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Glenveagh Homes Ltd.
Residential Development, Ennis, Co. Clare

Drainage Impact Assessment Report

Proposed Residential Development, Ennis, Co. Clare

Drainage Impact Assessment Report

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TOBIN Consulting Engineers

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1 INTRODUCTION

TOBIN Consulting Engineers were appointed to provide engineering consultancy services for a proposed residential development off Circular Road in Ennis, Co. Clare.

The site of the proposed development is currently a greenfield site. The site is adjacent to Ennis Golf Club, North/North-East of the site (See Figure 1). The west boundary is bounded by the N85 Ennis Bypass/Western Relief Road and the eastern boundary by the R474 Regional Road, Circular Road, into Ennis. There are 7no. private residential homes between the eastern boundary of the site and the R474 and a small, newly built residential estate along the southern boundary of the site
The development will consist of:

1. The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2. A 400.7m2 creche/childcare facility;
3. The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4. The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;
5. All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. Clare.

An Environmental Impact Assessment Report and a Natura Impact Statement has been prepared in respect of the proposed development.

Figure 1 - Site Location (Google Maps)

Figure 2 – Proposed Development Layout

This report has been prepared to provide details of the storm water elements associated with the proposed residential development.

This report deals with the following aspects associated with this development:

- Existing Site and Hydrological Features
- Site Investigation Testing
- Soil Type Classification
- Storm Water Drainage Design
- Sustainable urban Drainage Systems (SuDS)
- Flood Risk Assessment and Exceedance Flows
- SuDS Maintenance

2 SURFACE WATER DESIGN

2.1 Principle Design Considerations

During the design of the storm water drainage for the proposed site, including SuDS, the following key documents / standards were taken into consideration.

- Clare County Development Plan, 2017 – 2023
- Ennis Municipal District Plan (Volume 3a)
- Clare County Development Plan, 2017 – 2023, Strategic Flood Risk Assessment (SFRA)
- Greater Dublin Strategic Drainage Study (GDSDS)
- CIRIA report C753 The SuDS Manual-v6

2.2 Storm Water Drainage System Overview

The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces within the proposed development including roadways, roofs, parking areas etc. The development has been split into 7No. catchment areas.

All storm water generated by the catchment areas will flow by gravity and discharge via an Oil/Petrol Interceptor to 6No. soakaway units and 1No. Infiltration Basin, all strategically located. The storm water in the soakaways will infiltrate into the ground surrounding. The outfall from the infiltration basin will discharge via a hydro-brake manhole to a bio-swale running along the corridor adjacent to the N85 route. The storm water will then discharge to the Claureen River.

The storm sewer network was designed using Innovyze MicroDrainage modelling software. Outputs from the storm sewer design can be found in Appendix B of the Civil Works Design Report. The proposed storm sewer network is presented graphically on drawing no. 11269-2101, 2102, 2103 & 2104.

The maximum storm water pipe diameter is to be 450mm and the minimum proposed pipe diameter is 225mm, with a maximum and minimum gradient of 1/27 and 1/240 respectively. All flow velocities within the network fall within the limits of 0.75 and 3m/sec as set out in "Recommendations for Site Development Works" as published by the Department of Environment. The storm water network and infiltration basin are designed to accommodate the 100-year return period plus an additional 20% to account for the effects of climate change

2.3 Introduction

It is proposed to use a Sustainable Urban Drainage Systems, (SuDS) approach to storm water management throughout the site. This overall strategy aims to provide an effective system to mitigate the adverse effect of urban storm water runoff on the environment by reducing runoff rates, volumes and frequency, and reducing pollutant concentrations in surface water and emulate the greenfield runoff rate. The proposed SuDS features in the development are permeable paving on driveways, cellular underground soakaways, petrol interceptors, a hydro-brake flow control, an infiltration basin and bio-swale.

The storm water drainage design has been undertaken using Innovyze MicroDrainage modelling software. The design inputs, results and outputs from the analysis are shown in Appendix B of this report. The analysis considered the 100-year return period plus an additional 20% to account for the effects of climate change.

The proposed residential development has been divided into 7 No. catchment areas. 6 of the catchment areas will discharge to soakaways and percolate to the ground. Each soakaway has been strategically located to cater best for the associated catchment area. The 7th catchment area, catering for the northern section of the site, will discharge via gravity to a proposed infiltration basin, where it will both infiltrate to the ground and discharge to a bio-swale at a controlled rate. The bio-swale will in-turn discharge to the Claureen River.

Each soakaway network will also have a 150mm overflow in the case of an emergency. These are strategically located at points to allow the network to back up to a certain level and is connected to the closest network downstream to it.

There is an outfall proposed from the infiltration basin at invert level. Water from the basin will both infiltrate to the ground and flow from this outfall to a hydro brake manhole located alongside it. From here the water will discharge, at a controlled rate, to a bio-swale which runs along the corridor adjacent to the N85 road before discharging to the Claureen River located approximately 265m North of the basin.

All storm water collected in the proposed storm water sewer networks will flow through Oil/Petrol Interceptors and silt traps prior to discharging to the soakaways and infiltration basin which will serve to prevent hydrocarbons and debris entering the ground. The location of the soakaways and infiltration basin are shown graphically on drawing no.s 11269-2101 to 2104. A typical petrol interceptor brochure can be found in Appendix C of the Civil Works Design Report.

2.4 Soakaway (BRE 365)

Storm water from roof run-off and impermeable areas will discharge to 6No. soakaways on the site. The storm water discharges to groundwater and will be off cellular storage for 95% porosity. The soakaways are designed to hold water for the largest storage required over a 48-hour storm period with rainfall depths taken for the 100-year return period + 20% for climate change for sliding durations obtained from Met Eireann.

Soakaway tests were carried out during a site investigation in accordance with BRE Digest 365:2016 to establish the achievable infiltration rates on site. Conventional infiltration rates were used in the MicroDrainage modelling calculations to determine suitable soakaway volumes and invert levels. The infiltration rates were applied to the sides of the soakaways only, omitting the base. Results of the calculations and long sections can be found in Appendix B of the Civil Works Design Report. A Typical Attenuation/Soakaway Unit & Cross Section Detail is shown on drawing no. 11269-2125.

2.5 Kingspan Klargester Bypass Separator

It is proposed to install a Bypass Petrol Interceptor upstream of the connection into each of the proposed soakaways. Locations of the interceptors can be seen graphically on drawing no.s 11269-2101 to 2104. Storm water entering each soakaway will include run-off from the roadways and parking areas throughout the site and therefore may have hydrocarbons within their flow. These hydrocarbon pollutants require removal and are not to be discharged back into the environment. The separator has been sized to cater for roads, footways and driveway areas of each catchment area.

From the selection tables in the separator product brochure, attached in Appendix C of the Civil Works Design Report, and using the drainage area per square meter of each catchment, the following would be required, (or similar products approved):

- Network A – NSBP006
- Network B – NSBP003
- Network C – NSBP003
- Network D – NSBE010
- Network E – NSBE010
- Network F – NSBP006
- Network G – NSPB004

2.6 Infiltration Basin

The storm water drainage strategy proposes to provide an open infiltration basin located towards the northernmost area of the development as can be seen in drawing no. 11269-2103 & 2104 and cross sections on drawing no. 11269-2124.

Storm water is collected from the surrounding catchment area by road gullies and flows via the gravity storm sewer network to the infiltration basin, which lies at the lowest elevation within the development, thus making it ideally located. Prior to discharging to the basin, the storm water will flow through a petrol interceptor and then through a layer of clean crushed stone as per typical detail in drawing no. 11269-2131.

The infiltration basin has been designed to cater for the catchment area and the overflows from each of the soakaways if needed. The basin is relatively shallow at approximately 1.5m deep, designed with 4No. step formations at a 1/4 slope. Which can be seen in the cross-section drawing.

The infiltration basin provides several forms of treatment to the collected water within it. As a result of the size of the basin, much of the bacteria and pollutants that enter the basin settle over time prior to reaching the outfall pipe. Furthermore, infiltration basins can support vegetation and plant life, which provide further pollutant treatment and removal. The plants absorb dissolved pollutants and convert them into less harmful materials. Microorganisms can establish themselves in these basins too which can further treat and breakdown pollutants within the basin. Common pollutants that can be removed or reduced by these processes include bacteria, nitrogen, phosphorus, total suspended solids, oil and particulate matter from vehicles.

Energy from inflowing storm water as it enters the basin is absorbed by a proposed flow spreader, in this case the clean crushed stone and/or any water already in the basin, thus inflowing water does not cause erosion of materials at the base of the basin. The Infiltration basin also provides water quantity control as it retains the runoff and release it into watercourses at a pre-development flow rate.

Inspection of inlet and outlet pipes of infiltration basin should be performed quarterly to ensure there is no clogging, which could result in a build-up of water within the basin. Furthermore, the basin should be inspected for nuisance vegetation quarterly for the first 2-3 years, which should be removed if discovered to maintain a healthy treatment system and establish the marsh. Aquatic vegetation within the basin should be cut back and thinned when necessary.

The basin will need to be checked for erosion, subsidence and sediment accumulation, which will be required to be removed once every 5 to 7 years or when half of the forebay depth is filled with sediment.

The size of the infiltration basin was calculated using Innovyze MicroDrainage modelling software and Site 3D modelling software.

2.7 Storm Water Outfall

Storm water from the infiltration basin shall discharge into the Claureen River via a hydro brake manhole, which will limit the amount of water discharging to the river, and an open channel bioswale. The bioswale, approximately 190m in length, will run along the corridor of the N85 road.

The inlet to the Basin and the swale consists of a perforated outfall pipe wrapped in a geotextile membrane. The pipework will stop a minimum of 2 meters short of the outfall where the storm water will flow through a layer of 100 to 150mm clean crushed stone.

The amount of water discharged from the hydro brake manhole will be determined by using the allowable Greenfield Runoff rate for the developable area of the site – 8.9Ha. At 2 litres per second per hectare this equates to 17.8l/s maximum discharge rate.

The water will flow from the outfall pipe through a layer of clean crushed stone which will prevent debris from entering the bioswale and the river. The water will flow through the stone layer and into a bioswale which will provide further infiltration and storage, from which it will directly enter the Claureen River.

A letter of consent has been obtained from Clare County Council for the laying of the overflow storm sewer along the N85 verge and discharging of the overflow storm water to the Claureen River. Refer to Appendix E.

It is to be noted that all on site storm water storage facilities have been sized to cater for all storm water generated within the site boundary of the development. The existing attenuation areas that are being used for the N85 road drainage are stand alone and separate to the proposed development drainage network. There are no links in the proposed storm water network to the existing N85 drainage attenuation tanks and therefore will not impact on the existing N85 drainage system.

3 SITE INVESTIGATION

Ground Investigations for the proposed development were carried out by GII in July 2021 and included the following scope of work:

- Visit project site to observe existing conditions
- 16 No. Trial Pits to a maximum depth of 3.2m bgl
- 3 No. Soakaways to determine a soil infiltration value to BRE digest 365
- 63 No. Dynamic Probes to determine soil strength/density characteristics
- 4 No. Cable Percussion boreholes to a maximum depth of 1.0m bgl
- 4 No. Rotary Core Boreholes to a maximum depth of 6.90m bgl
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

Preliminary Ground Investigations, are summarised as follows:

- Topsoil
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m below ground level (m bgl).

Cohesive Deposits: Cohesive deposits were encountered beneath the topsoil and were described typically as brown sandy gravelly SILT or CLAY with occasional cobbles and boulders. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits was generally Firm below the topsoil but occasionally was soft to firm. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs. Three boreholes were undertaken as part of the site investigation works and generally observed gravelly SILT from 3.0m (trial pit target depth) to 8.8m below existing ground level. There are no peat soils on site.

Weathered Bedrock: In some of the exploratory holes weathered rock was encountered which was diggable with the large excavator to a depth of up to 1.0m below the top of the stratum in one of the pits. This material was recovered typically as angular gravel and cobbles. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

Bedrock: The rotary core boreholes recovered Strong massive grey fine to medium grained. This is typical of the Aillwee Member, which is noted on the geological underlying the proposed site. The depth to rock varies from 1.06m bgl in RC04 to a maximum of 2.6m bgl in RC03. The total core recovery is good, typically 100%. The SCR and RQD both mostly ok across the site due to rock type massive. Ground water was noted at approximately 4 metres in one of the boreholes and in a small number of trial pits generally below 1 metre.

Infiltration tests were carried out at eight locations. Tests results indicated infiltration rates (f) ranged from 0.00238 m/min. There is a variation in soil type across the site with low percolation noted in clay-based soils and test failures where high water table is present. Infiltration tests in the granular soils indicate that it should be suitable for dispersion of surface water

4 EXISTING SITE HYDROLOGY

The site is a gently undulating site comprised of open field and encroaching scrub from overgrown/rank hedgerowsThree streams are located in the surrounding area see Figure 8-2:

- Fergus River, which is located 2km northeast and east of the Project location.
- Claureen River, which is a tributary of the Fergus River 0.4km west of the Project location.

Surface water drainage comprises the Claureen River which runs to the northwest of the northern development site boundary, and which generally flows in a NE direction. The river is also known as the Inch River (EPA name, 2022) and converges with the river Fergus farther to the NE which in turn ultimately discharges into the Fergus and Shannon Estuary.

Regional and local hydrology is intrinsically connected to the hydrogeological setting within the greater development area.

According to the EPA (2021) on-line mapping, the proposed development site lies within the Shannon Estuary North Catchment (Hydrometric Area No. 27) and the River Fergus sub-catchment – Fergus_060, See Figure 8-1. While the greater area contains several karst features, there are no known karst features on site.

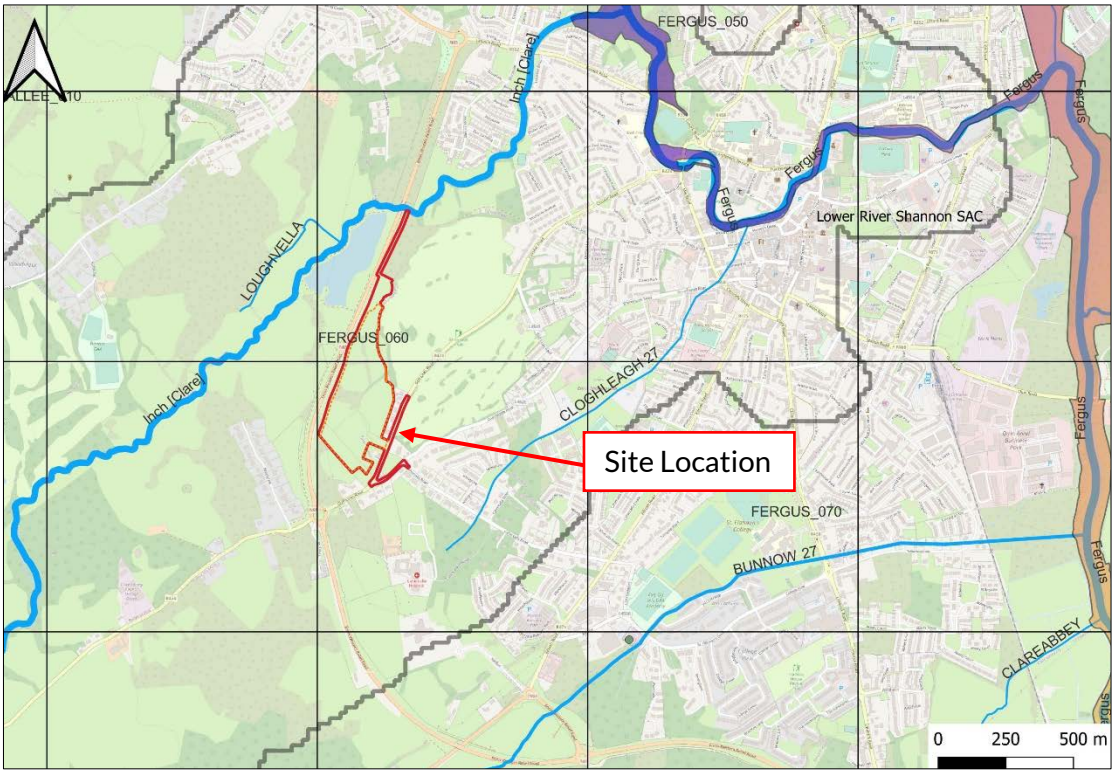

Figure 3 Surface Water Features and Sub-Catchments

The Claureen River is the closest surface water body to the proposed development. Prior to development, the Ordnance Survey Ireland (OSI) six-inch to 1-mile scale field sheets indicate that there were no natural surface water streams within the site.

5 FLOODING AND EXCEEDANCE FLOWS

TOBIN Consulting Engineers undertook a Flood Risk Assessment (FRA) for the proposed residential development at Drumbiggle in Ennis, Co. Clare. The greenfield site is located approximately 2km southwest of the town centre, alongside Ennis Golf Club and the N85, adjacent to the River Claureen (also known as the River Inch).

The PSFRM Guidelines classify residential development as “highly vulnerable” in terms of its sensitivity to flooding. Such developments should be constructed in Flood Zone C, where there is less than a 0.1% Annual Exceedance Probability (AEP) of fluvial, pluvial, groundwater and coastal flooding.

Based on the results of the Flood Risk Assessment by TOBIN, the Clare Strategic Flood Risk Assessment, and OPW modelling (PFRA, CFRAM) the developable area is located outside the predicted flood extents of the Claureen River. The risk of flooding (fluvial, pluvial, groundwater and coastal flooding) to the proposed development is considered minimal, and as such the development as it is currently proposed is considered ‘appropriate’ in line with the PSFRM Guidelines.

6 SUDS MAINTENANCE

6.1 Oil/Petrol Interceptor

Petrol Interceptor requires periodic inspection and removal of the separated oils and petrol residues to ensure it continues to operate effectively. Safe access must be provided for the provision of maintenance to the petrol interceptor.

6.2 Soakaway

Soakways are designed to allow storm water to permeate through to the ground, periodic inspections are required to ensure that the water is draining freely through the system and that it has not been impacted by silts and other debris which may reduce the permeability of the soakaway. Any build up of silts should be removed during dry weather conditions.

6.3 Infiltration Basin

Infiltration Basins can also be affected by silts and debris if not maintained. This reduces the permeability of the basin and could cause overflow in storm conditions if not properly maintained along with the inflow and discharge pipes which must be inspected to ensure there are no obstructions.

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