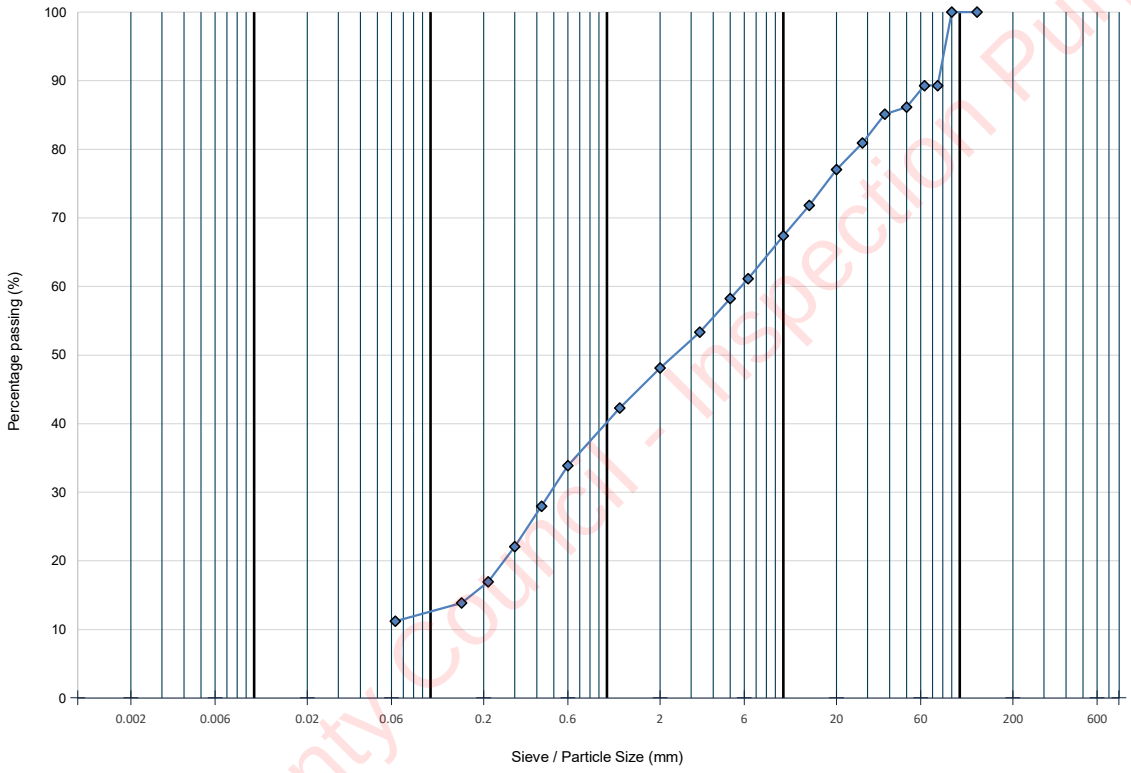
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP102	B	4.00	05	4.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
11.2	36.9	41.2	10.7

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	89.3
63	89.3
50	86.2
37.5	85.1
28	80.9
20	77.1
14	71.8
10	67.4
6.3	61.1
5	58.2
3.35	53.3
2	48.1
1.18	42.3
0.6	33.9
0.425	28.0
0.3	22.1
0.212	17.0
0.15	13.9
0.063	11.2

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

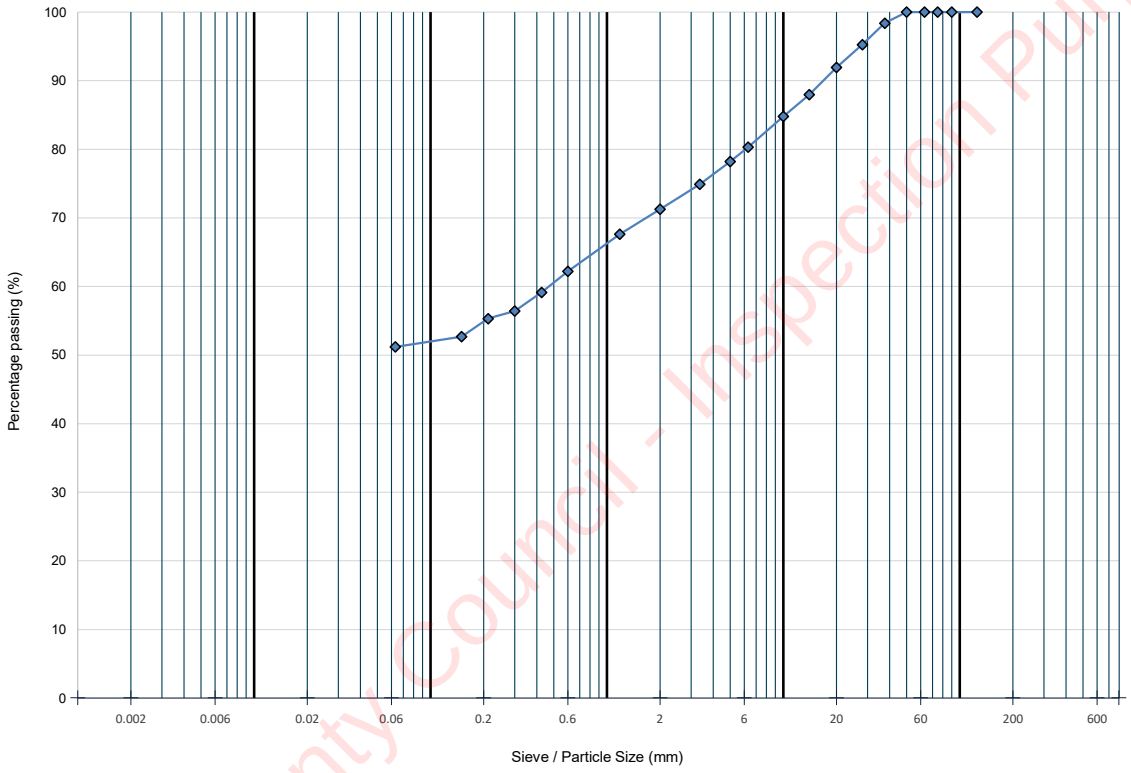
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP103	B	3.00	04	3.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
51.2	20.1	28.7	0.0

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	98.4
28	95.3
20	91.9
14	88.0
10	84.8
6.3	80.3
5	78.2
3.35	74.9
2	71.3
1.18	67.6
0.6	62.2
0.425	59.1
0.3	56.4
0.212	55.3
0.15	52.7
0.063	51.2

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

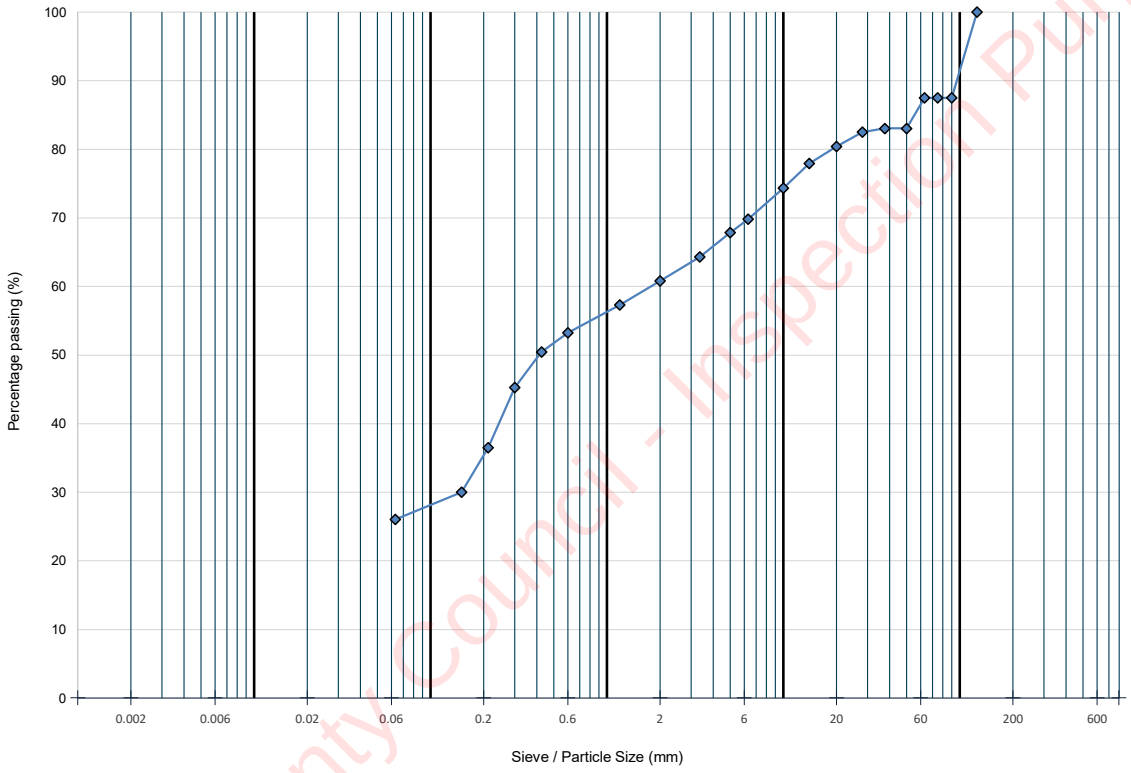
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP103	B	4.00	05	4.00	01	Grey, gravelly, sandy, clayey SILT with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
26.0	34.8	26.7	12.5

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	87.5
75	87.5
63	87.5
50	83.0
37.5	83.0
28	82.5
20	80.4
14	77.9
10	74.3
6.3	69.8
5	67.9
3.35	64.3
2	60.8
1.18	57.3
0.6	53.3
0.425	50.4
0.3	45.3
0.212	36.5
0.15	30.0
0.063	26.0

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

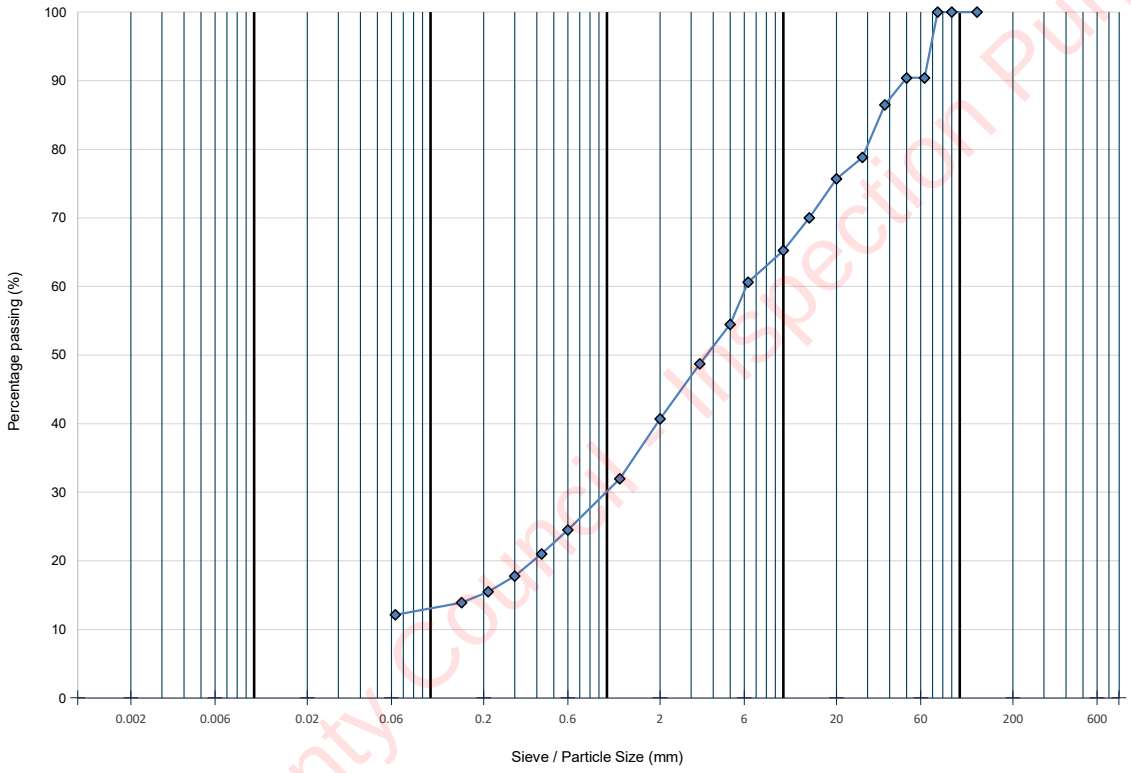
Project ID:
23-3281
Project Name:
Proposed Residential Development
Project Location:
Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP104	B	2.00	03	2.00	01	Grey, silty, gravelly, fine to coarse SAND with cobbles

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
12.1	28.5	49.7	9.6

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	90.4
50	90.4
37.5	86.5
28	78.8
20	75.7
14	70.0
10	65.2
6.3	60.6
5	54.5
3.35	48.7
2	40.7
1.18	32.0
0.6	24.5
0.425	21.0
0.3	17.8
0.212	15.5
0.15	13.9
0.063	12.1

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

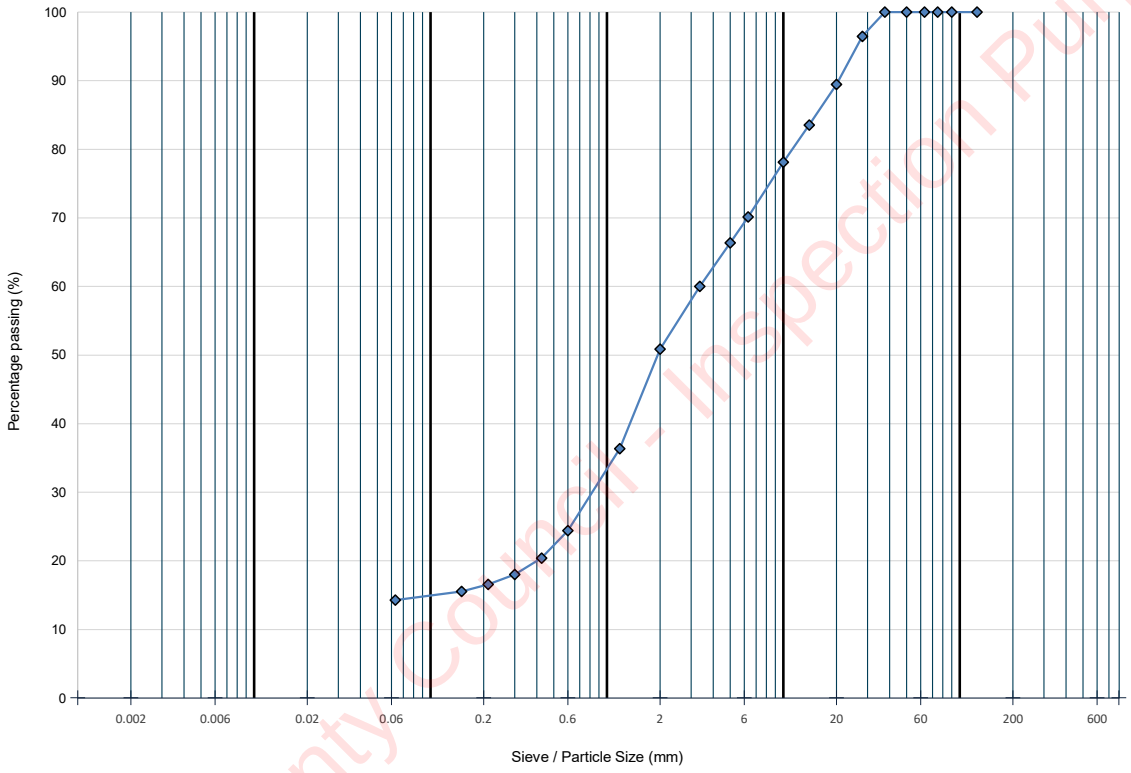
Project ID: 23-3281
Project Name: Proposed Residential Development
Project Location: Ruanbeg, Kildare.

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
TP104	B	3.00	04	3.00	01	silty, gravelly, fine to coarse SAND with bands of very sandy, clay

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
14.3	36.6	49.1	0.0

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	100.0
28	96.5
20	89.4
14	83.6
10	78.1
6.3	70.1
5	66.4
3.35	60.0
2	50.9
1.18	36.4
0.6	24.4
0.425	20.4
0.3	18.0
0.212	16.6
0.15	15.5
0.063	14.3

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck

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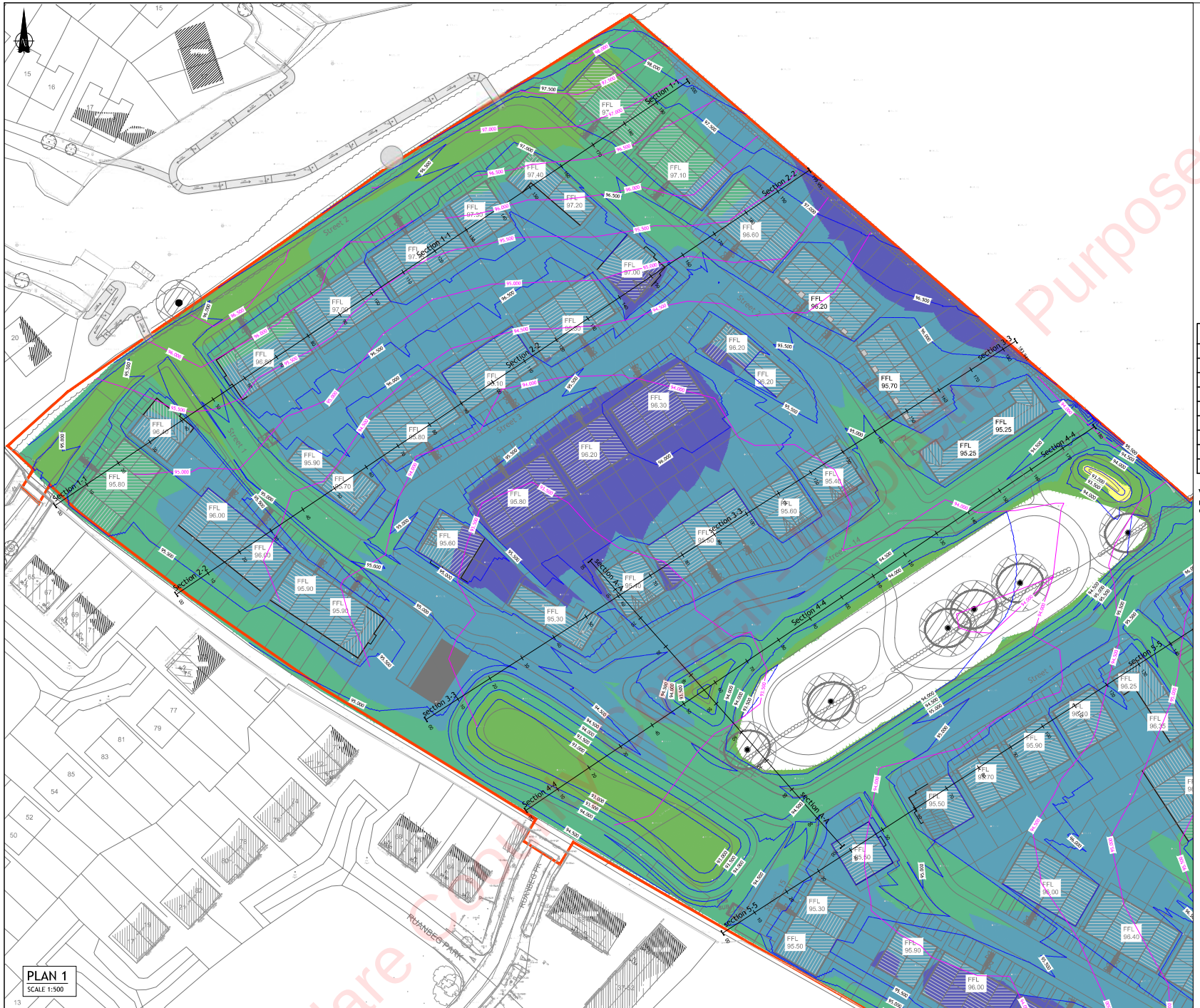
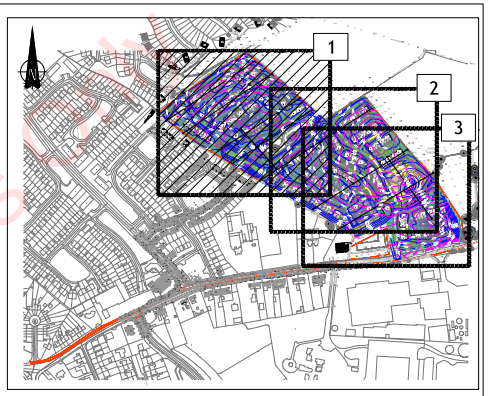
Appendix 6.4

Earthworks Drawings

Additional Information



PLAN 1
SCALE 1:500



KEY PLAN
N.T.S

SURFACE LEVEL DATA					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-4.00	-3.00		91.248m2	26.632m3
2	-3.00	-2.00		1589.701m2	539.431m3
3	-2.00	-1.00		4823.430m2	3498.833m3
4	-1.00	0.00		13626.447m2	12436.301m3
5	0.00	1.00		26119.756m2	58346.033m3
6	1.00	2.00		34775.109m2	24321.514m3
7	2.00	3.00		7748.705m2	3997.874m3
8	3.00	4.00		1522.307m2	729.568m3

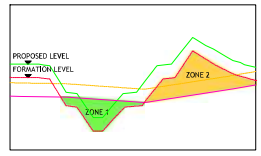
ZONE 1
MATERIAL BELOW BASE SURFACE & ABOVE COMPARISON SURFACE

ZONE 2
MATERIAL ABOVE BASE SURFACE & ABOVE COMPARISON SURFACE

VOLUMES COMPARISON (ENTIRE SITE)
BASE SURFACE = STRIPPED TOP SOIL
COMPARISON SURFACE = FORMATION LEVEL

LEGEND

FINISHED FLOOR LEVEL — FFL:12.000
PROPOSED SLOPE — 1:100
PROPOSED SITE SURFACE MAJOR CONTOURS — 96.000
STRIPPED SOIL SURFACE MAJOR CONTOURS — 96.000



Rev	Amendment	By	Date
S01	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

Client:

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS 1 OF 6

Drawn:	Date drawn:	Technician Check:	Engineer Check:	Approved:
DAP	AUGUST 2023	RD	MR	

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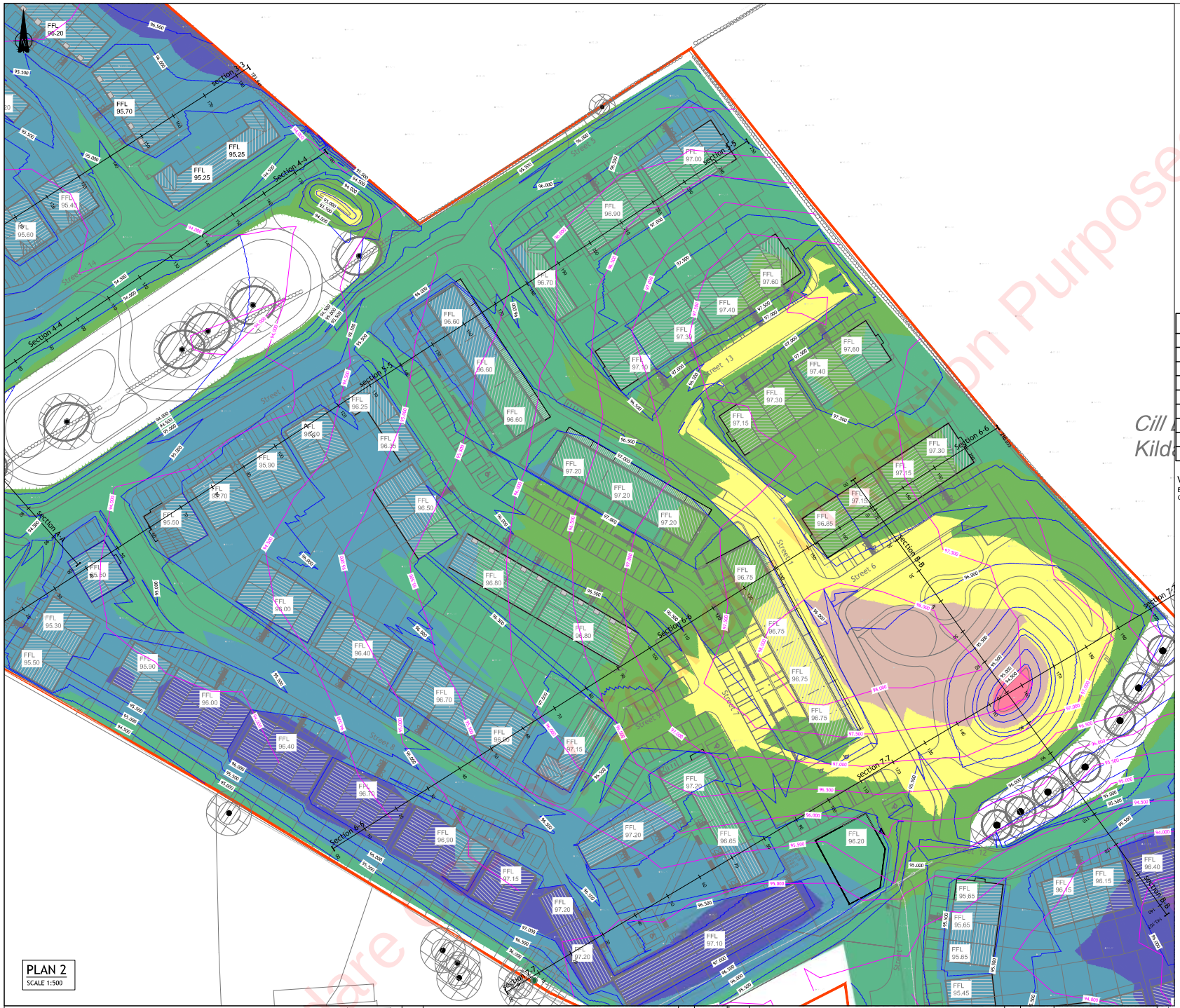
1:500	222143-PUNCH-XX-XX-DR-C-0750	C01



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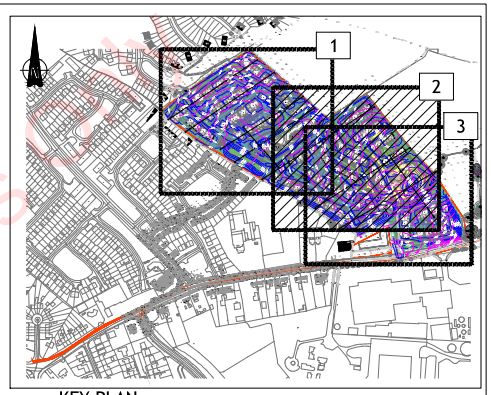
SCALE 1:500



KEY PLAN
N.T.S

SURFACE LEVEL DATA					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-4.00	-3.00		91.248m2	26.632m3
2	-3.00	-2.00		1589.701m2	539.431m3
3	-2.00	-1.00		4823.430m2	3498.833m3
4	-1.00	0.00		13626.447m2	12436.301m3
5	0.00	1.00		26119.756m2	58346.033m3
6	1.00	2.00		34775.109m2	24321.514m3
7	2.00	3.00		7748.705m2	3997.874m3
8	3.00	4.00		1522.307m2	729.568m3

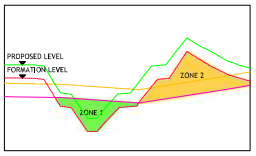
ZONE 1
MATERIAL BELOW BASE SURFACE & ABOVE COMPARISON SURFACE

ZONE 2
MATERIAL ABOVE BASE SURFACE & ABOVE COMPARISON SURFACE

VOLUMES COMPARISON (ENTIRE SITE)
BASE SURFACE = STRIPPED TOP SOIL
COMPARISON SURFACE = FORMATION LEVEL

LEGEND

FINISHED FLOOR LEVEL — FFL:12.000
PROPOSED SLOPE — 1:100
PROPOSED SITE SURFACE MAJOR CONTOURS — 96.000
STRIPPED SOIL SURFACE MAJOR CONTOURS — 96.000



NSAI Certified

Rev	Amendment	By	Date
S01	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS 2 OF 6

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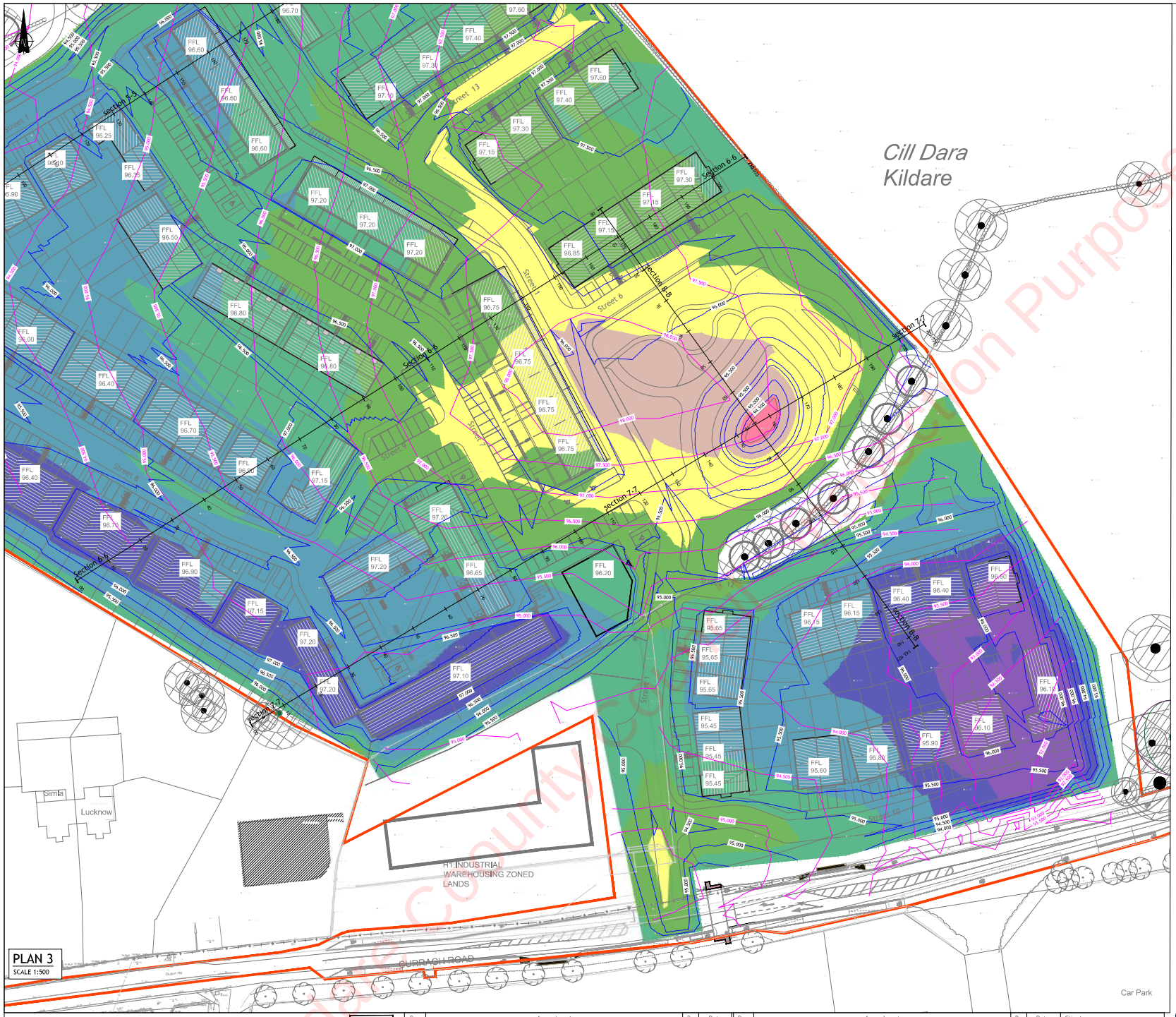


PLAN 3
SCALE 1:500

KEY PLAN
N.T.S

SURFACE LEVEL DATA					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-4.00	-3.00		91.248m2	26.632m3
2	-3.00	-2.00		1589.701m2	539.431m3
3	-2.00	-1.00		4823.430m2	3498.833m3
4	-1.00	0.00		13626.447m2	12436.301m3
5	0.00	1.00		26119.756m2	58346.033m3
6	1.00	2.00		34775.109m2	24321.514m3
7	2.00	3.00		7748.705m2	3997.874m3
8	3.00	4.00		1522.307m2	729.568m3

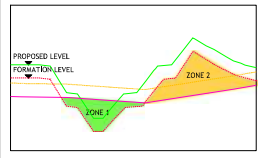
ZONE 1
MATERIAL BELOW BASE SURFACE & ABOVE COMPARISON SURFACE

ZONE 2
MATERIAL ABOVE BASE SURFACE & ABOVE COMPARISON SURFACE

VOLUMES COMPARISON (ENTIRE SITE)
BASE SURFACE = STRIPPED TOP SOIL
COMPARISON SURFACE = FORMATION LEVEL

LEGEND

FINISHED FLOOR LEVEL — FFL:12.000
PROPOSED SLOPE — 1:100
PROPOSED SITE SURFACE MAJOR CONTOURS — 96.000
STRIPPED SOIL SURFACE MAJOR CONTOURS — 96.000



Rev	Amendment	By	Date
S01	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

Rev	Amendment	By	Date

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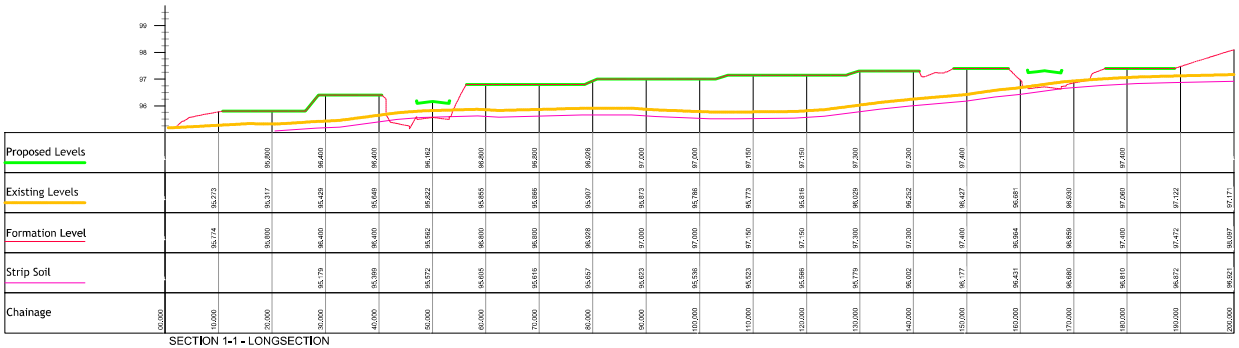
Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS 3 OF 6
Drawn: DAP | Date drawn: AUGUST 2023 | Technician Check: RD | Engineer Check: MR | Approved:
Project No: 222143 | Model Ref: 222143-PUNCH-XX-XX-M2-C-0750-0754 | Drawing Status: AO
Scale @ A1: 1:500 | Document Ref: 222143-PUNCH-XX-XX-DR-C-0752 | Revision No: C01



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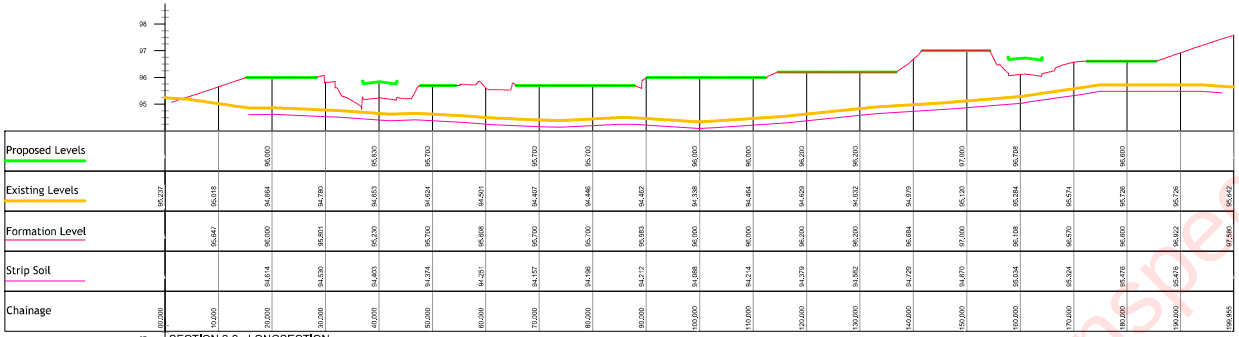

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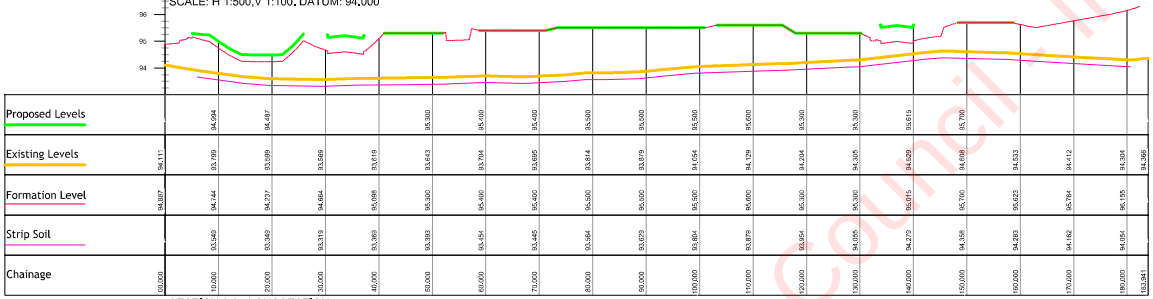

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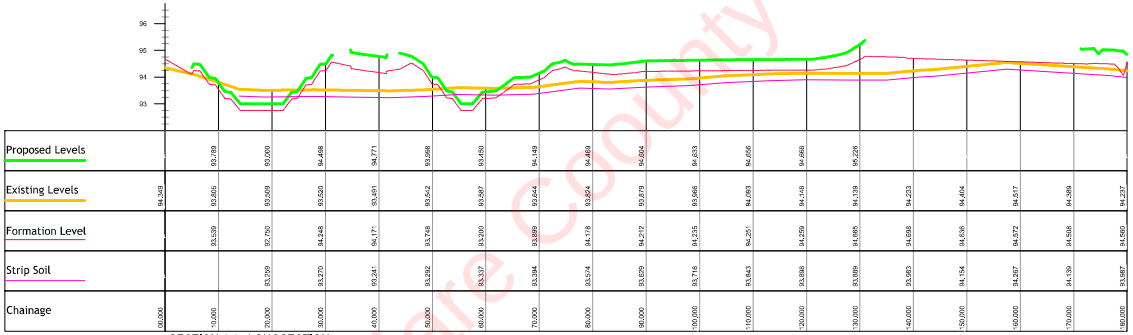

SECTION 4-4 - LONGSECTION
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LEGEND

- FINISHED FLOOR LEVELS (FFL)
- SITE FORMATION LEVEL
- EXISTING SITE LEVELS
- STRIPPED TOP SOIL

Rev	Amendment	By	Date
S01	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

Rev	Amendment	By	Date

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE

Title: EARTHWORKS & LONGSECTIONS 4 OF 6

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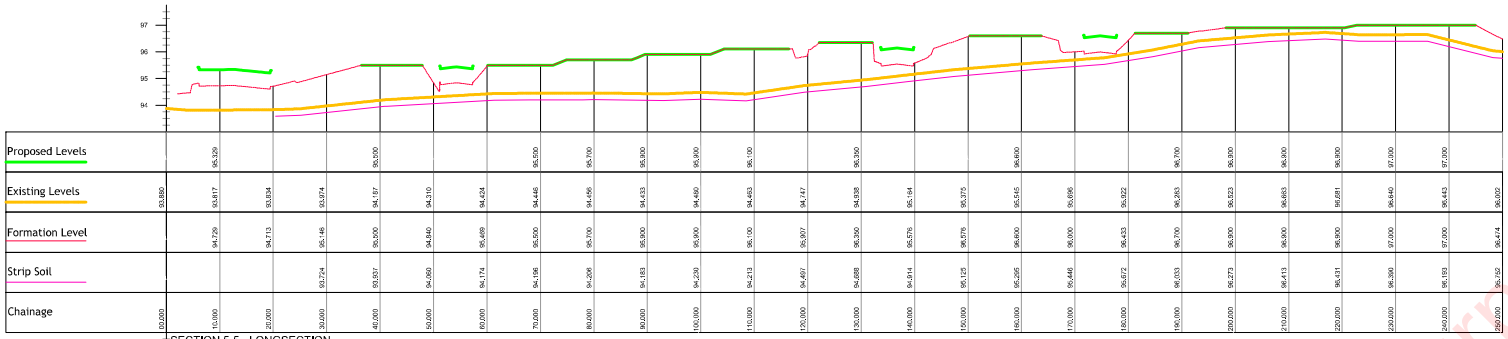
1:500	222143-PUNCH-XX-XX-DR-C-0753	C01



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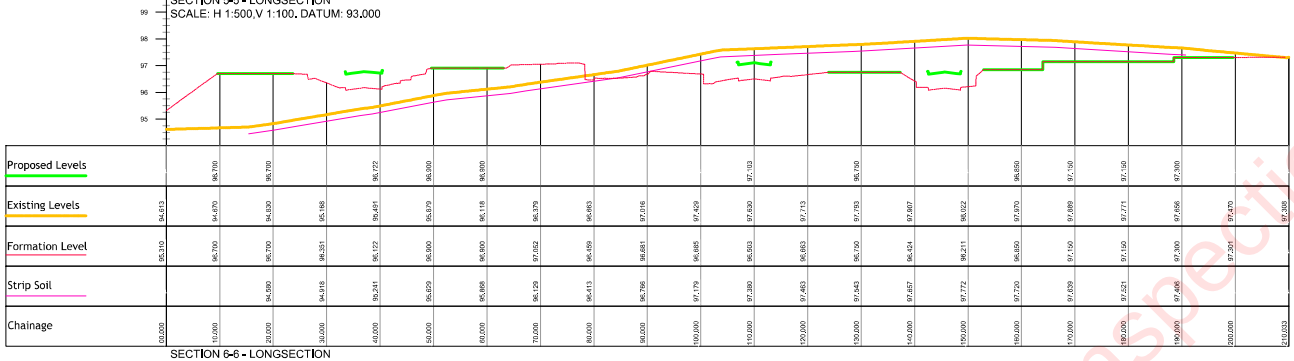

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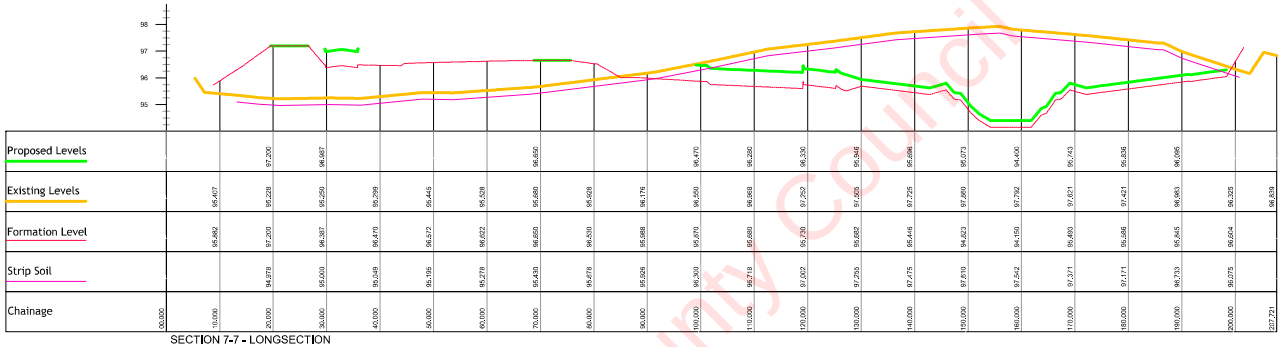

SECTION 7-7 - LONGSECTION
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LEGEND

- FINISHED FLOOR LEVELS (FFL)
- SITE FORMATION LEVEL
- EXISTING SITE LEVELS
- STRIPPED TOP SOIL

Rev	Amendment	By	Date
S01	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS 5 OF 6

Drawn:	Date drawn:	Technician Check:	Engineer Check:	Approved:
DAP	AUGUST 2023	RD	MR	

Project No:	Model Ref:	Drawing Status:
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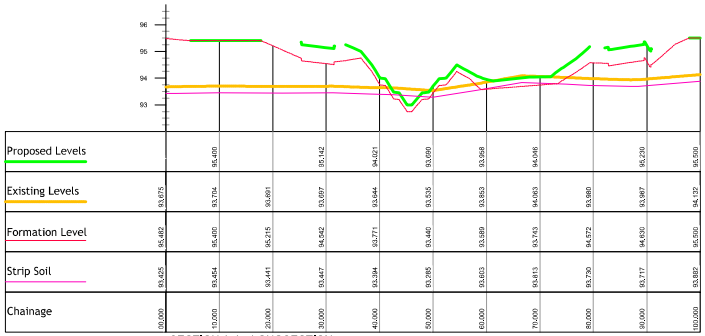

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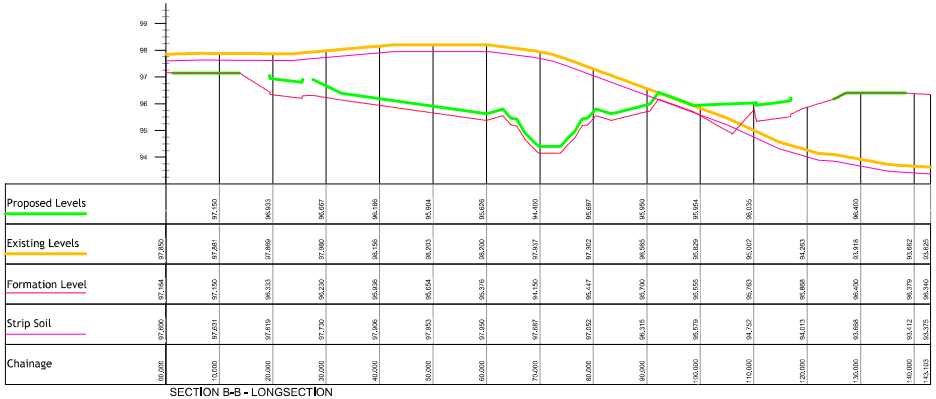

SECTION B-B - LONGSECTION
SCALE: H 1:500,V 1:100. DATUM: 93.000

LEGEND

- FINISHED FLOOR LEVELS (FFL)
- SITE FORMATION LEVEL
- EXISTING SITE LEVELS
- STRIPPED TOP SOIL

SECTION 5-5 CONTINUATION - LONGSECTION
SCALE: H 1:250,V 1:50. DATUM: 93.000

Rev	Amendment	By	Date
SO1	DRAFT PLANNING FI RESPONSE	RD	2023.08.25
C01	PLANNING FI RESPONSE	RD	2023.09.04

Client:

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS 6 OF 6

Drawn:	Date drawn:	Technician Check:	Engineer Check:	Approved:
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Project No:	Model Ref:	Drawing Status:
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Scale @ A1:	Document Ref:	Revision No:
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PLAN
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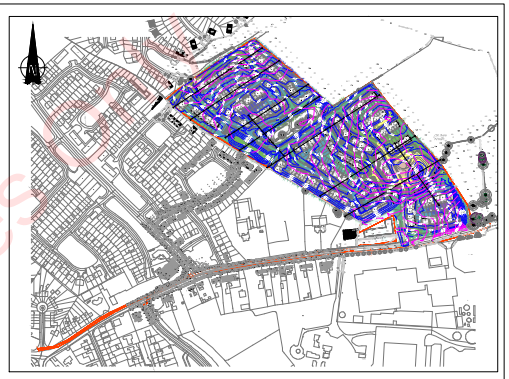

KEY PLAN
N.T.S

SURFACE LEVEL DATA					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-4.00	-3.00		91.248m2	26.632m3
2	-3.00	-2.00		1589.701m2	539.431m3
3	-2.00	-1.00		4823.430m2	3498.833m3
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7	2.00	3.00		7748.705m2	3997.874m3
8	3.00	4.00		1522.307m2	729.568m3

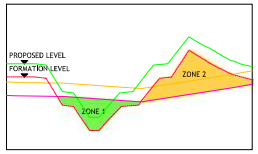
ZONE 1
MATERIAL BELOW BASE SURFACE & ABOVE COMPARISON SURFACE

ZONE 2
MATERIAL ABOVE BASE SURFACE & ABOVE COMPARISON SURFACE

VOLUMES COMPARISON (ENTIRE SITE)
BASE SURFACE = STRIPPED TOP SOIL
COMPARISON SURFACE = FORMATION LEVEL

LEGEND

FINISHED FLOOR LEVEL — FFL=12.000
PROPOSED SLOPE — 1:100
PROPOSED SITE SURFACE MAJOR CONTOURS — 96.000
STRIPPED SOIL SURFACE MAJOR CONTOURS — 96.000



Rev	Amendment	By	Date
C01	PLANNING FI RESPONSE	RD	2023.09.04

Rev	Amendment	By	Date

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE
Title: EARTHWORKS & LONGSECTIONS - OVERALL PLAN

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Scale @ A1	Document Ref.	Revision No.
1:500	222143-PUNCH-XX-XX-DR-C-0756	C01

Appendix 7.1

Updated Hydrological Site Assessment

Slight Change

Ruanbeg Residential Development

Updated Hydrogeological Site Assessment

Report for:
MRP Oakland Limited

Date:
1st September 2023

Report No:
BRE22014Rp03A02

BlueRock Environmental Limited
Suite 332,
The Capel Building,
Mary's Abbey,
Dublin 7.

Na Forbacha
Co.na Gaillimhe
H91 YD2T

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Project Title:	Ruanbeg Residential Development – Updated Hydrogeological Site Assessment
Project No.:	BRE22014
Report Ref.:	BRE22014Rp03A02
Status:	Final
Date:	5th September 2023
Client:	MRP Oakland Limited

Document Production / Approval Record

	Name	Signature	Date	Position
Prepared by (consultant)	Paul Cummins BSc. MSc.		05/09/23	Environmental Consultant
Approved by (consultant)	Niall Mitchell BE, MSc, CEng MIEI, PGeo		05/09/23	Hydrogeologist / Chartered Engineer

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The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by BREL has not been independently verified by BREL, unless otherwise stated in the report. Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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Any risk assessment and opinions provided, will have applied the Required Standard to take into consideration currently available guidance and available approaches in the generation of generic or site-specific assessment criteria or remedial target concentrations which relate to the assessment of risk in a specific land use scenario and risk posed to specific receptors. No liability can be accepted for the retrospective impact associated with any future changes or amendments to published assessment criteria, associated models, or associated guidance.

Certain statements made in the report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. BREL specifically does not guarantee or warrant any estimate or projections contained in this report.

Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this report.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 INTRODUCTION

1.1 General

BlueRock Environmental Ltd (BREL) was requested by MRP Oakland Limited to undertake an updated Hydrogeological Site Assessment for a proposed residential development at Ruanbeg, located to the east of Kildare Town, Co. Kildare. Additional site investigation and monitoring and amendments to the proposed drainage system for the site were subsequently undertaken on receipt of a Further Information (FI) response from Kildare County Council (KCC).

An initial Hydrogeological Assessment was issued for the site (Ref: BRE220014Rp01A02, 3rd May 2023). This updated report was provided to incorporate the additional site investigation information collated in 2023, to clarify that over 7 months of groundwater level monitoring was undertaken across the site in both shallow and deep monitoring wells, and to address specific queries as detailed in a Further Information (FI) request from Kildare County Council (KCC). It also reconfirms the original hydrogeological report that ground conditions underlying infiltration/attenuation tanks B and C are suitable for stormwater infiltration to ground and some low level and localised drainage design alterations were required in the vicinity of tank A. There have been no significant alterations to the proposed drainage design in terms of hydrogeology or groundwater since the previous Hydrogeological Assessment.

This updated Hydrogeological Assessment should be considered the most uptodate conceptual understanding of the hydrogeological conditions underlying the site, and its immediate environs, and supersedes all previous hydrogeological assessment reports/monitoring data. It also considers the risk of the development on the hydrogeological regime and any sensitive receptors with particular emphasis on Pollardstown Fen Special Area of Conservation (SAC).

The site comprises an area of approximately 10.3 hectares and currently consists of 3 no. open agricultural fields with associated shrubs and tree lines. The revised proposed residential development will comprise 285 residential units, a crèche, sheltered accommodation, courtyard garden and public open spaces.

1.2 Scope Of Work

The following scope of works was undertaken during the completion of this assessment:

- A desk top review of all available geological, hydrogeological, hydrological and ecological data pertaining to the site and its general environs and to develop an initial conceptual understanding of the hydrogeological regime;
- Site investigation activities over three phases and subsequent groundwater level monitoring over 7 months; and,
- Development of a detailed Updated Interpretative Hydrogeological Site Assessment.

1.3 Information Sources

The following sources of publicly available information were consulted as part of the desk study:

- Ordnance Survey of Ireland, Discovery Series, Sheet 55;
- Ordnance survey of Ireland (OSI) online historical maps and aerial photographs;
- Geology of Kildare - Wicklow, Geological Survey of Ireland (GSI) (1:100,000), Sheet 16;
- GSI On-line Groundwater database. Aquifer Classification, Aquifer Vulnerability, Teagasc Soil Classification;

- http://www.gsi.ie/Programmes/Groundwater/Groundwater+web+mapping.htm http://www.gsi.ie/Old+Mapping.htm#gsi;
- GSI Curragh West Groundwater body (GWB);
- Soil Map of Ireland (Second Edition, 1980), national Soil Survey of Ireland, An Foras Talúntais.
- National Parks and Wildlife Service On-line database www.npws.ie;
- EPA Online Water Quality Mapping; http://www.epa.ie/rivermap/;
- OPW Hydro-Data (http://www.opw.ie/hydro-data);
- Met Eireann - Met.ie – monthly climatological data;
- Kildare County Council Online Planning Files;
- Trinity College Civil & Environmental Engineering Dept in relation to monitoring and assessments of Pollardstown Fen;
- White Young Green (2002). Curragh Aquifer - Current Conceptual Understanding and Numerical Modelling; and,
- Wright (1988) The Mid-Kildare sand/gravel Aquifer. Geological Survey of Ireland.

2 BACKGROUND SITE INFORMATION

2.1 Site Location and Setting

The proposed residential development site comprises a landholding of 10.3 hectares immediately east of Kildare town. The site is located approximately 1.6km to the east of the centre of Kildare town, 450m north of the M7 motorway - see Figure 2.1.

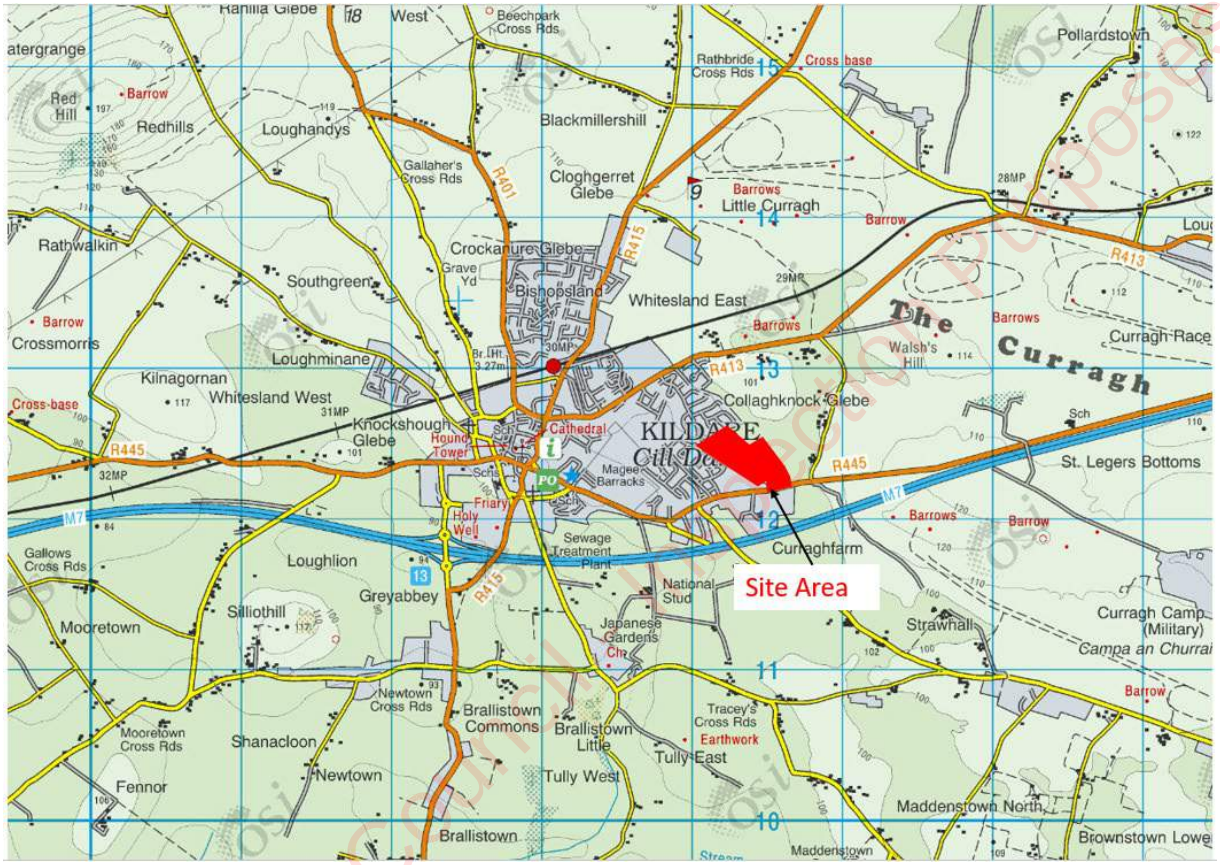


Figure 2.1 Site Location

The proposed site currently consists of a number of agricultural fields. The site is accessed by the regional road (R445) and the surrounding area is characterised by residential estates to the west and north and the Curragh Racetrack and associated surrounding Curragh plains to the east. The R445 bounds the southern boundary of the site.

The boundary treatment around the site comprises of mature trees, hedging and surface ditches. Agricultural farms lie in close proximity to the east and the town of Kildare lies to the west. A beef and lamb food processing facility lies immediately to the south of the site on the southern side of the R445 as well as the M7 motorway.

A topographical survey of the site and its environs was completed by CSS Land Surveys Ltd., in May 2022. The topography of the site varies, ranging between 92.00m AOD and 98.50m AOD, with a pronounced hillock located south-centre of the site and lower levels within the area adjacent to the Dublin Road.

3 REGIONAL & SITE GEOLOGY

3.1 Drift Deposits

The GSI subsoils map describes the soils of the general area of Kildare town and county as till derived from limestone with overlying cut over raised peat. Within the Kildare town area glacial till derived from Lower Palaeozoic and Devonian sandstones are recorded. A large gravel body (circa. 50km^2) is recorded to the south and west of Kildare town and underlies the subject site. These gravels area also delineated with associated alluvial deposits.

The soils map of Kildare specifies a general overburden of grey-brown podzols. Rarer Acid Brown Earths, Brown Podzolics associated with lower Palaeozoic deposits are found north of Kildare town and west of the Wicklow mountains. Isolated section of Basin Peats, Blanket Peats are also recorded and generally accumulate is size towards the east of Co. Kildare. The gravel deposits are described with an overlying soil group of Renzinas/Lithosols with minor shallow Peaty Gleys. There are also limited areas of alluvium associated with the fluvio-glacial gravel deposits and more recent River Liffey deposits.

3.2 Bedrock

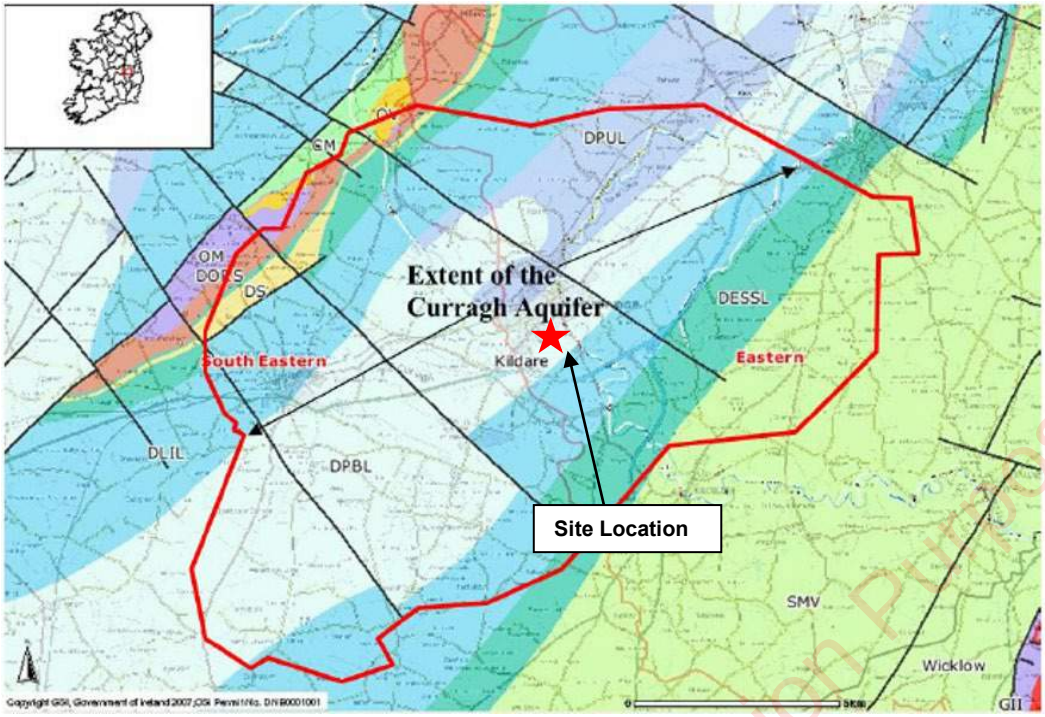
The bedrock geology beneath Kildare town consists of Carboniferous limestone deposits. According to GSI sheet 16, “Geology of Kildare-Carlow” (McConnell, 1994) land subsidence, which occurred during the Carboniferous period in the Upper Palaeozoic, led to extensive ingress of seawater into the low-lying areas which led to an accumulation of marine sediment deposits comprising intertidal laminated mud and sand. The type of sediment being accumulated was governed by the depth of the sea, and therefore progressive subsidence resulted in shallow water sediments to be deposited below the deep water marine sediments.

According to GSI sheet 11, the main rock units underlying the study area is the Rickardstown Formation (RK). The Rickardstown Limestone is cherty and often dolomitised. The GSI have identified two distinct horizons within this formation. The lower horizon is varied and includes thin interbedded units of nodular crinoidal, cherty micrite and fossilferous shale. The upper part consists primarily of quite uniform, moderately dark grey, fine grained dolomite with abundant chert.

Other formations in proximity to the site include the Boston Hill Formation which includes major units of very distinctive, laminated limestone, which distinguish this formation from the Ballysteen Formation.

The area surrounding Kildare town is cut with faults running predominantly in northwest-southeast direction. The site lies between two of these faults, one located approximately 1.55 km southwest and the other approximately 2.5 km northeast.

No bedrock outcrops have been mapped across or in the vicinity of the site.



Source: www.gsi.ie (Kuczynska, 2008).

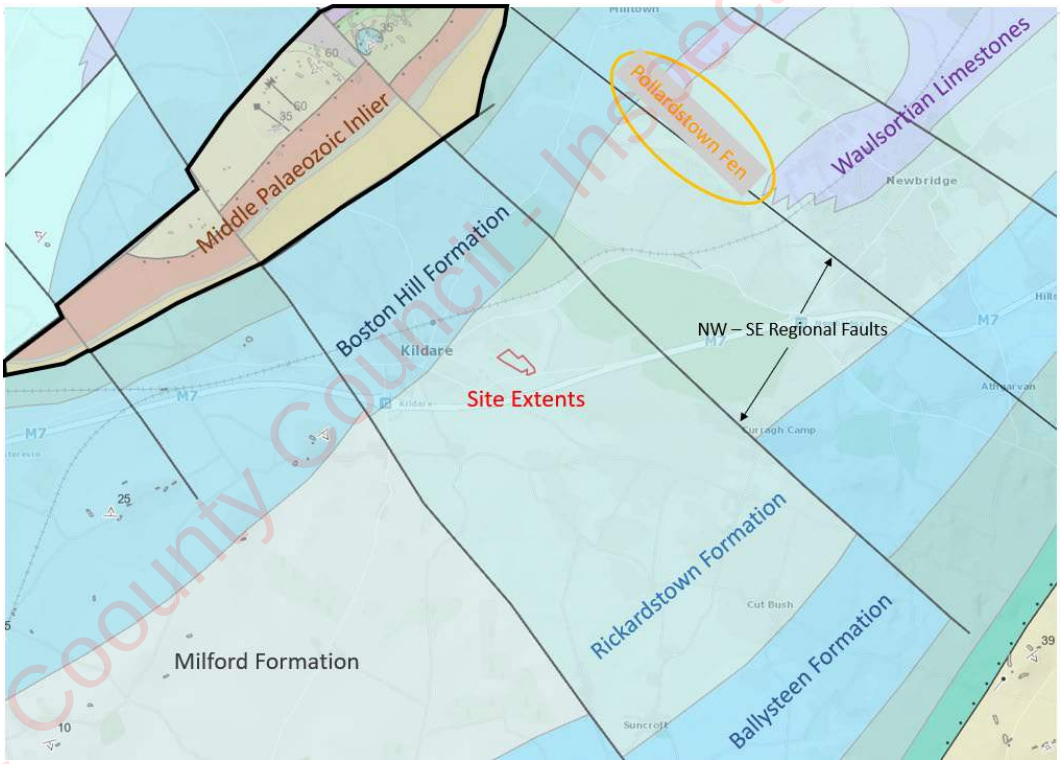


Figure 3.1 Bedrock geology map of the area surrounding (a) the Curragh aquifer; and (b) Pollardstown Fen.

4 HYDROGEOLOGY

4.1 Aquifer Classification

The site is underlain by the Regionally Important (Rg) Curragh Gravel Aquifer West Groundwater Body (GWB). This aquifer lies in a shallow trough, oriented NE-SW, at the surface of the limestone bedrock. The topography of the bedrock surface primarily controls the depth of this aquifer with the areas of greatest thickness to the northeast along the drainage divide where it can be up to 70 metres in thickness with reduced thickness away from this area of higher elevation.

The GWB is recharged from rainwater percolating through the topsoil and unsaturated sand and gravel deposits. The main discharge mechanisms present are baseflow discharge to rivers, seepages at the extremities of the body and discharge via springs. Where the water table is sufficiently close to the surface such that the riverbed elevation is lower than it is, the aquifer will contribute groundwater to the river. The occurrence of springs in a gravel aquifer is unusual, as these are more commonly associated with karstic aquifers. It is considered that the discharges from such areas were initially small seepages, which were then altered by man to increase the flow. Natural processes can also lead to the convergence of flow at these springs.

The interaction between groundwater and surface water is complex and the quantification of the volume of groundwater that contributes to surface water flow and its chemical composition is often difficult to calculate. Groundwater contributions to surface water flow vary; however in the more productive aquifers, such as the sand and gravel aquifer of this GWB, the contribution may be up to 80 or 90 percent (Toner et al., 2005).

The GWB is a feeder for the Grand Canal and an important source of baseflow for the major river catchments in Kildare, namely the Liffey, the Barrow and the Boyne. This is supported by the estimated flow from the aquifer to the Milltown Feeder at Pollardstown Fen, which is approximately 25,000 m^3/day.

The Curragh GWB has a large catchment area. Its hydrogeology is significant as it is an important source of baseflow for rivers and streams, it influences the ecology of a number of interesting habitats and it is the main source of water for Pollardstown Fen. In terms of groundwater body classifications for the WFD, a separate groundwater body has been delineated within the Curragh GWB for Pollardstown Fen (Figure 4.1).

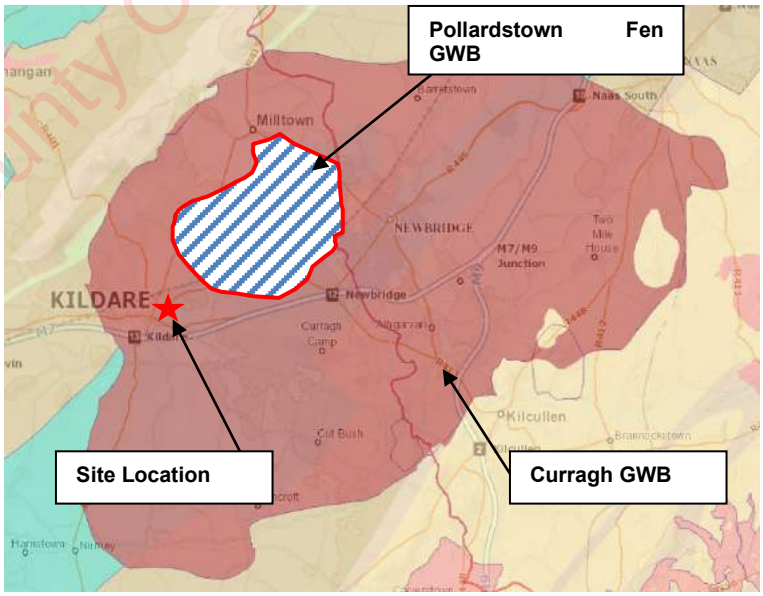


Figure 4.1 Curragh and Pollardstown Fen GWBs

The limestone bedrock aquifer underlying the gravel aquifer comprises a Regionally Important Aquifer – Karstified (diffuse) Rkd.

Karstification and dolomitisation are two processes which strongly influence the development of secondary permeability and aquifer potential in Irish bedrock units. Karstification is the process whereby limestones are slowly dissolved away by acidic waters moving through them. This occurs most often in the upper bedrock layers and along some of the pre-existing fissures and fractures in the rocks which become slowly enlarged. This results in the progressive development of distinctive karst landforms such as collapses, caves, swallow holes, sinking streams, turloughs and dry valleys, and a distinctive groundwater flow regime where drainage is largely underground in solutionally enlarged fissures and conduits. The solution is influenced by factors such as: the type and solubility of the limestone; the degree of jointing, faulting and bedding; the chemical and physical character of the groundwater; the rate of water circulation; the geomorphic history (upland/lowland, sea level changes, etc.); and the subsoil cover. One of the consequences of karstification is the development of an uneven distribution of permeability which results from the enlargement of certain fissures at the expense of others and the concentration of water flow into these high permeability zones.

The Rkd classification of the bedrock aquifer represents those aquifers where flow is more diffuse with higher storage potential. These aquifers frequently have caves and large springs associated with them but the springs have more regular flow associated with them.

4.2 Characteristics and Properties of the Curragh Gravel Aquifer

The lateral variability of the aquifer substrates makes it difficult to quantify the aquifer properties. Aquifer mapping carried out by the GSI (Wright, 1988) and Glanville (1997) indicated that hydraulic conductivities in the western portion of the aquifer are lower than in the main body of the aquifer. Dewatering volumes encountered in the road cuttings appeared to support this, as volumes increased in the east of the cutting (Misstear *et al.*, 2008).

Pumping tests carried out by K.T. Cullen & Co. Ltd (referenced in Langford, 2011 but not available at the time of compiling this assessment), to the southwest of Kildare Town indicated a transmissivity of 650 m^2/day where the aquifer was between 20 to 30 metres thick. This suggests permeabilities of between 22 to 33 m/d for the aquifer. Pumping tests carried out along the road cutting by Advanced Geotechnics Ltd., (AGL) indicated lower permeabilities of 5 to 21 m/d. However, test conditions were not ideal, and no account was taken for partial penetration effects (Misstear *et al.*, 2008a).

4.3 Characteristics of Pollardstown Fen

Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3km west north-west of Newbridge and 4.5 km northeast of Kildare town. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the Fen, rising chiefly at its margins, along distinct seepage areas of mineral ground above the Fen level. The continual inflow of calcium-rich water from the south of the Fen, primarily from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay.

Pollardstown Fen is unusual in Ireland as it is an extensive area of primary and secondary Fen peat, lacking scrub vegetation on its surface. The vegetation is quite varied and species-rich with numerous well-defined plant communities and several rare or scarce floral species. Species and communities characteristic of more nutrient-rich conditions occur on the Fen margins where the water first emerges from the ground, while the central Fen area is dominated by more uniform and less nutrient-demanding vegetation types. Damp pastures occur on wet mineral soils and partly-drained peats on the Fen margins, which are reasonably species-rich, with particularly good displays of orchids in some areas.

The Fen has ornithological importance for both breeding and wintering birds. An area of reclaimed land was re-flooded in 1983 and has now reverted to open water, swamp and regenerating Fen. Since

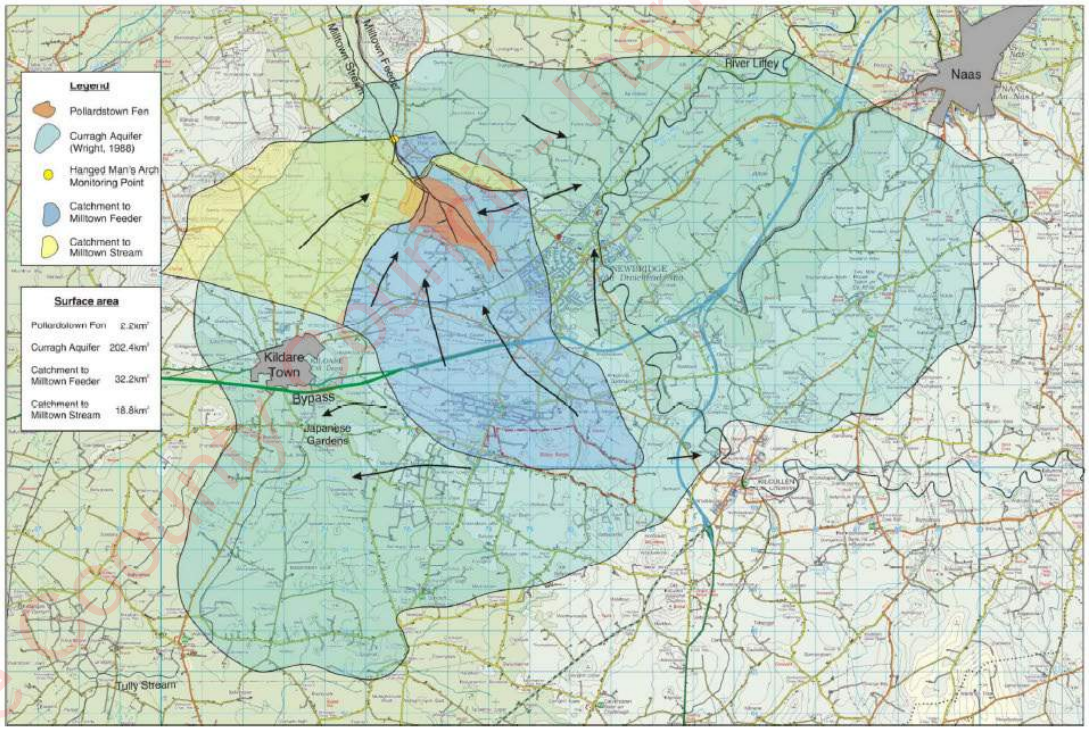
the re-flooding of the Fen and the development of the shallow lake, wintering waterfowl have been attracted in increased numbers.

Otter and Brook Lamprey (*Lampetra planeri*), two species listed in Annex II of the EU Habitats Directive, occur at Pollardstown. Various groups of the invertebrate fauna have been studied and the system has been shown to support a true Fen fauna. The species complexes represented are often rare in Ireland, with the sub-aquatic organisms particularly well represented. A number of internationally important invertebrates (mostly Order Diptera, i.e. two-winged flies) have been recorded from the site. Of particular conservation importance, however, is the occurrence of all three of the Whorl Snails (*Vertigo* spp.) that are listed on Annex II of the EU Habitats Directive. Pollardstown is the only known site in Ireland (or Europe) to support all three species (*Vertigo geyeri*, *V. angustior*, *V. moulinsiana*) (NPWS, 2003).

The full NPWS Site Synopsis for Pollardstown Fen SAC is provided in Appendix A.

There are a number of drains cross cutting the Fen which discharge to the Milltown feeder. The Milltown Feeder joins the Grand Canal near Robertstown Co. Kildare, and it is the main source of water for the canal. Daly (1981) estimated that approximately 25,000 m^3 per day was discharging through the Milltown feeder from the Fen. Approximately 92% of the discharge from the Fen emanates from the southern part of the catchment, while the remaining 8% is sourced from the smaller northern portion of the catchment, the spring at the public entrance to the Fen and direct precipitation (Kuczynska, 2008).

A schematic catchment map of the Curragh aquifer was historically prepared by Dr. Les Brown, which indicates groundwater flow direction and is presented in Figure 4.2 below. This map was prepared based on topography only and not on any groundwater hydraulic pressure records.



Source (Dr. Les Brown, 2008b)

Figure 4.2 Groundwater Flow Direction from Curragh Aquifer to Pollardstown Fen

4.4 Pollardstown Fen GWBs

As is evident from the above, groundwater was interpreted to discharge to Pollardstown Fen in the north, while in the south groundwater discharges via a number of springs (including those in the Japanese Gardens) and provides baseflow to the Tully River (a tributary of the River Barrow). To the east of the aquifer, groundwater provides baseflow to the River Liffey. A groundwater divide located northeast of Kildare town is clearly evident.

4.5 Aquifer Vulnerability

Aquifer vulnerability is largely dependent on overburden thickness and the inherent permeability of the bedrock. If bedrock is near or exposed at the surface the groundwater classification will be extreme. A detailed description of the groundwater vulnerability categories can be found in the Groundwater Protection Schemes document (DELG/EPA/GSI, 1999) and in the draft GSI Guidelines for Assessment and Mapping of Groundwater Vulnerability to Contamination (Fitzsimons et al, 2003). A regional groundwater vulnerability map can be viewed online (http://www.gsi.ie/Mapping).

According to the GSI the classification for the site is High (H) based on depths to bedrock and permeability of the overburden.

4.6 Groundwater WFD Status

Work completed for the Water Framework Directive has assigned 'Status' to surface waters and groundwater (www.EPA.ie - watermaps). The Water Framework Directive Status of the Curragh GWB, which is linked to Pollardstown Fen SAC, is rated as "Good" for 2016 – 2021.

In terms of groundwater body classification for the WFD, a separate groundwater body has been delineated within the Curragh GWB for Pollardstown Fen, as shown in Figure 4.1. The WFD status currently for the Pollardstown Fen is classified as "Good status".

The regionally important aquifer that underlies the Pollardstown Fen GWB is a Karstified (Diffuse) aquifer: the Bagenalstown Upper Aquifer and it has an overall GW_Status of "good".

Groundwater quality and quantity must be protected in their own right under the requirements of the WFD (2000/60/EC). The Groundwater Directive (80/68/EEC) and the WFD are the relevant pieces of EU legislation relating specifically to groundwater. The current standards related to groundwater in Irish legislation are the environmental quality standards set for Schedule 1 and Schedule 2 substances in the water pollution regulations (S.I. 271 of 1992) and the Groundwater Regulations 2010 (source: EPA Website).

4.7 Local Groundwater Usage and Source Protection Area

There are no source protection areas mapped within 3km of the site. Two public water supply (PWS) schemes are mapped by the GSI as follows (Figure 4.3):

- Curragh Camp PWS – Area of 0.13 km^2 – (Code IE_SE_G_133) – located within the Curragh Gavel West GWB – Ruanbeg Residential Development site is located approximately 3.4 km northwest of the outer extent of the closest Inner Protection Zone (IPZ) of the supply.

- Monasterevin/Rathangan PWS – Area of 2.92 km^2 – Code (IE_SE_G_153) – located within the Bagenalstown Upper GWB – Ruanbeg Residential Development is located approximately 4.2 km southeast of outer extent of the Outer Protection Zone (OPZ) and greater than 6 km southeast of the closest part of the IPZ of the supply.

The GSI online map does not identify any significant or notable abstraction wells within 1 km of the proposed development. All 11 no. GSI wells mapped within 1 km are summarised below in Table 4.1.

GSI Name	Well Type	Drill Date	Depth of Hole (m)	Depth to rock (m)	Distance to subject site (km)	Yield (m^3/d)	Source Use
2621SWW137	Borehole	1980	56.6	48.8	0.77	Unknown	Unknown
2621SWW240	Borehole	1899	22.4	Unknown	0.83	Unknown	Unknown
2621SWW241	Dug well	1899	14.8	Unknown	0.73	Unknown	Unknown
2621SWW194	Unknown	1899	13.5	Unknown	0.96	Unknown	Unknown
2621SWW193	Unknown	1899	21	19.5	0.89	Unknown	Unknown
2621SWW243	Borehole	1899	13.4	Unknown	0.84	Unknown	Unknown
2621SWW242	Dug well	1899	11.4	Unknown	0.84	Unknown	Unknown
2621SWW116	Borehole	1899	30.5	Unknown	0.81	Unknown	-
2621SWW244	Dug well	1899	5.8	Unknown	0.46	Unknown	Unknown
2621SWW245	Borehole	1899	16.2	Unknown	0.42	Unknown	Unknown
2621SWW246	Dug well	1899	4	Unknown	0.31	Unknown	Unknown
2621SWW195	Borehole	1998	15	Unknown	0.33	Unknown	Other
2621SWW167	Borehole	1992	13.5	Unknown	0.54	Unknown	Unknown
2621SWW165	Borehole	1992	13.5	Unknown	0.57	2,964	Unknown
2621SWW168	Borehole	1992	10	Unknown	0.61	Unknown	Unknown
2621SWW169	Borehole	1992	11.6	Unknown	0.61	Unknown	Unknown
2621SWW196	Borehole	1998	18.6	Other	0.9	Unknown	Other
2621SWW111	Unknown	1899	13.4	Unknown	0.54	Unknown	-

Table 4.1 Mapped Groundwater wells within 1 km

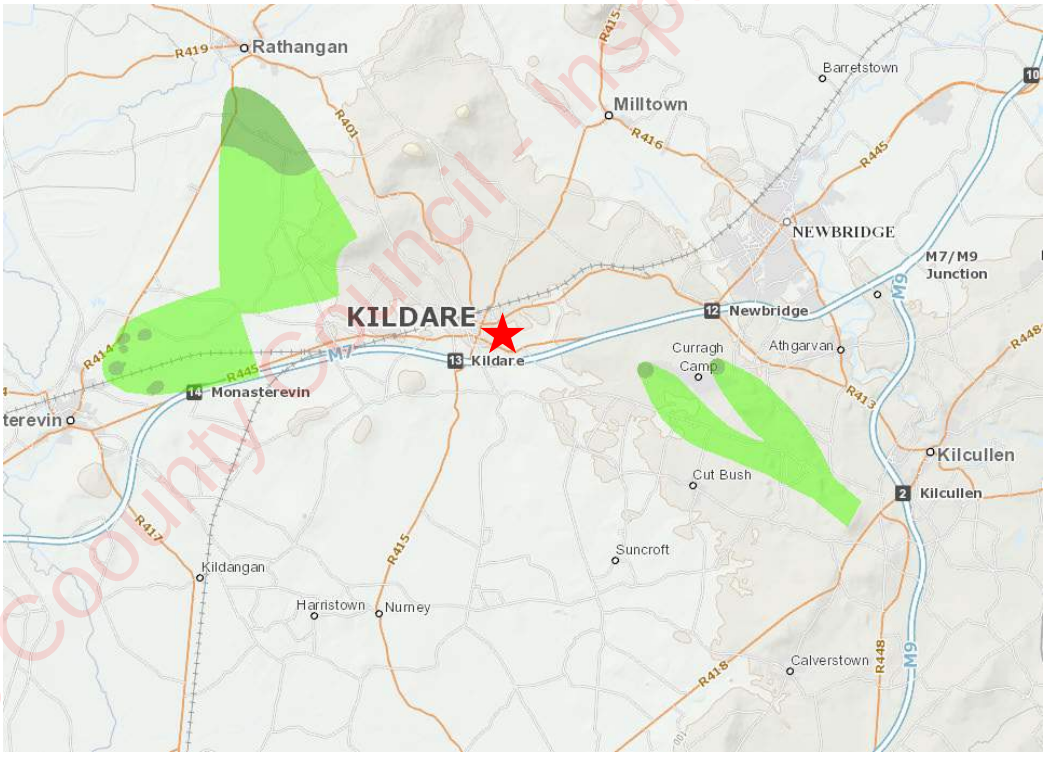


Figure 4.3 Mapped Source Protection Zones

4.8 Recharge Rainfall

This GWB is recharged from rainwater percolating through the topsoil and unsaturated sand and gravel deposits. Surface runoff from such gravel aquifers is considered to be low, not more than 20% of effective rainfall. Less permeable layers in the deposit, even if thin, can create perched water tables

and prevent recharge of the true water table. Where the water table lies below the local river network it is likely that some stream water may pass into the aquifer. This will be most likely be in higher elevations where a river flows onto the aquifer from where it has previously been flowing over impermeable subsoil or bedrock.

The Effective Rainfall (ER) for the site is 491 mm per year according to the GSI.

4.9 Groundwater Levels, Flow Directions and Gradients

The Curragh gravel aquifer has relatively large intergranular primary porosity allowing for increased waterflow. However the aquifer is reportedly unconfined across most of the GWB. Groundwater gradients are estimated from the water table contours produced by Wright (1988) and White Young Green (2002) to be in the order of 0.002.

The Mid-Kildare aquifer is a feeder for the Grand Canal and is an important source of baseflow for the streams and rivers. This is supported by the estimated flow from the aquifer to the Milltown Feeder at Pollardstown Fen of approximately 25,000 m_3/day (Daly, D. 1981). It is also supported by high specific dry weather flow for the Tully Stream which is calculated as 3.9 l/sec/km^2 (figures in excess of 2 l/sec/km^2 are considered to indicate significant baseflow). The aquifer provides baseflow for the major river catchments in Kildare, namely the Liffey, the Barrow and the Boyne. Pollardstown Fen, an important Natural Heritage Site, also derives its water from the aquifer.

Regional groundwater flow directions estimated by Wright (1988) and Misstear (2008b) is outlined in Figure 4.2. However, subsequent detailed groundwater level mapping was undertaken by Mr. Richard Langford in 2011 in conjunction with Trinity College, Dublin.

Groundwater monitoring was undertaken by Langford, 2011 at a local scale for intensive monitoring of water levels at the Fen margin, and at a regional scale for intensive monitoring of the groundwater flow regime across the Curragh Aquifer. The groundwater monitoring network (27 no. monitoring boreholes in total) were set up previously by WYG and Kildare County Council as part of the monitoring programme established during the construction of the Kildare town by-pass. Monthly groundwater levels were recorded manually from June 2010 to July 2011. Historical groundwater head data from 1997 to 2008 was also assessed by Langford, 2011.

The assessment, which is considered to be more accurate than Figure 4.2 as it is based on actual groundwater heads within numerous monitoring wells across a significant area, confirms that regional groundwater flow direction to the south of Pollardstown Fen to be generally in a northeasterly direction towards the Fen. However a groundwater divide was confirmed and mapped to the northeast of Kildare town. South of this divide, groundwater was interpreted to flow in a southwesterly direction across Kildare town. The proposed residential development site is located southwest of this divide and therefore groundwater is interpreted to flow locally in a southwesterly direction across the site and not towards Pollardstown Fen.

The monitoring borehole locations utilised by Langford, 2011 are presented in Figure 4.4 and Figure 4.6 with a cross section of the aquifer and interpreted ground flow directions provided in Figure 4.5 and Figure 4.6.

In addition, the catchment of Pollardstown Fen was reassessed by Langford, 2011, and the proposed site was confirmed to be located southwest of the catchment boundary (Figure 4.6).

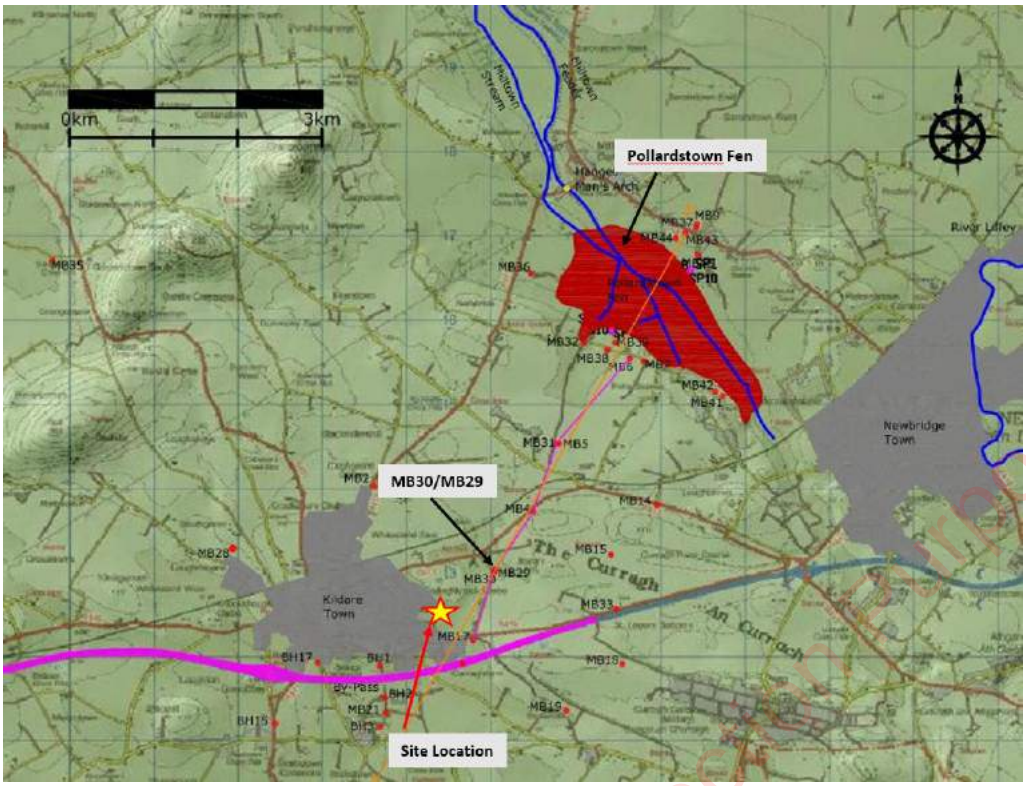


Figure 4.4 Transect through Curragh Aquifer & Pollardstown Fen

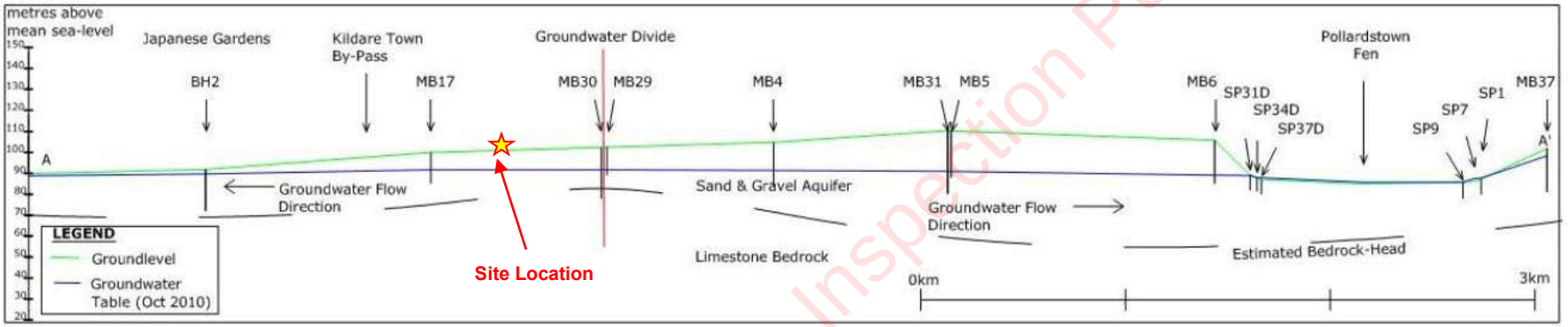


Figure 4.5 Section through Curragh Aquifer & Pollardstown Fen

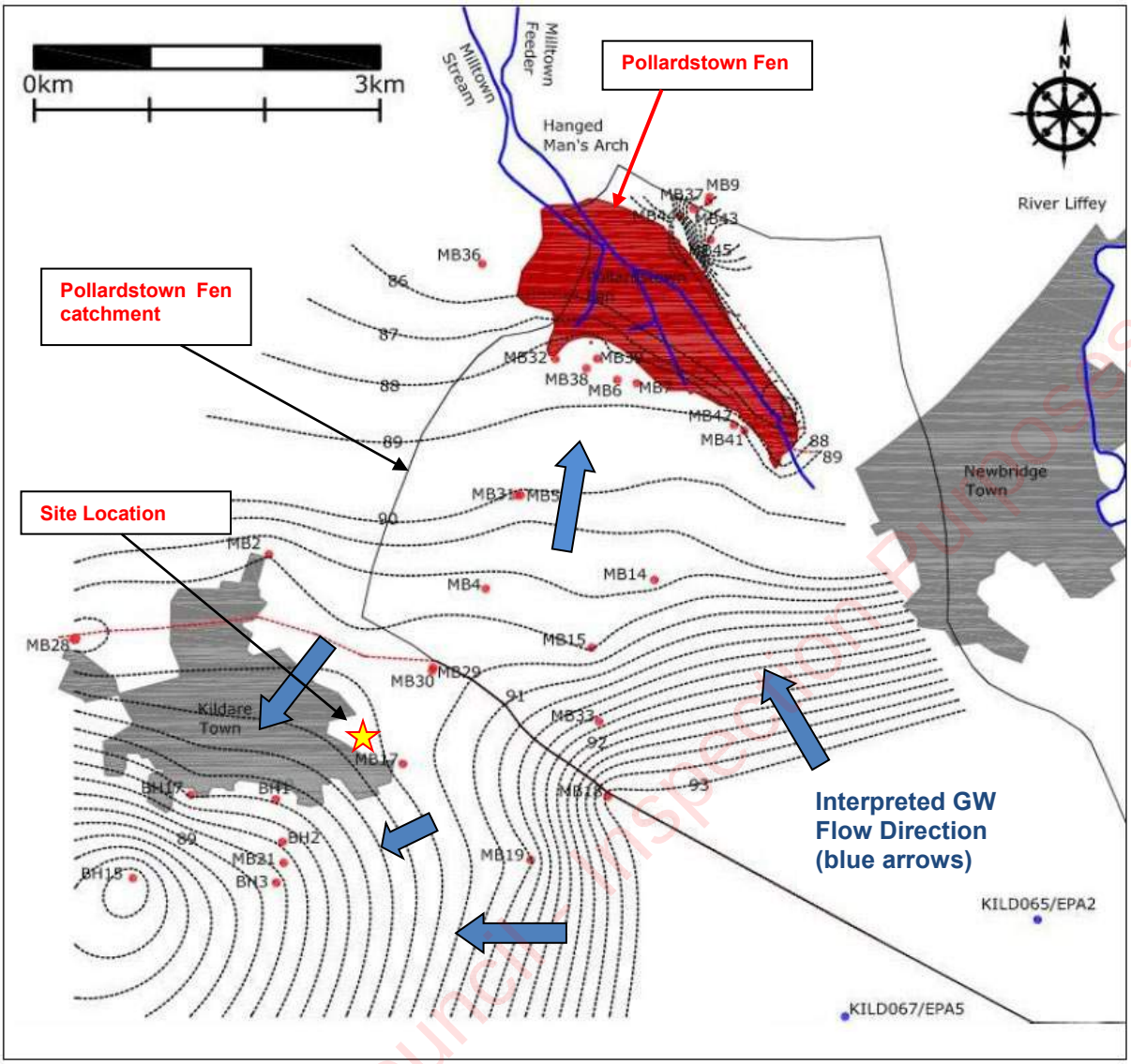


Figure 4.6 Regional Interpreted Groundwater Contours and Fen Catchment

4.10 Hydrology

The majority of the site is located in the South Eastern River Basin District (SERBD) in the Barrow catchments (Code: IE14_01) (www.epa.ie).

There are no mapped streams/rivers in the vicinity of the site. The Cloncumber Stream that flow into the Slate River in a northeasterly direction is location approximately 5km northeast of the site to the northeast of Pollardstown Fen. The Tully stream, located 2.5 km to the south of the site, flows in a southwesterly direction an ultimately into the River Barrow.

These surface water features are not considered at risk from the proposed development.

5 DESIGNATED PROTECTED AREAS

The nearest site designated for nature conservation is the Curragh proposed Natural Heritage Area (pNHA), (site code 000392) approximately 0.5km to the northeast the site. The Grand Canal pNHA (002104) is 5km to the northwest.

The nearest Special Areas of Conservation (SAC), are Pollardstown Fen SAC (000396), approx. 3.8km to the northeast, the River Barrow and River Nore SAC (002162), approx. 11.8km to the west and Mouds Bog SAC (002331), approx. 6.5km to the northeast. Ballynafagh Lake SAC (001387) and Ballynafagh Bog SAC (000391) are approx. 14.5km to the northeast.

A number (7 no.) of proposed Natural Heritage Areas (pNHAs) within 15 km of the proposed development are summarised in Table 5.18. The locations of designated sites are shown in Figure 5.1 below. No Natural Heritage Areas occur within 15 km of the proposed development.

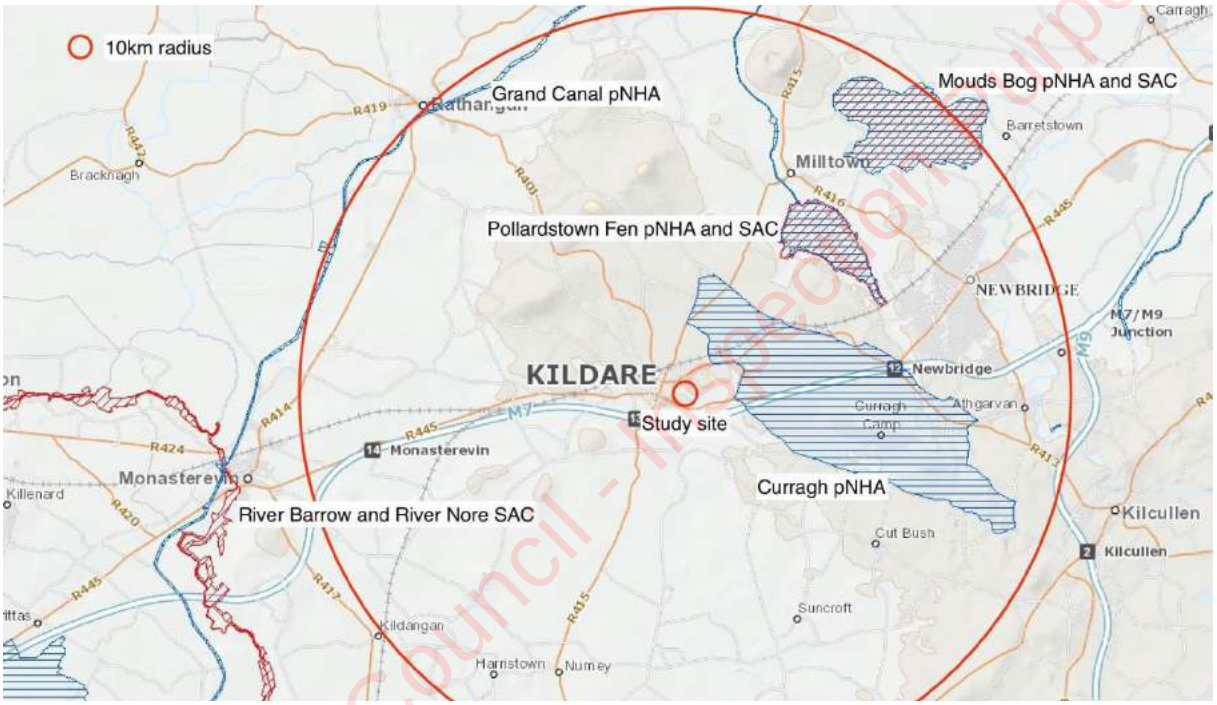


Figure 5.1 Designated Sites Map

6 PROPOSED DEVELOPMENT

The proposed development will consist of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments blocks and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development.

The proposed drainage system for the site incorporates a surface and foul sewer system. The proposed surface water and foul water drainage pipes align with the overlying road network and services the residential dwellings as well as the sheltered accommodation and creche areas – refer to Punch Consulting drainage drawings for the proposed development.

Initial runoff from all areas is to be directed to dedicated SuDS measures such as:

a. Bioretention areas

b. Green Roofs

c. Permeable Pavements

e. Pond Areas

Overflows from these areas will be directed to overflow gullies within or adjacent to the treatment area, draining below ground drainage and then to the infiltration attenuation tank.

The infiltration tanks are designed for 1 in 100-year storm (plus 30% climate change and 10% urban creep). Please refer to PUNCH Documentation for design details (see Section 8).

Figure 6.1 Proposed Ruanbeg Development

7 SITE INVESTIGATION

Three (3 no.) phases of site investigation activities were undertaken across the site between 2022 and 2023. Phases 1 and 2 were completed by Causeway GeoTech Ltd and Phase 3 completed by Ground Check Ltd. All investigation activities are summarised below and all investigation locations are present in Figures 7.1 and 7.2. The site investigation reports are provided in Appendix B.

7.1 Causeway Geotech Subsurface Investigation (2022 - 2023)

Causeway Geotech Ltd undertook a ground investigation across the entire footprint of the proposed residential development site in two phases in 2022. The works in total comprised the following:

- 7 no. light cable percussion boreholes;
- 3 no. Rotary boreholes;
- 10 no. trial pits;
- 10 no. infiltration tests within trial pits;
- 10 no. standpipe installations; and,
- Installation of automatic groundwater data loggers monitoring over a period of 6 months.

A series of geotechnical laboratory tests were also completed on designated trail pit and borehole soil samples. The locations of the intrusive investigation site are presented in Figure 7.1. Copies of all investigation activities are provided in Appendix B.

7.2 Ground Check Additional Investigation

Ground Check Limited subsequenlty undertook additional site investigation at the site in August 2023. The works comprised the following:

- 4 no. light cable percussive boreholes with standpipe installations and hydraulic conducitivity testing;
- 4 no. trial pits with BRE365 infiltration tests; and,
- Additional automatic groundwater level monitoring with data loggers.

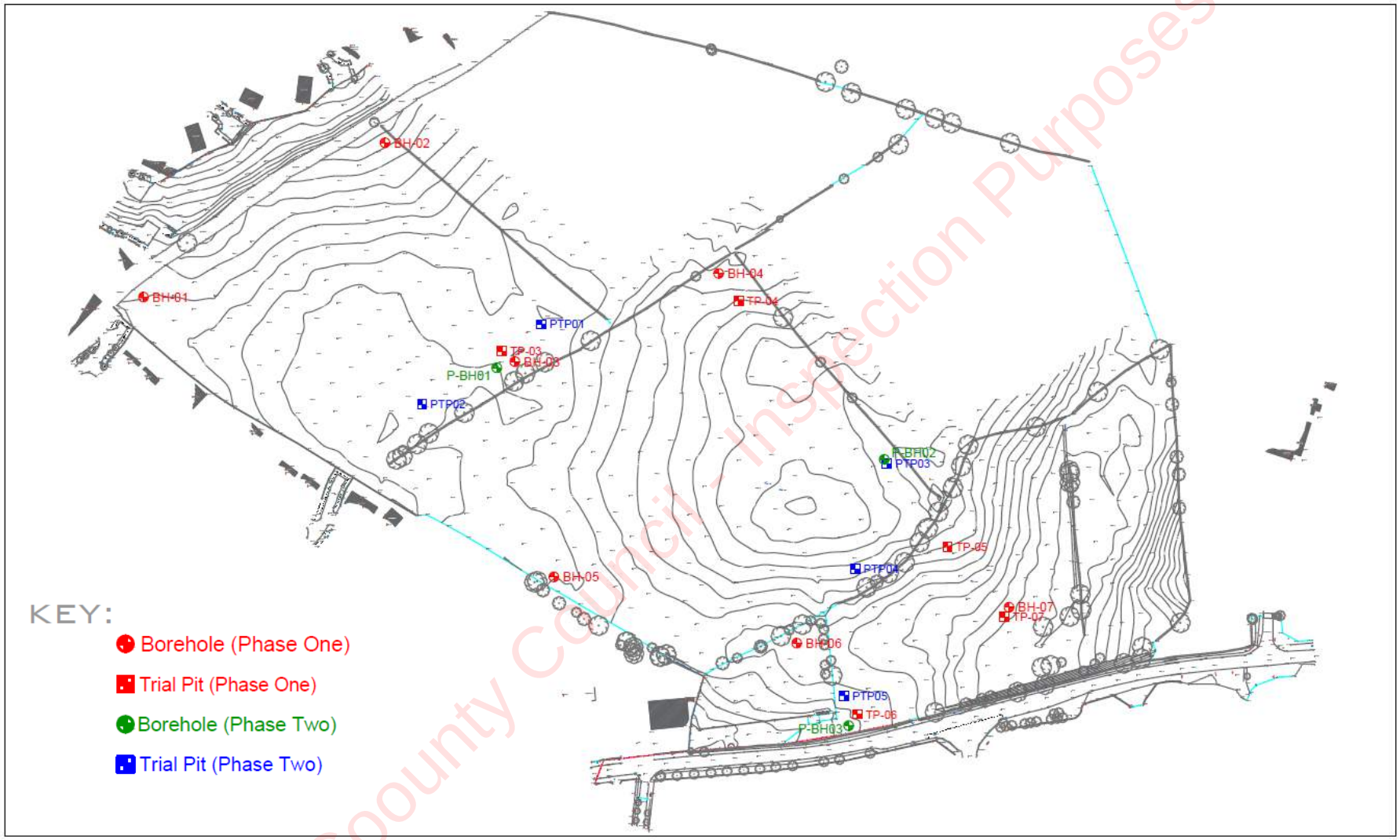


Figure 7.1 Intrusive Investigation Locations

Figure 7.2 Intrusive Investigation Locations – Phase 3

7.2.1 Borehole and Trial Pits

Boreholes were drilled and installed both within the shallow overburden and the deeper Sand and Gravels of the Curragh Sand & Gravel aquifer. The shallow wells were drilled using percussive Shell & Auger drilling techniques and the deeper boreholes drilled using air rotary drilling techniques. In addition, trial pits were excavated across the site with a particular focus on the proposed infiltration areas.

A total of 11 no. boreholes/shallow monitoring wells were installed within the upper 7.7 metres of overburden and 3 no. boreholes/monitoring wells installed within the deeper gravels of the Curragh Gravel aquifer.

A total of 14 no. trial pits were excavated within the upper 4.5 metres of overburden.

BH Label	Total Depth (mbgl)	Response Zone (mbgl)	Response Zone (mOD)	Water strike (mbgl)
P-BH01	15.0	11.0 - 15.0	83.07 – 79.07	7.9
P-BH02	15.0	12.0-15.0	85.41 – 82.41	11.5
P-BH03	15.0	12.0-15.0	83.99 – 80.99	10.3
BH01	5.0	2.5 - 3.5	92.95 – 91.95	-
BH02	6.0	5.0 - 6.0	92.81 – 91.81	-
BH03	3.6	2.0 - 3.6	91.71 – 90.11	-
BH04	3.0	1.5 - 3.0	94.5 – 93.0	-
BH05	5.0	3.5 - 5.0	91.29 – 89.79	-
BH06	4.7	1.5 - 3.5	93.22 – 91.22	-
BH07	5.0	2.5 - 5.0	90.93 – 88.43	-
BH101	4.0	2.0 – 4.0	91.46 – 89.46	-
BH102	7.5	3.0 – 7.5	91.04 – 86.54	-
BH103	7.0	3.0 – 7.0	91.34 – 87.34	-
BH104	3.2	0.5 - 3.2	97.64 – 94.94	-

Table 7.1 Summary of Borehole Installations

A summary of the ground conditions and hydrogeological conditions encountered is outlined below:

- Topsoil, approximately 200 – 300mm in thickness over a widespread deposit of typical boulder clay comprising gravelly clay with a sand and a silty sandy gravel component. This boulder clay was recorded at depths across the site ranging between 0.2 and 5.0 mbgl across the site. The thickness of this deposit generally ranges between 1 and 2 metres in the northwestern and northern regions of the site (i.e. boreholes BH01 and BH02) at thicknesses up to 4.5 metres.
- The boulder clays are underlain by fluvioglacial deposits of predominately medium dense silty sands and gravels with interlayered firm to stiff sandy gravelly clay/silt lenses. These deposits range between 5.4 and 7.9 metres in thickness, however the base horizon is considered gradational and is not sharply defined. The upper horizons of these fluvioglacial deposits are generally described as a sandy gravelly clay or clayey/silty sandy gravel. The lower horizon is characterised as a similar material with a notably reducing fines content with depth.
- Dense gravels are present at depths ranging between 10.7 and 11.5 mbgl in PBH01 and PBH02 respectively and encountered at much shallower depths within PBH03 between 2.3 and 13.1 mbgl. Generally the upper sections of the main dense gravel unit have an increased sand content with the material becoming dense clean gravels with depth.
- The thickness of the gravels is unknown from site investigations; however it is considered to be in the region of 30.0 - 40.0m. Depth of bedrock has not been confirmed to date at the site at depths up to 15 mbgl.

- Groundwater was not encountered during the trial pitting or borehole drilling activities hole between 0.0 and 7.9 mbgl (i.e. 97.64 mOD and 87.49 mOD).
- Strong water strikes were recorded in the deeper rotary boreholes ranging between 10.3 and 11.5 mbgl (i.e. 85.91 mOD and 85.69 mOD). These strikes correlate with the very dense gravels which were deemed representative of the underlying Curragh Sand and Gravel aquifer. No water strikes were recorded during the drilling of the Shell & Auger boreholes due to the addition of water during drilling.

A schematic representation of ground conditions encountered is presented in Figures 8.2, 8.3 and 8.4.

7.2.2 Infiltration Testing

Infiltration testing was completed within a number of trial pit investigation locations to determine the infiltration rate of the shallow subsurface across the site.

A summary of the infiltration test results within the trial pits are outlined below in Table 7.2.

Investigation Location	Depth of test (mbgl)	Infiltration rate, q (m/sec)	Trial Pit Log Strata Description	Infiltration Area
PTP01	3.4	Very low	Light greyish brown sandy silty GRAVEL	Area A
PTP02	3.1	Very low	Light brown/grey gravelly clayey SAND	Area A
PTP03	4.4	Very low	Light brownish grey gravelly clayey SAND	
PTP04 test 2	3.8	5.19 x 10^{-5} m/s	Grey sandy silty GRAVEL	Area B
PTP05	3.8	1.61 x 10^{-5} m/s	Brownish grey SAND and GRAVEL	Area C
TP03	2.7	Very low	Gravelly clayey SAND	Area A
TP04	2.25	3.39 x 10^{-5} m/s	Gravelly clayey SAND	
TP05	2.7	3.77 x 10^{-5} m/s	Gravelly clayey SAND	Area B
TP05 (repeated due to pit collapse)	2.3	6.08 x 10^{-5} m/s	Clayey very gravelly fine to coarse SAND	Area B
TP06	2.75	1.17 x 10^{-5} m/s	Gravelly clayey SAND	
TP07	3.3	Very low	Stiff sandy gravelly CLAY	Area C
TP101	4.4	2.25 x 10^{-7} m/s	Firm to stiff, becoming stiff, light grey, gravelly sandy, CLAY/SILT containing cobbles and occasional boulders.	
TP102	4.5	1.07 x 10^{-7} m/s		
TP103	4.5	8.51 x 10^{-8} m/s		
TP104	3.8	2.23 x 10^{-2} m/s	Grey, silty, gravelly, fine to coarse SAND with bands of greyish brown, very sandy, clayey silt.	Area B

Table 7.2 Summary of Infiltration Testing

7.2.3 Hydraulic Conductivity Testing

A series of variable head permeability tests were conducted within all monitoring wells across the site to determine permeabilities within the overburden strata.

BH ID	Response zone (mbgl)	Permeability, K (m/s)	Strata Description	
BH01	2.5-3.5	6.28×10^{-6}	Greyish brown gravelly slightly silty fine to coarse SAND.	
BH02	5.0-6.0	1.22×10^{-5}	Brown slightly silty very gravelly fine to coarse SAND.	
BH03	2.0-3.6	6.24×10^{-7}	Brownish grey gravelly slightly clayey fine to coarse SAND.	Area A
BH04	1.5-3.0	4.06×10^{-6}	Sandy GRAVEL	
BH05	3.5-5.0	9.56×10^{-6}	Slightly clayey/silty sandy GRAVEL	
BH06	1.5-3.5	4.21×10^{-6}	Slightly clayey/silty sandy GRAVEL	
BH07	2.5-5.0	5.79×10^{-7}	Slightly clayey/silty sandy GRAVEL	
PBH01	11.0-15.0	Highly permeable	Dense GRAVEL	Area A
PBH02	12.0-15.0	Highly permeable	Dense GRAVEL	Area B
PBH03	12.0-15.0	Highly permeable	Dense GRAVEL	Area C
BH101	2.0 – 4.0	5.85×10^{-6}	Slightly silty, gravelly, fine to coarse SAND and very stiff, gravelly, slightly sandy, CLAY/SILT.	Area A
BH102	3.0 – 5.07	1.02×10^{-5}	Slightly silty, very sandy, fine to coarse GRAVEL and occasional bands of brown, gravelly, sandy, clayey silt.	
BH103	3.0 – 6.9	Although reported as - 4.45×10^{-4} m/s, permeability at depths below 3.33 mbgl were recorded as very low.	Firm to stiff, gravelly, slightly sandy, fissured, clayey SILT with low cobble content and silty, very gravelly, fine to coarse SAND with low to medium cobble content.	
BH104	0.5 - 3.2	4.76×10^{-6}	Gravelly sandy, clayey SILT.	Area B

Table 7.3 Variable head permeability testing

Hydraulic conductivity of the site is mainly characterised into two main horizons. The upper overburden (ranging in depth between 0.0 and 10.0 mbgl) comprised clayey/silty sandy gravels, clayey/silty sands, sandy gravelly clays and dense sandy gravels. The lower horizons (generally ranging >7.9 mbgl) comprised dense to very dense gravels.

Permeability testing results within the upper horizons recorded highly variable permeabilities from very low (i.e. 8.51×10^{-8} m/s) to moderate/high permeability (i.e. ranging between 2.23×10^{-2} m/s and 5.19×10^{-5} m/s). The highest permeability recorded was in TP104 located in the upper 3.8 metres underlying Attenuation Tank B.

Permeability test results within the lower gravels recorded highly permeable conditions. It is noted that a thick clay deposit was recorded in the northeastern region of the site to circa 10.0mbgl (i.e. location BH1).

The infiltration and permeability test results indicate reduced infiltration in the area of the proposed Infiltration tank A with increased infiltration conditions in the areas of proposed Infiltration Tanks B and C.

7.2.4 Groundwater Level Monitoring

Groundwater level monitoring was undertaken within all shallow and deeper groundwater monitoring wells across the site between the 19th September 2022 and the 4th April 2023 and again between the 16th August 2023 and 25th August 2023 representing a period of over 7 months.

Groundwater levels were monitored using both automated groundwater level dataloggers and manual dipping.

The automated dataloggers were initially installed within wells BH01–BH07 on the 16th September for a period of 4 months i.e. until the 9th January 2023. All wells with the exception of BH07 were recorded as continually dry throughout this period. The dataloggers, from selected consistently dry shallow wells, were transferred to the deeper monitoring wells for further on-going monitoring until the 4th April 2023 (i.e. 3 months). Weekly manual monitoring of the dry shallow wells continued to confirm consistently dry conditions over time within wells BH01 to BH06.

It is noted that a small quantity of water (was reported by Causeway Geotec on the 12th January 2023 in shallow wells BH01 and BH03 (see Appendix A, Report No. 22-1436, Table 6). The detections represented approximately 100 mm and 250 mm of water at the base of each well respectively. On review, and in consultation with the SI Contractor, it was deemed more likely that these detections were due to a damaged well head at each location with rainfall the most likely source. In addition, dry conditions in these wells were subsequently recorded by a BREL hydrogeologist on the following day i.e. 13th January 2023 and subsequently on a weekly basis between January and April 2023, Therefore, the levels reported in Table 6 are not deemed to be representative of a shallow groundwater body at the site. This interpretation was further confirmed by both the continuous and manual water level monitoring in shallow wells BH01 to BH06 between the 13th January 2023 and 17th August 2023.

The resulting groundwater levels recorded in monitoring wells where groundwater was recorded are summarised in Table 7.4 and outlined in Figure 7.3. A summary of the recorded groundwater levels is outlined below:

- All shallow groundwater monitoring wells were recorded as dry throughout the 4 months of data logger monitoring and subsequent 4 months of manual groundwater level monitoring with the exception of BH07 and BH102. Groundwater was recorded at levels ranging between 3.73 and 4.83 mbgl respectively (i.e. between 88.97 and 87.83 mOD) within these wells. Well BH07 is located in the lowest region of the site.
- Groundwater levels recorded within the deeper gravel monitoring wells were recorded at levels ranging between 5.18 and 8.95 mbgl (i.e. between 88.89 - 88.83mOD).
- Rainfall data was sourced from the closest Met Eireann station with up-to-date rainfall data i.e. Mullingar Met Station for the monitoring period (Figure 7.2).
- A number of spikes in groundwater levels were recorded within BH07 over time. The spike recorded on the 12th January 2023 is attributed to falling head testing undertaken within this well. The previous spikes in levels are attributed to notable rainfall events that occurred immediately prior to these records. The highest groundwater levels were recorded on the 12th August 2023 following unusually wet month. Groundwater levels start to reduce from the 8th August 2023 with notably drier climatic conditions recorded.

Monitoring Well ID	Max Water Level (mbgl)	Max Water Level (mOD)	Min Water Level (mbgl)	Min Water Level(mOD)
BH07	3.73	88.97	4.83	87.83
P-BH01	5.18	88.89	5.65	88.41
P-BH02	8.57	88.83	8.95	88.45
P-BH03	7.25	88.74	7.64	88.34

Table 7.4 Maximum and Minimum Recorded Groundwater Levels

Date of Water Level Monitoring	BH01	BH02	BH03	BH04	BH05	BH06
13/1/2023	DRY	DRY	DRY	DRY	DRY	DRY
20/1/2023	DRY	DRY	DRY	DRY	DRY	DRY
27/1/2023	DRY	DRY	DRY	DRY	DRY	DRY
10/2/2023	DRY	DRY	DRY	DRY	DRY	DRY
17/2/2023	DRY	DRY	DRY	DRY	DRY	DRY
23/2/2023	DRY	DRY	DRY	DRY	DRY	DRY
3/3/2023	DRY	DRY	DRY	DRY	DRY	DRY
10/3/2023	DRY	DRY	DRY	DRY	DRY	DRY
15/3/2023	DRY	DRY	DRY	DRY	DRY	DRY
24/3/2023	DRY	DRY	DRY	DRY	DRY	DRY
31/3/2023	DRY	DRY	DRY	DRY	DRY	DRY
7/4/2023	DRY	DRY	DRY	DRY	DRY	DRY
14/4/2023	DRY	DRY	DRY	DRY	DRY	DRY
21/4/2023	DRY	DRY	DRY	DRY	DRY	DRY

Table 7.5 Manual Water Level Monitoring in wells BH01 to BH06

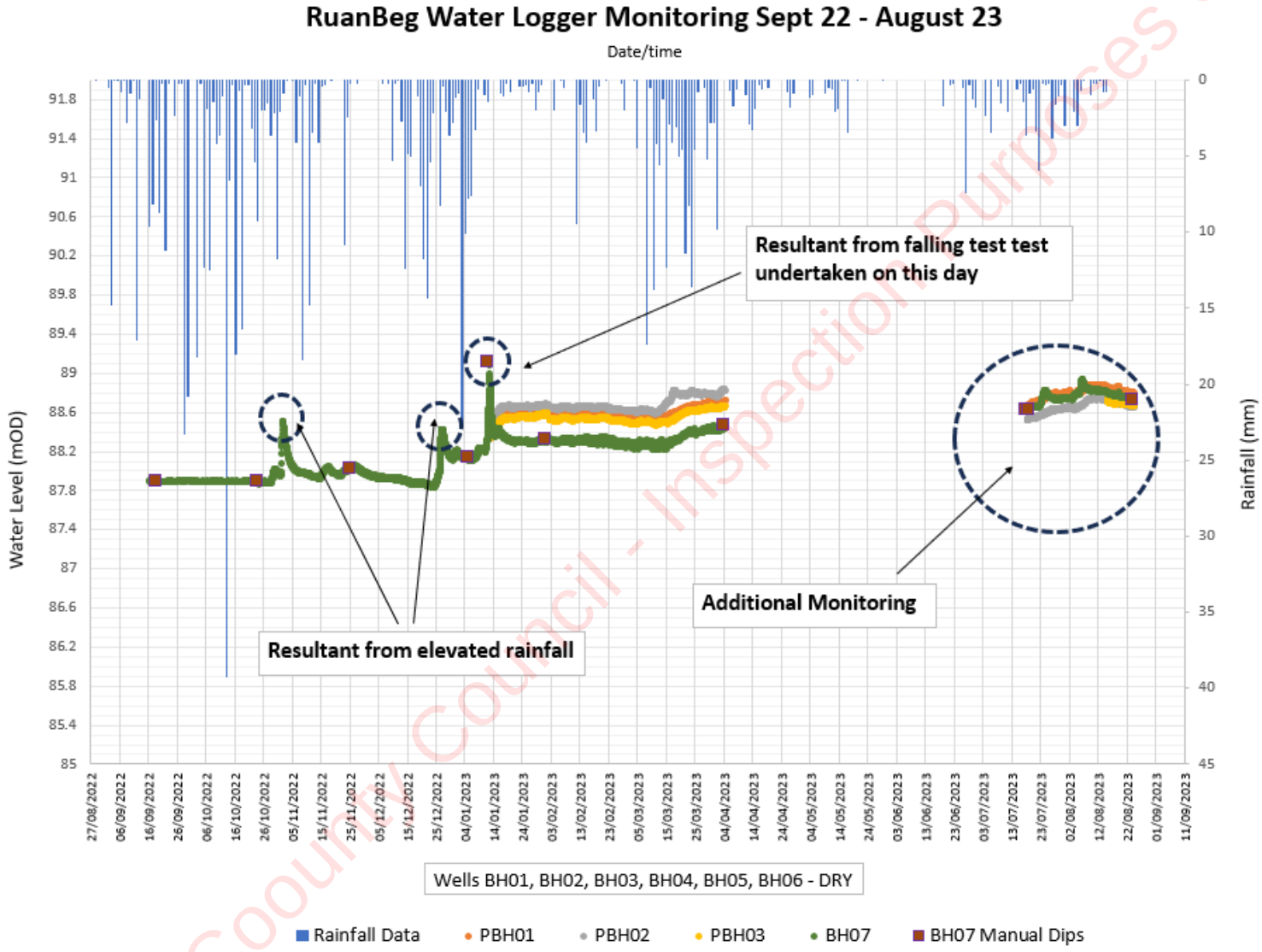


Figure 7.3 Groundwater Levels

7.2.5 Groundwater Flow & Conditions

Interpretation of groundwater levels recorded over time in conjunction with both the trial pit and borehole logs is outlined below:

- Groundwater flow within the deeper dense gravel body is interpreted to be consistently flowing in a south to southwesterly direction across the site i.e. in the opposite direction to Pollardstown Fen (Figure 7.4). This interpretation is based on the triangulation of groundwater levels across the site with groundwater flowing from areas of elevated groundwater to lower groundwater levels. The lowest groundwater levels were recorded in the southern region of the site. More recent groundwater levels recorded in August 2023 interpreted a groundwater flow direction to the south. Both interpreted flow directions over time are consistent with the regional groundwater flow pattern mapped by Trinity College and previous studies referenced in Section 4.9. Groundwater flow recorded on the 31st January 2023 is presented in Figure 7.4 and on 19th August 2023 presented in Figure 7.5. Both are consistent with interpreted groundwater flow direction during the period when groundwater levels were considered to be at their most elevated.
- Groundwater within shallow monitoring wells BH07 and BH102 are considered to be hydraulically connected with the deeper gavel aquifer with groundwater flowing as a single hydraulic unit across the site. No perched shallow groundwater body has been identified underlying the site.
- Groundwater is interpreted to be flowing under unconfined conditions across the site (Figure 7.4).
- Groundwater levels recorded within BH07 suggest that the levels are responsive to rainfall events with water level increases correlating to notable particular rainfall events identified. As mentioned previously, the notable spike recorded in BH07 in January 2023 is attributed to a falling head test undertaken on this day.
- Groundwater level differences across the site are not considered to be significant with relatively low gradients recorded between 0.001 and 0.005 between September 2023 and April 2023 with lower gradients recorded in July and August 2023.
- The highest recorded groundwater level was recorded within well BH07 (i.e. 88.97 mOD) in the southeastern region of the site at a depth of 3.73 mbgl.
- The highest recorded groundwater levels underlying the 3 no. proposed Infiltration Tanks A, B and C was 88.89 mOD, 88.83 mOD and 88.74 mOD respectively. The inverts of the proposed 3 no. Attenuation / Infiltration Tanks are 90.3 mOD (Infiltration Tank A), 93.18 mOD (Infiltration Tank B) and 90.0 mOD (Infiltration Tank C). Therefore the separation distance between each Attenuation tank and the highest recorded groundwater level recorded in each area of the site is consistently above the recommended 1 metre distance as outlined in the CIRIA SuDs manual (C753).

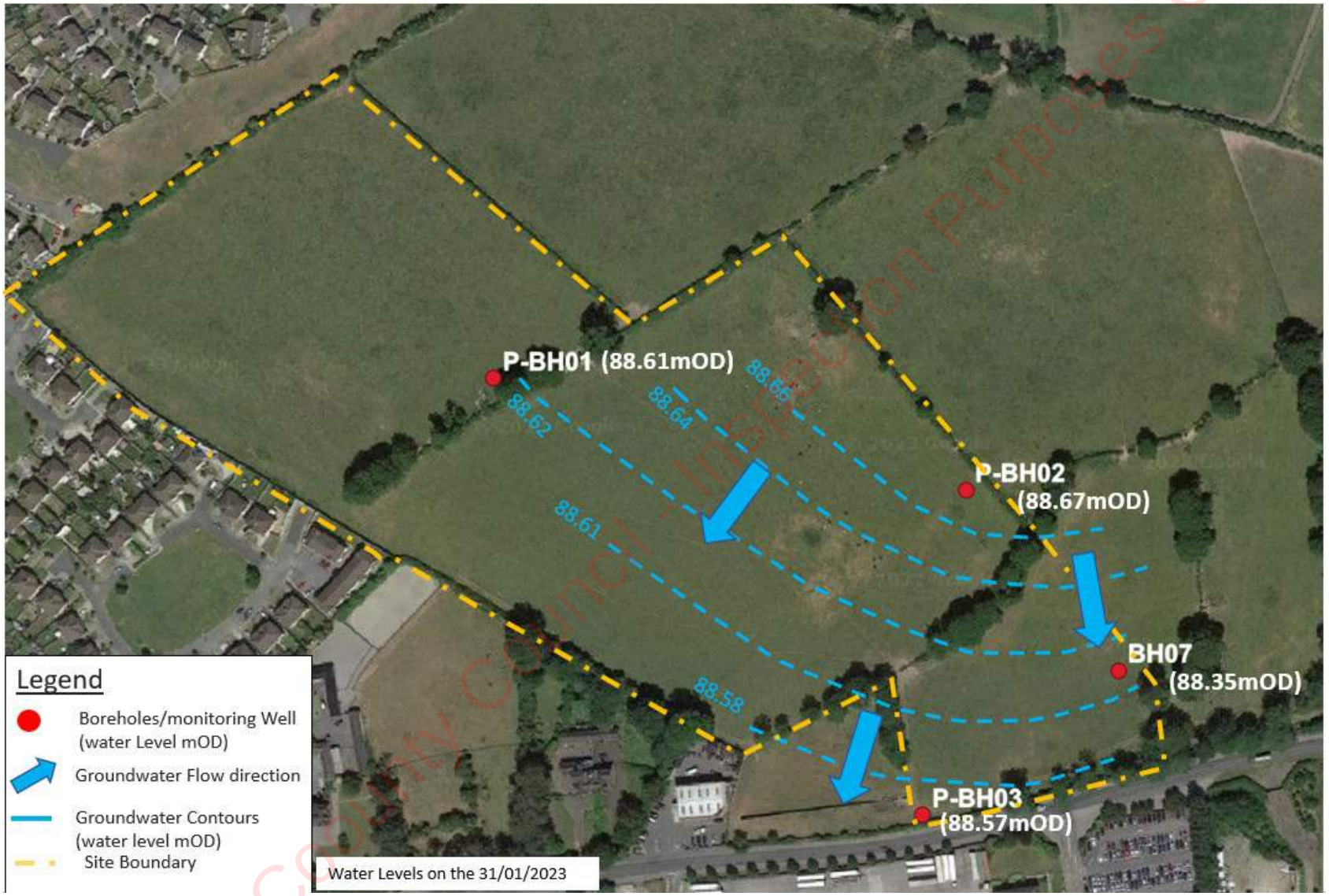


Figure 7.4 Groundwater Flow Direction 31st January 2023

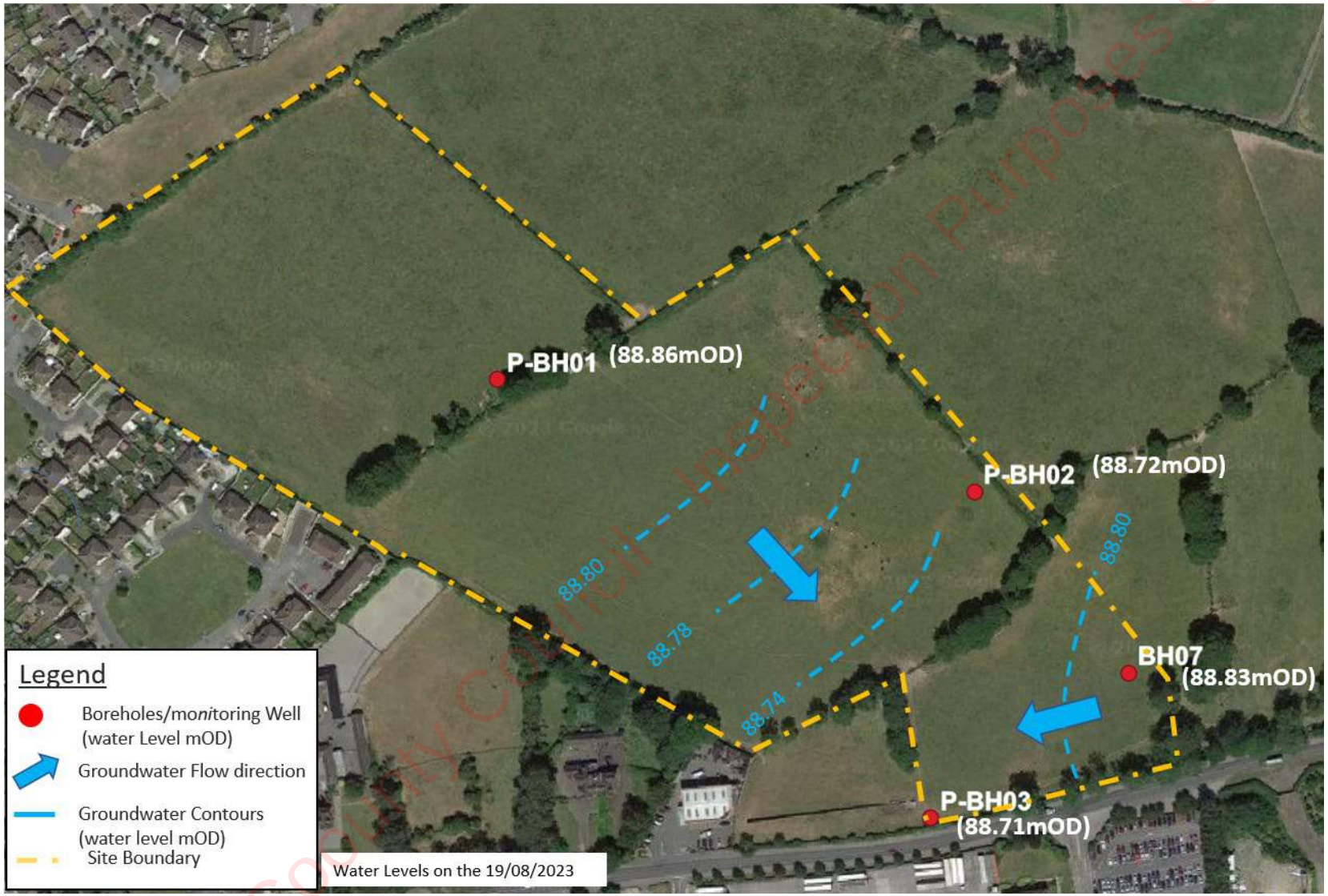


Figure 7.5 Groundwater Flow Direction 19th August 2023

8 PROPOSED DRAINAGE SYSTEM

The proposed drainage system for the site incorporates a surface and foul sewer system. The proposed surface water and foul water drainage pipes align with the overlying road network and services the residential dwellings as well as the age friendly accommodation and creche areas – refer to Punch Consulting drainage drawings for the proposed development.

Initial runoff from all areas is to be directed to dedicated SuDS measures such as:

- Bioretention areas
- Green Roofs
- Permeable Pavements
- Pond Areas

Overflows from these areas will be directed to overflow gullies within or adjacent to the treatment area, with overflow to road gully drainage and then to the infiltration attenuation tank.

A series of drainage design reports and drawings are provided by Punch Engineers as follows:

Engineering Reports

- 222143-PUNCH-XX-XX-RP-C-0007 Sustainable Urban Drainage Strategy Report
- 222143-PUNCH-XX-XX-RP-C-0003 Engineering Planning Report

Drainage layouts:

- 222143-PUNCH-XX-XX-DR-C-0100
- 222143-PUNCH-XX-XX-DR-C-0101
- 222143-PUNCH-XX-XX-DR-C-0102
- 222143-PUNCH-XX-XX-DR-C-0103
- 222143-PUNCH-XX-XX-DR-C-0104

Proposed surface water long sections.

- 222143-PUNCH-XX-XX-DR-C-0200
- 222143-PUNCH-XX-XX-DR-C-0201
- 222143-PUNCH-XX-XX-DR-C-0202
- 222143-PUNCH-XX-XX-DR-C-0203
- 222143-PUNCH-XX-XX-DR-C-0204
- 222143-PUNCH-XX-XX-DR-C-0205
- 222143-PUNCH-XX-XX-DR-C-0206
- 222143-PUNCH-XX-XX-DR-C-0207

Infiltration tank typical detail and bioretention detail

- 222143-PUNCH-XX-XX-DR-C-0500
- 222143-PUNCH-XX-XX-DR-C-0501

Pond/ wetland and attenuation tank detail drawings:

- 222143-PUNCH-XX-XX-DR-C-510
- 222143-PUNCH-XX-XX-DR-C-511
- 222143-PUNCH-XX-XX-DR-C-512
- 222143-PUNCH-XX-XX-DR-C-513
- 222143-PUNCH-XX-XX-DR-C-514

SUDS plans

- 222143-PUNCH-XX-XX-DR-C-0150
- 222143-PUNCH-XX-XX-DR-C-0151
- 222143-PUNCH-XX-XX-DR-C-0152
- 222143-PUNCH-XX-XX-DR-C-0160

8.1 Attenuation & Infiltration Areas

A total of 3 no. infiltration areas have been proposed for the development at each attenuation tank location A, B and C, located in the northwestern, central/southeast and southern regions of the site – see Figure 8.1). The proposed design infiltration rate utilised in the drainage design for each location was 1 x 10^{-5} m/s. In addition, all infiltration tanks are provided with petrol interceptors upstream prior to infiltration.

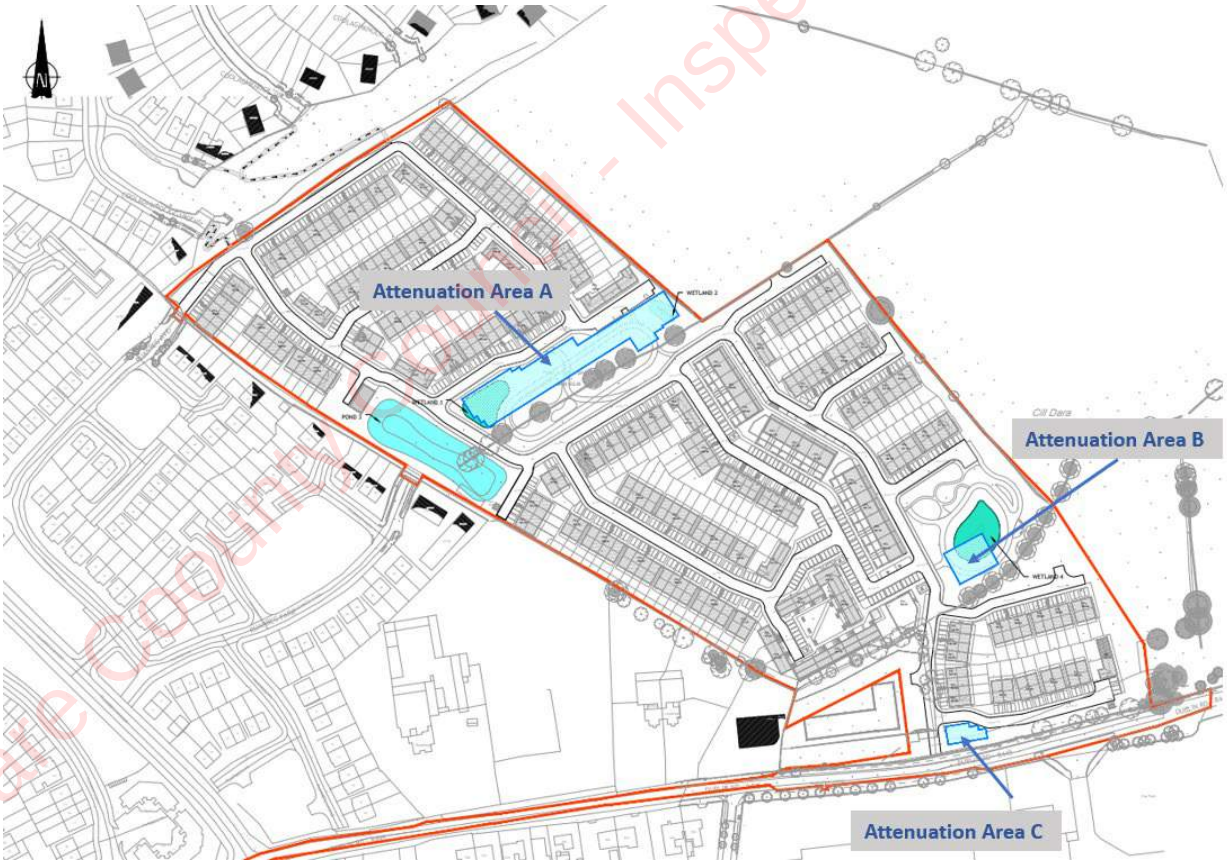


Figure 8.1 Proposed Attenuation Areas

8.1.1 Attenuation/Infiltration Area A

The invert of the proposed Attenuation Tank A is 90.3 mOD across an area of 2,500 m^2. Permeability testing of the shallow overburden in this area was found to be highly variable ranging from very low permeability to locally low/moderate permeability- see Table 7.2 and Table 7.3.

To facilitate vertical infiltration from Tank A, it is proposed to excavate a small number of linear trenches from the base of the proposed infiltration tank (1 metre in depth below the base of the tank i.e. to 89.3 mOD), through the lower permeability subsoils, and into the deeper more permeable silty sandy gravels at depth. These trenches will be located within the area of increased permeability recorded at depth within the areas surrounding wells BH102 and PBH01 and infilled with natural gravelly sand similar in composition to the surrounding fluvioglacial sand and gravels of the area. The trenches will enable the infiltration of storm water to greater depths thereby preventing any potential for ponding and will facilitate the natural filtration of stormwater before it enters the underlying groundwater.

Based on the highest groundwater level encountered in this area of the site (i.e. 88.89 mOD in well PBH01 – see Table 7.4), the minimum unsaturated zone between the base of the proposed tank and groundwater is 1.41 metres. This is consistent with the recommended 1.0 metre separation as outlined in the CIRIA SuDs manual (C753).

The proposed design infiltration rates utilised by Punch Engineers for the drainage system was $1x10^{-5}$ m/s.

8.1.2 Attenuation/Infiltration Area B

The invert of the proposed Attenuation Tank B is 92.0 mOD across an area of 500 m^2. Permeability testing of the shallow overburden in this area was found to be suitably permeable to facilitate the infiltration of rainwater/runoff to ground. Ground conditions and associated infiltration testing within trial pits PTP04 ($5.19 x10^{-5}$ m/s), TP104 ($2.23 x 10^{-2}$ m/s) and TP05 ($3.77x10^{-5}$ m/s), all located within the footprint of the proposed tank, recorded suitable permeability conditions to facilitate the discharge of water from the tank.

Based on the highest groundwater levels recorded in this area of the site (i.e. 88.97 mOD within PBH02), this equates to an unsaturated zone of 3.03 metres between groundwater and the invert of the proposed tank consistent with C753 recommendations.

The proposed design infiltration rates utilised by Punch Engineers for the drainage system was $1x10^{-5}$ m/s.

8.1.3 Attenuation/Infiltration Area C

The invert of the proposed Attenuation Tank C is 92.9 mOD across an area of 225 m^2. Permeability testing of the shallow overburden in this area was found to be suitably permeable to facilitate the infiltration of rainwater/runoff to ground. Ground conditions and associated infiltration testing within trial pits PTP05 ($1.61 x10^{-5}$ m/s), TP06 ($1.16x10^{-5}$ m/s), all located within the footprint of the proposed tank, recorded suitable permeability conditions to facilitate the discharge of water from the tank.

Based on the highest groundwater levels recorded in this area of the site (i.e. 88.74 mOD within PBH03), this equates to an unsaturated zone of 4.16 metres between groundwater and the invert of the proposed tank consistent with C753 recommendations.

The proposed design infiltration rates utilised by Punch Engineers for the drainage system was $1x10^{-5}$ m/s.

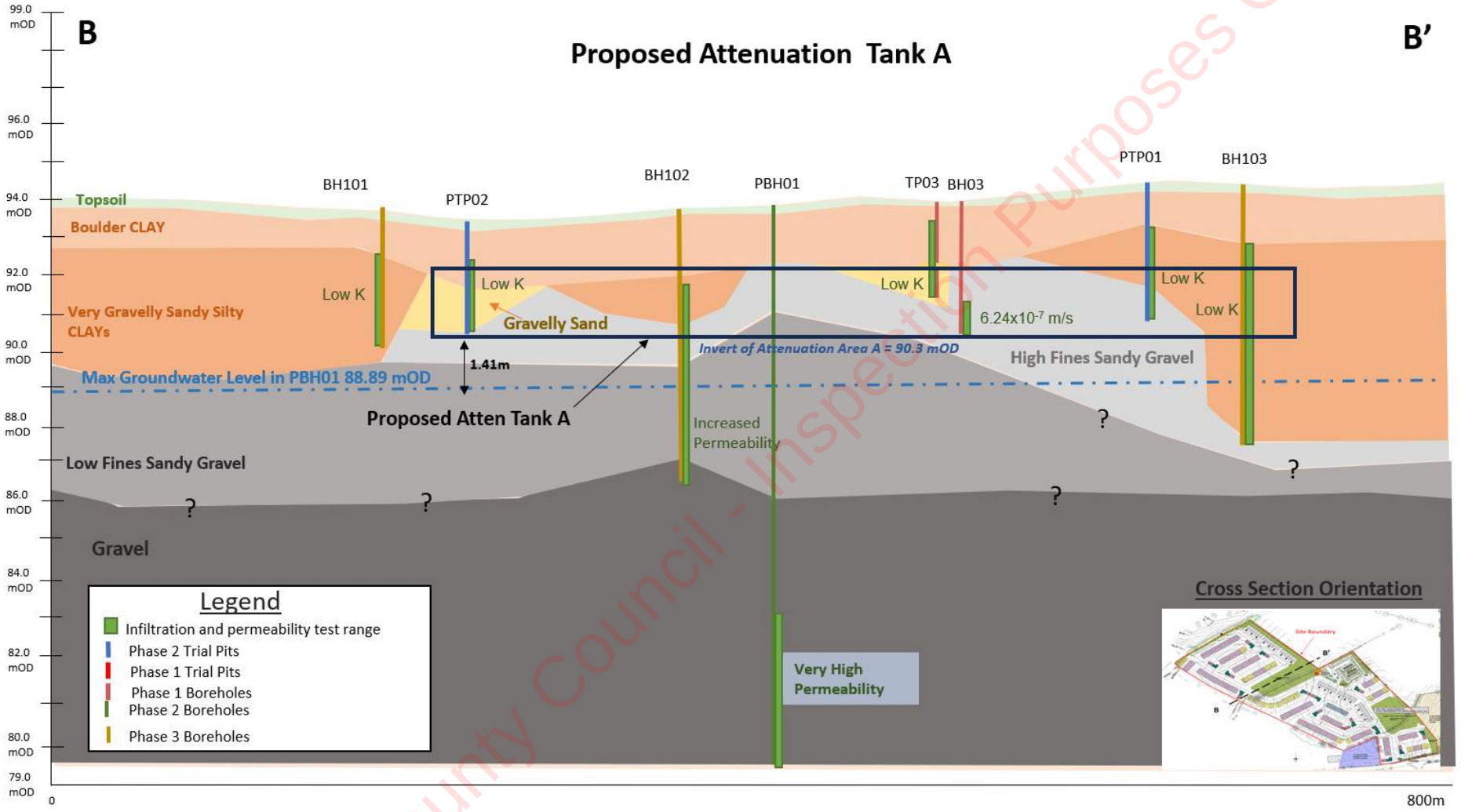


Figure 8.2 Proposed Attenuation Tank A Cross Section B – B'

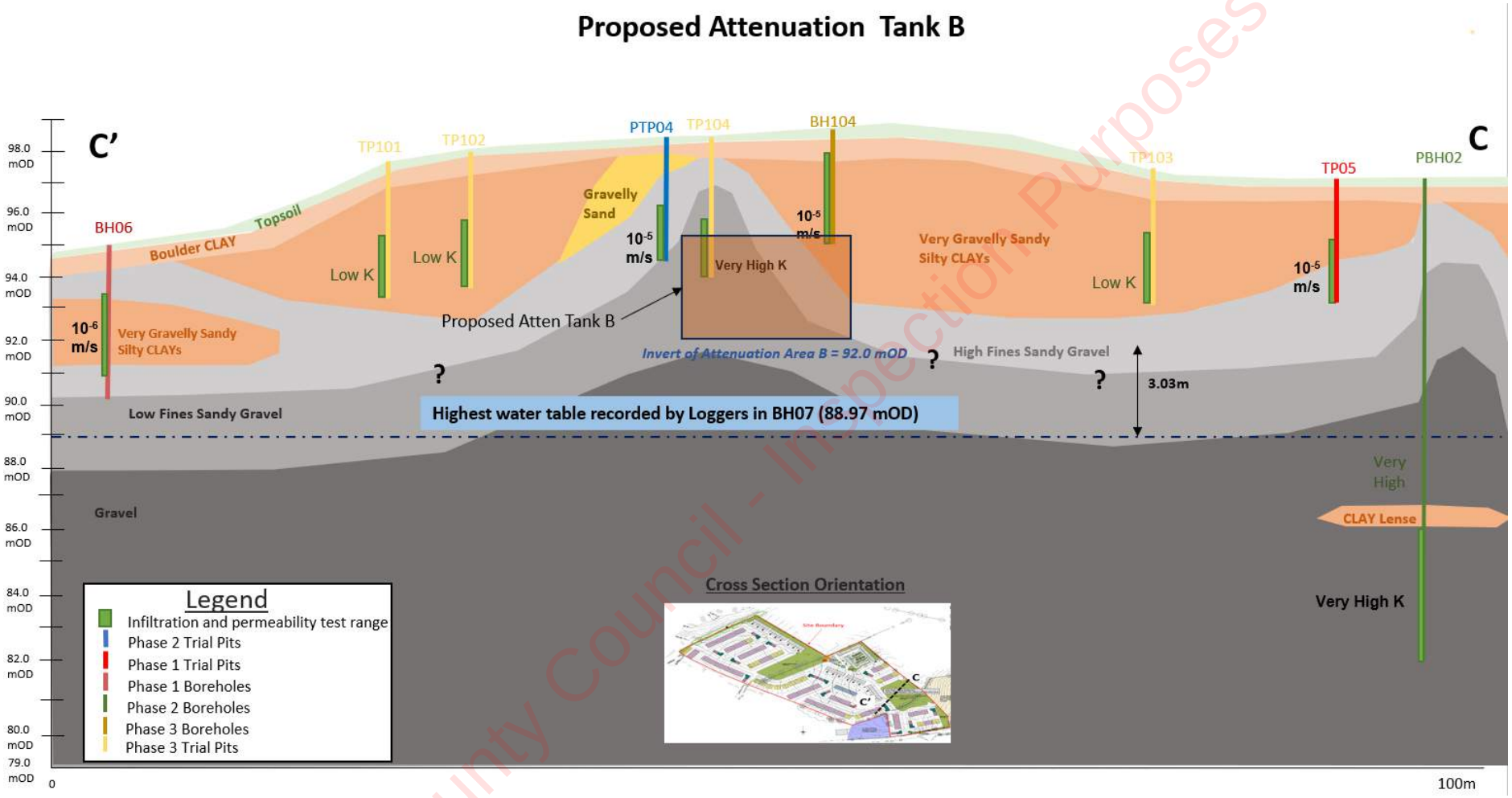


Figure 8.3 Proposed Attenuation Tank B Cross Section (C' – C)

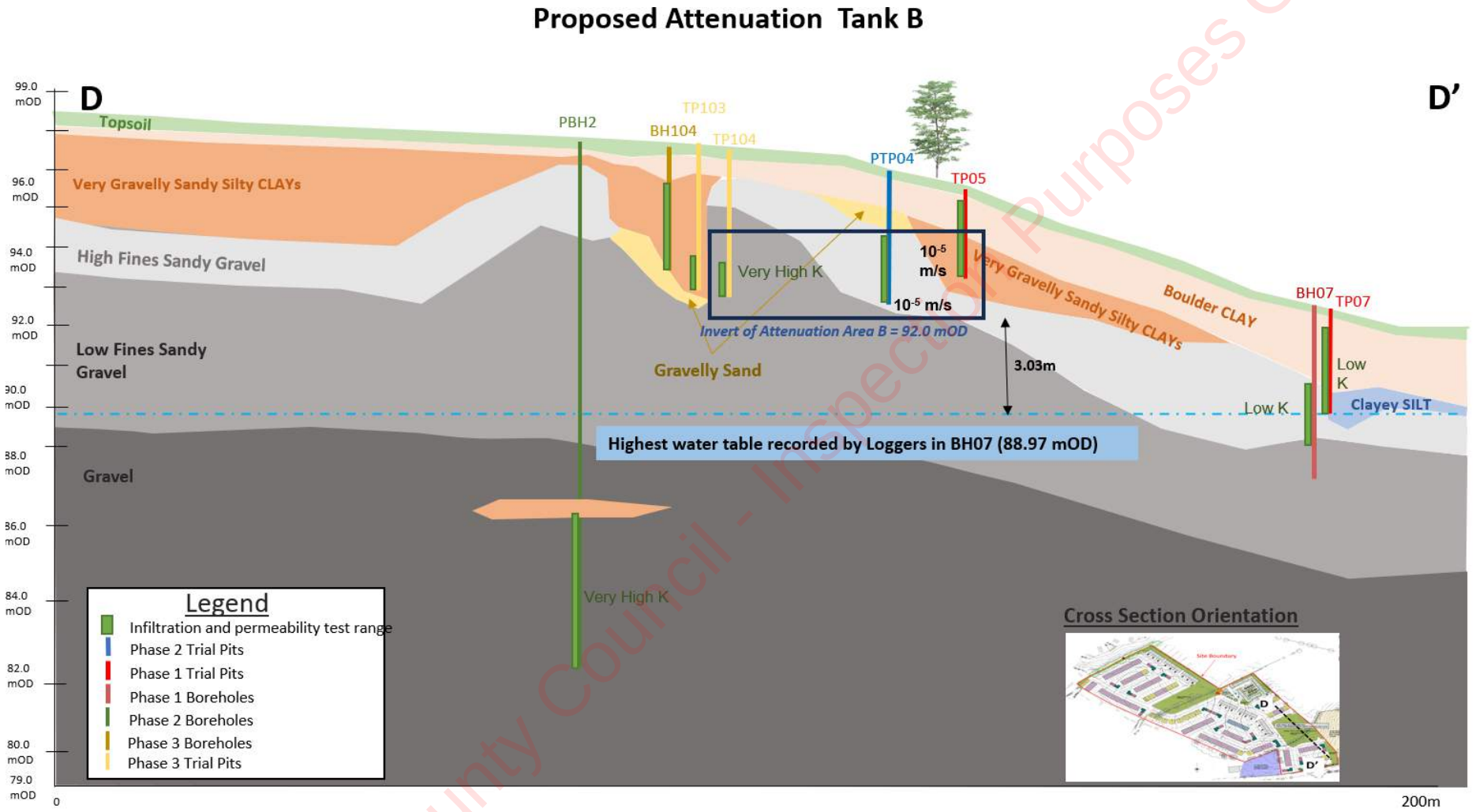


Figure 8.4 Proposed Attenuation Tank B Cross Section (D – D')

9 PRELIMINARY CONCEPTUAL SITE MODEL

Source-Pathway Receptors linkages outlined below in Table 9.1. The SPR model is used to identify the sources of potential contaminants, the environmental assets affected by such, and the pathways by which contaminant soils/water and contaminants reaches those receptors. It is evolved as the assessment proceeds and more information is acquired.

9.1 Preliminary S-P-R

The conceptual source-pathway-receptor model for the site was developed. The main potential impacts associated with the proposed development to the hydrogeological environment relates to the potential impact to groundwater quality underlying the site, the potential impact to downgradient groundwater-dependant environmental receptors and the impact on reduced infiltration of rainwater to groundwater.

Linkage	Source	Pathway	Receptors
1	Treated drainage water	Vertical Percolation to Groundwater	Groundwater Quality
2			Water Ponding
3			Pollardstown Fen
4	Reduced recharge to groundwater	Vertical Percolation to Groundwater	Curragh Aquifer Pollardstown Fen

Figure 9.1 Preliminary Source-Pathway-Receptor

9.2 Assessment of Impacts

Based on the identified potential risk linkages associated with the proposed development, the level of risk posed by each is considered to be low. Each linkage is discussed below.

No.1 Potential Impact of Treatment Surface Water Runoff/Drainage on Groundwater Quality

The proposed drainage system for the proposed development comprises the discharge of all roof water and surface water runoff from roads and parking areas to ground utilising Sustainable Urban Drainage Systems (SuDs). As discussed in Section 6.0, the proposed drainage system will comprise a combination of

a. Bioretention areas
b. Green Roofs
c. Landscape Areas
d. Permeable Pavements
e. Pond Areas
f. Rainwater Butts

Overflows from these areas will be directed to overflow gullies within or adjacent to the treatment area, with overflow to road gully drainage and then to the attenuation tank before infiltrating to ground.

The infiltration tanks are designed for 1 in 100-year storm (plus climate change). If the design capacity for infiltration of the infiltration tanks are exceeded, water levels will rise and water will be conveyed via

pipes through the tank and manholes to water storage areas above the tanks. This overflow water will be drained by infiltration to the infiltration tank and evapotranspiration.

The main contaminants of concern to groundwater relating to the proposed housing development primarily relates to suspended solids, heavy metals and hydrocarbons contaminated runoff generated mainly from vehicles movements. The proposed Suds drainage system incorporates measures to filter these contaminants generated to appropriate levels that will ensure the risk posed to the groundwater body is low. These measures also include sediment silt/retaining measures and a minimum of 1 metre of unsaturated depth of subsoil between the invert of the proposed Attenuation tanks and the highest recorded groundwater level.

No.2 Potential Impact of Storm water runoff ponding due to reduced infiltration within subsoils

The site investigation data indicates that the overburden has increased permeability to facilitate the infiltration of stormwater in the vicinity of proposed Infiltration Tanks B and C. Reduced infiltration conditions were identified immediately underlying the proposed Attenuation tank A in the central region of the site. Access into the underlying, deeper more permeable horizons as part of the design of the drainage system in this area will facilitate appropriate infiltration and ensure the potential risk of ponding is low.

No. 3 Potential Impact of Pollutants to Groundwater then flowing to Pollardstown Fen

As detailed in point No. 1 above, no impact is anticipated from the proposed development on groundwater quality. In the event of an unforeseeable event with groundwater quality being impacted, e.g. leaking sewer, the site is considered to be downgradient of Pollardstown Fen with groundwater flow determined to be flowing in a southwesterly direction i.e. in the opposite direction to Pollardstown Fen. Therefore the risk posed to the fen is considered to be low.

No.4 Potential Impact of Reduce Recharge to the Curragh Aquifer

All rainfall will be directed on site to ground utilising Suds drainage measures thereby minimising any impact on recharge levels to the underlying groundwater.

10 CONCLUSIONS

1. BlueRock Environmental Ltd (BREL) was requested by MRP Oakland Limited to undertake an updated Hydrogeological Site Assessment for a proposed residential development at Ruanbeg, located to the east of Kildare Town, Co. Kildare. 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments blocks and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces.

2. An initial Hydrogeological Assessment was issued for the site (Ref: BRE220014Rp01A02, 3rd May 2023). This updated report was provided to incorporate additional site investigation information collated in 2023, to clarify that over 7 months of groundwater level monitoring was undertaken across the site in both shallow and deep monitoring wells and to address specific queries as detailed in a Further Information (FI) request from Kildare County Council (KCC). It also reconfirms the original hydrogeological report that ground conditions underlying infiltration/attenuation tanks B and C are suitable for stormwater infiltration to ground and some low level and localised drainage design alterations required in the vicinity of tank A. There have been no significant alterations to the proposed drainage design in terms of hydrogeology or groundwater since the previous Hydrogeological Assessment.

3. Additional site investigation and monitoring and amendments to the proposed drainage system for the site were subsequently undertaken on receipt of a Further Information (FI) response from Kildare County Council (KCC).

4. **This updated Hydrogeological Assessment should be considered the most uptodate conceptual understanding of the hydrogeological conditions underlying the site, and its immediate environs, and supersedes all previous hydrogeological assessment reports/monitoring data.** It also considers the risk of the development on the hydrogeological regime and any sensitive receptors with particular emphasis on Pollardstown Fen Special Area of Conservation (SAC).

5. BREL undertook a detailed desk study review of the site and its general environs (including a review of Pollardstown Fen and its hydrogeological environment), supervised the hydrogeological investigation elements of the project, developed an interpretation of the hydrogeological regime underlying the site and assessed the risk posed by the proposed development to the hydrogeological environment.

6. The detailed site investigation and monitoring was initially undertaken by Causeway Geotech Site Investigation contractors between August 2022 and April 2023 that involved the following under the supervision of a BREL hydrogeologist:

    a. 7 no. light cable percussion boreholes;
    b. 3 no. Rotary boreholes;
    c. 10 no. trial pits;
    d. 10 no. infiltration tests within trial pits;
    e. 10 no. standpipe installations; and,
    f. Installation of automatic groundwater data loggers monitoring over a period of 7 months.

    An additional site investigation was undertaken at the site by Ground Check Limited in August 2023. The works comprised the following:

    a. 4 No. light cable percussive boreholes with standpipe installations and hydrualic conducitivity testing
    b. 4 no. trial pits with infiltration tests
    c. Additional automatic groundwater level monitoring with data loggers.

7. A summary of the ground conditions and hydrogeological conditions encountered is outlined below:

    a. Topsoil, approximately 200 – 300mm in thickness over a widespread deposit of typical boulder clay comprising gravelly clay with a sand and a silty sandy gravel component. This boulder clay was recorded at depths across the site ranging between 0.2 and 5.0 mbgl across the site. The thickness of this deposit generally ranges between 1 and 2 metres in the northwestern and northern regions of the site (i.e. boreholes BH01 and BH02) at thicknesses up to 4.5 metres.

    b. The boulder clays are underlain by fluvioglacial deposits of predominately medium dense silty sands and gravels with interlayered firm to stiff sandy gravelly clay/silt lenses. These deposits range between 5.4 and 7.9 metres in thickness, however the base horizon is considered gradational and is not sharply defined. The upper horizons of these fluvioglacial deposits are generally described as a sandy gravelly clay or clayey/silty sandy gravel. The lower horizon is characterised as a similar material with a notably reducing fines content with depth.

    c. Dense gravels are present at depths ranging between 10.7 and 11.5 mbgl in PBH01 and PBH02 respectively and encountered at much shallower depths within PBH03 between 2.3 and 13.1 mbgl. Generally the upper sections of the main dense gravel unit have an increased sand content with the material becoming dense clean gravels with depth.

    d. The thickness of the gravels is unknown from site investigations; however it is considered to be in the region of 30.0 - 40.0m. Depth of bedrock has not been confirmed to date at the site at depths up to 15 mbgl.

8. Groundwater level monitoring was undertaken within all shallow and deeper groundwater monitoring wells across the site between the 19th September 2022 and the 4th April 2023 and again between the 16th August and 25th August 2023 representing a period of over 7 months.

9. Groundwater levels were monitored using both automated groundwater level dataloggers and manual dipping. The automated dataloggers were initially installed within wells BH01–BH07 on the 16th September for a period of 4 months i.e. until the 9th January 2023. All wells with the exception of BH07 were recorded as continually dry throughout this period. The dataloggers, from selected consistently dry shallow wells, were transferred to the deeper monitoring wells for further on-going monitoring until the 4th April 2023 (i.e. 3 months). Weekly manual monitoring of the dry shallow wells continued to confirm consistently dry conditions over time within wells BH01 to BH06. Additional automated monitoring was undertaken between the 16th and 25th August 2023.

10. A summary of the recorded groundwater levels is outlined below:

    a. All shallow groundwater monitoring wells were recorded as dry throughout the 4 months of data logger monitoring and subsequent 4 months of manual groundwater level monitoring with the exception of BH07 and BH102. Groundwater was recorded at levels ranging between 3.73 and 4.83 mbgl respectively (i.e. between 88.97 and 87.83 mOD) within these wells. Well BH07 is located in the lowest region of the site.

    b. Groundwater levels recorded within the deeper gravel monitoring wells were recorded at levels ranging between 5.18 and 8.95 mbgl (i.e. between 88.89 - 88.83mOD).

    c. A number of spikes in groundwater levels were recorded within BH07 over time. The spike recorded on the 12th January 2023 is attributed to falling head testing undertaken within this well. The previous spikes in levels are attributed to notable rainfall events that occurred immediately prior to these records. The highest groundwater levels were recorded on the 12th August 2023 following unusually wet month. Groundwater levels start to reduce from the 8th August 2023 with notably drier climatic conditions recorded.

    d. Groundwater flow within the deeper dense gravel body is interpreted to be consistently flowing in a south to southwesterly direction across the site i.e. in the

opposite direction to Pollardstown Fen. The lowest groundwater levels were recorded in the southern region of the site. More recent groundwater levels recorded in August 2023 interpreted a groundwater flow direction to the south. Both interpreted flow directions over time are consistent with the regional groundwater flow pattern mapped by Trinity College and previous studies referenced in Section 4.9.

e. Groundwater level differences across the site are not considered to be significant with relatively low gradient recorded between 0.001 and 0.005 between September 2023 and April 2023 with lower gradients recorded in July and August 2023.

f. Groundwater within shallow monitoring wells BH07 and BH102 are considered to be hydraulically connected with the deeper gavel aquifer with groundwater flowing as a single hydraulic unit across the site. No perched shallow groundwater body has been identified underlying the site. Groundwater is interpreted to be flowing under unconfined conditions across the site (Figure 7.4).

g. The highest recorded groundwater levels underlying the 3 no. proposed Infiltration Tanks A, B and C was 88.89 mOD, 88.83 mOD and 88.74 mOD respectively. The inverts of the proposed 3 no. Attenuation / Infiltration Tanks are 90.3 mOD (Infiltration Tank A), 93.18 mOD (Infiltration Tank B) and 90.0 mOD (Infiltration Tank C). Therefore the separation distance between each Attenuation tank and the highest recorded groundwater level recorded in each area of the site is consistently above the recommended 1 metre distance as outlined in the CIRIA SuDs manual (C753).

11. Permeability testing results within the upper horizons recorded highly variable permeabilities from very low (i.e. 8.51 x 10^{-8} m/s) to moderate/high permeability (i.e. ranging between 2.23 x 10^{-2} m/s and 5.19 x 10^{-5} m/s). The highest permeability recorded was in TP104 located in the upper 3.8 metres underlying Attenuation Tank B. Permeability test results within the lower gravels recorded highly permeable conditions. It is noted that a thick clay deposit was recorded in the northeastern region of the site to circa 10.0mbgl (i.e. location BH1). The infiltration and permeability test results indicate reduced infiltration in the area of the proposed Infiltration tank A with increased infiltration conditions in the areas of proposed Infiltration Tanks B and C.

12. A conceptual source-pathway-receptor model for the site was developed. The main potential impacts associated with the proposed development to the hydrogeological environment relates to the potential impact to groundwater quality underlying the site, the potential impact to downgradient groundwater-dependant environmental receptors, the potential impact from ponding due to sufficient infiltration conditions and the impact on reduced infiltration of rainwater to groundwater.

13. The proposed Suds drainage system for the development incorporates measures to filter and settle contaminants of concern generated within stormwater runoff from the development that will ensure the risk posed to the underlying groundwater body is low. These measures also include sediment silt/retaining measures and a minimum of 1 metre of unsaturated depth of subsoil or aquifer material above the highest recorded groundwater level. Infiltration conditions in the vicinity of Attenuation Tanks B and C are deemed sufficiently permeable to facilitate the infiltration of stormwater to ground. The Punch Engineering design drainage drawings should be referred to. In addition, all infiltration tanks are provided with petrol interceptors upstream prior to infiltration.

14. Reduced infiltration conditions were identified immediately underlying the proposed Attenuation tank A in the central region of the site. Access into the underlying, deeper more permeable horizons as part of the design of the drainage system in this area will facilitate appropriate infiltration and ensure the potential risk of ponding is low. These measures include the excavation of a small number of pathway trenches, located in confirmed areas of suitable permeabilities, infilled with natural gravelly sand, that will facilitate increase infiltration and also provide additional filtration of stormwater before entering groundwater. Infiltration conditions underlying Areas B and C are deemed suitable to facilitate the infiltration of stormwater to ground.

15. In the event of an unforeseeable event with groundwater quality being impacted, e.g. leaking sewer etc, the site is considered to be downgradient of Pollardstown Fen with groundwater flow determined to be flowing in a south to southwesterly direction i.e. in the opposite direction to Pollardstown Fen. Therefore the risk posed to the fen is considered to be low.

16. All rainfall will be directed on site to ground utilising Suds drainage measures thereby minimising any impact on recharge levels to the underlying groundwater.

17. Based on the above assessment, the overall risk posed by the proposed development on the Curragh Gravel Aquifer and Pollardstown Fen is considered to be Low. The design of any infiltration systems at the site should maintain a 1 metre unsaturated zone above the highest recorded groundwater level and should be suitably sized to carer for the variably permeabilities recorded across the site.

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APPENDIX A

NPWS Site Synopsis for Pollardstown Fen SAC

E.U. Annex II Habitats and EU Annex IV Species sensitivity to changes in groundwater

SITE NAME: POLLARDSTOWN FEN (SITE CODE: 000396)

Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3km westnorth- west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the Fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the Fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay.

Pollardstown Fen is unusual in Ireland as it is an extensive area of primary and secondary Fen peat, lacking scrub vegetation on its surface. The Fen vegetation is generally from 0.5 - 1.5 m high and consists mainly of Saw Sedge *(Cladium mariscus),* Reed *(Phragmites australis),* Blunt-flowered Rush *(Juncus subnodulosus)* and a variety of Sedges *(Carex* spp.). The vegetation is quite varied and species-rich with numerous well defined plant communities and several rare or scarce species, including Narrow-leaved Marsh Orchid *(Dactylorhiza traunsteineri),* Fly Orchid *(Ophrys insectifera)* and Broad-leaved Bog Cotton *(Eriophorum latifolium).* Of particular interest is the occurrence of the moss, *Homalothecium nitens* - a boreal relict species which is rare in Ireland. Species and communities characteristic of more nutrient-rich conditions occur on the Fen margins where the water first emerges from the ground, while the central Fen area is dominated by more uniform and less nutrient-demanding vegetation types.

Damp pastures occur on wet mineral soils and partly-drained peats on the Fen margins. These are reasonably species-rich, with particularly good displays of orchids in some areas. The Fen has ornithological importance for both breeding and wintering birds. Little Grebe, Coot, Moorhen, Teal, Mallard, Mute Swan, Water Rail, Snipe, Sedge Warbler and Reed Bunting all breed annually within the Fen vegetation. Reed Warbler and Garganey, both rare breeding species in Ireland, have been recorded at Pollardstown and may have bred. In recent years two very specialised bird species associated with Fens, Marsh Harrier and Savi's Warbler, have been seen at Pollardstown.

An area of reclaimed land was reflooded in 1983 and has now reverted to open water, swamp and regenerating Fen. Since the reflooding of the Fen and the development of the shallow lake, wintering waterfowl have been attracted in increased numbers. Maximum counts during winter 1984/85 were as follows: Little Grebe 24; Teal 161; Mallard 220; Coot 81; Snipe 68.

Otter and Brook Lamprey *(Lampetra planeri),* two species listed in Annex II of the EU Habitats Directive, occur at Pollardstown.

Various groups of the invertebrate fauna have been studied and the system has been shown to support a true Fen fauna. The species complexes represented are often rare in Ireland, with the sub-aquatic organisms particularly well represented. A number of internationally important invertebrates (mostly Order Diptera, i.e. two-winged flies) have been recorded from the site. Of particular conservation importance, however, is the occurrence of all three of the Whorl Snails *(Vertigo* spp.) that are listed on Annex II of the EU Habitats Directive. Pollardstown is the only known site in Ireland (or Europe) to support all three species *(Vertigo geyeri, V. angustior, V. moulinsiana)* and thus provides a unique opportunity to study their different habitat and hydrological requirements.

Much of the Fen vegetation is now owned by the Office of Public Works and is a Statutory Nature Reserve.

Pollardstown Fen is the largest spring-fed Fen in Ireland and has a well-developed flora and fauna. Owing to the rarity of this habitat and the numbers of rare organisms found there, the site is rated as of international importance.

Surface water ecosystems and terrestrial ecosystems directly dependent on groundwater. * Indicates priority habitats (after Mayes, 2008)

EU Habitat Code	EU Annex I Habitat	Number of SACs	Type	Sensitivity to changes in Groundwater Quantity	Sensitivity to changes in Groundwater Quality
1150	* Coastal lagoons	25	SW	low - high	Moderate - high
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	38	GWDTE	low - moderate	low
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	33	GWDTE	low - moderate	low
2170	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	11	GWDTE	high	high
2190	Humid dune slacks	15	GWDTE	high - extreme	high - extreme
21A0	Machairs (* in Ireland)	19	GWDTE	high - extreme	moderate - high
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	32	SW	moderate	extreme
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	9	SW	moderate	high
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	18	SW	high	high-extreme
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation	9	SW	moderate	moderate
3160	Natural dystrophic lakes and ponds	10	SW	low	extreme
3180	* Turloughs	43	GWDTE	high	moderate - extreme
3260	Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	21	SW	moderate	moderate
3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation	1	GWDTE	moderate	low
4010	Northern Atlantic wet heaths with *Erica tetralix*	37	GWDTE	low - (extreme)	high
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	13	GWDTE	low - moderate	low - moderate
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	3	GWDTE	moderate	moderate
7110	* Active raised bogs	51	GWDTE	low - (extreme)**	low -(high)**
7120	Degraded raised bogs still capable of natural regeneration	53	GWDTE	low - (extreme)**	low -(high)**
7130	Blanket bog (* if active bog)	50	GWDTE	low - (extreme)**	low -(high)**
7140	Transition mires and quaking bogs	16	GWDTE	extreme	moderate
7150	Depressions on peat substrates of the *Rhynchosporion*	62	GWDTE	low	moderate
7210	* Calcareous fens with *Cladium mariscus* and species of *Caricion davallianae*	17	GWDTE	extreme	high
7220	* Petrifying springs with tufa formation (*Cratoneurion*)	19	GWDTE	extreme	extreme
7230	Alkaline fens	39	GWDTE	extreme	high
8310	Caves not open to the public	9	GWDTE	extreme	high
91D0	* Bog woodland	11	GWDTE	extreme	low
91E0	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-padion, Alnion incanae, Salicion albae*)	23	GWDTE	moderate	low - high

GWDTE – Groundwater Dependent Terrestrial Ecosystem; SW – Surface Water, Aquatic Ecosystem; ** when fen present

GWDTE – Groundwater Dependent Terrestrial Ecosystem; SW – Surface Water, Aquatic Ecosystem; ** when Fen present

Appendix B

2022 and 2023 Site Investigation Reports

Ground Investigation, October 2022 – No Change

Ground Investigation, January 2023 – No Change

Ground Investigation, September 2023 – Additional Information, See Appendix 6.3

Appendix 7.2

Site Specific Flood Risk Assessment

Slight Change

PUNCH consulting engineers

Celebrating 50 Years 1973 - 2023

Proposed Residential Development at Ruanbeg, Kildare Town, Co. Kildare

Site Specific Flood Risk Assessment

222143-PUNCH-XX-XX-RP-C-0004

September 2023

Document Control

Document Number: **222143-PUNCH-XX-XX-RP-C-0004**

Status	Rev	Description	Date	Prepared	Checked	Approved
A0	C01	Planning Application	04/05/2023	C Shannon	M Richardson	M Richardson
A0	C02	RFI Surface Water Audit	18/8/2023	C Shannon	M Richardson	M Richardson
A0	C03	Planning FI response	06/09/2023	M Richardson	C Shannon	J Tiernan

Table of Contents

1 Introduction

1.1 Background

PUNCH Consulting Engineers were appointed by MRP Oakland Limited to carry out a Site-Specific Flood Risk Assessment for a proposed housing development at Ruanbeg, Kildare Town, Co. Kildare.

The assessment is carried out in full compliance with the requirements of "The Planning System & Flood Risk Management Guidelines" published by the Department of the Environment, Heritage and Local Government in November 2009.

This report is provided as a amended Site Specific Flood Risk Assessment in response to a request for further information (Kildare Co Co reference 23/510). The proposed site layout is detailed in a series of planning drawings provided by MCORM in the planning documentation and documentation submitted as part of the response to the request for further information.

1.2 Existing Site

The existing site is approximately 10.3 ha and is predominantly greenfield. It has been consistently used for agricultural purposes over the years. The site is comprised of several smaller field units with tree and hedge boundaries, with no existing structures present. The topography of the site varies with the site sloping from both north to southwest and north to southeast.

The proposed development is located on the northern side of R445 and the M7 (Kildare Bypass). The site is within the Kildare Council Development Plan (2023-2029) boundary and included within the Draft Kildare Local Area Plan (2023-2029).

The site location is shown in Figure 1-1 below.

Figure 1-1: Site Location.

1.3 Nature of the Proposed Development

The proposed development will consist of a Large-scale Residential Development. As a result of the response to the request for further information, the quantity of dwellings has been reduced to 285 no. units. The development will include a combination of one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with duplexes/apartments, a single storey age friendly accommodation block, and a creche.

The development also includes associated car parking, bicycle parking, landscaping, and open spaces.

Vehicular and pedestrian access is proposed from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services are proposed to facilitate development.

The proposed works are outlined in a series of architectural drawings prepared by MCORM Architects, CSR Landscape Architects, and engineering drawings prepared by PUNCH Consulting Engineers supplied as part of the planning documentation.

Please refer to Architectural Documents for full proposed site layout.

2 Relevant Guidance

2.1 The Planning System and Flood Risk Management Guidelines

In September 2008, "The Planning System and Flood Risk Management" Guidelines were published by the Department of the Environment, Heritage and Local Government in Draft Format. In November 2009, the adopted version of the document was published.

The Flood Risk Management Guidelines give guidance on flood risk and development. The guidelines recommend a precautionary approach when considering flood risk management in the planning system. The core principle of the guidelines is to adopt a flood risk sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for river and coastal flooding. The guidelines include definitions of Flood Zones A, B and C, as noted in Table 2-1 below. It should be noted that these do not take into account the presence of flood defences, as there remain risks of overtopping and breach of the defences.

Table 2-1: Flood Zone Designation

Flood Zone	Type of Flooding	Annual Exceedance Probability (AEP)
Flood Zone A	Coastal	Less than a 1:200 (0.5% AEP) year event
	Fluvial	Less than a 1:100 (1% AEP) year event
Flood Zone B	Coastal	Greater than a 1:200 (0.5% AEP) and less than a 1:1000 (0.1% AEP) year event
	Fluvial	Greater than a 1:100 (1% AEP) and less than a 1:1000 (0.1% AEP) year event
Flood Zone C	Coastal	Greater than a 1:1000 (0.1% AEP) year event
	Fluvial	Greater than a 1:1000 (0.1% AEP) year event

Once a flood zone has been identified, the guidelines set out the different types of development appropriate to each zone. Exceptions to the restriction of development due to potential flood risks are provided for through the use of the **Justification Test**, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. This recognises that there will be a need for future development in existing towns and urban centres that lie within flood risk zones, and that the avoidance of all future development in these areas would be unsustainable.

A three staged approach to undertaking an FRA is recommended:

Stage 1: Flood Risk Identification – Identification of any issues relating to the site that will require further investigation through a Flood Risk Assessment;

Stage 2: Initial Flood Risk Assessment – Involves establishment of the sources of flooding, the extent of the flood risk, potential impacts of the development and possible mitigation measures;

Stage 3: Detailed Flood Risk Assessment – Assess flood risk issues in sufficient detail to provide quantitative appraisal of potential flood risk of the development, impacts of the flooding elsewhere and the effectiveness of any proposed mitigation measures.

This report addresses the requirements for Stage 1.

2.2 KCC Draft Development Plan 2023 – 2029

Section 6.7 (Flood Risk Management) of the KCC Draft Development Plan 2023 – 2029 provides a list of Council Objectives with regards to flood risk. The objective relevant to this report is as follows:

It is an objective of the Council to:

IN O31 *Manage flood risk in the county in accordance with the sequential approach and requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) and circular PL02/2014 (August 2014), when preparing plans, programmes, and assessing development proposals. To require, 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, demonstrating compliance with the Guidelines or any updated version of these guidelines, paying particular attention to avoidance of known flood risk, residual flood risks and any proposed site-specific flood management measures.*

A Draft Strategic Flood Risk Assessment (SFRA) was completed for KCC in March 2022 to supplement the KCC Draft Development Plan 2023-2029. The relevant objectives of the SFRA are listed as follows:

HO P30 *Require that site specific flood risk assessments are carried out where required, in accordance with the requirements of The Planning System and Flood Risk Management Guidelines for Planning Authorities.*

IN O31 *Manage flood risk in the county in accordance with the sequential approach and requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) and circular PL02/2014 (August 2014), when preparing plans, programmes, and assessing development proposals. To require, 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, demonstrating compliance with the Guidelines or any updated version of these guidelines, paying particular attention to avoidance of known flood risk, residual flood risks and any proposed site-specific flood management measures.*

2.3 Kildare Town Local Area Plan 2012 - 2018

Kildare Town is subject to its own Local Area Plan (LAP) and the current adopted LAP is dated 2012-2018. The LAP identifies those areas within Kildare Town which require a Site-Specific Flood Risk Assessment (SSFRA). An excerpt from the Kildare Town LAP Map 8.2 is presented here as Figure 2-1 and shows that the LAP does not require an SSFRA for the site. Refer to Appendix A for the full map.

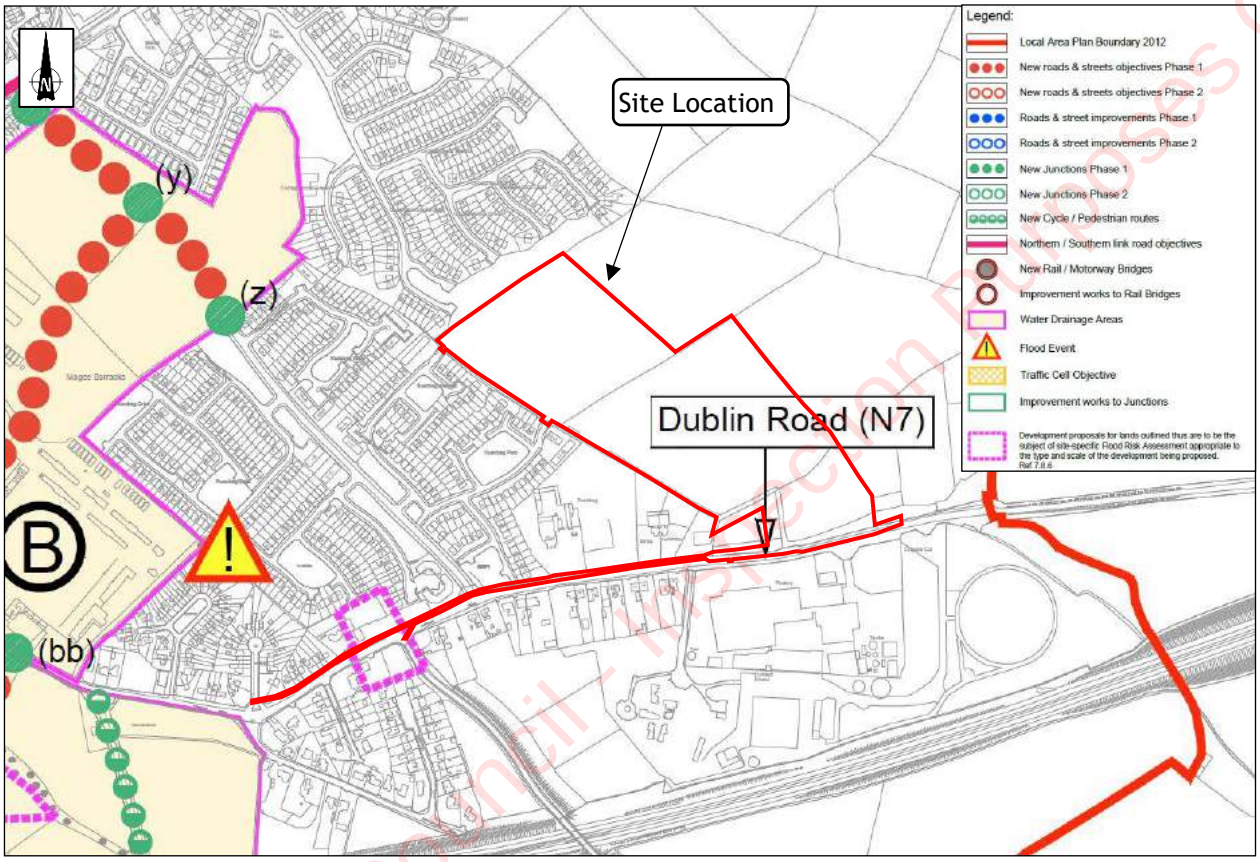


Figure 2-1: Kildare Town LAP - Excerpt from Map 8.2 (Ref: KCC LAP 2012 - 2018)

2.4 Draft Kildare Town Local Area Plan 2023-2029

2.4.1 Content of initial Draft Kildare Town Local Area Plan 2023-2029

Kildare Town is subject to a Draft Local Area Plan (LAP). A Draft SFRA has been prepared for this LAP and state the following in relation to flood risk in Kildare Town:

> *… Kildare Town is not at risk from coastal or fluvial flooding but may be exposed to pluvial flooding and to a lesser extent groundwater flooding…*

Flood mapping is included with no flood risk indicated at the proposed development site. Please refer Map 10.2 as included in the original Draft Kildare Town Local Area Plan 2023-2029 in Appendix B.

2.4.2 Content of August 2023 Material Amendment to Draft Kildare Town Local Area Plan 2023-2029

A proposed Material Amendment to Section 6.5.4 of the Kildare Town LAP was prepared in August 2023 relating to pluvial flooding:

> *Given the significant area of surface water drainage reliant on discharge via infiltration in addition to historic observations of surface water flood risk within Kildare Town, a pluvial flood model was developed to inform the identification of areas within the LAP area that may be susceptible to surface water flooding.*

The output from this pluvial flood model identified a pluvial flood risk within the lands subject to this SSFRA as shown in Figure 2-2 below:

Figure 2-2: Extract from Proposed Material Amendment to Draft Kildare Town LAP SFRA Section 6.5.4 (Site Boundary Shown in Red)

An amended Map 10.2 has been proposed as part of the Material Amendment to the Draft Local Area Plan. Please see below Figure 2-3 for the location of the development site within the proposed Map 10.2. Please refer the full map as included in Appendix C.

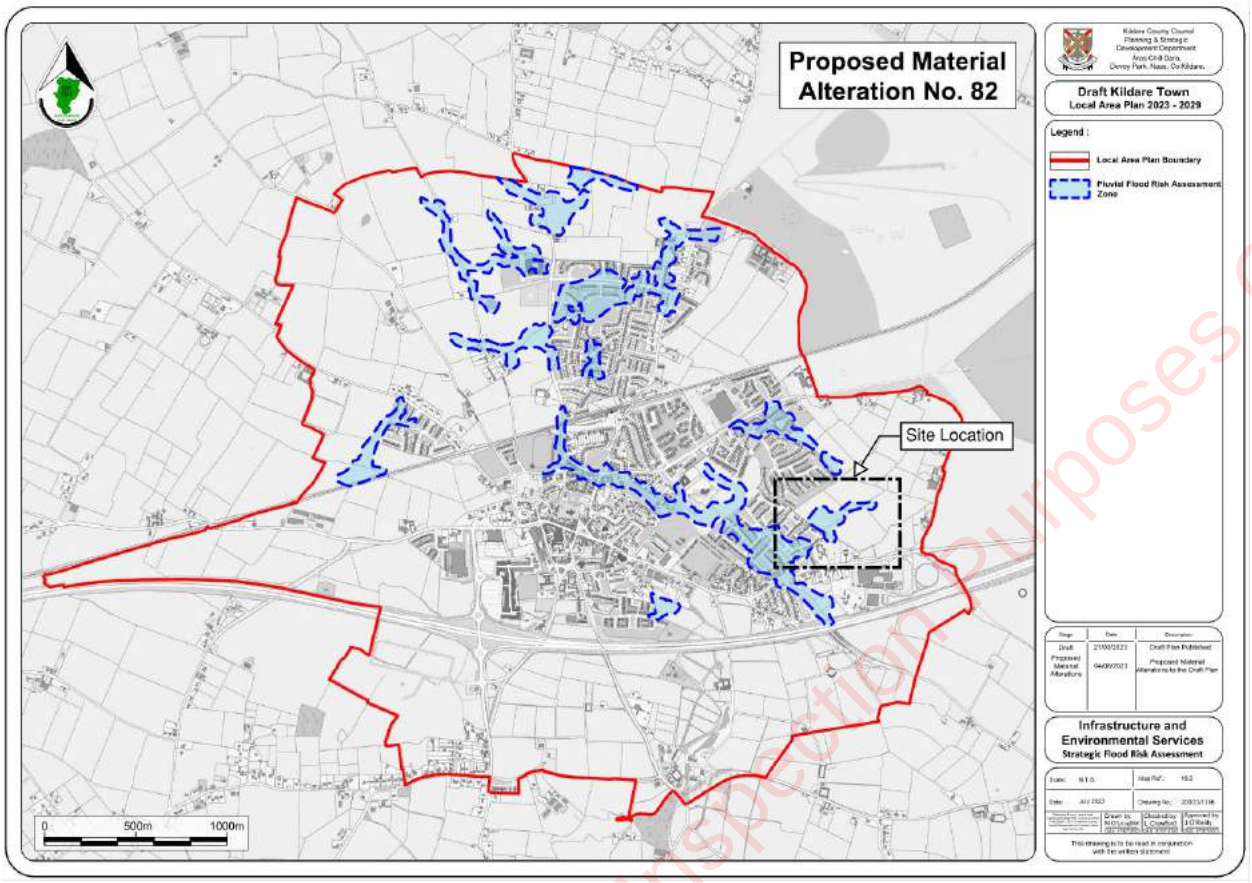


Figure 2-3 - Site location within Map 10.2

2.4.3 Response to Draft Kildare Town Local Area Plan 2023-2029

The flooding report that the material amendment to the Draft Kildare Local Area Plan is based on is not provided with the material amendment.

Assumption Scenario 1: Development Site Pluvial Flooding

Pluvial flooding may have been determined to accumulate as a result of development at the proposed development site.

In response to this possibility, it should be noted that proposed development at the site would be required to accommodate its own drainage with design to 1 in 100 year with suitable climate change and urban creep in accordance with the Kildare County Development Plan.

This is particularly relevant to the proposed planning application (Planning Ref. 23/510) at the development site. A planning FI is to be submitted imminently for this development, which includes a detailed Site-Specific Flood Risk Assessment that deals fully with this scenario.

Assumption Scenario 2: Overland Flow Directed from Neighbouring Site

Pluvial flooding may have been determined to flow overland from a neighbouring site, directly to the south. Please refer below Figure 2-4 indicating this possible assessment.

PUNCH contend that the flood zone indicated on the development site results directly from the incorrect interpretation of the surface water runoff and associated flood risk in the area.

We believe that the pluvial flooding assessment has been based on a high-level review of aerial imagery and that the lands in question have been incorrectly identified as impermeable hard standing material, e.g. concrete or pavement.

Please also refer below to aerial photos of the site. Please note that the area assumed to discharge to the development site **currently consists of an exercise arena for horses with a permeable sand-based surface and does not provide an increase in runoff to the development site**. Table 2-2 below summarises the PUNCH assessment in conjunction with the aerial images at Figure 2-5, Figure 2-6, and Figure 2-7.

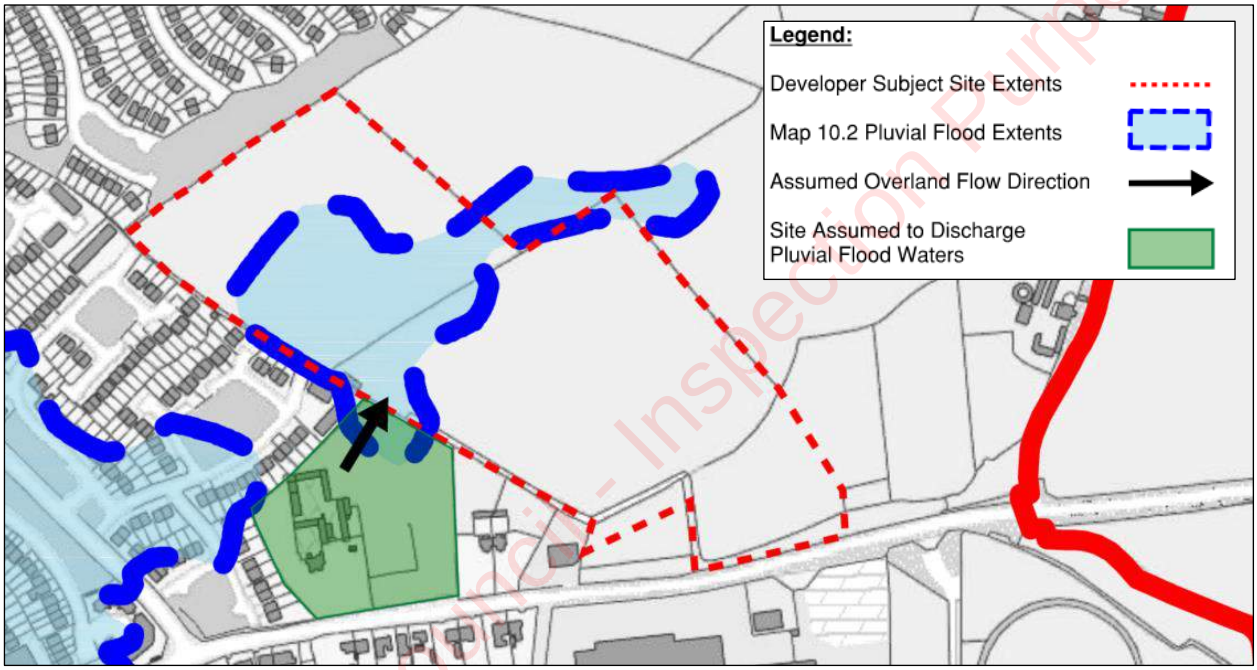


Figure 2-4 Annotated Extract from Map 10.2

Figure 2-5: Aerial photo of Local Area

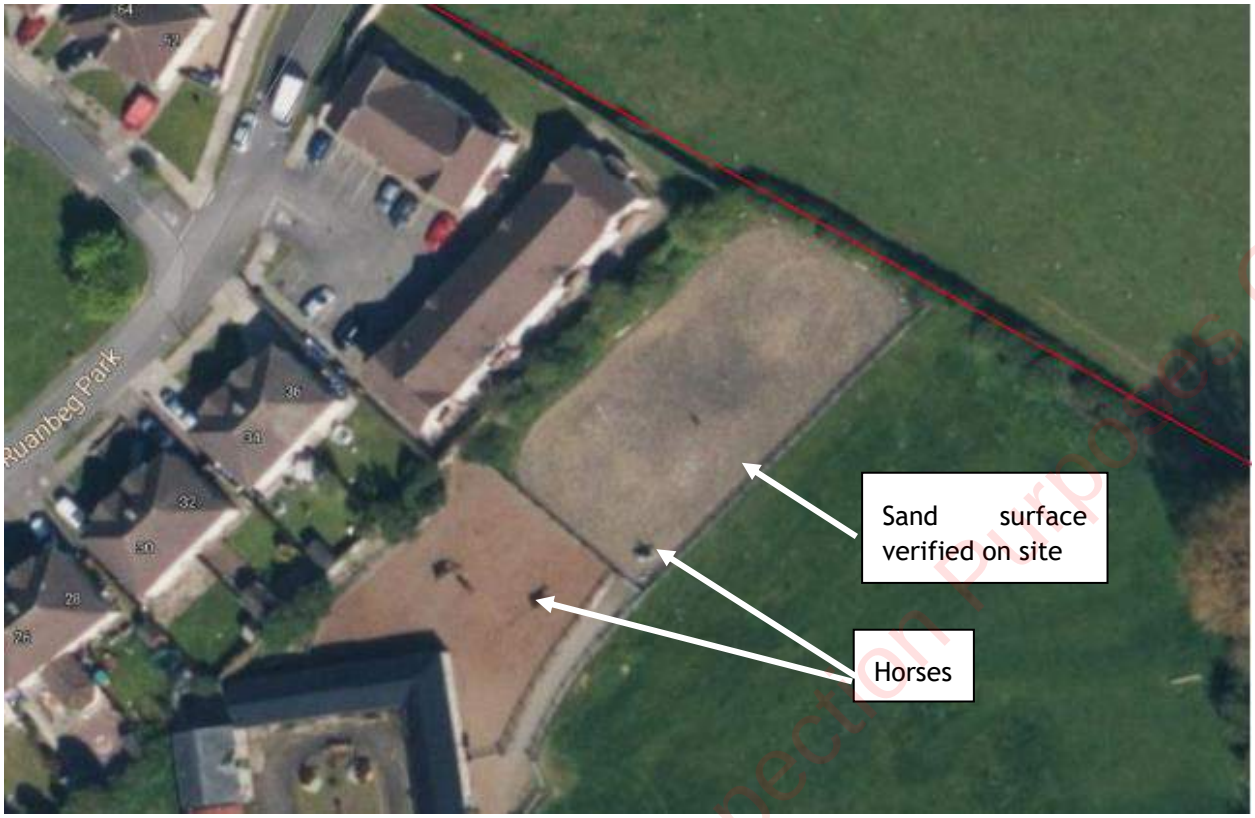


Figure 2-6: Detail aerial photo of site to south showing surface as sand with horses visible

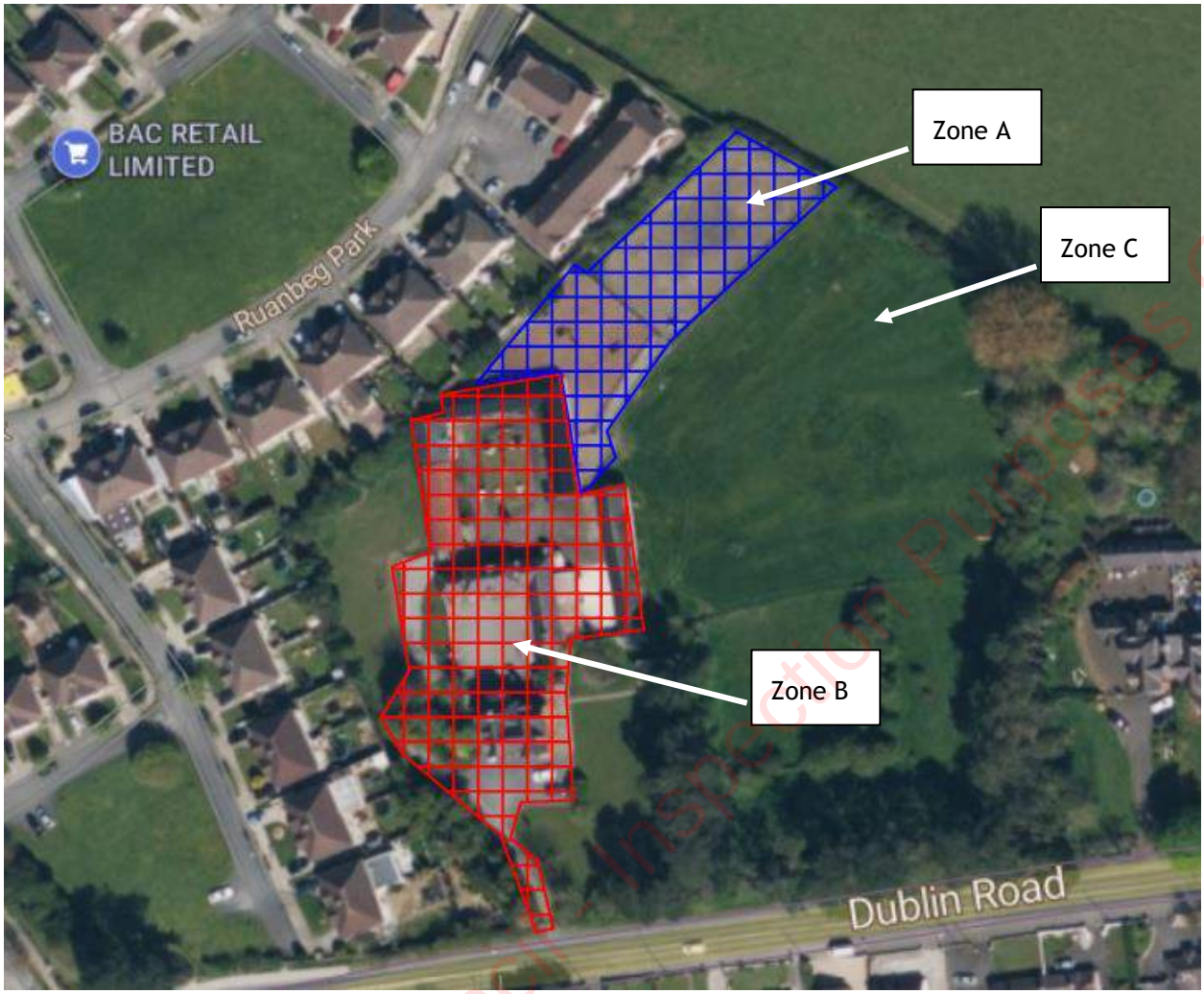


Figure 2-7: Neighbouring Site Zone references. Refer Table 2-2

Table 2-2: Summary Runoff Expectation from Neighbouring Site

Zone reference	Finish type	Drainage expectation	Levels Comment
Zone A	Sand	Permeable, infiltrates to ground. Negligible runoff expected to development site	Falls to development site
Zone B	Mixed roof, courtyard and car park	Impervious. Controlled drainage expected to discharge to public services on R445	Higher than R445
Zone C	Landscape	Permeable, infiltrates to ground Negligible runoff expected to development site	Mixed falls

The above photos and table indicate that there is no runoff expected to the proposed development site.

2.4.4 Conclusion of Assessment of Draft Kildare Town Local Area Plan 2023-2029 and Material Amendment August 2023

PUNCH have completed an assessment of the amended Map 10.2 as provided as part of the material amendments to the Draft Kildare Town Local Area Plan 2023-2029. This is provided in section 2.4.3 above. Based on this assessment, it is determined that there would not be any runoff from the neighbouring site to the development site. On this basis there is no increase in pluvial flood risk to the site to be assessed.

2.5 Flood Risk Management Plan

The OPW publish Flood Risk Management Plans detailing the feasible range of flood risk management measures proposed for their respective river basins. Kildare Town falls within the Barrow River Basin (UoM14) Flood Risk Management Plan (FRMP) area. The UoM14 FRMP was published by the OPW in 2018 and is valid for the period 2018-2021. The plan lists current flood management measures in place and potentially viable Flood Relief Works. There are a number of measures proposed in the plan which are applicable for all areas. However, no additional measures specific to the area surrounding the site are proposed.

3 Flood Risk Identification

3.1 Existing Hydrogeological Environment

There are no identifiable waterbodies in the vicinity of the site.

3.2 Topographical Survey

A topographical survey of the site and its environs was completed by CSS Land Surveys Ltd., in May 2022. The topography of the site varies, ranging between 92.00m AOD and 98.50m AOD, with a pronounced hillock located south-centre of the site and lower levels within the area adjacent to the R445. The extent of the topographical survey is shown in Figure 3-1.

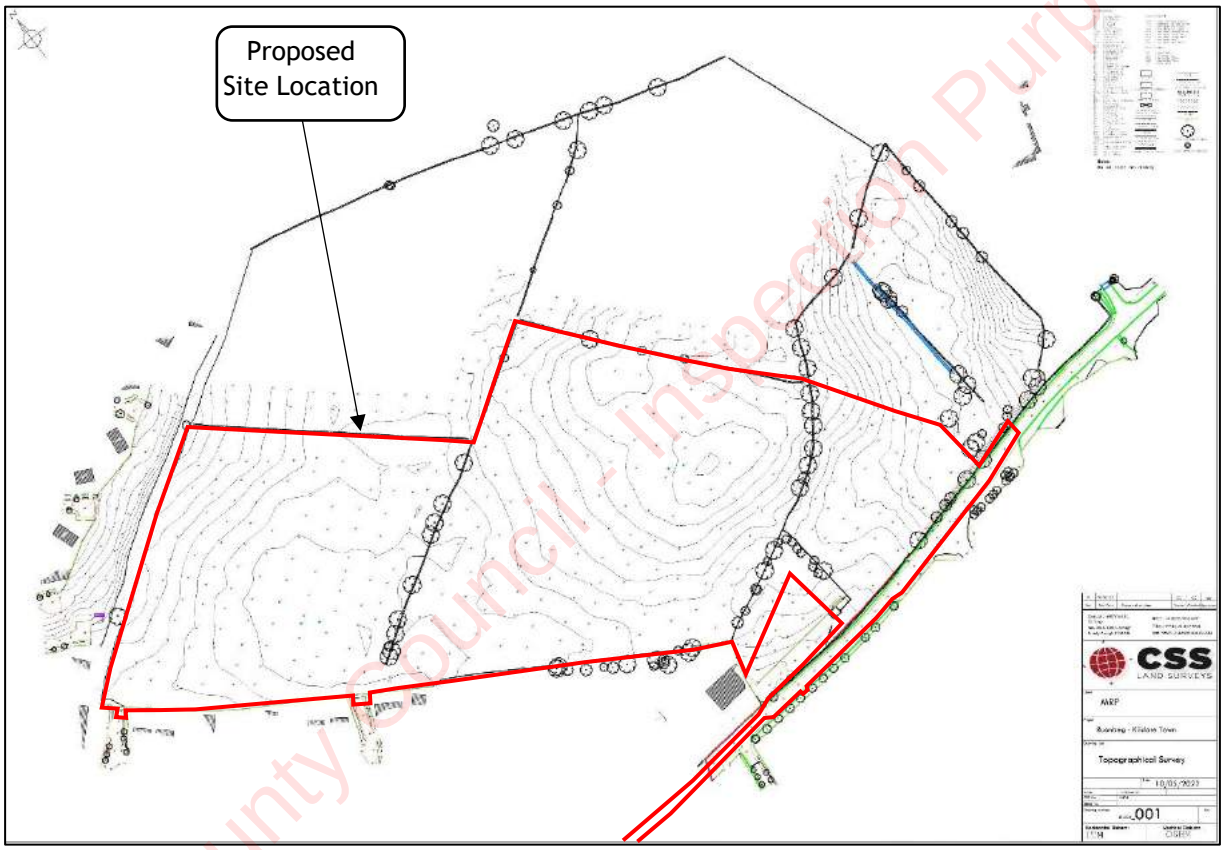


Figure 3-1: Topographical Survey Extent

3.3 Site Geology

The geology of the site was reviewed using data from the Geological Survey of Ireland (available at www.gsi.ie). The soil type at the location of the proposed development is identified as 'Gravels derived from Limestones' as seen in Figure 3-2.

Figure 3-2: Geology of the surrounding area (source: Geological Survey of Ireland (http://www.gsi.ie)

3.4 Groundwater Flooding

There is no identifiable flood risk associated with the site as shown in Figure 3-3.

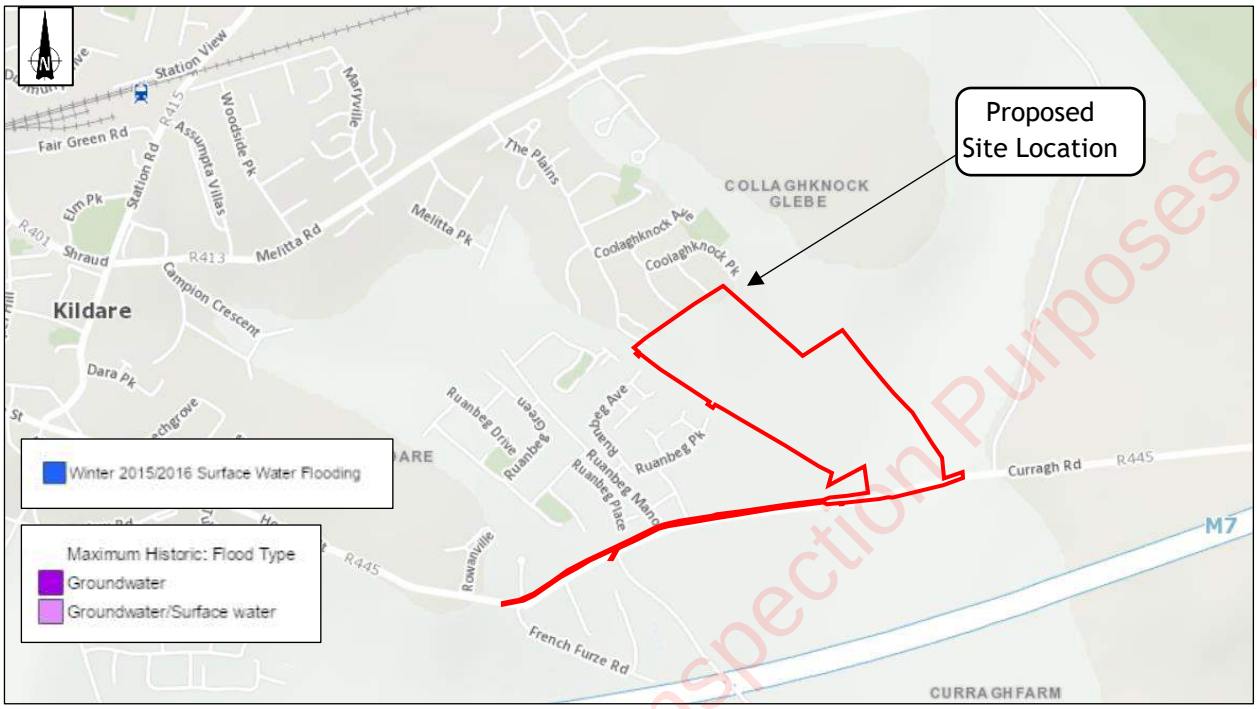


Figure 3-3: Winter 2015/2016 Surface Water Flooding and Maximum Historic Groundwater Flooding (source: Geological Survey of Ireland (www.gsi.ie))

3.5 Review of Existing Surface Water Infrastructure

Record drawings provided by Irish Water/KCC indicate the presence of an existing 225mm uPVC surface water sewer outside the western boundary of the site. Figure 3-4 below shows an extract from maps received from Irish Water/KCC.

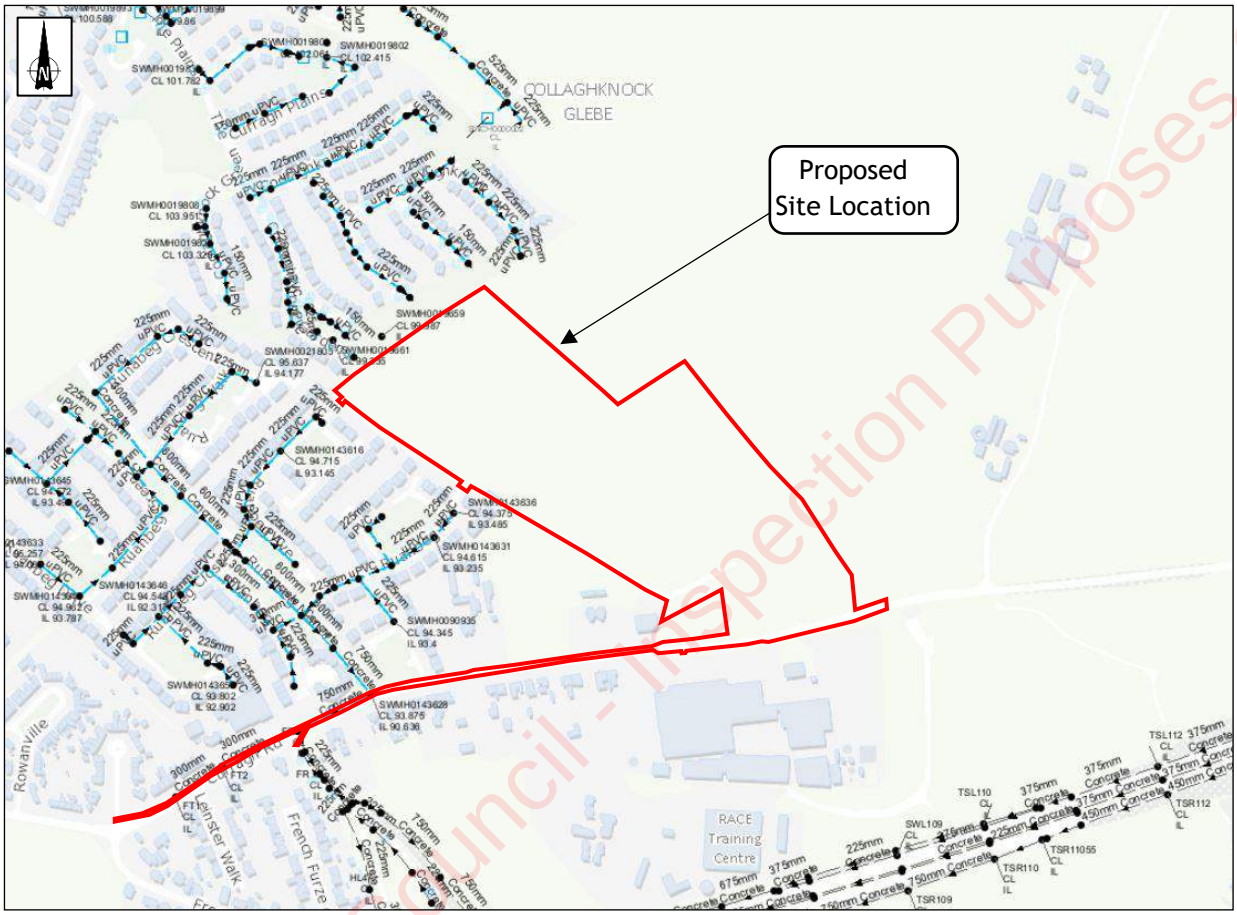


Figure 3-4: Extract from Irish Water Record Drawings (© Irish Water)

3.6 Review of Historic Mapping

A review of the OSI Historical maps[1] was carried out. Figure 3-5 shows an extract from the 25-inch historic map for the site. The site is not identified as "liable to flood" in the available historic OSI maps.

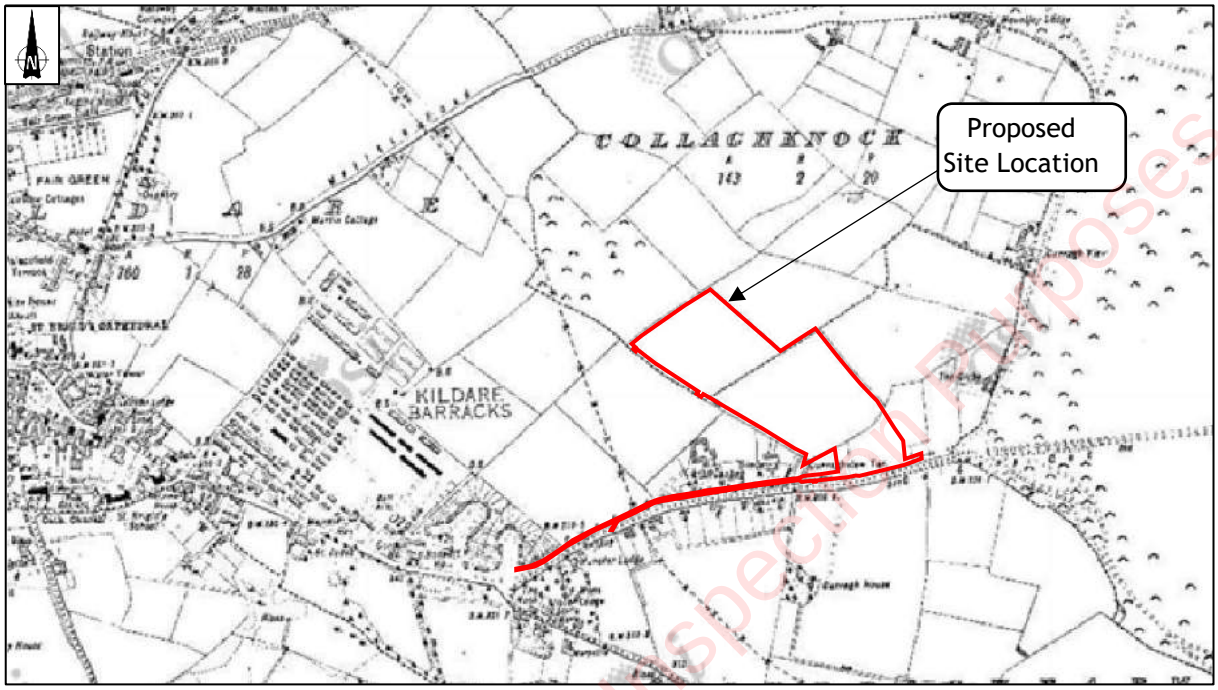


Figure 3-5: Extract from OSI historical 25-inch map

[1] Maps available: http://map.geohive.ie/mapviewer.html

3.7 History of Flooding

The OPW Flood Hazard Mapping Website is a record of historic flood events. This database does not identify any historic flooding at the site, as shown in Figure 3-6. Please note that this is not a guaranteed record of all flood events. See Appendix D for full Past Flood Event Local Area Summary Report.

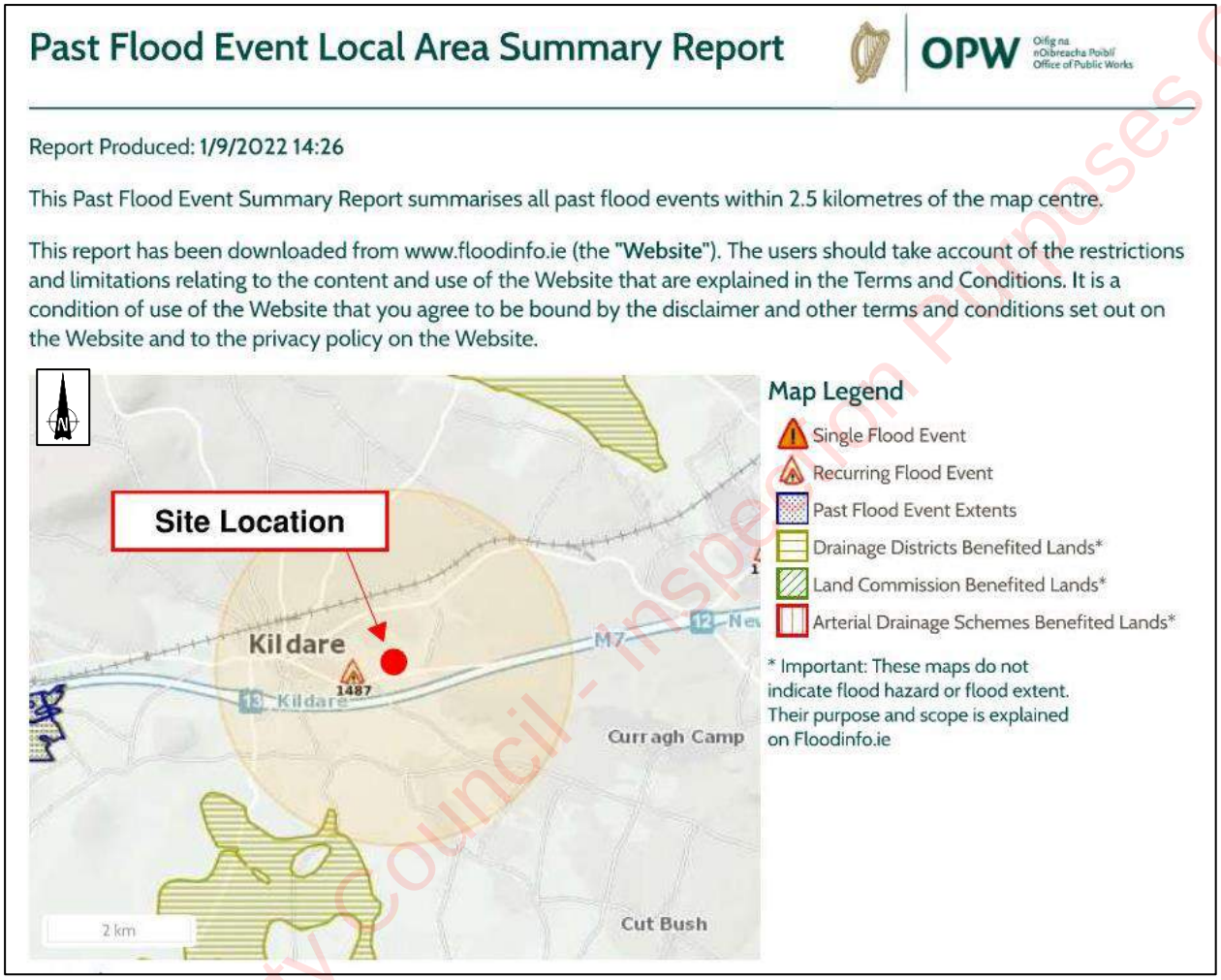


Figure 3-6: OPW Past Flood Event Report (Ref: OPW Flood Maps)

3.8 Catchment Flood Risk Assessment and Management Study (CFRAMS) Mapping

The CFRAMS is an OPW led national programme which seeks to identify and map potential existing and future flood hazard in areas at significant risk from flooding. It also aims to identify flood relief measures and prepare Flood Risk Management Plans for these areas.

As part of the CFRAMS programme, mapping is available online for public viewing (www.floodinfo.ie), and the local area has been assessed as part of the South Eastern CFRAMS. The OPW has published detailed flood hazard mapping for the area based on results from the CFRAMS. This includes flood extent and flood depth mapping for a number of return periods for fluvial and coastal flood events. There are no CFRAMS flood mapping details available for Kildare Town and its environs.

3.9 National Indicative Fluvial Mapping

The OPW published the National Indicative Fluvial Mapping (NIFM) in 2021 and they are now publicly available on https://www.floodinfo.ie/map/floodmaps/. The NIFM is a series of preliminary mapping of catchments greater than 5km^2 which are not covered by the CFRAMS programme. These maps are 'predictive' flood maps showing indicative areas predicted to be inundated during a theoretical fluvial flood event with an estimated probability of occurrence. A review of this mapping does not indicate a flood risk to the site as shown in Figure 3-7.

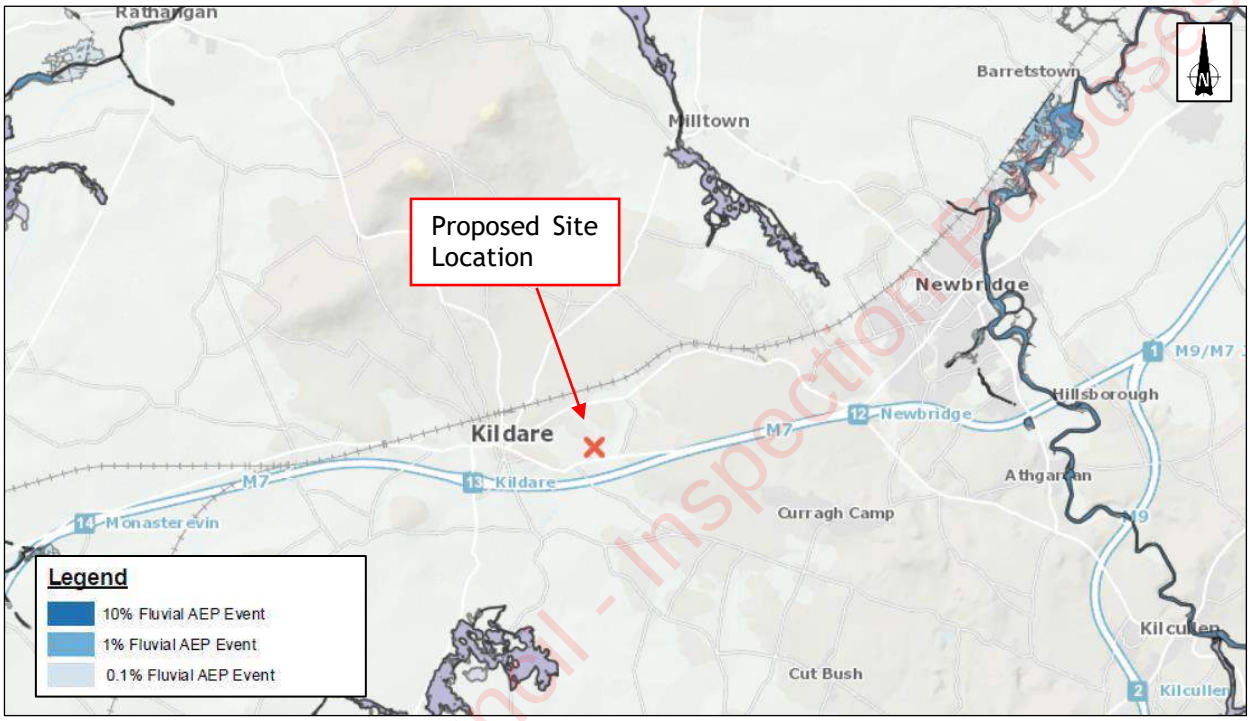


Figure 3-7: Extract from the National Indicative Fluvial Mapping (Low and Medium Probability)

3.10 Pluvial Flooding

Pluvial flooding is due to overland flow from sewer surcharging, blocked gullies, high runoff rates etc. usually associated with high intensity rainfall. The site is currently greenfield in nature and any surface runoff enters an existing network of land-drains in the area. However pluvial flood risk to the site has been identified in the Proposed Material Amendment to the Draft Kildare LAP 2023-2029 as detailed in Section 2.4 of this report. As part of the proposed residential development, the site will be extensively redeveloped, and a new surface water drainage network will be constructed thus mitigating any potential pluvial flood risk. An assessment of the pluvial risk associated with the indicated area in the Proposed Material Amendment to the Draft Kildare LAP 2023-2029 is provided in section 2.4.3, above. As a result, it is determined that there is no additional pluvial flooding created at the subject development site as a result of adjacent sites.

3.11 Estimate of Flood Zone

PUNCH Consulting Engineers have reviewed the available information as outlined in the above sections. We have concluded that the site is located in Flood Zone C and is therefore at low risk of flooding.

4 Conclusions

PUNCH Consulting Engineers were appointed to carry out a Site-Specific Flood Risk Assessment for a proposed residential development at Ruanbeg, Kildare Town, Co. Kildare.

This Site-Specific Flood Risk Assessment has been carried out in accordance with *"The Planning System & Flood Risk Management Guidelines"* published by the Department of the Environment, Heritage and Local Government in November 2009 and the Kildare County Council Local Area Plan.

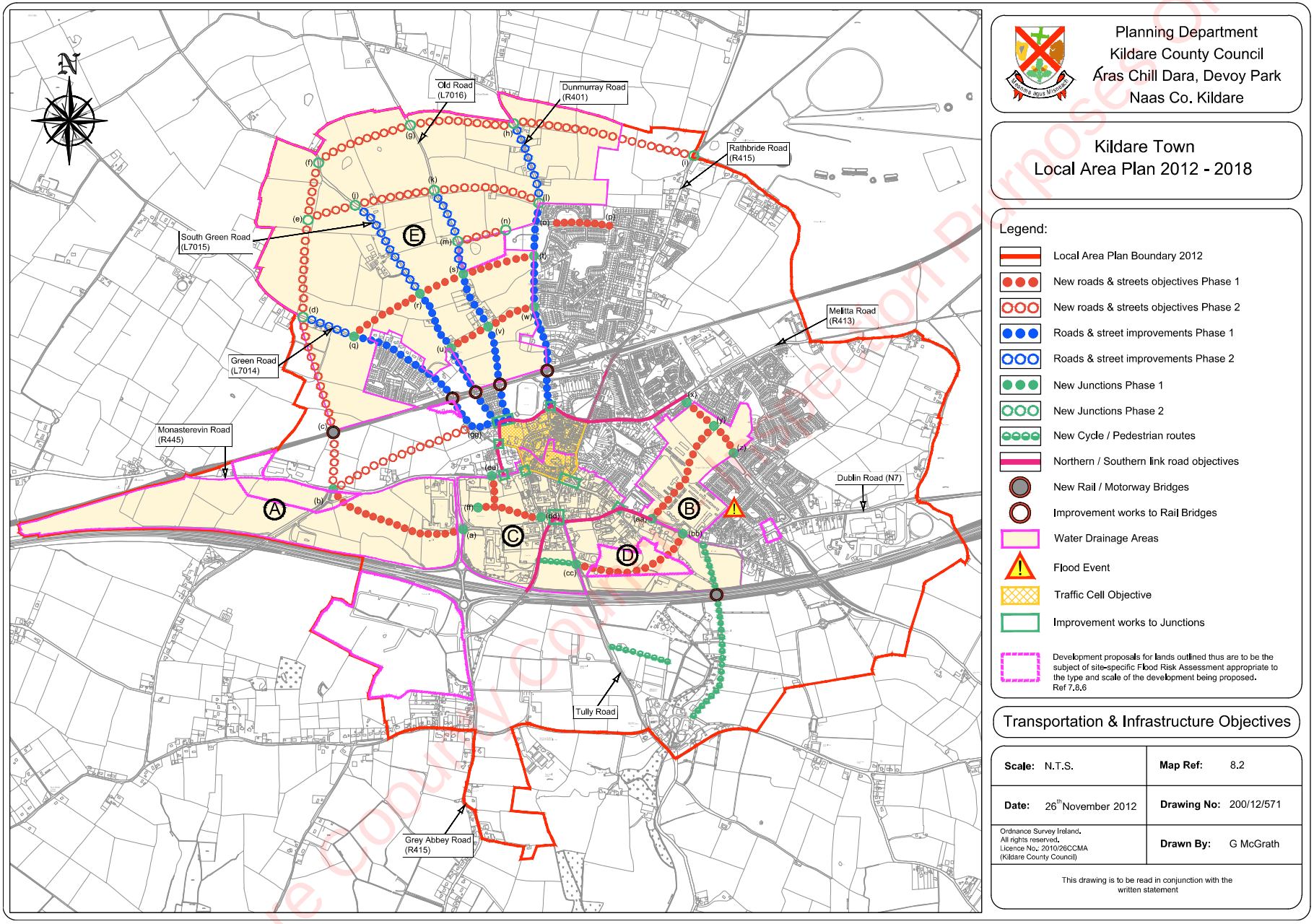
A review of the flood risk in the area was carried out for the site.

Flood Maps produced as part of the NIFMS were consulted to establish the Flood Zone. It was determined that the proposed development site is currently located in Flood Zone C for fluvial flooding.

A Proposed Material Amendment to the Draft Kildare LAP identical a pluvial flood risk to the site. However, this risk will be mitigated through the provision of a new surface water drainage system to be constructed as part of the development.

The proposed development is at a low risk of flooding and is deemed appropriate for the site.

Appendix A Kildare Town LAP 2012 – 2018 Map 8.2



Planning Department
Kildare County Council
Áras Chill Dara, Devoy Park
Naas Co. Kildare

Kildare Town
Local Area Plan 2012 - 2018

Legend:

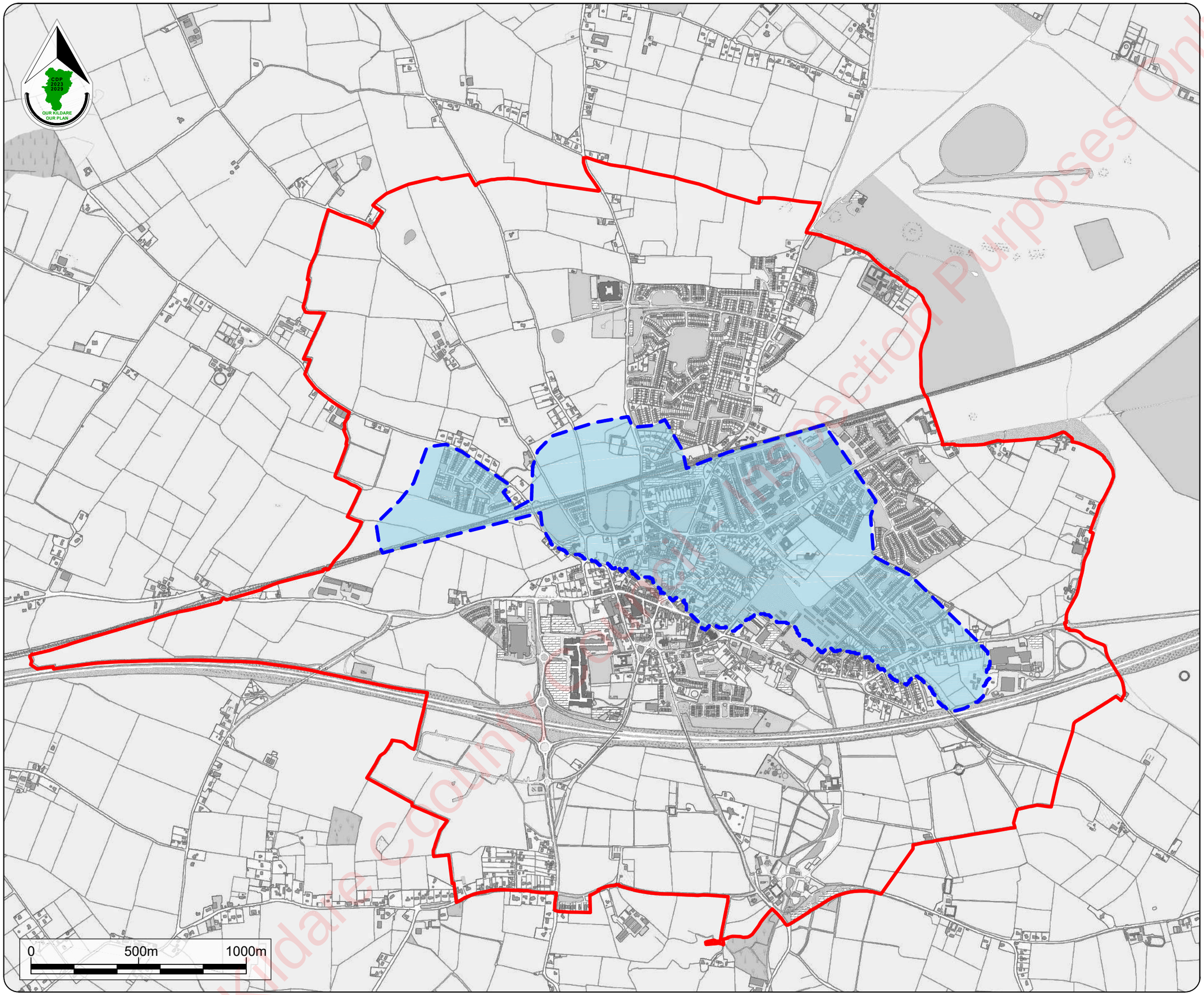
- Local Area Plan Boundary 2012
- New roads & streets objectives Phase 1
- New roads & streets objectives Phase 2
- Roads & street improvements Phase 1
- Roads & street improvements Phase 2
- New Junctions Phase 1
- New Junctions Phase 2
- New Cycle / Pedestrian routes
- Northern / Southern link road objectives
- New Rail / Motorway Bridges
- Improvement works to Rail Bridges
- Water Drainage Areas
- Flood Event
- Traffic Cell Objective
- Improvement works to Junctions
- Development proposals for lands outlined thus are to be the subject of site-specific Flood Risk Assessment appropriate to the type and scale of the development being proposed. Ref 7.8.6

Transportation & Infrastructure Objectives

Scale: N.T.S.	**Map Ref:** 8.2
Date: 26th November 2012	**Drawing No:** 200/12/571
Ordnance Survey Ireland. All rights reserved. Licence No. 2010/26CCMA (Kildare County Council)	**Drawn By:** G McGrath

This drawing is to be read in conjunction with the written statement

Appendix B Draft Kildare Town LAP 2023-2029 Map 10.2



Kildare County Council
Planning & Strategic
Development Department
Áras Chill Dara,
Devoy Park, Naas, Co Kildare.

Draft Kildare Town
Local Area Plan 2023 - 2029

Legend :

- Local Area Plan Boundary
- Pluvial Flood Risk Assessment Zone

Stage	Date	Description
Draft	21/03/2023	Draft Plan Published

Infrastructure and Environmental Services
Strategic Flood Risk Assessment

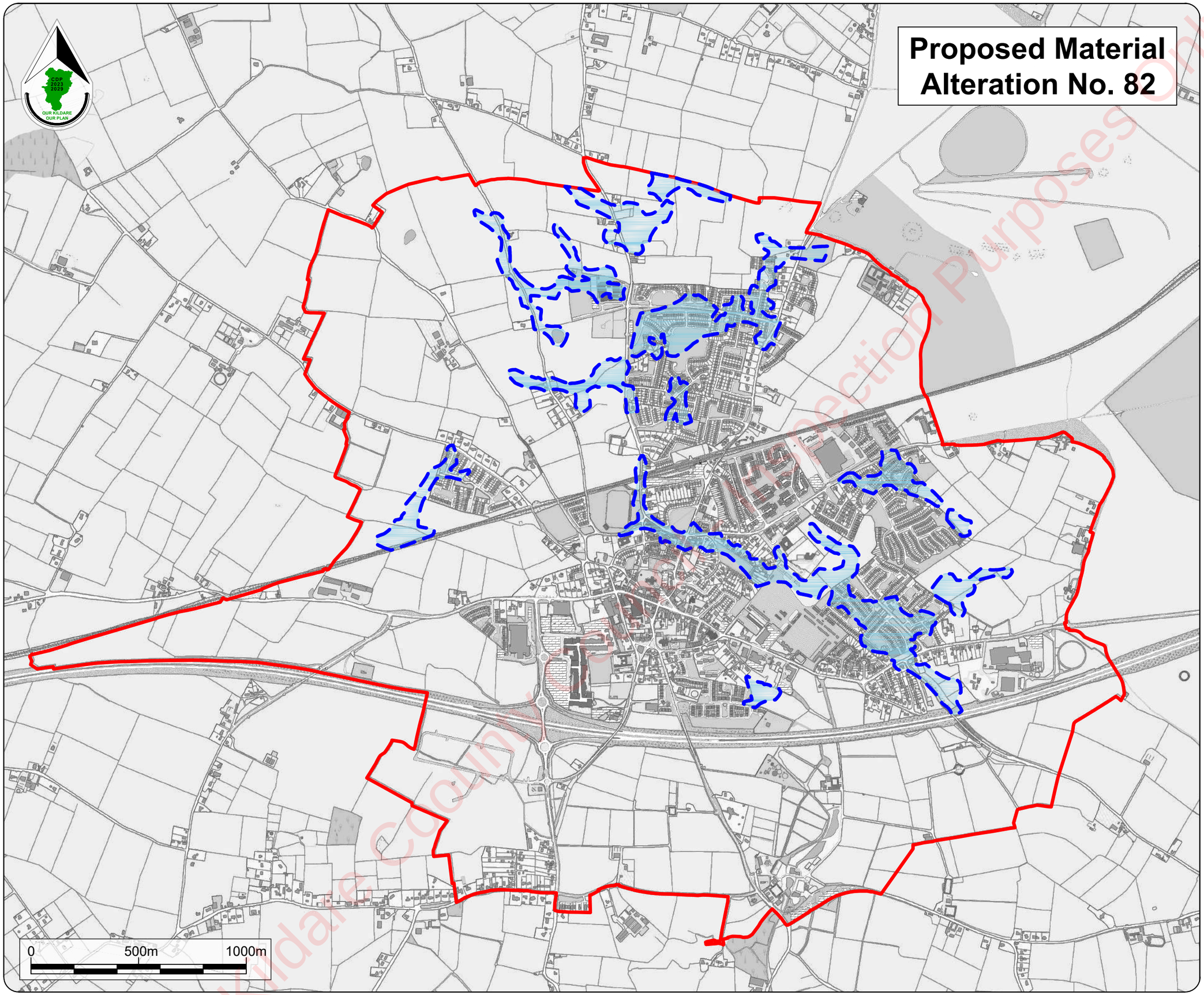
Scale:	N.T.S.	Map Ref.:	10.2
Date:	March 2023	Drawing No.:	200/23/1374

Drawn by:	Checked by:	Approved by:
M O'Loughlin	L Crawford	J O'Reilly
Date: 15/02/2023	Date: 15/02/2023	Date: 15/02/2023

This drawing is to be read in conjunction with the written statement

Appendix C **Material Amendment to Draft Kildare Town LAP 2023-2029 Map 10.2**

Proposed Material Alteration No. 82



Kildare County Council
Planning & Strategic
Development Department
Áras Chill Dara,
Devoy Park, Naas, Co Kildare.

Draft Kildare Town
Local Area Plan 2023 - 2029

Legend :

- Local Area Plan Boundary
- Pluvial Flood Risk Assessment Zone

Stage	Date	Description
Draft	21/03/2023	Draft Plan Published
Proposed Material Alterations	04/08/2023	Proposed Material Alterations to the Draft Plan

Infrastructure and Environmental Services
Strategic Flood Risk Assessment

Scale:	N.T.S.	Map Ref.:	10.2
Date:	July 2023	Drawing No.:	200/23/1386

Drawn by:	Checked by:	Approved by:
M O'Loughlin	L Crawford	J O'Reilly
Date: 27/07/2023	Date: 27/07/2023	Date: 27/07/2023

This drawing is to be read in conjunction with the written statement

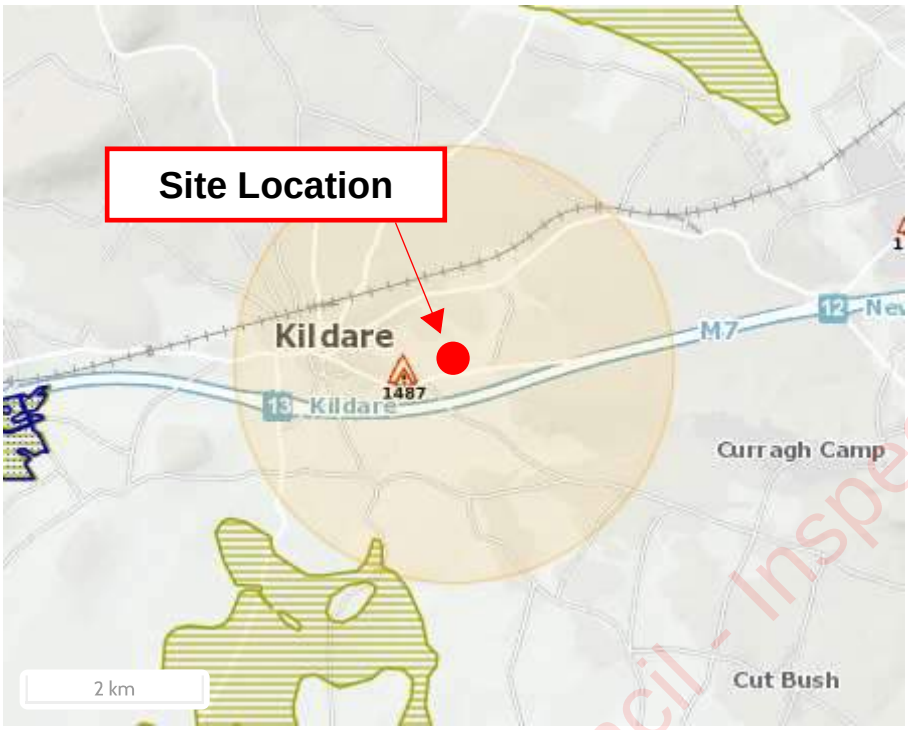
Appendix D OPW Historic Flood Events Record

Past Flood Event Local Area Summary Report

Report Produced: **1/9/2022 14:26**

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

1 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Kildare Town Recurring (ID-1487)	n/a	Approximate Point

Additional Information: Reports (1) Press Archive (0)

Appendix 8.1

Equipment Specification and Weather Conditions

No Change

Appendix 8.2

Baseline Noise Monitoring Results

No Change

Appendix 9.1

Ambient Air Quality Standards

No Change

Appendix 9.2

Transport Infrastructure Ireland Significance Criteria

No Change

Appendix 9.3

Dust Management Plan

No Change

Appendix 10.1

Photomontages

Slight Change

RUANBEG DEVELOPMENT

Visually Verified Views
Methodology Report
September 2023

Contents

STATEMENT OF RESPONSIBILITY

The verified views contained within this report have been prepared based on survey data supplied by P.C.A Ltd and proposed drawings supplied by McCrossan O'Rourke Manning Architects. Whilst Urban 3D endeavour to create technically accurate imagery, it is essential to recognise that photographic images/photo-montages verified or unverified alone cannot capture or reflect the complexity underlying the visual experience, and should therefore be considered an highly accurate approximation of the three-dimensional visual experience that an observer would receive in the field.

As part of a technical process, impact assessment and considered judgements using photographs and/or photo montages can only be reached by way of a visit to the location from which the photographs were taken.

1.0 About Urban 3D

Urban 3D, established in 2003, is a multidisciplinary design and CGI company with offices in Northern Ireland and London.

We work with independent House Builders, Estate Agents, Property Developers, Architects and Planning Consultants. Our enviable list of clients include Berkeley Group, Savills, Henry Boot, Acorn Property Group, HAB Housing, London Development Group, and a range of small boutique developers and architectural practices.

We deliver high quality, technically accurate computer generated images (CGI) and a range of associated services which include, 3D property animations, drone videography, photography, photo-montages and visually verified views (VVM's).

Our in-house team are qualified in their respective fields to a minimum of degree level, and those working on visually verified montages have a relevant degree in Architecture and a minimum of 5 years experience working within the architectural field.

2.0 Visually Verified Montages

WHAT ARE VERIFIED VIEWS?

Also known as accurate visual representations (AVR), verified images, visually verified montages (VVM) and verified photo montages, verified views are highly accurate photo montages which have been created using a methodology which is compliant with the Guidelines for Landscape and Visual Impact Assessment, third edition. A verified view is a photograph captured at a specific recorded location, and merged with a highly accurate 3D model of the proposed scheme and existing survey data of fixed structures within the photograph. The result is a verified photo montage showing the proposal in context with the existing environment, which can then be used to assess the visual impact of a proposed scheme or development. They have become central to the Irish & UK planning system.

THE NEED FOR VERIFIED VIEWS

Verified views eliminate the guesswork and artistic interpretation associated with photo montages. Using rigorous methodologies set out by the Landscape Institute and London Framework, the results give the actual impression of scale and magnitude of a proposed scheme or development.

VERIFIED VIEW COMPLIANCE

Our process for creating verified views is compliant with:

1. The Landscape Institute Guidelines for Landscape and Visual Impact Assessment: 3rd edition.
2. Photography and photo montage in landscape and visual impact assessment Landscape Institute Advice Note 01/11
3. London View Management Framework SPG (March 2012) - Appendix C: Accurate Visual Representations.

This document is intended to clearly convey the underlying principles and processes that are used in the production of Verified Views.

The information presented in this document will allow a third party to verify the accuracy of the images produced.

The “London View Management Framework” has the following to say regarding Verified Views.

> ***“By accurately combining an image of a proposed development with a representation of its existing context, verified views explain the location and massing of a proposed development. They may also illustrate additional properties including the degree of visibility, architectural form or choice of materials selected.”***

For more information on these publications:

- https://www.landscapeinstitute.org/technical/glvia3-panel/
- https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/migrated-legacy/LIPhotographyAdviceNote01-11.pdf
- https://www.london.gov.uk/what-we-do/planning/implementing-London-plan/planning-guidance-and-practice-notes/London-view-management

3.0 Project Overview

This proposed development is situated at Ruanbeg, Kildare Town, County Kildare.

We have been commissioned as an independent VVM consultant to produce a total of 12 verified views at the following locations:

The team responsible for the information requirements to produce the VVM's are as follows:

- Architects – McCrossan O'Rourke Manning Architects
- Land Surveyor – P.C.A. Ltd
- Photography & VVM – Urban 3D

VIEW 1
Coolaghknock Cl.

VIEW 2
Coolaghknock Gardens

VIEW 3
Ruanbeg Cres

VIEW 4
Ruanbeg Avenue

VIEW 5
Ruanbeg Park

VIEW 6
Dublin Road R445

VIEW 7
Dublin Road R445

VIEW 8
L7022

VIEW 9
Melitta Road R413

VIEW 10
Curragh Chase R413

VIEW 11
Dublin Road R445

VIEW 12
Dublin Road R445

4.0 Photography

EQUIPMENT

Camera
Canon EOS 5D Mark iii

Lens
Sigma 50mm Prime F1.4 Art

Filter
Neutral Density Filter

Tripod
ALTA PRO 2 263AGH Aluminium Tripod kit

Plumb Bob & Line (Plummet)
115mm body accurately machined point

Survey Paint
Semi-permanent with a tight spray

3-Axis Camera Level
Fotosnow Professional 3 Axis Bubble Spirit Level

4.1 Camera

We maintained the same camera and lens settings for all 12 VVM's to ensure continuity when comparing this proposal from the various vistas.

- Canon EOS 5D Mark iii
- Sigma 50mm Prime F1.4 Art Lens
- Image Width - 5760 pixels
- Image Height - 3840 pixels
- Bit depth - 24
- Focal Length - 50mm
- Horizontal FOV - Variable
- Vertical FOV - Variable
- Exposure - 1/250 sec | F10 | ISO 200
- Files - RAW + JPEG

4.2 Tripod & Level

As per The Landscape Institute Guidelines for Landscape and Visual Impact Assessment: 3rd edition it is critical that the camera lens is level on all axis. We need to achieve a setup that ensures zero tilting left or right and zero banking forward or backwards.

To achieve this we use a combination of 3 separate levels to ensure accuracy to within +/- 1 degree.

1. The Canon 5D Mark iii - inbuilt digital leveling system
2. The Vanguard tripod head bubble level
3. Fotosnow Professional 3 Axis Bubble Spirit Level hot-shoe mount

4.3 On-site

The following workflow was used to produce the final image set:

- The viewpoint location is established and the tripod is set up.
- The camera is mounted on the tripod head and leveled so that the lens axis is horizontal; this is achieved by a combination of 3 separate levels to ensure accuracy to within +/- 1 degree allowing the camera to be corrected for both roll and tilt.
- The subject is then framed and camera settings dialed in.
- Once the camera is level the plumb line is placed over the lens at the point of no parallax.
- The plumb line length is set to 1.6m (Average human eye level).
- The tripod centre column is then raised until the plumb line makes contact with the surface below.
- Documentation images are taken of the camera and setup for record and evidence if required.
- The lens is manually focused so that the subject is at the plane of focus.
- The aperture is set to F10 to create a large depth of field whilst retaining sharpness throughout the image.
- Image capture button is remote to ensure no shake or movement within the lens and camera.
- Images are captured in RAW format and JPEG so that the original data is preserved and no “automatic” changes are, made to the data.
- The plumb line and bob are then used as a pendulum and swung at the precise angle of the lens. This establishes the viewing angle which is then transferred to the ground using survey spray paint.
- The cross point is the exact centre of the lens and the arrow is the exact angle of the lens, both of which will be surveyed at a later date.
- This process is repeated for all 12 required verified views.

5.0 Topographical Survey

EQUIPMENT

Leica GS 15 antenna with a 360 prison Leica Flexline TS10 Total Station

SURVEY TEAM

P.C.A. Ltd.
Hillcrest House
Hillcrest Road
Sandyford
Dublin
D18 V058
Tel: 01 213 6300
Please see more information here www.pca.ie

PROCESS

Once on-site photography is complete we study each photograph and select fixed structural points, typically a minimum of 6 objects. These objects are surveyed and are later used to ensure the 3D model of the proposed building is placed within the existing photograph accurately.

To ensure accuracy at the photo-merge stage we typically require and number of fixed points within the foreground, mid-ground & background.

A number of points will also cross the y axis to establish height, some will cross the x axis to establish width and some will cross the z axis to establish depth within each of the VVM's.

The survey team document all required structural points relative to a datum point which also relates to the location and levels of the proposal.

Please see section 7 for more details.

6.0 Software

PHOTOGRAPHY – PHOTOSHOP

The photographs are captured as RAW images and are then processed in Photoshop.

SURVEY – AUTOCAD

The survey is supplied in AutoCad format.

3D MODEL – VECTORWORKS

The 3D model of the surveyed points is created in Vectorworks for mm perfect precision.

CAMERA MATCH – CINEMA 4D

We camera match the existing surveyed points and surveyed camera position to the virtual camera within Cinema 4D. All camera and lens parameters are transferred from real to virtual.

LIGHTING AND MATERIALS – CORONA RENDERER

We add all materials, lighting, reflections etc using Corona Renderer.

POST-PRODUCTION – PHOTOSHOP

Final correction and inspection of the images happens within Photoshop.

CINEMA 4D

7.0 Method Explained

7.1 Photography

- Documented images showing camera setup with bank, tilt and roll corrected using levels as previously noted.
- The mid point of the lens is set to 1.6m above ground level (Average human eye level).
- Plummet (Bob & Line) set with string tied to zero parallax point on lens.
- Ground marked for survey with the intersection recording mid point of lens and the arrow recording the viewing angle.

Plumb Line & Bob with yellow arrow + cross hairs transferring the centre of lens and viewing angle to the ground ready for surveying.

Canon 5D Electronic Level, balanced

Hot-shoe External Level, balanced

Lens set at eye level 1.6M above ground

7.2 Identify Required Survey Points

We identify fixed structural points within each photograph then label each point or object and instruct the survey team to proceed.

As noted it is best practice to have a varied range of fixed structural points between near, mid and far ground, and across the x,y,z axis.

WALL

VP 5.1 - VP 5.4
(Mid-ground / X & Y Axis)

PILLAR

VP 5.13 - VP 5.16
(Foreground / X & Y Axis)

ROOF

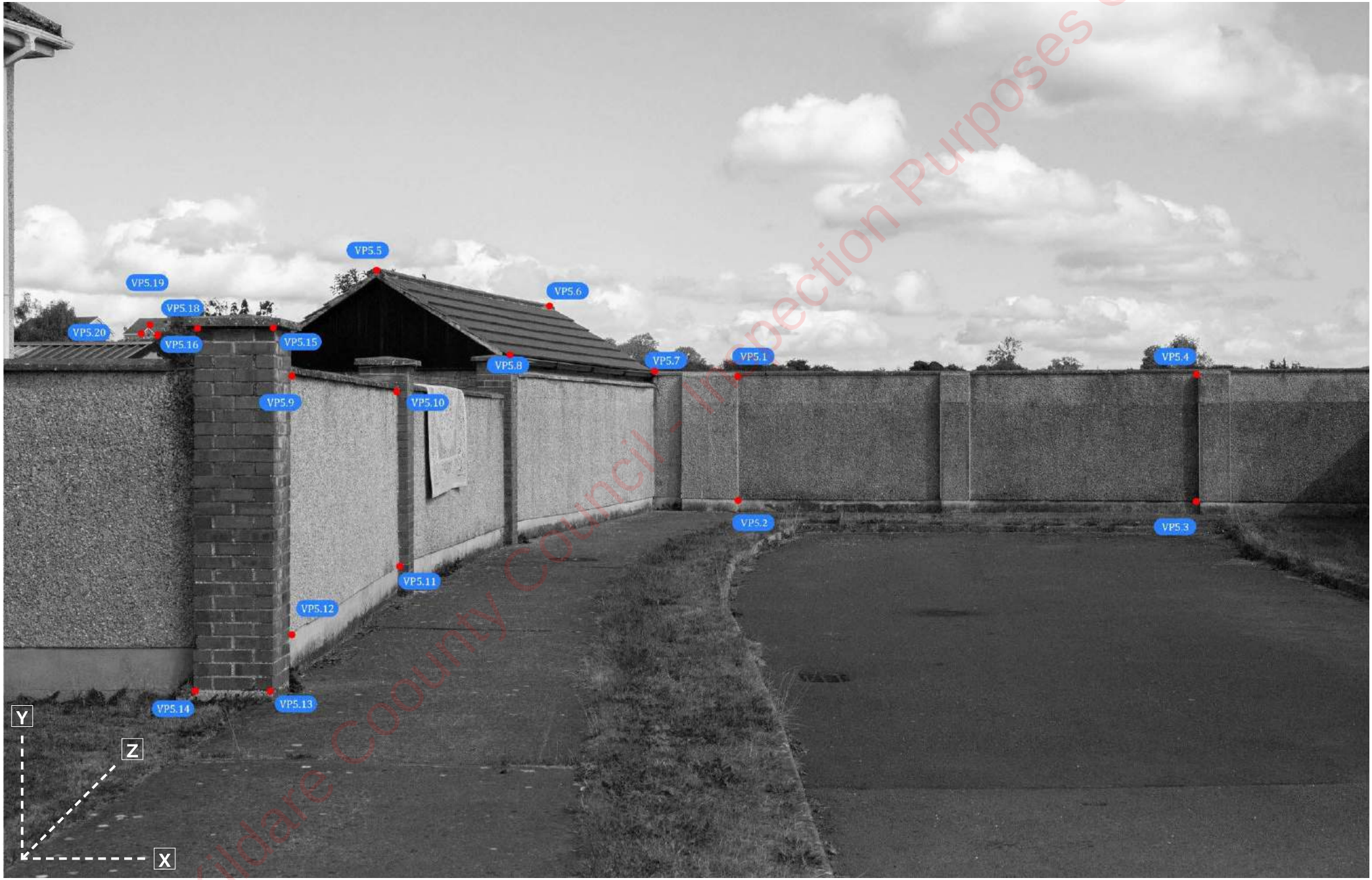
VP 5.5 - VP 5.8
(Mid-ground / Z & Y Axis)

ROOF 2

VP 5.18 - VP 5.20
(Background / X & Y Axis)

WALL 2

VP 5.9 - VP 5.12
(Foreground / Z & Y Axis)



7.3 Survey

Maintaining the same naming convention, the surveyor supplies us with the survey data in AutoCad format.

This data is now transferred to Vectorworks where the points are modelled in 3D space relative to the same datum point as the proposed building.

All base levels and heights of models created of the fixed structures, are set relative to the finished floor levels and ridge heights etc. of the proposal.

WALL

VP 5.1 - VP 5.4
(Mid-ground / X & Y Axis)

ROOF

VP 5.5 - VP 5.8
(Mid-ground / Z & Y Axis)

WALL 2

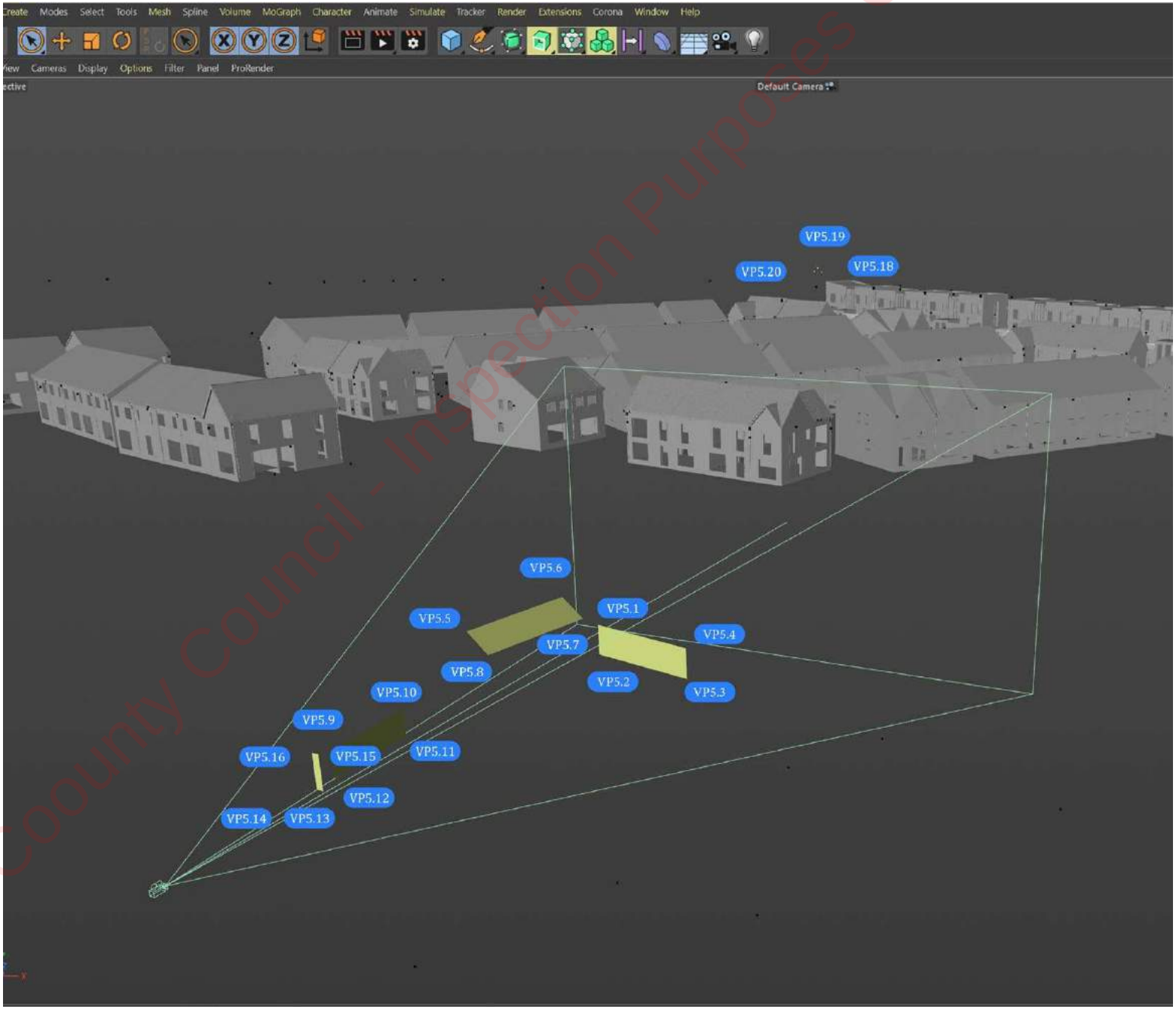
VP 5.9 - VP 5.12
(Foreground / Z & Y Axis)

PILLAR

VP 5.13 - VP 5.16
(Foreground / X & Y Axis)

ROOF 2

VP 5.18 - VP 5.20
(Background / X & Y Axis)



7.4 3D Model

All objects / points, camera position, height and viewing angle are now modelled in 3D space relative to the proposed building model / datum.

WALL

VP 5.1 - VP 5.4
(Mid-ground / X & Y Axis)

ROOF

VP 5.5 - VP 5.8
(Mid-ground / Z & Y Axis)

WALL 2

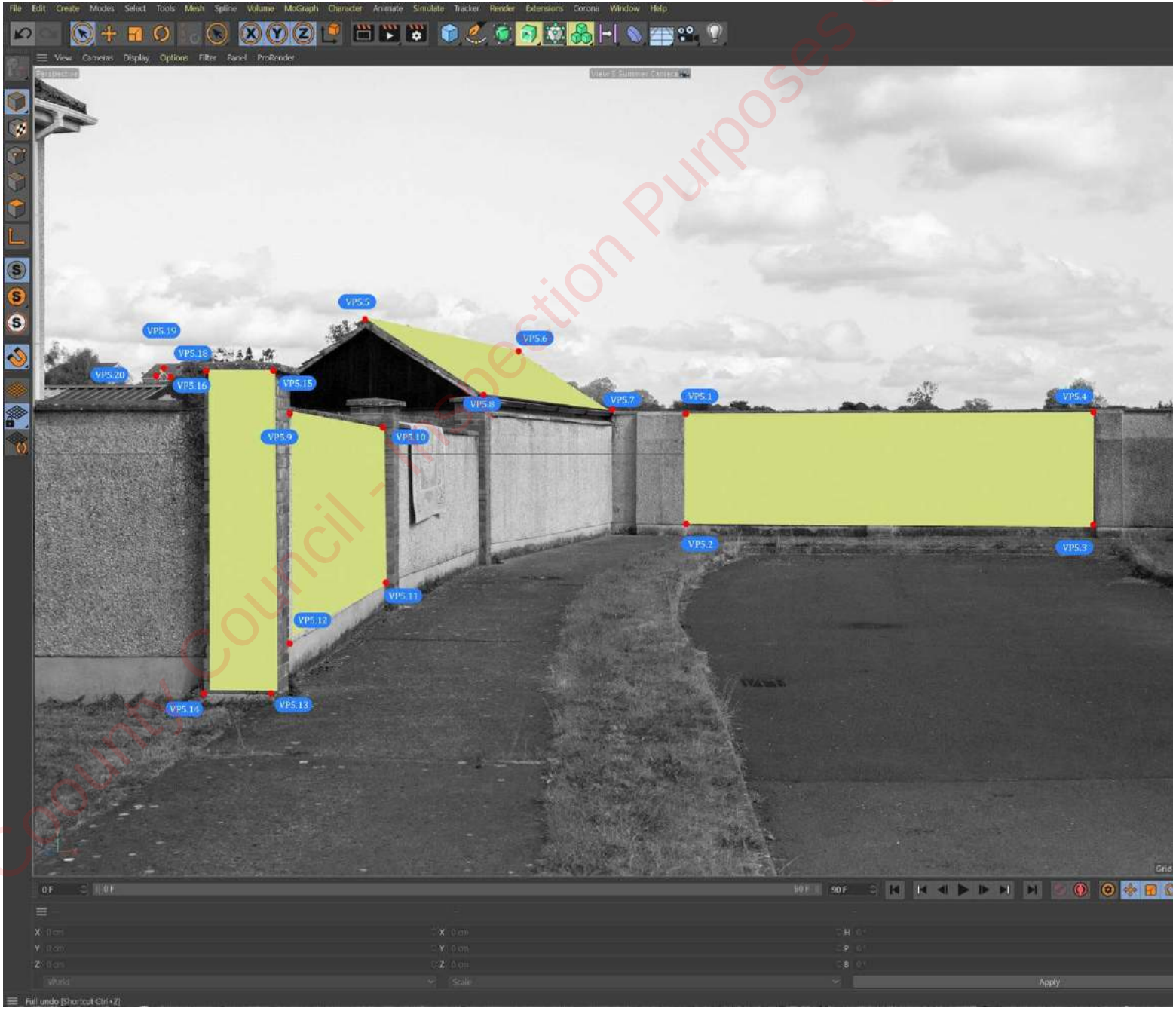
VP 5.9 - VP 5.12
(Foreground / Z & Y Axis)

PILLAR

VP 5.13 - VP 5.16
(Foreground / X & Y Axis)

ROOF 2

VP 5.18 - VP 5.20
(Background / X & Y Axis)



7.5 Camera Match

We now match up the two cameras (Virtual & Physical) and the points should sit at the correct position within the photographs. If they align correctly this tells us that the proposal will also sit at the correct position and scale within the same view.

WALL

VP 5.1 - VP 5.4
(Mid-ground / X & Y Axis)

ROOF

VP 5.5 - VP 5.8
(Mid-ground / Z & Y Axis)

WALL 2

VP 5.9 - VP 5.12
(Foreground / Z & Y Axis)

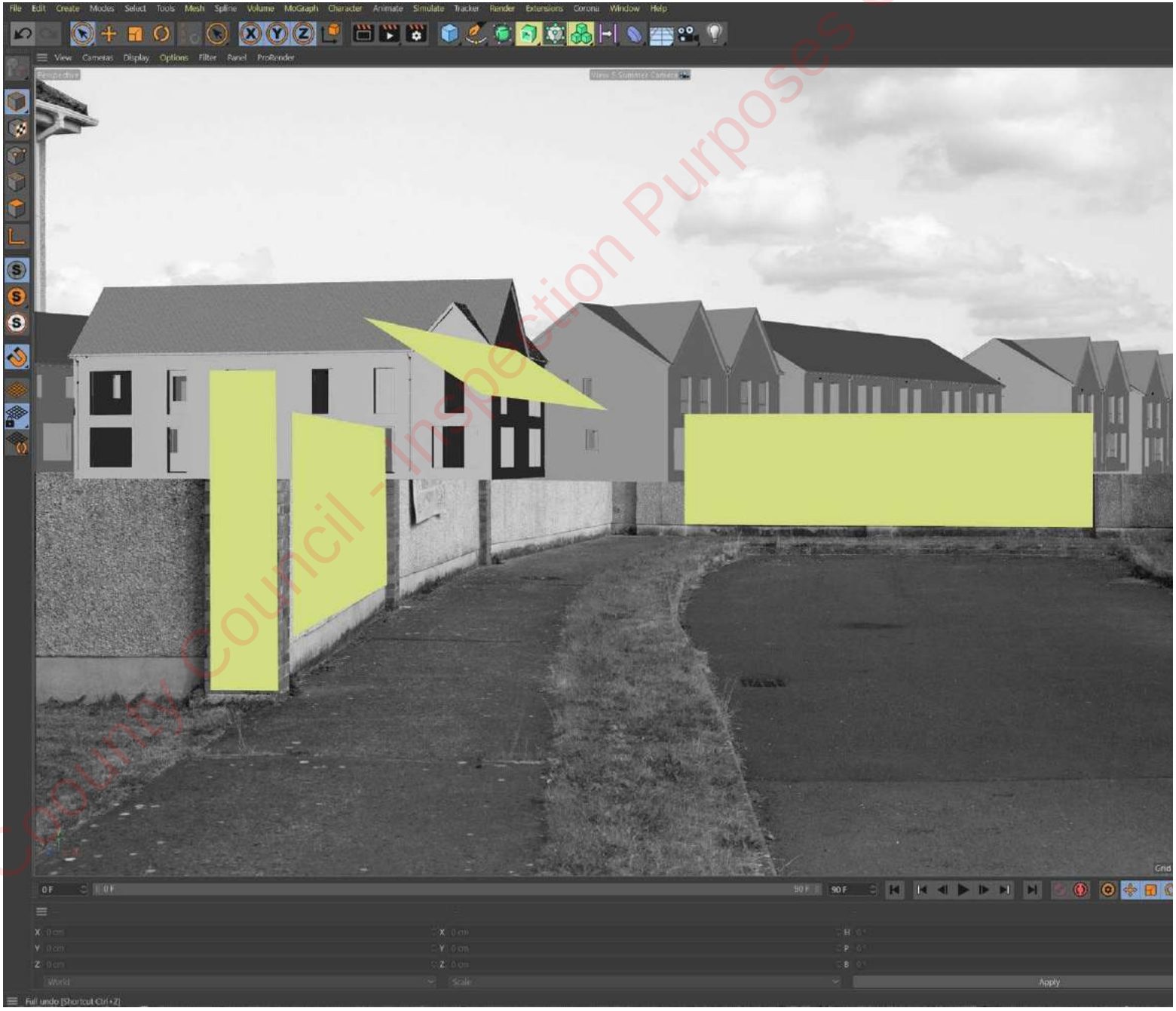
PILLAR

VP 5.13 - VP 5.16
(Foreground / X & Y Axis)

ROOF 2

VP 5.18 - VP 5.20
(Background / X & Y Axis)

We then repeat this method & procedure for each of the verified views on the following pages.



8.0 Verified View Locations

VIEW 1
Coolaghknock Cl.

VIEW 2
Coolaghknock Gardens

VIEW 3
Ruanbeg Cres

VIEW 4
Ruanbeg Avenue

VIEW 5
Ruanbeg Park

VIEW 6
Dublin Road R445

VIEW 7
Dublin Road R445

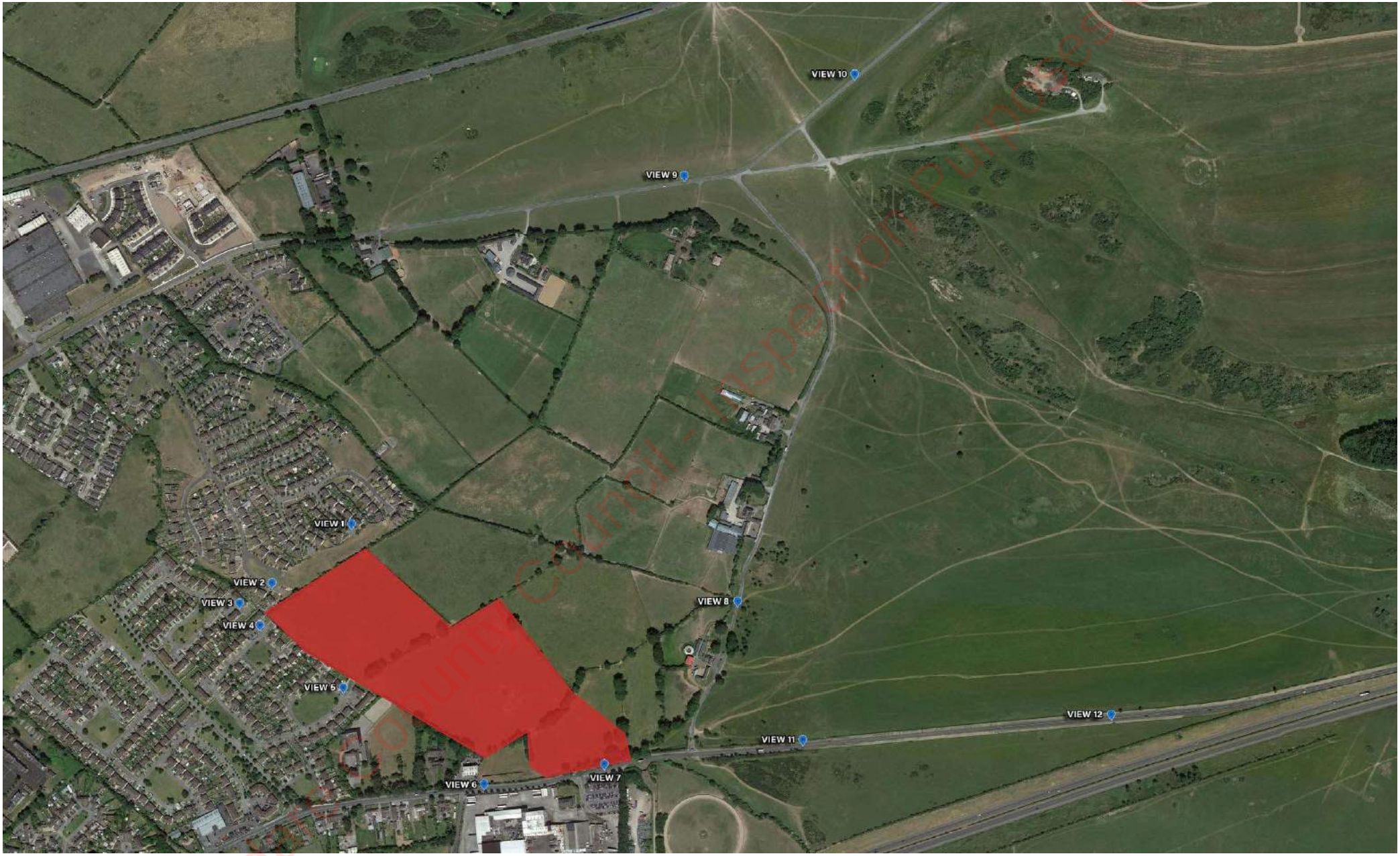
VIEW 8
L7022

VIEW 9
Melitta Road R413

VIEW 10
Curragh Chase R413

VIEW 11
Dublin Road R445

VIEW 12
Dublin Road R445



Key: Ruanbeg Development

9.0 Verified Views

VP1 | PHOTOGRAPH 50mm | F10

SUMMER BEFORE

VP1 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

VP1 | PHOTOGRAPH 50mm | F10

WINTER BEFORE

VP1 | VERIFIED VIEW 50mm | F10

WINTER AFTER

VP3 | VERIFIED VIEW 50mm | F10 SUMMER AFTER Key: Ruanbeg Development

VP3 | VERIFIED VIEW 50mm | F10

WINTER AFTER

Key: Ruanbeg Development

VP6 | PHOTOGRAPH 50mm | F10

WINTER BEFORE

VP7 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

VP8 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

Key: Ruanbeg Development

VP8 | PHOTOGRAPH 50mm | F10

WINTER BEFORE

VP8 | VERIFIED VIEW 50mm | F10

WINTER AFTER

Key: Ruanbeg Development

VP9 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

Key: Ruanbeg Development

VP9 | VERIFIED VIEW 50mm | F10

WINTER AFTER

Key: Ruanbeg Development

VP10 | VERIFIED VIEW 50mm | F10 SUMMER AFTER

Key: Ruanbeg Development

VP10 | VERIFIED VIEW 50mm | F10

WINTER AFTER

Key: Ruanbeg Development

VP11 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

Key: Ruanbeg Development

VP11 | PHOTOGRAPH 50mm | F10

WINTER BEFORE

VP12 | VERIFIED VIEW 50mm | F10

SUMMER AFTER

Key: Ruanbeg Development

VP12 | VERIFIED VIEW 50mm | F10

WINTER AFTER

Key: Ruanbeg Development

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Appendix 10.2

Landscape Masterplan

Additional Information

KEY

PLANTING LEGEND

Existing Hedgerows to be Retained
- outside of developable area

(See Arborist's report for details)

Existing Hedgerows to be Retained
(See Arborist's report for details)

Existing Hedgerows to be Removed
(See Arborist's report for details)

Existing Trees to be Retained
(See Arborist's report for details)

Existing Trees to be Removed
(See arborist's report for details)

Proposed StreetTrees - 146no. TOTAL
Planted in same species groups or lines on individual streets

Medium / Small Trees
Acer campestre 'Elsrijk' 14-16cmg, 4-6m ht
Corylus colurna 14-16cmg, 5-6m ht
Tilia cordata 'Greenspire' 16-18cmg, 5-6m ht
Ulmus 'Lobel' 16-18cmg, 5-6m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Trees in garden frontagesof smaller spaces - 129no. TOTAL
Planted in same species groups or lines on individual streets

Medium / Small Trees
Pyrus 'Chanticlee', 14-16cm, 3-4m ht
Betula pendula 8-10cm, 3-4m h
Malus floribunda 12-14cm, 2.5-3.5m ht
Prunus padus 12-14cm, 2.5-3.5m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed PublicOpen Space Trees - 70no. TOTAL
Planted in same species groups or lines on individual streets

Semi-Mature Trees
Betula pubescens – semi-mature, 18-20cmg, 3.5-5m ht
Casteanea sativa extra heavy- 18-20cmg, 5-7m ht
Sorbus aucuparia – semi-mature, 18-20cmg, 4-5m ht
Pinus sylvestris – 250 – 300cm high, RB
Quercus petraea – semi-mature, 18-20cmg, 4-6m ht

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Curragh Buffer Native Woodland - 105no. TOTAL
Planted in same species groups or lines on individual streets

Large Trees	Small Trees / Shrubs
Alnus glutinosa 14-16cm, 4-6m ht	Sambucus nigra, 12-14cm, 3-4m ht
Quercus robur 14-16cm, 4-6m ht	Prunus avium, 12-14cm, 3-4m ht
Pinus sylvestris, 14-16cm, 4-6m ht	Sorbus aucuparia, 12-14cm, 2.5-3.5m ht
Salix alba 14-16cm, 4-6m ht	Betula pubescens, 12-14cm, 3-4m ht
	Corylus avellana
	Cornus sanguinea
	Viburnum opulus

Proposed MixedNative Hedgerows Planting
Planted in doublestaggered row at 0.5m c/c
Prunus spinosa, 1+2, B, 80-100cm height - 30%
Crataegus monogyna, 1+1, B, 80-100cm height - 30%
Corylus avellana, 1+2, B, 60-80cm height - 10%
Ilex aquifolium, 2L C, 40-60cm height - 20%
Sambucus nigra, 1+2, B, 60-80cm height - 10%

Proposed Roadside Mixed Native Hedgerows Planting
Planted in doublestaggered row at 0.4m c/c
Prunus spinosa, 1+2, B, 80-100cm height - 20%
Crataegus monogyna, 1+1, B, 80-100cm height - 50%
Corylus avellana, 1+2, B, 60-80cm height - 10%
Ilex aquifolium, 2L C, 40-60cm height - 5%
Sambucus nigra, 1+2, B, 60-80cm height - 5%
Viburnum opulus, 1+2, B, 60-80cm height-10%

Proposed Formal Hedge Planting
Planted in staggered rows of single species 60-90cm at 3/ln. m

Carpinus betulus	Taxus baccata
Ilex crenata	Eleagnus ebbingei
Ilex aquifolium "Alaska"	Griselinia littoralis
Prunus lusitanica	

Proposed Shrubs & Perennials Ornamental Planting (indicative planting list)
Planting also to be used for bioretention areas
Low to medium height ornamental shrubs/plants, max ht 40-150cm, 2L min. pot size and planted at 3/m2

Low to medium shrubs	Perennial Planting
Viburnum tinus *	Verbena bonariensis *
Philadelphus coronarius *	Sedum 'Brilliant' *
Pachysandra terminalis *	Agastache 'Black Adder'
Lonicera pileata *	Knautia macedonica *
Lavandula angustifolia *	Echinacea purpurea *
Hebe 'Mrs Winder' *	Achillea sp. (deep reds/whites) *

Underplanted with selected bulbs - Narcissus and Hyacinthoides non - scripta

Proposed Meadow Planting
Sowing 1.5 gr / metre
Recomended product
Sandro's Irish Wildflower Conservation Grade Seed Mixture:
Range: DesignerWild Flower Mixtures (Code DW)
Product Name: Short Cut Floral Lawn
Product Code: DW01

Indicative species list
Birdsfoot Trefoil, Black Meddick, Burne Saxifrage, Century, Wild Chamomile, Cowslip, Eyebright, Meadow Buttercup Marjoram, Red Bartsia, Mallow, Forget-me-not, Hoary Plantain, Kidney Vetch, Lady's Bedstraw, Ox-eye Daisy, Red Clover, Ribwort Plantain, Rough Hawkbit, St Johnswort, Wild Carrot, Sorrel, Yarrow, Quaking Grass, Lady's Smock White Bedstraw, Selfheal, Smooth Hawksbit, Corn Marigold, Corn Poppy, Cornflower, Corncockle, Scented Mayweed

Proposed Wildflower Meadow Planting
Recomended product:
Sandro's Irish Wildflower Conservation Grade Seed Mixture:
Range: Designer Wild Flower Mixtures(Code DW)
Product Name: Medium Height Wildflower
Meadow Mixture Product Code: DW02

Indicative species list
Birdsfoot Trefoil, Black Meddick, Devil's Bit Scabious, Corn Marigold, Corn Poppy, Corncockle, Cornflower, Cowslip, Eyebright, Fleabane, Kidney Vetch, Lady's Bedstraw, Lesser Knapweed, Marjoram, Scented Mayweed, Ox-eye Daisy, Ribwort Plantain,, Red Campion, Red Clover, Red Bartsia, Rough Hawksbit, Selfheal, Sorrel, St Johnswort, White Campion, Wild Carrot, White Clover, Yarrow

Proposed Bioretention Area Planting
For shrubs - see Proposed Shrub Ornamental Planting Mix

Perennial Planting	Ornamental Grasses
Low height ornamental plants, max.ht. 40-150cm, 2L min. pot size andplanted at 6-10/m2	Low height ornamental plants, max.ht. 40-150cm, 2L min. pot size and planted at 6-10/m2
Rudbeckia fulgida var. deamii *	Molinia 'Poul Petersen'
Gaura lindheimeri *	Deschampsia cespitosa 'Goldtau'
Veronicastrum virginicum 'Album' *	Stipa barbata *
Achillea filipendulina 'Coronation Gold' *	Deschmapsia cespitosa
Echinops 'Veitch's Blue' *	

Underplanted with selected bulbs - Anemone nemorosa 'Robinsonia' and Hyacinthoides non - scripta

Proposed Wetland Wildflower Planting List
Wetland wildflower seed mixture(Irish provenance), 1.5g/m2

Devils Bit Scabious, Common Sorrel, Cowslip, Fleabane, Greater Trefoil, Hemp Agrimony, Lesser Knapweed, Marsh Cinquefoil, Marsh Marigold, Meadow Buttercup, Meadowsweet, Meadow Rue, Oxeye ,Daisy, Purple Loosestrife, Ragged Robin, Red Clover, Red Rattle, Ribwort Plantain, Selfheal, Sneezewort, Tufted Vetch, Water Avens, Wild Angelica, Wild Valerian, Yarrow, Yellow Flag Iris, Yellow Rattle, Red Rattle, Corn Marigold, Corn Poppy, Corncockle, Cornflower, Scentless Mayweed, Redshank

***Species selected for their pollinator qualities.**

Proposed Wet Pond Planting List
Low height ornamental and native plants, max.ht. 40-150cm, Aq 9cm pot and 2L min. pot sizes and planted at 6-10/m2
To include mix of marginal, submerged and floating plants

Molinia caerulea*	Iris sibirica 'Perfect Vision'
Polystichum setiferum *	Iris laevigata
Dryopteris filix-mas *	Ranunculus aquatilis (oxygenator)
Eupatorium maculatum	Caltha palustris
Thalictrum flavum	Myosotis scorpioides
Trollius Europaeus	Veronica beccabunga

Amenity Grass Seeding - Rear Gardens
Following grading and cultivation above level and rake seed bed to fine tilth. Remove stones greater than 75mm dia.
Sow lawn seed mix No 2 to specification.

Amenity Grass Seeding - Public Grass
Following grading and cultivation above level and rake seed bed to fine tilth. Remove stones gnater than 75mm dia.
Sow lawn seed mix No 3 to specification.

SURFACE LEGEND

Paving Type 1
- Permeable Concrete Pavers/Slabs Mixed Sizes
- To private threshold paved areas

Paving Type 2
- Permeable Concrete Paving Blocks 200x100/150mm
- Semi-private threshold paved areas

Permeable Parking Bays
- Permeable Concrete Paving Bocks, 200x100mm
- To private and semi-private threshold paved areas

Impermeable Parking Bays
- PCC Concrete Paving Blocks,200x100mm
- To southeast end of site

Asphalt Surface Road
- To Engineers' Detail

Homezone
- To Engineers' Detail

Footpath
- Brushed concrete footpath / To Engineers' Detail

Park Footpath
- Self Binding Gravel/ To Engineers' Detail

Informal Footpath
- Stepping stones

Play Surface/Safety Surface
- To internal creche play area
- Wet pour safety play surface

Play Surface/Safety Surface
- Grass with rubber matt to re-inforce

Grasscrete

Dry Pond

Wet Pond

Seating
- Recycled composite timber seates

Bollards

Selected Play Equipment

Selected Fitness Equipment

Selected Nature Play Equipment
- willow tunnels, logs, boulders, insect hotels

Retaining walls

Low mound to roadside hedgerow

Outline of Attenuation tank-refer to engineers drawing

LIGHTING LEGEND

6m high fixed column & base.

8m high fixed column & base.

REV	DATE	AMENDMENT
D	06/09/23	RFI
C	05/09/23	RFI
B	30/08/23	RFI
A	22/08/23	DUPLEX & BOUNDARY UPDATE

CUNNANE STRATTON REYNOLDS
LAND PLANNING & DESIGN

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N

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE	DATE: JUNE 2022
	SCALE: 1:1000@A1
DRAWING: LANDSCAPE MASTERPLAN	DRAWN: ES/TS CHECKED: MS
	DRAWING NO: 22178-1-101

Appendix 13.1

Resource and Waste Management Plan (RWMP)

Slight Change

RESOURCE & WASTE MANAGEMENT PLAN

FOR THE PROPOSED DEVELOPMENT

AT

RUANBEG

KILDARE TOWN

CO. KILDARE

Prepared for

MRP Oakland limited

Prepared by

Traynor Environmental Ltd

Reference Number

23.021 TE

Date of Issue

5th September 2023

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Client: MRP Oakland limited

Traynor Env Ref: 23.021 TE

Status: Final

Date: 5th September 2023

Report Title:	Resource & Waste Management Plan
Doc Reference:	23.021 TE
Client:	MRP Oakland limited
Authorised By:	 *Nevin Traynor BSc. Env, H. Dip I.T, Cert SHWW, EPA/FAS Cert. Environmental Consultant*

Rev No	Status	Date	Writer	Reviewer
1.	Final	03rd May 2023	Angela Kelly	Nevin Traynor
2.	Final	5th September 2023	Angela Kelly	Nevin Traynor

This report refers, within the limitations stated, to the condition of the site at the time of the report. No warranty is given as to the possibility of future changes in the condition of the site. The report as presented is based on the information sources as detailed in this report, and hence maybe subject to review in the future if more information is obtained or scientific understanding changes.

CONTENTS

1.0 INTRODUCTION

Traynor Environmental Ltd has prepared this Resource & Waste Management Plan (RWMP) on behalf of MRP Oakland limited for the proposed development at Ruanbeg, Co. Kildare. The proposed development will consist of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development.

This is an update of the previous report to reflect the changes as a result of the RFI in particular the reduction in the no. of units and introduction of the community centre. These changes will have a minimal impact in relation to all wastes. All wastes can be treated appropriately throughout the site as stated in the original application.

This plan will provide information necessary to ensure that the management of Construction & Demolition (C&D) waste at the site is undertaken in accordance with the current legal and industry standards including the Waste Management Act 1996 as amended and associated Regulations, Environmental Protection Agency Act 1992 as amended, Litter Pollution Act 1997 as amended and the Eastern-Midlands Region Waste Management 2015 – 2021.

In particular, this plan aims to ensure maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g., contamination of soil and/or water).

This RWMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the proposed development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and should be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible.

2.0 CONSTRUCTION AND DEMOLITION RESOURCE & WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998 known as *'Changing Our Ways'*, which identified objectives for the prevention, minimisation, reuse, recycling, recovery, and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five-year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e., 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled '*Recycling of Construction and Demolition Waste'* concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, 'A Waste Action Plan for a Circular Economy' (WAPCE), replaces the previous national waste management plan, "A Resource Opportunity" (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction, textiles, green public procurement, and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Environmental Protection Agency (EPA) of Ireland issued 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage, and Local Government (DoEHLG) in 2006. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle, and reuse wastes.
- Design teams roles and approach.
- Relevant EU, national and local waste policy, legislation, and guidelines.
- Waste disposal/recycling of C&D wastes at the site.
- Provision of training for Resource Waste Manager (RM) and site crew.
- Details of proposed record keeping system.
- Details of waste audit procedures and plan; and

- Details of consultation with relevant bodies i.e., waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste. A development which exceeds one or more of these thresholds is classed as Tier-2 projects.

This development requires a RWMP as a Tier 2 development as it is above following criterion:

- New residential development of less than 10 dwellings

Other guidelines followed in the preparation of this report include 'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers', published by FÁS and the Construction Industry Federation in 2002 and the previous guidelines, 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2 Regional Level

The proposed development is located in the Local Authority area of Kildare County Council (KCC).

The Eastern-Midlands Region Waste Management Plan 2015 – 2021 is the regional waste management plan for the Kildare area published in May 2015. The Regional Plan sets out the strategic targets for waste management in the region and also specifies a mandatory target of 70% of C&D wastes to be prepared for reuse, recycling, and material recovery (excluding soil and stones) by 2020. This reflects the target for management of C&D waste in the Waste Framework Directive.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the Waste Management (Landfill Levy) (Amendment) Regulations 2012.

The *Kildare County Development plan 2023-2029* came into effect on 28th January 2023 and sets policies and objectives in support of the regional development plan and the Waste Action Plan for a Circular Economy 2020-2025 for the proper planning and sustainable development of the Kildare area. The following policies and objectives are of particular relevance to waste management:

- *P6: Implement European Union, National and Regional waste related environmental policy, legislation, guidance, and codes of practice, in order to support the transition from a waste management economy towards a circular economy.*

- *INO36: Encourage a just transition from a waste economy to a green circular economy in accordance with 'A Waste Action Plan for a Circular Economy 2020-2025'.*
- *INO37: Provide, promote, and facilitate high quality sustainable waste recovery and disposal infrastructure /technology in keeping with the EU waste hierarchy to cater for anticipated population growth and the business sector in the County.*
- *IN O38: Ensure the provision of adequately sized public recycling facilities in association with new commercial developments and in tandem with significant change of use / extensions of existing commercial developments where appropriate to maximise access by the public.*
- *IN O39: Require the appropriate provision for the sustainable management of waste within developments (particularly apartment buildings), including the provision of facilities for storage, separation, and collection of waste*
- *IN O41: Encourage waste prevention, minimisation, re-use, recycling, and recovery as methods for managing waste.*
- *IN O44: Support and facilitate the separation of waste at source into organicandnon-organicstreamsorotherwastemanagementsystemsthatdivertwaste from landfill and maximise the potential foreach waste type to be re-used, recycled, or composted.*
- *IN O46: Support the implementation of the actions outlined in the Kildare Litter Management Plan 2020-2023 (and any subsequent updates).*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Act 1996 - 2001 and subsequent Irish legislation, is the principle of "Duty of Care". This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery, or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of "Polluter Pays" whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g., for transportation and disposal/recovery/recycling of waste.

It is therefore imperative that the client ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery, and disposal. This includes the requirement that a contractor handle, transport, and recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or Waste Facility Permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste or IED licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The proposed development will consist of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development.

Figure 1 – Site Layout Plan

3.2 Details of the Non-Hazardous Wastes to be produced.

There will be topsoil and subsoil excavated to facilitate the new residential development. During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, cladding, plastics, metals, and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and supply of materials will also be generated. Waste will also be generated from construction workers e.g., organic/food waste, dry mixed recyclables (wastepaper, newspaper, plastic bottles, packaging, aluminium cans, tins, and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided onsite during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

3.3 Potentially Hazardous Wastes to be Produced.

3.3.1 Contaminated Soil

In the event that any contaminated material is encountered, it will need to be segregated from clean/inert material, tested, and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled '*Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous*' using the *HazWasteOnline* application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous, or hazardous in accordance with the *EC Council Decision 2003/33/EC*, which establishes the criteria for the acceptance of waste at landfills.

3.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to, and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

3.3.3 Other known Hazardous Substances

Paints, glues, adhesives, and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor. In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or fluorescent tubes and other mercury containing waste may be generated during construction activities. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor. In the event that hazardous soil, or historically deposited hazardous waste is encountered during the work, the contractor must notify Kildare County Council (KCC), Environmental Enforcement Section, and provide a Hazardous/Contaminated Soil Management Plan, to include estimated tonnages, description of location, any relevant mitigation, destination for authorised disposal/treatment, in addition to information on the authorised waste collectors.

4.0 KEY MATERIALS & QUANTITIES

4.1 Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information will be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled, or recovered. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or Volume (m^3) of waste generated per construction value.
- Weight (tonnes) or Volume (m^3) of waste generated per construction floor area (m^2).
- Fraction of resource reused on site.
- Fraction of resource notified as by-product.
- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.

4.2 Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction activities at a typical site are shown in Table 4.1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Waste Material	LoW Code
Concrete	17 01 01
Bricks	17 01 02
Tiles and ceramics	17 01 03
Wood	17 02 01-03
Glass	17 02 02
Plastic	17 02 03
Bituminous mixtures, coal tar and tarred products	17 03 02
Copper, Bronze, Brass	17 04 01
Aluminium	17 04 02
Lead	17 04 03
Zinc	17 04 04
Iron & steel	17 04 05
Tin	17 04 06
Mixed metals	17 04 07
Soil and Stones	17 05 04
Gypsum-based construction material	17 08 02
Mixed C&D waste	17 09 04

Table 4.1 Typical waste types generated and EWCs (individual waste types may contain hazardous substances)

5.0 WASTE MANAGEMENT

5.1 Demolition Waste Generation

There are no demolition works required as part of the development.

5.2 Construction Waste Generation

Table 5.1 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA National Waste Reports, the GMIT and other research reports.

Waste Types	%
Mixed C&D	33
Timber	28
Plasterboard	10
Metals	8
Concrete	6
Other	15
Total	**100**

Table 5.1 Waste materials generated on a typical Irish construction site

Table 5.2 shows the predicted construction waste generation for the proposed development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average largescale development waste generation rate per m^2, using the waste breakdown rates shown in Table 5.1 and the schedule of areas supplied by the project architects.

Waste Types	Tonnes	Reuse		Recycle/Recover		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	304.22	10	30.422	80	243.376	10	30.42
Timber	250.43	40	100.172	55	137.7365	5	12.52
Plasterboard	60.34	30	18.102	60	30.17	10	6.34
Metals	85.87	5	4.2935	90	77.283	5	4.29
Concrete	64.4	30	19.32	65	41.86	5	3.22
Other	114.01	20	22.802	60	68.406	20	22.80
Total	**879.27**		**195.11**		**598.83**		**79.60**

Table 5.2 Estimated on and off-site reuse, recycle and disposal rates for construction waste.

These quantities are provisional only and subject to further determination during construction works.

Punch Consulting Engineers have estimated additional material to be imported on site will be 64,030 cubic metres and will be used for raising ground levels locally, construction retention basins, road pavement foundations, buildings drainage etc.

5.3 Proposed Resource and Waste Management Options

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source where feasible. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the KCC Region that provide this service.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring disposal off-site will be reused, recycled, recovered, or disposed of at a facility holding the appropriate registration, permit or licence, as required. Written records will be maintained by the contractor(s) detailing the waste arising throughout the C&D phases, the classification of each waste type, waste collection permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required. The management of the main waste streams is outlined as follows:

Soil, Stone, Gravel & Clay

The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e., incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase.

When material is removed off-site it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011, which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material should not be removed from site until approval from the EPA has been received. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material, pending environmental testing to classify the material as hazardous or non-hazardous in accordance with the EPA Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous publication. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. Article 27 will be investigated to see if the material can be imported onto this site for beneficial reuse instead of using virgin materials.

If the material is deemed to be a waste, then removal and reuse / recovery / disposal of the material will be carried out in accordance with the Waste Management Act 1996 as amended, the Waste Management (Collection Permit) Regulations 2007 as amended and the Waste Management (Facility Permit & Registration) Regulations 2007 as amended. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

Bedrock

While it is not envisaged that bedrock will be encountered, if bedrock is encountered, it is anticipated that it will not be crushed on site. Any excavated rock is expected to be removed off- site for appropriate reuse, recovery and / or disposal. If bedrock is to be crushed on- site, the appropriate mobile waste facility permit will be obtained from KCC.

Silt & Sludge

During the construction phase, silt and petrochemical interception will be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

Concrete Blocks, Bricks, Tiles & Ceramics

The majority of concrete blocks, bricks, tiles, and ceramics generated as part of the construction works are expected to be clean, inert material and will be recycled, where possible.

Hard Plastic

As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

Timber

Timber that is uncontaminated, i.e., free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.

Metal

Metals will be segregated where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Plasterboard

There are currently a number of recycling services for plasterboard in Ireland. Plasterboard from the construction phases will be stored in a separate skip, pending collection for recycling. The site manager will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.

Glass

Glass materials will be segregated for recycling, where possible.

Waste Electrical and Electronic Equipment (WEEE)

Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

Other Recyclables

Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

Non-Recyclable Waste

C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be

examined by a member of the waste team (see Section 9.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Other Hazardous Wastes

On-site storage of any hazardous wastes produced (i.e., contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

On-Site Crushing

It is currently not envisaged that the crushing of waste materials will occur on- site. However, if the crushing of material is to be undertaken, a mobile waste facility permit will first be obtained from KCC, and the destination of the accepting waste facility will be supplied to the KCC waste unit. It should be noted that until a construction contractor is appointed it is not possible to provide information on the specific destinations of each construction waste stream. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to KCC by the project team.

5.4 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project Waste Manager (see Section 9.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the Waste Management Acts 1996 - 2011, Waste Management (Collection Permit) Regulations 2007 as amended and Waste Management (Facility Permit & Registration) Regulations 2007 and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project waste manager (see Section 10.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project waste manager (see Section 10.0). If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from KCC (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

6.0 DESIGN APPROACH

The client and the design team have integrated the 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' guidelines into the design workshops, to help review processes, identify, and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post demolition and construction.

Further details on these design principles can be found within a forementioned guidance document. The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continue to be analysed and investigated throughout the design process and when selecting material. The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention.
- Reuse.
- Recycling.
- Green Procurement Principles.
- Off-Site Construction.
- Materials Optimisation; and
- Flexibility and Deconstruction.

6.1 Designing for Prevention, Reuse and Recycling

Undertaken at the outset and during project feasibility and evaluation the Client and Design Team considered:

- Establishing the potential for any reusable site assets (buildings, structures, equipment, materials, soils, etc.).
- The potential for refurbishment and refit of existing structures or buildings rather than demolition and new build.
- Assessing any existing buildings on the site that can be refurbished either in part or wholly to meet the Client requirements; and
- Enabling the optimum recovery of assets on site.

6.2 Designing for Green Procurement

Waste prevention and minimisation pre-procurement have been discussed and will be further discussed in this section. The Design Team will discuss proposed design solutions, encourage innovation in tenders and incentivise competitions to recognise sustainable approaches. They will also discuss options for packaging reduction with the main Contractor and subcontractors/suppliers using measures such as 'Just-in-Time' delivery and use ordering procedures that avoid excessive waste. The Green procurement extends from the planning stage into the detailed design and tender stage and will be an ongoing part of the long-term design and selection process for this development.

6.3 Designing for Off-Site Construction

Use of off-site manufacturing has been shown to reduce residual wastes by up to 90% (volumetric building versus traditional). The decision to use offsite construction is typically cost led but there are significant benefits for resource management. Some further considerations for procurement which are being investigated as part of the planning stage design process are listed as follows:

- Modular buildings as these can displace the use of concrete and the resource losses associated with concrete blocks such as broken blocks, mortars, etc.
    - Modular buildings are typically pre-fitted with fixed plasterboard and installed insulation, eliminating these residual streams from site.
- Use of pre-cast structural concrete panels which can reduce the residual volumes of concrete blocks, mortars, plasters, etc.

- The use of prefabricated composite panels for walls and roofing to reduce residual volumes of insulation and plasterboards.
- Using pre-cast hollow-core flooring instead of in-situ ready mix flooring or timber flooring to reduce the residual volumes of concrete/formwork and wood/packaging, respectively; and
- Designing for the preferential use of offsite modular units.

6.4 Designing for Materials Optimisation During Construction

To ensure manufacturers and construction companies adopt lean production models, including maximising the reuse of materials onsite. This helps to reduce the environmental impacts associated with transportation of materials and from waste management activities. This includes investigating the use of standardised sizes for certain materials to help reduce the number of offcuts produced on site, focusing on promotion and development of off-site manufacture.

6.5 Designing for Flexibility and Deconstruction

Design flexibility has and will be investigated throughout the design process to ensure that where possible products (including buildings) only contain materials that can be recycled and are designed to be easily disassembled. Material efficiency is being considered for the duration and end of life of a building project to produce; flexible, adaptable spaces that enable a resource-efficient, low-waste future change of use; durability of materials and how they can be recovered effectively when maintenance and refurbishment are undertaken and during disassembly/deconstruction.

7.0 ROLES & RESPONSIBILITIES

The Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects promotes that a RM (Resource Waste Manager) should be appointed. The RM may be performed by number of different individuals over the life cycle of the Project; however, it is intended to be a reliable person chosen from within the Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction and demolition methodology that is designed to facilitate maximum reuse and/or recycling of waste.

7.1 Role of the Client Advisory Team

The Client Advisory Team or Design Team is formed of architects, consultants, quantity surveyors and engineers and is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project.
- Appointing a RM to track and document the design process, inform the Design Team, and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This should also include data on waste types (e.g., waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team.
- Managing and valuing the demolition work with the support of quantity surveyors.
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor.
- Working with the Contractor as required to meet the performance targets for the project.

7.2 Future Role of the Contractor

The future construction Contractors have not yet been decided upon for this RWMP. However, once selected they will have major roles to fulfil. They will be responsible for:

- Preparing, implementing, and reviewing the RWMP throughout the construction phase (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines.
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP.
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site.
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable.
- Renting and operating a mobile crusher to crush concrete for temporary reuse onsite during construction and reduce the amount of HGV loads required to remove material from site.
- Applying for the appropriate waste permit to crush concrete onsite.
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a 'waste' must only be transported to an authorised waste facility.
- End-of-waste and by-product notifications addressed with the EPA where required.
- Clarification of any other statutory waste management obligations, which could include on-site processing.
- Full records of all resources (both wastes and other resources) will be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

8.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

The total cost of C&D waste management will be measured and will consider handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

8.1 Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones etc. which cannot be reused on site may be used as access roads or capping material for landfill sites etc. This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

8.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

8.3 Disposal

Landfill charges are currently at around €130 - €150 per tonne which includes a €75 per tonne landfill levy specified in the Waste Management (Landfill Levy) Regulations 2015. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

9.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the RM to ensure commitment, operational efficiency, and accountability in relation to waste management during the C&D phases of the development.

9.1 Resource Waste Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, i.e., members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site.

The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the Waste Manager to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this RWMP.

9.2 Site Crew Training

Training of site crew in relation to waste is the responsibility of the Waste Manager and, as such, a waste training program will be organised. A basic awareness course will be held for all site crew to outline the RWMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Areas (WSAs). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

10.0 TRACKING AND TRACING / RECORD KEEPING

Records will be kept for all waste material which leaves the site, either for reuse on another site, recycling, or disposal. A recording system will be put in place to record the waste arisings on Site. A waste tracking log will be used to track each waste movement from the site. On exit from the site, the waste collection vehicle driver will stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or Waste Transfer Form (WTF) for hazardous waste) for the waste load collected. At this time, the security personnel will complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by, e.g., Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC / LoW

The waste vehicle will be checked by security personnel or the RM to ensure it has the waste collection permit no. displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the KCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically checked by the RM. Subcontractors who have engaged their own waste contractors, will provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

11.0 OUTLINE WASTE AUDIT PROCEDURE

11.1 Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the proposed Project. Contact details for the nominated RM will be provided to the KCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

11.2 Review of Records and Identification of Corrective Actions

A review of all waste management costs and the records for the waste generated and transported off-site should be undertaken mid-way through the construction phase of the proposed Project.

If waste movements are not accounted for, the reasons for this will be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery / reuse / recycling targets for the site. Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Upon completion of the C&D phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling / reuse / recovery figures for the development.

12.0 CONSULTATION WITH RELEVANT BODIES

12.1 Local Authority

Once construction contractors have been appointed and have appointed waste contractors, and prior to removal of any C&D waste materials off-site, details of the proposed destination of each waste stream will be provided to the KCC Waste Regulation Unit.

KCC will also be consulted, as required, throughout the excavation and construction phases in order to ensure that all available waste reduction, reuse, and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

12.2 Recycling / Salvage Companies

The appointed waste contractor for the main waste streams managed by the construction contractors will be audited in order to ensure that relevant and up-to-date waste collection permits and facility registrations / permits / licences are held. In addition, information will be obtained regarding the feasibility of recycling each material, the costs of recycling / reclamation, the means by which the wastes will be collected and transported off-site, and the recycling / reclamation process each material will undergo off-site.

Appendix 13.2

Operational Waste & Recycling Management Plan (OWRMP)

Slight Change

OPERATIONAL WASTE & RECYCLING MANAGEMENT PLAN

FOR DEVELOPMENT

AT

RUANBEG

KILDARE TOWN

CO. KILDARE

Prepared for

MRP Oakland limited

Prepared by

Traynor Environmental Ltd

Reference Number

23.021 TE

Date of Issue

5th September 2023

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Report Title:	Operational Waste & Recycling Management Plan
Doc Reference:	5th September 2023
Client:	MRP Oakland limited
Authorised By:	 *Nevin Traynor BSc. Env, H. Dip I.T, Cert SHWW, EPA/FAS Cert.* *Environmental Consultant*

Rev No	Status	Date	Writer	Reviewer
1.	Final	13th September 2022	Angela Kelly	Nevin Traynor
2.	Final	03rd May 2023	Angela Kelly	Nevin Traynor
3.	Final	5th September 2023	Angela Kelly	Nevin Traynor

This report refers, within the limitations stated, to the condition of the site at the time of the report. No warranty is given as to the possibility of future changes in the condition of the site. The report as presented is based on the information sources as detailed in this report, and hence maybe subject to review in the future if more information is obtained or scientific understanding changes.

CONTENTS

1.0 INTRODUCTION

This Operational Waste Management Strategy (the 'Strategy') has been prepared by Nevin Traynor BSc.Env, HDIP IT, Cert SHWW, IAH of Traynor Environmental Ltd on behalf of MRP Oakland limited in support of the proposed Ruanbeg development (hereafter referred to as the 'Proposed Development') within Kildare.

This is an update of the previous report to reflect the changes as a result of the RFI in particular the reduction in the no. of units and introduction of the communal area. These changes will have a minimal impact in relation to all wastes. All wastes can be treated appropriately throughout the site as stated in the original application and outlined below.

The principal aim of this Strategy is to demonstrate how the Proposed Development has taken into account sustainable methods for waste and recycling management during its operation. Furthermore, with regards to waste and recycling management within the Proposed Development, this Strategy has the following aims:

- To contribute towards achieving current and long-term government, Eastern Midlands Region (EMR) and Kildare County Council targets for waste minimisation, recycling, and re-use.
- To comply with all legal requirements for handling operational waste.
- To achieve high standards of waste management performance, through giving (and continuing to give) due consideration to the waste generated by the Proposed Development during its operation; and
- To provide the Proposed Development with a convenient, clean, and efficient waste management strategy that enhances the operation of the Proposed Development and promotes recycling.

It is important to note that the Kildare County Council is part of the Eastern Midlands Region. The Eastern Midlands Region comprises of Dublin City Council, Dun Laoghaire – Rathdown, Fingal, South Dublin, Kildare, Louth, Laois, Longford, Meath, Offaly, Westmeath, and Wicklow County Council.

This Strategy provides a review of the requirements placed upon the Proposed Development under national legislation and implemented policy at all levels of government (i.e., national (Ireland), regional (EMR), district and local (Kildare). Consideration has also been given to requirements included in local standards and guidance documents (i.e., DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2018) in line with the Regional Waste Management Plan and British Standard Waste Management in Buildings, Code of Practice (BS 5906:2005) so as to comply with relevant objectives and targets.

Estimate volumes of waste generated during operation of the Proposed Development have been provided in the report which also includes a breakdown of the waste management process, which details waste handling, storage area provision, and collection arrangements. All waste reduction measures are compliant with BS 5906:2005, Eastern Midlands Region (EMR) and Sustainable Urban Housing: Design Standards for New Apartments which are also discussed in this strategy. This Operational waste management plan should be read in conjunction with the drawings prepared by Mc Crossan O Rourke Manning Architects which show the Waste Storage Areas and associated infrastructure.

2.0 LEGISLATION/ PLANNING POLICY

A summary of the European, national regional and local planning policy relevant to the Proposed Development is outlined in the section below. It should be noted that this summary identifies those elements of the policy or guidance applicable to waste management within the Proposed Development.

2.1 International and European Policy

The EU Waste Framework Directive (EU WFD) provides the overarching legislative framework for the collection, transport, recovery, and disposal of waste, and includes a common definition of waste. It encourages the prevention and reduction of harmful waste by requiring that Member States put waste control regimes into place. These waste management authorities and plans should ensure that necessary measures exist to recover or dispose of waste without endangering human health or causing harm to the environment and includes permitting, registration and inspection requirements.

The directive also requires Member States to take appropriate measures to encourage firstly, the prevention or reduction of waste production and its harmfulness and secondly the recovery of waste by means of recycling, re-use or reclamation or any other process with a view to extracting secondary raw materials, or the use of waste as a source of energy. The directive also puts an end to co-disposal of waste streams.

The definition of waste for the Ireland is governed by the EU WFS as:

"*Any substance or object…which the holder discards or intends or is required to discard.*"

It is the responsibility of the holder of a substance or object to decide whether or not they are handling waste. The European Protection Agency is the authority responsible for enforcing waste management legislation in Ireland, but where there is a disagreement as to whether or not something is waste it is ultimately a matter for the courts to decide.

The European Waste Catalogue In 1994, the *European Waste Catalogue* and *Hazardous Waste List* were published by the European Commission. In 2002, the EPA published a document titled the *European Waste Catalogue and Hazardous Waste List*, which was a condensed version of the original two documents and their subsequent amendments. This document has been replaced by the EPA '*Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous*' which became valid from the 1st of June 2015. This waste classification system applies across the EU and is the basis for all national and international waste reporting, such as those associated with waste collection permits, COR's, permits and licences and EPA National Waste Database.

The European Landfill Directive is in place to reduce the negative effects of land filling on the environment and health. It aims to encourage waste minimisation and increased levels of recycling and recovery; the increased costs of land filling associated with compliance with the Directive will also encourage alternative waste management methods.

The first requirement of the regulations was a ban on the co-disposal of hazardous waste with non-hazardous waste in landfills. The Directive has also imposed a ban on whole tyres going to landfill since 2003, with this ban extending to shredded tyres from July 2006, while liquid wastes were banned from landfill from October 2007.

The Directive also brings with it, tighter site monitoring and engineering standards. This is supplemented by the European Waste Catalogue, which has extended the range of materials classified as 'hazardous', and the Waste Acceptance Criteria, which has introduced potential pre-treatment requirements.

2.2 National Legislation

The Government issued a policy statement in September 1998 titled as *'Changing Our Ways'* which identified objectives for the prevention, minimisation, reuse, recycling, recovery, and disposal of waste in Ireland. A heavy emphasis was placed on reducing reliance on landfill and finding alternative methods for managing waste. Amongst other things, Changing Our Ways stated a target of at least 35% recycling of municipal (i.e., household, commercial and non-process industrial) waste.

A further policy document *'Preventing and Recycling Waste – Delivering Change'* was published in 2002. This document proposed a number of programmes to increase recycling of waste and allow diversion from landfill. The need for waste minimisation at source was considered a priority.

This view was also supported by a review of sustainable development policy in Ireland and achievements to date, which was conducted in 2002, entitled *'Making Irelands Development Sustainable – Review, Assessment and Future Action'*. This document also stressed the need to break the link between economic growth and waste generation, again through waste minimisation and reuse of discarded material

In order to establish the progress of the Government policy document *Changing Our Ways*, a review document was published in April 2004 entitled *'Taking Stock and Moving Forward'*. Covering the period 1998 – 2003, the aim of this document was to assess progress to date with regard to waste management in Ireland, to consider developments since the policy framework and the local authority waste management plans were put in place, and to identify measures that could be undertaken to further support progress towards the objectives outlined in *Changing Our Ways*.

In particular, *Taking Stock and Moving Forward* noted a significant increase in the amount of waste being brought to local authority landfills. The report noted that one of the significant challenges in the coming years was the extension of the dry recyclable collection services.

In September 2020, the Irish Government published a new policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan 'A Waste Action Plan for a Circular Economy' (WAPCE), was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities, replacing the previous national waste management plan "A Resource Opportunity" (2012).

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including Circular Economy, Municipal Waste, Consumer Protection & Citizen Engagement, Plastics and Packaging, Construction and Demolition, Textiles, Green Public Procurement and Waste Enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) to set a course for Ireland to transition across all sectors and at all levels of Government toward

circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

Since 1998, the Environmental Protection Agency (EPA) has produced periodic 'National Waste (Database) Reports' detailing, among other things, estimates for household and commercial (municipal) waste generation in Ireland and the level of recycling, recovery, and disposal of these materials. The 2019 National Waste Statistics, which is the most recent study published, along with the national waste statistics web resource (November 2021) reported the following key statistics for 2019:

- **Generated –** Ireland produced 3,085,652 t of municipal waste in 2019. This is almost a 6% increase since 2018. This means that the average person living in Ireland generated 628 kg of municipal waste in 2019.
- **Managed –** Waste collected and treated by the waste industry. In 2019, a total of 3,036,991 t of municipal waste was managed and treated.
- **Unmanaged –** Waste that is not collected or brought to a waste facility and is, therefore, likely to cause pollution in the environment because it is burned, buried, or dumped. The EPA estimates that 48,660 t was unmanaged in 2019.
- **Recovered –** The amount of waste recycled, used as a fuel in incinerators, or used to cover landfilled waste. In 2019, around 83% of municipal waste was recovered – a decrease from 84% in 2018.
- **Recycled –** The waste broken down and used to make new items. Recycling also includes the breakdown of food and garden waste to make compost. The recycling rate in 2019 was 37%, which is down from 38% in 2018.
- **Disposed –** Less than a sixth (15%) of municipal waste was landfilled in 2019. This is an increase from 14% in 2018.

2.3 Regional Level

The proposed development is located in the Local Authority area of Kildare County Council. The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the DLR area which was published in May 2015. This plan replaces the previous Dublin region plan due to changing National policy as set out in *A Resource Opportunity: Waste Management Policy in Ireland* and changes being enacted by the *Waste Framework Directive (2008/98/EC)*.

The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan.
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and Indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2015.* The *Kildare County Development Plan 2023 – 2029* sets out a number of objectives and actions for the Kildare area in line with the objectives of the regional waste management plan.

The *Kildare County Development plan 2023-2029* came into effect on 28th January 2023 and sets policies and objectives in support of the regional development plan and the Waste Action Plan for a Circular Economy 2020-2025 for the proper planning and sustainable development of the Kildare area. The following policies and objectives are of particular relevance to waste management:

- *P6: Implement European Union, National and Regional waste related environmental policy, legislation, guidance, and codes of practice, in order to support the transition from a waste management economy towards a circular*

economy.

- *INO36: Encourage a just transition from a waste economy to a green circular economy in accordance with 'A Waste Action Plan for a Circular Economy 2020-2025'.*
- *INO37: Provide, promote, and facilitate high quality sustainable waste recovery and disposal infrastructure /technology in keeping with the EU waste hierarchy to cater for anticipated population growth and the business sector in the County.*
- *IN O38: Ensure the provision of adequately sized public recycling facilities in association with new commercial developments and in tandem with significant change of use / extensions of existing commercial developments where appropriate to maximise access by the public.*
- *IN O39: Require the appropriate provision for the sustainable management of waste within developments (particularly apartment buildings), including the provision of facilities for storage, separation, and collection of waste*
- *IN O41: Encourage waste prevention, minimisation, re-use, recycling, and recovery as methods for managing waste.*
- *IN O44: Support and facilitate the separation of waste at source into organicandnon-organicstreamsorotherwastemanagementsystemsthatdivertwaste from landfill and maximise the potential foreach waste type to be re-used, recycled, or composted.*
- *IN O46: Support the implementation of the actions outlined in the Kildare Litter Management Plan 2020-2023 (and any subsequent updates).*

2.4 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended. Secondary legislation includes:
  - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended o Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
  - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended
  - Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
  - Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended.
  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015) as amended.
  - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014) as amended.
  - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
  - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended o European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 430 of 2015)
  - Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
  - Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
  - European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324/2011
  - European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
  - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended.
- Environmental Protection Agency Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended.

2.5 Responsibilities of the Waste Producer

The waste producer is responsible for waste from the time it is generated through until its legal disposal (including its method of disposal.) Waste contractors will be employed to physically transport waste to the final waste disposal / recovery site.

It is therefore imperative that the residents, commercial tenants, and the proposed facilities management company undertake on-site management of waste in accordance with all legal requirements and employ suitably permitted/licenced contractors to undertake off-site management of their waste in accordance with all legal requirements. This includes the requirement that a waste contactor handle, transport, and reuse/recover/recycle/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended or a waste or IED (Industrial Emissions Directive) license granted by the EPA. The COR/permit/license held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

2.6 Kildare County Council Waste Management Bye-Laws

The *Kildare County Council Waste Management (Segregation, Storage and Presentation of Household and Commercial Waste) Bye-Laws 2018* were entered into force on the 1st day of March 2019. The bye-laws set a number of enforceable requirements on waste holders with regard to storage, separation, and presentation of waste within the KCC functional area. Key requirements under these bye-laws of relevance to the development include the following:

• Kerbside waste presented for collection shall not be presented for collection earlier than 8:00 pm on the day immediately preceding the designated waste collection day.

• All containers used for the presentation of kerbside waste and any uncollected waste shall be removed from any roadway, footway, footpath, or any other public place no later than 8:00am on the day following the designated waste collection day, unless an alternative arrangement has been approved in accordance with bye-law.

• Documentation, including receipts, is obtained, and retained for a period of no less than one year to provide proof that any waste removed from the premises has been managed in a manner that conforms to these byelaws, to the Waste Management Act and, where such legislation is applicable to that person, to the European Union (Household Food Waste and Bio-Waste) Regulations 2015; and

• Adequate access and egress onto and from the premises by waste collection vehicles is maintained.

2.7 Regional Waste Management Service Providers & Facilities

Various contractors offer waste collection services for the residential and commercial sector in the Kildare County Council. Details of waste collection permits (granted, pending, and withdrawn) for the region are available from the NWCPO. As outlined in the new regional waste management plan, there is a decreasing number of landfills available in the region. Only three municipal solid waste landfills remain operational and are all operated by the private sector. There are a number of other licensed and permitted facilities in operation in the region including waste transfer stations, hazardous waste facilities and integrated waste management facilities. A copy of all CORs and waste permits issued by the Local Authorities are available from the NWCPO website and all waste/IED licenses issued are available from the EPA. Additionally, textiles and other bulky wastes can be brought to local bring banks or recycling centres. These can be utilised by the residents of the development for other household waste streams.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The proposed development will consist of a Large-scale Residential Development of 285 no. units. The development will include one, two, three and four bed units in the form of two storey detached, semi-detached / terraced houses, along with 3 no. three storey duplexes/apartments and a single storey age friendly accommodation block. The development also includes a creche along with associated car parking, bicycle parking, landscaping, and open spaces. Vehicular and pedestrian access will be provided from the Dublin Road (R445) and via Ruanbeg Avenue. Additional pedestrian access will be provided via Ruanbeg Park. All other site works including boundary treatments and site services to facilitate development.

	Number of Units			
	Age-friendly Units	**Duplexes**	**Houses**	**Total**
1-Bed	12	-	-	12
2-Bed	2	20	20	42
3-Bed	-	20	173	193
4-Bed	-	-	38	38
Total	**14**	**40**	**231**	**285**

Table 1.0 Residential Development Unit Mix

Non-Residential Floor Areas	Area (m^2)
Crèche	472.7
Multifunctional Centre	89.1
	526.9

Table 2.0 Mixed Development Details Non-Residential Floor Areas

3.2 Typical Waste Categories

The predicted waste types that will be generated at the proposed development include the following:

- **Dry Mixed Recyclables (DMR)** – includes Newspaper / General paper Magazines, Cardboard Packaging, Drink (Aluminum) Cans, Washed Food (Steel/Tin) Cans, Washed Tetra Pak Milk & Juice Cartons, Plastic Bottles (Mineral/Milk/Juice/Shampoo/Detergents), Rigid Plastics. (Pots/Tubs/Trays*)
- **Mixed Non-Recyclables (MNR) / All General Waste** – Nappies, soiled food, packaging, old candles, plasters, vacuum cleaner contents, broken delph, contaminated plastics.
- **Organic (food) Waste** – Bread, pasta and rice, Meat, fish, poultry bones, out of date food (no plastic packaging), Tea Bags, Coffee grounds and paper filters**.** Fruit and vegetables (cooked and uncooked). Food soiled cardboard or paper (no coated paper) Eggs and dairy products (no plastic packaging) Paper napkin and paper towels
- **Glass**

In addition to the typical waste materials that will be generated on a daily basis, there will be some additional waste types generated in small quantities that will need to be managed separately including:

- Green/garden waste - may be generated from internal plants and external landscaping carried out by the management company.
- Textiles
- Batteries
- Waste electrical and electronic equipment (WEEE)

- Chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.)
- Furniture (and from time-to-time other bulky wastes)
- Covid-19 Waste

Wastes should be segregated into the above waste types to ensure compliance with waste legislation and guidance while maximising the re-use, recycling, and recovery of waste with diversion from landfill wherever possible.

3.3 European Waste Codes

Under the classification system, different types of wastes are fully defined by a code. The List of Waste (LoW) code (also referred to as European Waste Code or EWC) for typical waste materials expected to be generated during the operation of the proposed development are provided in the Table below 3.0.

Waste Material	LoW Code
Paper and Cardboard	20 01 01
Plastic	20 01 39
Metals	20 01 40
Mixed Municipal Waste	20 03 01
Glass	20 01 02
Biodegradable Kitchen Waste	20 01 08
Oils and Fats	20 01 25/26*
Biodegradable garden and park wastes	20 02 01
Textiles	20 01 11
Batteries and accumulators*	20 01 33*-34
Printer Toner / Cartridges*	20 01 27* -28
Green Waste	20 02 01
Waste electrical and electronic equipment*	20 01 35*-36
Chemicals (solvents, pesticides, paints & adhesives, detergents etc) *	20 01 13 / 19 /27 / 28 / 29* 30
Fluorescent tubes and other mercury containing waste*	20 01 21*
Bulky wastes	20 03 07

Table 3.0 LoW Code

3.4 Methodology

3.4.1 Residential Calculation Methodology

Waste arisings were calculated in accordance with BS 5906:2005 and included a provision of 5 litres (L) of food waste per residential unit per week. These guidelines determine the minimum capacity for waste storage space to be allocated and are as follows:

- 30 litres (L) per unit + 70L per bedroom (see Table 4.0 for further details).
- Split 50:50 between DMR and residual waste; and
- 5L per residential unit for food waste.

Number of Bedrooms	Weekly Waste Arisings per Unit (L)			
	DMR	Food Waste	MNR	Total
1 Bedroom	50	5	50	**105**
2 Bedrooms	85	5	85	**175**
3 Bedrooms	120	5	120	**245**
4 Bedrooms	155	5	155	**315**

Table 4.0 Weekly Waste Arisings Methodology

3.4.2 Commercial Calculation Methodology

BS 5906:2005 provides a methodology for the calculation of waste arisings from the Multifunctional Centre and crèche and this has been used to calculate for the site.

4.0 ESTIMATED WASTE ARISING

The estimated quantum/volume of waste that will be generated from the residential units is based on BS 5906:2005. The waste generation for the Crèche and Multifunctional Centre is based on waste generation rates per m^2 of floor area for the proposed area uses.

The estimated quantum/volume of waste that will be generated from the residential units has been determined based on the predicted occupancy of the units and is presented in table 6.0 and 7.0 below.

Waste type	Age-friendly Units	Duplexes	Houses	Totals (L)
Organic Waste	70	200	1,145	**1,415**
Mixed Dry Recyclables	770	4,100	28,040	**32,910**
Glass	70	200	1,145	**1,415**
Mixed Municipal Waste	770	4,100	28,040	**32,910**
Total	**1680**	**8,600**	**58,370**	**68,650**

Table 6.0 Residential Waste Prediction (L/per week)

Non-Residential Floor Areas	Area (Sq.m)	DMR (Recycling)	Food Waste	MNR (Residual)	Glass	Total (L)
Crèche	472.7	1219.90	30	1219.90	10	**2479.8**
Multifunctional Centre	89.1	217.34	20	217.34	20	**474.68**

Table 7.0 Crèche and* Multifunctional Centre *(L/per week)

4.1 Waste Storage and Collection

This section provides information on how waste generated within the development will be stored and how the waste will be collected from the development. The locations of the WSAs can be viewed on the drawings submitted with the Further information planning application. This has been prepared with due consideration of the proposed site layout as well as best practice standards, local and national waste management requirements including those of Kildare County Council. In particular, consideration has been given to the following documents:

- BS 5906:2005 Waste Management in Buildings – Code of Practice.
- EMR Waste Management Plan 2015 – 2021.
- Kildare County Council, *Presentation and Storage of Waste Byelaws* (2018).
- DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2018).

4.2 Residential Waste and Recycling Management and Storage Strategy

It is required that space be provided for recycling bins to accommodate 50% of the total weekly volume. This is in line with the BS5906:2005 requirements. Residual waste (MNR) is required for 87.5% of the total weekly arising. For the purpose of the strategy Glass and Organic Waste is required for 87.5% of the total weekly arising.

Block	Number of Bins Required for a Weekly Collection			
	MNR	Organic	DMR	Glass
Houses	1 x 240L	1 x 120L	1 x 240L	Bring Bank
Age-friendly Units	1 x 1100L	1 x 120L	1 x 1100L	1 x 120L
Duplexes – Block 1	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Duplexes – Block 2	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Duplexes – Block 3	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L

Table 8.0 Residential Storage Requirements

Block	Number of Bins Required for a Collection			
	MNR (Weekly)	Organic (Weekly)	DMR (Weekly)	Glass (Weekly)
Crèche	1 x 1100L	1 x 120L	1 x 1100L	1 x 120L
Multifunctional Centre	1 x 240L	1 x 120L	1 x 240L	1 x 120L

Table 9.0 Commercial Storage Requirements

4.2.1 Duplexes

The proposed duplex units WSA will have access for all (including people with disabilities) in a brightly lit, safe & well sighted area, spacious enough for easy manoeuvrability, good ventilation and ready access if required for the control of potential vermin.

Sufficient access and egress will be provided to enable receptables to be moved easily from the storage area to an appropriate collection point within the curtilage of the development.

It is anticipated that DMR, MNR and organic waste will be collected on a weekly basis. Space has been allocated in the WSAs to accommodate glass if required for the residents of the duplexes.

4.2.2 Houses

Residential houses will have a typical three/four bin system per house which will be separate to the waste storage areas discussed above in Section 3.0. Residents will be required to segregate their waste into the following waste categories within their own houses:

- DMR.
- MNR.
- Organic waste; and
- Glass.

It is anticipated that residents in houses and with external access to the rear of the property will store waste in bins at the back of their houses. For houses without external access to the rear of the property, a dedicated shielded area for storage of the wheelie bins has been allocated at the front of each property.

4.2.3 Crèche

Staff will be expected to take all waste arisings from the Crèche to the appropriate waste storage area. Staff will be required to segregate their waste into the following waste categories:

- DMR.
- MNR.
- Organic waste; and
- Glass.

It is recommended that the WSAs will have secure access with either key or fob. On collection day, the bins will be brought from the bin store to the waste collection point. Once the bins are emptied the bins will be brought back to the waste storage area.

4.2.4 Multifunctional Centre

Those using the Multifunctional Centre will be expected to take all waste arising to the appropriate waste storage area. Segregation of the waste into the following waste categories:

- DMR.
- MNR.
- Organic waste; and
- Glass.

On collection day, the bins will be brought from the bin store to the waste collection point by the management company personnel. Once the bins are emptied the bins will be brought back to the waste storage area.

4.2.5 Age Friendly Units

Residents in the Age Friendly units will each be supplied with a 3/4-bin system. Residents will be required to segregate their waste into the following waste categories:

- DMR,
- MNR,
- Organic waste,
- Glass

The bins storage area is located at each Age friendly unit. On collection day, the bins will be brought from the bin storage area to the waste collection point by the management company personnel. Once the bins are emptied the bins will be brought back to the waste storage area.

4.3 Waste Storage Residential Units

Provision is made for the segregation and storage of domestic waste within each unit. Each unit is provided with bins in the kitchen area to enable the separation of waste into different waste streams – 1.) glass, 2.) food, 3.) DMR (Dry Mixed Recycling) and 4.) general waste (MNR). Sample images of bin types in each unit below.

4.4 Waste Collection Contractors

There are numerous private contractors that provide waste collection services in the Kildare area who hold a valid waste collection permit for the specific waste types collected. All waste collected must be transported to registered/permitted/licensed facilities only.

All waste requiring collection by the appointed waste contractor will be collected from the WSAs by nominated waste contractors or facilities management depending on the agreement and will be brought to the temporary waste collection areas. The empty bins will be promptly returned to the appropriate WSAs.

All waste receptacles presented for collection will be clearly identified as required by waste legislation and the requirements of the Kildare County Council Byelaws. Also, waste will be presented for collection in a manner that will not endanger health, create a risk to traffic, harm the environment or create a nuisance through odours or litter.

4.5 Additional Waste Materials

There is likely to be a small component of the overall waste arisings from the Proposed Development that will comprise other waste streams, such as WEEE, printer and toner cartridges, and fluorescent light tubes. Building maintenance will also give rise to materials such as paints and will be the responsibility of the management company to dispose of this waste.

4.6 Waste Storage Area Design

This area will be installed in accordance with BS 5906:2005.

- The walls and roofs of the bin stores will be formed of non-combustible, robust, secure, and impervious material, and have a fire resistance of one hour.
- All containers for waste, including recyclable material, will be easily accessible to both the occupier and waste collector.
- Waste stores will be designed and located in such a way as to limit potential noise disturbance to residents.
- Storage areas for waste and DMR will be clearly designated for this use only, by a suitable door or wall sign and, where appropriate, with floor markings.
- Waste storage sites will include areas for instructional signage detailing correct use of the facilities.
- The entrance of the waste storage room will be free from steps and projections.
- Where the area is to be enclosed in a roofed building, adequate ventilation will be provided. Permanent ventilators will be provided giving a total ventilation area of not less than 0.2m^2;
- Contain electrical lighting by means of sealed bulkhead fittings (housings rated to IP65 in BS EN 60529:199 for the purpose of cleaning down with hoses and inevitable splashing. Luminaires will be low energy light fittings or low energy lamp bulbs, controlled by proximity detection or a time delay button to prevent lights being left on; and
- Gullies for wash down facilities will be positioned so as not to be in the track of container trolley wheels.
- In addition to the above requirements, experience, and best practice for the storage of waste materials will include the following provisions:
- Waste storage facilities will not block any utility service points.
- Waste storage areas will not obstruct sight lines for pedestrians, drivers, and cyclists, if doors open outwards, they will not open onto a road or highway.
- Waste containers will be inside or at least enclosed. If bins are outside, they will be secured in a compound; Information packs will be provided to residents to include full information on available recycling facilities.
- Colour coding will be used for bins of different streams; and any internal storage areas adjacent to a fire escape route will be fitted with fire doors, automatic fire detection and a sprinkler system and comply with the Building Regs.
- The facilities management company will be required to maintain the bins and their WSAs in good condition. All residents should be made aware of the waste segregation requirements and waste storage arrangements.

5.0 Waste Collection Requirements

In line with BS 5906:2005 and Kildare County Council Bye Laws 2018 guidance, the following collection requirements have been designed into the Proposed Development in order to comply with all mandatory waste storage requirements:

5.1 BS 5906 2005

All paths used to transport bins from the storage area to the collection point will have a minimum width of 2m, be free from kerbs or steps, have a solid foundation and be finished with a smooth, continuous finish. Based on the clearance height and tonnage specified by the dimensions of a standard waste collection vehicle have been used to undertake the swept path analysis located in Appendix A.

Dimensions	
Width	2.53 metres
Gross vehicle weight	26 tonnes
Length	11.2 metres
Clearance Height	4.75m (Any part of a building through which a waste collection vehicle passes must have a minimum clear height of 4.75 m, to allow for overhead fixtures and fittings)
Turning Circle (diameter)	9.5 metres

Table 10.0 Collection Vehicle Dimensions: Waste/Recycling Collection Vehicle

6.0 CONCLUSIONS

The Proposed Development will be achieved with high standards of waste management performance. As such, due consideration has been given to waste which will be generated by the Proposed Development during its operation. Waste management within the Proposed Development has the following aims:

- To contribute towards achieving current and long-term government, Kildare County Council and EMR targets for waste minimisation, recycling, and reuse.
- To ensure that all legal requirements for the handling and management of waste during the operation of the Proposed Development are complied with; and
- To provide tenants with convenient, clean, and efficient waste management systems that enhance the operation of the buildings and promote high levels of recycling.

Residential waste storage allows for a weekly (seven day) storage capacity for DMR, Organic and MNR (i.e., nonrecyclable). In summary, this OWRMP presents a waste strategy that complies with all legal requirements, waste policies and best practice guidelines and demonstrates that the required storage areas have been incorporated into the design of the development.

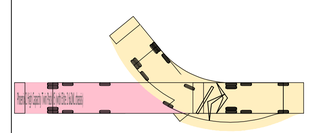
MRP OAKLAND LIMITED

OPERATIONAL WASTE & RECYCLING MANAGEMENT PLAN

COMPLETED BY

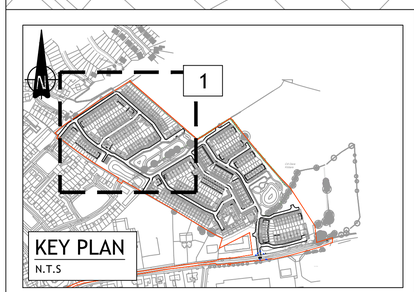
TRAYNOR ENVIRONMENTAL LTD

APPENDIX A – VEHICLE SWEPT PATH ANALYSIS



Phoenix 2 High Capacity Twin Pack 15 (with Elite 2 6x2ML chassis)

Overall Length	9.040m
Overall Width	2.500m
Overall Body Height	3.205m
Min Body Ground Clearance	0.410m
Track Width	2.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	7.800m



VEHICLE SWEPT PATH ANALYSIS - REFUSE VEHICLE PLAN 1

SCALE 1:500

BUILDING INFORMATION MODELLING (BIM) I.S EN ISO 19650-2:2018
NSAI Certified

Rev	Amendment	By	Date
C01	STAGE 2 LRD PLANNING SUBMISSION	RD	2022.09.14
C02	KCC INTERIM ENGINEERING SUBMISSION	JB	2023.02.03
C03	ROAD SAFETY AUDIT REVIEW	AF	2023.04.06
C04	PLANNING ISSUE	DAP	2023.05.07
C05	PLANNING FI ROAD SAFETY AUDIT	AF	2023.08.18
P01	DRAFT PLANNING FI RESPONSE	DAP	2023.08.25

Rev	Amendment	By	Date

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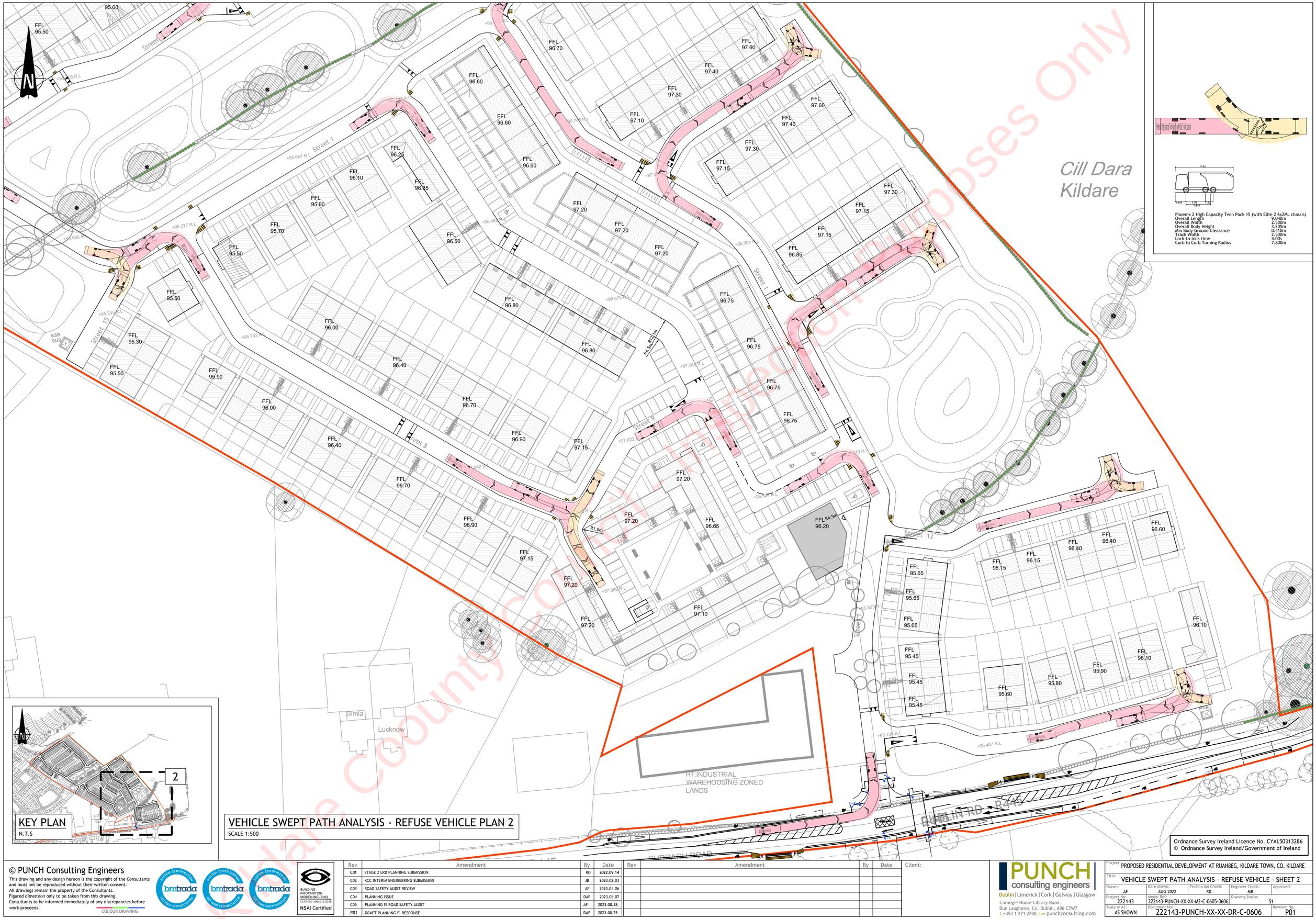
Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE

Title: VEHICLE SWEPT PATH ANALYSIS - REFUSE VEHICLE - SHEET 1

Drawn:	Date drawn:	Technician Check:	Engineer Check:	Approved:
AF	AUG 2022	RD	MR	

Project No:	Model Ref:	Drawing Status:
222143	222143-PUNCH-XX-XX-M2-C-0605-0606	S1

Scale @ A1:	Document No:	Revision No:
AS SHOWN	222143-PUNCH-XX-XX-DR-C-0605	P01



KEY PLAN
N.T.S

VEHICLE SWEPT PATH ANALYSIS - REFUSE VEHICLE PLAN 2
SCALE 1:500

BUILDING INFORMATION MODELLING (BIM)
I.S. EN ISO 19650-2:2018
NSAI Certified

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C01	STAGE 2 LRD PLANNING SUBMISSION	RD	2022.09.14
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C04	PLANNING ISSUE	DAP	2023.05.07
C05	PLANNING FI ROAD SAFETY AUDIT	AF	2023.08.18
P01	DRAFT PLANNING FI RESPONSE	DAP	2023.08.25

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Project: PROPOSED RESIDENTIAL DEVELOPMENT AT RUANBEG, KILDARE TOWN, CO. KILDARE				
Title: VEHICLE SWEPT PATH ANALYSIS - REFUSE VEHICLE - SHEET 2				
Drawn: AF	Date drawn: AUG 2022	Technician Check: RD	Engineer Check: MR	Approved:
Project No.: 222143	Model Ref.: 222143-PUNCH-XX-XX-M2-C-0605-0606	Drawing Status: S1		
Scale @ A1: AS SHOWN	Document No.: 222143-PUNCH-XX-XX-DR-C-0606			Revision No.: P01

Appendix 14.1

Geophysical Survey Report

No Change

Appendix 14.2

Cultural Heritage Response Letter

No Change