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Kildare County Council

Proposed Development of 77 no. Residential Units at College Wood Manor, Ballingappa Road, Clane, Co. Kildare.

Engineering Report

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Contents Amendment Record

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MALONE O'REGAN

Title: Proposed Development of 77 no. Residential Units at College Wood Manor, Ballingappa Road, Clane, Co. Kildare. - Engineering Report

Job Number: SHB2-NAN-CS-MOR-DOC-Engineering Report

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Checked By: Doug Weir **Signed:**

Approved By: Noel Dillon **Signed:**

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1 INTRODUCTION

1.1 Introduction

Malone O'Regan have been commissioned to prepare drainage, water supply and road infrastructure plans in relation to a proposed residential development at College Wood Manor, Ballingappa Road, Clane, County Kildare. This report has been prepared to describe the proposed infrastructure and to support a Part VIII planning application for the development.

The proposed development is fully described on the drawings which accompany this planning submission. Where reference is made to drawings and drawing numbers within this report these should be taken as meaning those drawings produced by Malone O'Regan unless specifically stated otherwise.

1.2 The Site

The proposed site is located along the College Wood Manor, which is off Ballinagappa Road (L1023). The site is approximately 1.0km to the west of Clane town centre. The site is located at the southern edge of an established residential area. Scoil Mhuire Community School and Scoil Phadraig Boys' National School are located immediately to the south of the site. To the north of the site is an established crèche. Clane Rugby Club is located to the east of the site.

The lands to the east and west are curenlty undeveloped greenfields. Lands to the west are zoned as residential use, and lands to the east are zoned for education and community.

Figure 1.1 – Site Location

1.3 Project Description

The proposed development includes the construction of 77 residential properties as well as access roads, car parking bays and other ancillary utility services. Details of the proposed development are indicated on Malone O'Regan drawing SHB2-CLA-CS-MOR-DR-101.

1.4 Site Topography

The site has an overall area of 3.7 hectares. A topographical survey has been conducted which indicates that site generally slopes towards the existing ditchline. The existing ground level falls from a highest elevation of +80.50m at the northwest corner of the site to a lowest elevation of +75.82 in the southern point of the existing ditchline.

The intention is to raise the existing ground levels by approximately 2m. This will generally occur to the south of the site and the areas adjacent the existing ditchline. This will allow for gravity feed connection points to Collegewood Manor. Some minor re-grading of the surrounding ground levels within the site will be required in order to maintain acceptable gradients on internal roads and footpaths.

1.5 Consultation

In preparing this planning application Malone O'Regan consulted with the following personnel within the Local Authority and within Irish Water:

Mr David Creighton	Kildare County Council, Architectural Services
Mr Alan Dunney	Kildare County Council, Water Services
Mr John McGowan	Kildare County Council, Water Services
Mr George Willoughby	Kildare County Council, Roads Services
Mr Fionán Ginty	Irish Water

A Pre-Connection enquiry form was also submitted to Irish Water. A feedback form was returned from Irish Water which confirmed that the potable and wastewater connections are “feasible without infrastructure upgrade by Irish Water”.

1.6 References

Reference has been made to the following publications in the preparation of this report.

- Greater Dublin Regional Code of Practice for Drainage Works, Version 6.0.
- Greater Dublin Strategic Drainage Study.
- Kildare County Development Plan 2017-2023.
- Naas Town Development Plan 2011-2017.
- EPA Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels.
- Planning Systems and Flood Risk Management: Guidelines for Planning Authorities November 2009

2 SURFACE WATER DRAINAGE DESIGN

2.1 Proposed Layout

The proposed surface water drainage layout is indicated on drawing SHB2-CLA-CS-MOR-DR-102. It is proposed to discharge all surface water runoff generated on site into the existing surface water sewer at the northern boundary of the site, located on College Wood Manor Road.

Surface water runoff from the new road surfaces and the roofs of the new buildings will be collected by gullies and directed towards a new attenuation tank from where it will discharge at a controlled rate. The rate of discharge will be controlled using a Hydrobrake and will be limited to the QBAR value for the site. This will ensure that the rate of surface water discharge from the proposed site is not greater than that from the existing greenfield site.

2.2 Sustainable Drainage Systems

It is proposed to include the following SuDS measures as part of the development:

- As described in Section 2.1 above it is proposed to provide on-site attenuation in the form of a new underground attenuation system. The discharge form the underground attenuation system will be limited to 2 l/s/ha.
- It is proposed to discharge a small amount of water into the existing ditchline. The ditchline currently falls to the south of the site.

2.3 Attenuation / Runoff Calculations

<u>Development Area Details</u>

Total Area = 33,000 m^2 (3.3 hectares). Note: The embankment to the south of the site and Nancys' Lane are not included in the attenuation tank calculations. Nancy's Lane surface water will discharge as it does in its current capacity and the embankment will be outside of the final site boundary line.

Total Impermeable Area = 19,297 m^2

<u>Rainfall Data</u>

The rainfall data used was based on Met Eireann Rainfall Data for Naas. The rainfall data and drainage criteria employed is as follows:

M5 – 60 = 16mm (Max. rainfall in 1 hour for 5 year return period)

M5 - 2D = 57.1mm (Max. rainfall in 2 days for 5 year return period)

Ratio, r = 0.28 (M5 - 60/ M5 - 2D)

Standard Average Annual Rainfall (SAAR) = 838mm

When calculating the required size of attenuation tank using Micro Drainage, an additional 10% was added to the above rainfall intensities to account for the future effects of climate change.

Permissible Runoff

The regression equation recommended for use by the Greater Dublin Strategic Drainage Study 2005 calculates a value, QBARrural. This value is the mean annual flood flow from a rural catchment in m^3/s and is given by the equation,

QBARrural = 0.00108[Area^0.89] x [SAAR^1.17] x [Soil^2.17]

Where:

QBARrural – Mean annual flood flow from a rural catchment in m^3/s

Area – Area of the catchment in km^2

SAAR – Standard average rainfall in mm.

Soil – Soil index

When this equation is applied to the proposed development in Kilkenny the following value for QBARrural is obtained.

For 50 Ha area ~ QBARrural = $0.00108\ [0.5]^{0.89} \times [838]^{1.17} \times [0.3]^{2.17} = 0.113\ m^3/s$

For 3.3 Ha ~ QBARrural = $0.110\ m^3/s \times (3.58/50) = 0.0075\ m^3/s$

$= 7.9\ l/s$

This equates to 2.27 l/s per hectare.

In accordance with the Greater Dublin Strategic Drainage Study document, it is proposed to limit the outflow from the attenuation tank to 2 l/s per hectare, which is lower than the QBARrural value calculated above, using a Hydrobrake flow control device. A Class I bypass separator unit will be installed on the drainage pipework downstream of the attenuation tank prior to discharge.

Attenuation Design & Outflow Connection

Calculations for the design of the attenuation tank are provided in Appendix A. These calculations are based on the design parameters listed above. The attenuation tank has been sized to cater for a 1 in 100 year storm event.

The required attenuation volume has been calculated using industry-standard design package Micro Drainage. The calculations provided in Appendix A show that the required volume of attenuation storage for a 1 in 100 year storm event is **1099m^3**.

3 FOUL WATER DRAINAGE DESIGN

3.1 Proposed Layout

The proposed foul drainage layout is indicated on drawing SHB2-CLA-CS-MOR-DR-102. It is proposed to discharge all foul water from the site into the existing public foul sewer at the northern boundary of the site, located on College Wood Manor Road.

It is proposed to provide a network of gravity sewers within the site to collect foul waste from each property and discharge it towards the manhole described above.

3.2 Foul Discharge Calculations

The average and peak discharge rates were calculated using loading rates provided by Irish Water:

Dry Weather Flow (DWF) = 600 litres per dwelling
(Source: Irish Water Pre-Connection Enquiry Form)

Number of properties = 77.

Total DWF = 600 x 74 = 46,200 litres / day
= 0.535 l/s

Peak Discharge = 6 x DWF = 6 x 0.514
= 3.21 l/s

4 WATERMAINS

4.1 Proposed Layout

The proposed watermain layout is indicated on drawing SHB2-CLA-CS-MOR-DR-104. It is proposed to connect into the existing watermain located on College Wood Manor Road at the northern site boundary. This new connection allows for a new watermain to loop around the proposed development site.

A Pre-Connection enquiry form was submitted to Irish Water who, in return, provided a feedback form. This feedback form (Irish Water customer reference CUST17412) states that the proposed potable water connection would be “feasible without infrastructure upgrade by Irish Water”.

4.2 Water Demand Calculations

The average and peak water demand rates were calculated in accordance with the Irish Water Pre-Connection Enquiry Form which assumes a loading rate of 150 litres / person / day and an average occupancy ratio of 2.7 persons per dwelling. The average day, peak week demand is taken as 1.25 times the average daily domestic demand. The peak demand is taken to be 2.1 times the average day, peak week demand.

Number of properties = 77

Average Daily Domestic Demand = 150 x 74 x 2.7 = 31,185 litres / day
= 0.361 l/s

Average Day Peak Week Demand = 0.347 x 1.25 = 0.451 l/s

Peak Demand = 0.451 x 2.1
= 0.947 l/s

Normal Demand (assuming principal water usage over 8 hrs) = 0.434 x 24/8 = 1.35 l/s

APPENDIX A – ATTENUATION TANK CALCULATIONS

Summary of Results for 100 year Return Period (+10%)

Half Drain Time : 1626 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	0.300	0.300	0.0	5.3	5.3	307.5	O K
30 min Winter	0.413	0.413	0.0	5.3	5.3	424.0	O K
60 min Winter	0.533	0.533	0.0	5.3	5.3	547.2	O K
120 min Winter	0.662	0.662	0.0	5.3	5.3	680.1	O K
180 min Winter	0.742	0.742	0.0	5.4	5.4	761.5	O K
240 min Winter	0.799	0.799	0.0	5.6	5.6	820.3	O K
360 min Winter	0.879	0.879	0.0	5.8	5.8	902.0	O K
480 min Winter	0.932	0.932	0.0	6.0	6.0	957.2	O K
600 min Winter	0.971	0.971	0.0	6.1	6.1	996.7	O K
720 min Winter	0.999	0.999	0.0	6.2	6.2	1025.9	O K
960 min Winter	1.037	1.037	0.0	6.3	6.3	1064.1	O K
1440 min Winter	1.067	1.067	0.0	6.4	6.4	1095.0	O K
2160 min Winter	1.070	1.070	0.0	6.4	6.4	1098.5	O K
2880 min Winter	1.060	1.060	0.0	6.4	6.4	1088.5	O K
4320 min Winter	1.011	1.011	0.0	6.2	6.2	1037.8	O K
5760 min Winter	0.947	0.947	0.0	6.0	6.0	972.5	O K
7200 min Winter	0.881	0.881	0.0	5.8	5.8	904.3	O K
8640 min Winter	0.815	0.815	0.0	5.6	5.6	836.3	O K
10080 min Winter	0.750	0.750	0.0	5.4	5.4	769.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	77.150	0.0	277.1	26
30 min Winter	53.317	0.0	370.7	41
60 min Winter	34.650	0.0	541.3	70
120 min Winter	21.849	0.0	675.8	128
180 min Winter	16.543	0.0	756.6	186
240 min Winter	13.550	0.0	810.2	244
360 min Winter	10.200	0.0	861.8	360
480 min Winter	8.326	0.0	869.9	476
600 min Winter	7.109	0.0	871.2	592
720 min Winter	6.246	0.0	873.4	706
960 min Winter	5.091	0.0	879.6	932
1440 min Winter	3.814	0.0	884.3	1362
2160 min Winter	2.856	0.0	1621.9	1712
2880 min Winter	2.325	0.0	1696.5	2172
4320 min Winter	1.736	0.0	1614.1	3116
5760 min Winter	1.411	0.0	2188.7	4032
7200 min Winter	1.200	0.0	2325.8	4904
8640 min Winter	1.052	0.0	2441.3	5792
10080 min Winter	0.941	0.0	2536.5	6648

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.000	Shortest Storm (mins)	15
Ratio R	0.280	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+10

Time Area Diagram

Total Area (ha) 1.929

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1711.0	1711.0	1.200	0.0	1904.6
1.100	1711.0	1904.6			

Hydro-Brake® Outflow Control

Design Head (m) 1.100 Hydro-Brake® Type Md6 SW Only Invert Level (m) 0.000
Design Flow (l/s) 6.6 Diameter (mm) 104

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	6.8	3.000	10.7	7.000	16.3
0.200	5.2	1.400	7.3	3.500	11.5	7.500	16.9
0.300	5.1	1.600	7.8	4.000	12.3	8.000	17.5
0.400	4.9	1.800	8.3	4.500	13.1	8.500	18.0
0.500	4.9	2.000	8.7	5.000	13.8	9.000	18.5
0.600	5.0	2.200	9.2	5.500	14.5	9.500	19.0
0.800	5.6	2.400	9.6	6.000	15.1		
1.000	6.2	2.600	10.0	6.500	15.7		