SOCIAL HOUSING DEVELOPMENT

RATHELLEN, FINISKLIN, CO. SLIGO

Drainage and Watermain Design Report

SHB3-FIN-CS-RPS-RP-001
Drainage and Watermain Planning
Design Report
P02

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Prepared by**:**

RPS **Sligo County Council**

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1 INTRODUCTION

RPS are the appointed Civil and Structural Engineering advisors for the proposed residential development at Rathellen, Finisklin, Co. Sligo. This project will deliver 39 houses and 24 apartments to Sligo County Council Planning Authority.

New watermain, storm water and foul water networks will be constructed to service the proposed development. The storm water and foul water networks will outfall to Local Authority (LA) and Irish Water (IW) systems within the site. These existing systems are currently crossing the site and will be diverted to accommodate the works. The watermain, storm water and foul water drainage proposals are shown in **Appendix A**. This report addresses the following design streams:

- Foul flows which are dealt with in Section 2 of the report,
- Surface water flows, and infiltration are dealt with in Section 3 of the report, and
- Water supply to the site which is dealt with in Section 4 of the report.

This report should be read in conjunction with the following RPS drawings, being submitted with this planning application:

- SHB3-FIN-CS-RPS-DR- DA001 - Watermain Layout
- SHB3-FIN-CS-RPS-DR- DA002 - Foul & Storm Water Network Layout

1.1 Site Characteristics

The site is located in Far Finisklin, c 3 km from the centre of Sligo, close to Sligo Port. The adjoining industrial estate and Sligo town are centres of employment. The wider area is well served by schools.

The site area and redline boundary is 2.46 ha. The site is bounded to the north by Far Finisklin road and Sea road to the west. The development site is in an irregular shape and contains an existing nineteenth century period house, Rathellen House, which is derelict, and a number of out-buildings.

The sites highest point is at Rathellen house, from which the site falls gently away from the house to the south eastern boundary. The ground falls gently to the north of the site to the existing access road.

2 FOUL FLOWS

2.1 Site Background

2.1.1 Existing foul water services

A topographical and underground utility survey was completed by NCW Surveys in May 2021. The survey provides information on service locations, indicative depth, and the nature (type) of the underground service/utility. This information is used to assist with preparing the drainage design for the proposed development.

2.2 Foul Sewer Design Procedure

The proposed foul sewerage system was designed using the Wallingford Tables and Microdrainage design software. Wastewater loadings were based on EPA Guidance document, 'Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'.

Drainage calculations submitted in **Appendix B** have been generated by 'Micro Drainage' flow modelling software, and the 'Hydraulic Design for Gravity Sewers' method to Irish Water Code of Practice for Wastewater Infrastructure. Gradients should be selected so that self-cleansing velocities can be maintained under normal operating conditions. The range of flow velocity within the sewers should be between 0.75m/s at low flow and 3m/s, when flowing full.

The proposed foul drainage network will be constructed in accordance with Irish Water Code of Practice for Wastewater Infrastructure, The Building Regulations 'Part H' & the Regional Code of Practice for Drainage Works. The sewers will be compliant with the requirements of the Irish Water Code or Practice for Wastewater Infrastructure and will be from 150mm to 225mm in diameter. Foul sewers within the building plots may be as small as 100mm dia. In accordance with TGH H – Drainage specifications and with Irish Water Code of Practice.

Foul water will outfall to the east of the proposed development to an existing IW manhole on the Sea road. The proposed foul sewerage system will outfall to IW foul sewerage system via existing manhole, See drawing **SHB3-FIN-CS-RPS-DR- DA002 in Appendix A.**

2.3 Foul Services design parameters

The following parameters were used for the basis of design (refer to **Table 2-1**).

Table 2-1 Design Parameters

Parameters	Values	Reference
Flow Rates	Varies	As per EPA Wastewater Treatment Manual
Peak Flow	6.0 x Dry Weather Flow (DWF) (based on a 10hr working day)	Irish Water Guidelines
Min Velocity	0.75m/s at one-third design flow. Alternatively, as set out in Section B4 of Sewers for adoption.	Wastewater Code of Practice & Sewers for Adoption
Pipe Roughness	1.50mm	(Colebrook/White)
Pipe Cover	1.2m minimum without concrete encasement– light trafficked areas 0.6m minimum without concrete encasement – gardens	Site Development Works for Housing Areas

2.4 Pipe and manhole numbering

The manhole numbers define the structure of the network. The foul water manholes are labelled such that labels in the direction of flow are typically in increasing order. F01, F02, etc. is used for foul sewers located inside the site boundary of this development. Existing manholes will be labelled EF01 (refer to Drawing **SHB3-FIN-CS-RPS-DR- DA002 in Appendix A**).

2.5 Foul loadings from proposed development

Foul loadings from the proposed development are shown below. The maximum foul flow from the proposed development has been calculated as 1.95 litres/sec. This value is based on a peak factor of 6:

- 446l/day per residential unit (based on 2.7 persons per unit x 150l/person/day, + a 10% increase factor).
- 446l/day/unit x 63 units = 28,098 l/day = 28.1 m3/day;
- 0.325 l/sec Average flow (1 DWF);
- 1.95 l/sec Peak Flow (6 DWF – Population between 0 and 750)

The minimum capacity of any sewer in the proposed design is **29.7 litres/sec** as such the design can cater for the proposed developments flow. For detailed output from the foul sewer design refer to **Appendix B.**

2.6 Foul Water Network Connection

RPS completed a Pre-connection enquiry form and submitted this to Irish Water on the 23rd March 2021. RPS received feedback from Irish Water on the 12th May 2021 via a standard confirmation of feasibility, attached in **Appendix E.**

The pre connection agreement was based on a gravity connection to the existing foul sewer on the Sea Road. Irish Waters response noted that the proposed connection to the Irish Water wastewater network can be facilitated subject to the upgrade of the existing 150mm dia. foul sewer located on the Sea road. The pipe will be upgraded from a 150mm dia pipe to a 225mm dia pipe and will outfall to the existing foul water network on the Finisklin Road to the south of the development. The upgraded section is shown on **SHB3-FIN-CS-RPS-DR- DA002 in Appendix A.**

3 SURFACE WATER FLOWS

3.1 Site Background

3.1.1 Existing Storm Water Services

The existing site is a greenfield site, as such there is no existing surface water network within the site area, with rainfall discharging directly to the ground. There are no watercourses in the vicinity of the site that can be reached by gravity, due to the site topography.

In light of the fact that there isn't a suitably deep outfall manhole and to comply with criteria 2 of the Greater Dublin Strategic Drainage Study (GDSDS), RPS will store and discharge water on site to a suitably designed infiltration system.

The site is approximately 2.46ha and has a total impermeable area of 0.532ha which is to be drained to the new proposed surface water systems. Storm flows will infiltrate to ground via an appropriately designed infiltration system.

All proposed developments must ensure that SUDS are incorporated into the development. SUDS requires that post development run-off rates be maintained at the equivalent to, or lower than, the pre-development run-off levels. Thus, the development must be able to retain, within its boundaries, storm water volumes from extreme storm events up to and including a design for a 1 in 100 year storm event, more commonly expressed as a 1.0% AEP (Annual Exceedance Probability), while also allowing for climate change factors (+CC).

Any new development must have physical capacity to retain storm water volumes as directed under the GDSDS and, if necessary, release this attenuated surface water runoff before it enters a natural watercourse or into a public sewer, which ultimately discharges to a water body. This is to ensure the highest possible standard of storm water quality.

The new surface water sewerage system was designed using Innovyze MicroDrainage software which is based on the Wallingford Tables and the Modified Rational Method of storm flow modelling. The rainfall and climate data used in all designs was extracted directly from maps built into the program. The M5-60, R, SAAR, soil infiltration values etc were all derived for the site. Such data is given on the appropriate appendices of this report of MicroDrainage outputs for surface water networks.

Ground investigation infiltration tests were undertaken by Priority Geotechnical to assess the infiltration rate on site. RPS have used an infiltration figure of 135mm per hour for design purposes. This figure was found through infiltration testing on the subject site**.**

The design shows that the proposed surface water drainage system for this development can use soakaways within the open spaces to drain the site for storm events up to and including a 1 in 100 year event (including an allowance of 20% increase in rainfall intensity for climate change).

3.2 Site Specific SUDS Measures

Sustainable Drainage Systems (SuDS) were considered for the site, in line with recommendations of Greater Dublin Strategic Drainage Strategy (GDSDS). SuDS are a method of replicating the natural characteristics of rainfall runoff from any site. The various types of SuDS considered are outlined below.

- Infiltration – Soaking water into the ground. This is the most desirable solution to runoff management as it restores the natural hydrological process. Site Investigation confirms infiltration rates in this area are suitable for infiltration of a 100 year, 6 hour duration storm event within the site. This was determined by site investigation works to carried out by Priority Geotechnical Ltd. Infiltration to ground will also be accommodated to the rear of the proposed dwellings using a soakaway system design to meet the requirements of BRE 365.

- Conveyance – the transfer of surface water runoff from one place to another. Controlled conveyance can provide links between various SuDS components. Conveyance is implemented within this development through the use of landscaped swales. The swales will be placed where appropriate to drain roads next to public open spaces. The swale will be broad and shallow and covered in suitable vegetation to slow water, facilitating sedimentation, filtration through root zones and soil matrix, evapotranspiration and infiltrating into the underlying soil. Excess flows will be conveyed into the stormwater system in periods of high rainfall.

- Detention/Attenuation – Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release, or use. In this case, infiltration will be utilised on site. This is achieved using a Geo-cellular storage attenuation system with water infiltrating to ground.

3.3 Design Parameters

The following parameters were used for the basis of design in the Innovyze MicroDrainage Module.

Table 3-1 Design Parameters Road Runoff Surface Network

Parameters	Values	Reference
Return Period	30 Year	Wallingford Procedure
M5-60	**17.4**	Wallingford Procedure
Ratio ‘R’	**0.300**	Wallingford Procedure
Max Rainfall	Paved Areas 50mm/hr Roof Areas 75mm/hr	Wallingford Procedure
Global Time Entry	5 minutes	Wallingford Procedure
Minimum Velocity	0.75m/s	Site Development Works for Housing Areas
Run-Off Co-efficient	Roof Areas 1.0 Paved Areas 0.75	BS EN 16941-1
Pipe Roughness	0.6mm Concrete / 0.15mm uPVC	Colebrook/White
Pipe Cover	As per Irish Water Wastewater Code of Practice	Document IW-CDS-5030-03, Irish Water
Climate Change	20%	Transport Infrastructure Ireland Drainage Systems for National Roads - DN-DNG-03022

3.3.1 Proposed Storm Water Services

Storm water generated from new hard landscaping and roofs on site will be directed to an onsite infiltration tank. Prior to entering the infiltration system, the proposed surface water collection networks will outfall to a silt trap manhole and hydrocarbon interceptor. Terraced housing and apartment buildings will incorporate appropriately sized soakaways to rear gardens to capture storm water runoff. The soakaways are to be designed to BRE365 specifications and will infiltrate to ground.

Surface water from trafficked areas will be intercepted by a suitable petrol interceptor prior to entering the infiltration system. In some instances, surface water from trafficked areas will enter landscaped swales.

The proposed storm water sewer system is shown on Drawings **SHB3-FIN-CS-RPS-DR- DA002.** For detailed outputs from the surface water network design, including network details and 100-year storm event simulation results, refer to **Appendix B.**

3.4 Pipe and Manhole Numbering

The manhole numbers define the structure of the network. The surface manholes are labelled such that labels in the direction of flow are typically in increasing order. S01, S02, etc. is used for surface water sewers. Existing manholes will be labelled ES01. The manholes are labelled such that labels in the direction of flow are typically in increasing order. (refer to drawing **SHB3-FIN-CS-RPS-DR- DA002 in Appendix A**).

3.5 Hydrocarbon / Oil Interceptor

A hydrocarbon interceptor will be provided prior to the infiltration area. In accordance with the requirements of BS EN 858, 4.1 (b) '(run-off) from impervious areas, e.g., car parks, roads, factory yards areas;' the size of the separator will depend on the design, rainfall intensity and the catchment area draining to the separator.

A Class1 Bypass hydrocarbon Interceptor is proposed prior to surface water entering the infiltration area. It is recommended to use a Kingspan Klargester or equivalent approved surrounded in 300 mm mass concrete. The location of the interceptor is outlined in drawing **SHB3-FIN-CS-RPS-DR- DA002, in Appendix A.**

The maximum rainwater flow rate Q_r in l/sec shall be calculated using the equation below in accordance with EN 752-4:

$$Q_r = \Psi.i.A$$

Where,

- i is the rainfall intensity, in litres /sec / hectare.
- A is the area receiving rainfall, measured horizontally, in ha;
- Ψ is a dimensionless coefficient (usually taken as one)

Pollution prevention guidelines (PPG 3) use rainfall intensity equal to 6.5mm/hr which corresponds to the following formula for a bypass separator:

$$NSB = 0.0018 \times A$$

Where,

- NSB: Nominal Size of Bypass separator
- A: Catchment Area in m^2

The impermeable area draining to the proposed bypass separators is approximately 5320m^2 which includes all impermeable surfaces on the site.

NSB required:

- 0.0018 x 5320 = 9.576 l/s NSBE015 is suitable

Details of the sizing of the proposed interceptor for NSBE015 is provided in **Appendix D**. The maximum storm water flow that the bypass facility can cater for is 150 l/s. The maximum design flows in the storm system is 115.5 l/s for a 1 in 30yr storm event so the bypass facility has sufficient capacity to cater for this flow.

3.6 Infiltration Design

RPS carried out further investigation to assess the possibility for localised infiltration within the site. RPS assessed the groundwater vulnerability of the area complying with TII publication (Road Drainage and the Water Environment – DN-DNG-03065) This document outlines the groundwater protection response matrix for use of permeable drains in road schemes, used in this instance to assess the appropriateness of infiltration within the site.

The Groundwater protection Response Matrix requires the identification of groundwater vulnerability and groundwater resources. GSI data indicates that the area is underlain by a Locally important bedrock aquifer (Figure 3.2 - Bedrock which is Moderately Productive only in Local Zones (Ll)) overlain by well-drained soil with a medium subsoil permeability (Figure 3.3 & 3.4). Mapping also shows a high groundwater vulnerability (Figure 3.5).

From the vulnerability rating and aquifer classifications table below (Groundwater Protection Response Matrix) of the TII document shows a resource protection rating of R2(2) for the site. This rating stipulates that certain conditions must be met to allow permeable paving to be incorporated into the design. These are shown in extracts below.

Table 3-2 - Extract from TII Publication: Road Drainage and the Water Environment – DN-DNG-03065

Vulnerability rating	Source protection area	Resource protection area (aquifer category)							
		Regionally Important Aquifer			Locally Important Aquifer			Poor aquifer	
		Rk*	Rf	Rg	Lg	Lm	Ll	Pl	Pu
Extreme: Rock near Surface or karst (X)	R4	R4	R4	R3(2)	R3(2)	R3(1)	R3(1)	R3(1)	R3(1)
Extreme (E)	R4	R2 (3)	R2 (2)	R3(2)	R3(2)	R2 (2)	R2 (2)	R2 (1)	R2 (1)
High (H)	R3(2)	R2 (2)	R2 (2)	R2(2)	R2(2)	R2 (2)	R2 (2)	R2 (1)	R2 (1)
Moderate (M)	R3(1)	R2 (1)	R2 (1)			R2 (1)	R2 (1)	R1	R1
Low (L)	R3(1)	R1	R1			R1	R1	R1	R1

* A small proportion of the country (~0.6%) is underlain by locally important karstic aquifers (Lk); in these areas, the groundwater protection responses for the Rk groundwater protection zone shall apply.

A rating of R2(2) requires the design to meet the minimum standard of R2(1) and of additional design standards R2(2). As the subsoil is classified as a sandy gravelly CLAY and is underlain by Limestone bedrock, (which is the stratum description provided in the Site Investigation Information provided), Table R2(2) of the TII document requires that a minimum of 2m unsaturated subsoil is required beneath the invert level of the drainage system.

R1	Acceptable subject to minimum design standards in the NRA DMRB and Notes 1 and 2.
R2	
R2(1)	Acceptable subject to minimum design standards in the NRA DMRB and to meeting the following requirements : 1. There is a consistent minimum thickness of 1 m unsaturated subsoil, or 2 m in areas of karstified rock (Rk & Lk), beneath the invert level of the drainage system (Note 1). 2. During all stages of design particular attention must be paid to the presence of karst features and additional assessments undertaken if required. If karst features are identified response R2 (3) must be applied as a minimum. 3. During all stages of design particular attention must be paid to receptors (such as; public wells, group schemes, industrial water supply sources and springs) and additional assessments undertaken if required.

R2(2)	Acceptable subject to minimum design standards in the NRA DMRB, meeting requirements 1, 2 and 3 of above and the following additional requirements:
	4. Where the subsoil is classed using BS5930 as; SAND, GRAVEL or SILT (in circumstances where the clay content is <10%) AND/OR is underlain by limestone bedrock, there is a consistent minimum thickness of 2 m unsaturated subsoil beneath the invert level of the drainage system. OR There is a minimum consistent unsaturated thickness 1m of "appropriate material" (Note 3) either natural or man-made beneath the invert level of the point of discharge. 5. Where a gravel aquifer is present, a consistent minimum thickness of 3 m unsaturated subsoil beneath the invert level of the drainage system must be present.

Figure 3-1 - Extract from TII Document DN-DNG-03065

It is the conclusion of the investigation that infiltration to ground is suitable in this location if the minimum requirements as set out above are met. The infiltration rate determined on site at the soakaway location was 0.135m/hr, which is sufficient to allow for a soakaway design.

The infiltration system is designed to cater for the 1 in 100-year return period storms with an additional allowance of 20% for climate change, this in accordance with the GDSDS. Using a proprietary infiltration system, with a nominal void ratio of 95%. The typical layout is shown in Drawing **SHB3-FIN-CS-RPS-DR-**

DA002 in Appendix A. A plan area of 275m^2 will be required to accommodate the infiltration area provided a storage capacity of 206.5m^3.

The maintenance of the infiltration system should be carried out as per the manufacturer's recommendations.

Infiltration design calculations can be found in **Appendix C.**

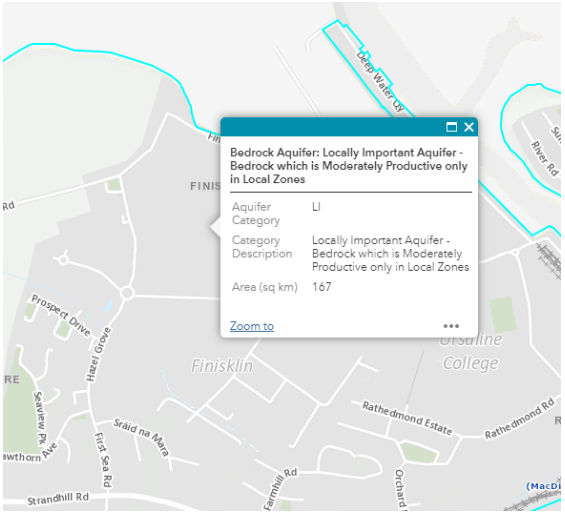


Figure 3-2 Aquifer Classification - Bedrock Aquifer

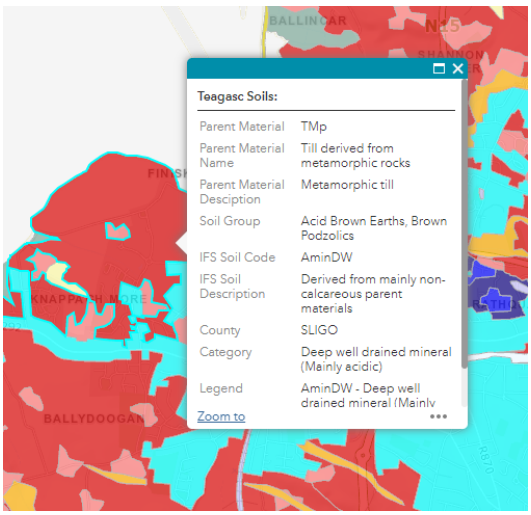


Figure 3-3 - GSI Soil Classification

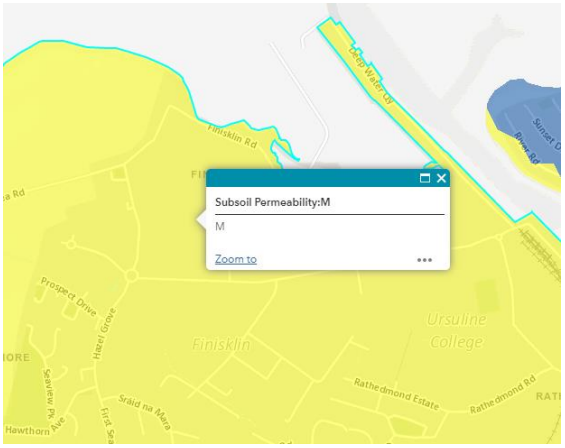


Figure 3-4 Subsoil Permeability

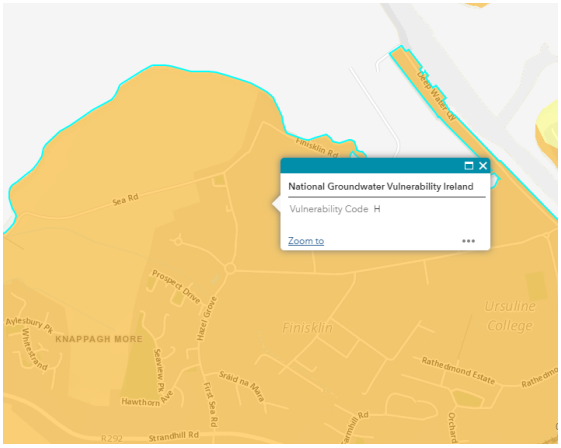
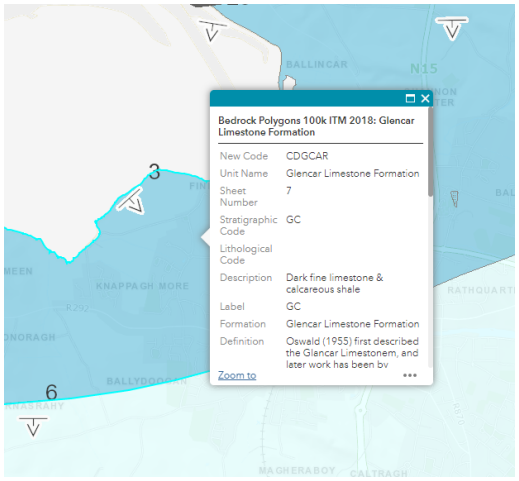


Figure 3-5 Groundwater vulnerability

Figure 3-6 Bedrock Formation



3.7 Surface Water Impact Assessment

The management of surface water for the proposed development has been designed to comply with the policies and guidelines outlined in the GDSDS and with the requirements of Sligo County Council. The guidelines require the following 4 main criteria to be provided by the design:

3.7.1 Criterion 1: River Water Quality Protection:

Interception storage of at least 5mm, and preferably 10mm, of rainfall where runoff to the receiving water can be prevented. It is proposed that the overall drainage system, serving this development, will contain a range of surface water treatment methods such as:

- Car parking spaces on site to incorporate a permeable paving system;
- Interception storage and treatment within the site
- All road gullies to be trapped
- Intensive landscaping where possible
- Fuel separator and silt trap prior to entering infiltration area.

3.7.2 Criterion 2: River Regime Protection

Criterion 2 is satisfied by attenuating run-off within an infiltration tank. Appendix C gives MicroDrainage Source Control simulation output showing the soakaway storage volumes required for the 100 year event (including an allowance of 20% increase in rainfall intensity for climate change) with the soakage rate from the tank being controlled by the infiltration rate found for the site. The infiltration tank will have a storage volume of 206.5m^3. The infiltration system is designed to meet the requirements of the GDSDS.

3.7.3 Criterion 3: Level of Service (flooding) for the site.

There are four sub-criteria for the required level of service, for a new development; as set out in the GDSDS Volume 2, Section 6.3.4 (Table 6.3):

- 3.1 - No flooding on site except where planned (30-year high intensity rainfall event);
- 3.2 - No internal property flooding (100-year high intensity rainfall event);
- 3.3 - No internal property flooding (100-year river event and critical duration for site) and;
- 3.4 - No flood routing off site except where specifically planned. (100-year high intensity rainfall event).

3.7.3.1 Sub-Criteria 3.1

The surface water drainage system serving the proposed development has been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding. Therefore, the system has capacity for the 30-year return period rainfall event without flooding. The performance of the proposed drainage system has been analysed for design rainfall events up to, and including, the 1% Annual Exceedance Probability (AEP) event (including an allowance of 20% increase in rainfall intensity for climate change) using the MicroDrainage Network Design Software, by Innovyze Inc. Refer to **Appendix B** for details of design criteria, calculations, and results. The analyses indicate that no flooding will occur for design rainfall events up to, and including, the 1% AEP.

3.7.3.2 Sub Criteria 3.2

The surface water drainage system serving the proposed development has been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding. The performance of the proposed drainage system in 100-year return period storm events (incl. 20% climate change allowance) has been analysed – Refer Appendix B for calculations. The analyses show that no flooding will occur in 100-year return period storm events.

3.7.3.3 Sub Criteria 3.3

Details of the potential flood risk associated with the proposed development is outlined in a Site Specific Flood Risk Assessment, which will be submitted under separate cover, as part of this application. The assessment will indicate if there is an apparent risk of internal property flooding.

3.7.3.4 Sub Criteria 3.4

The surface water drainage system serving the proposed development has been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding, so no flood routing off site will be experienced for such a rainfall event. The performance of the proposed drainage system in 100-year return period storm events (incl. 20% climate change allowance) has been analysed – Refer Appendix B for calculations. The analyses show that no flooding will occur in 100-year return period storm events.

3.7.4 Criterion 4: River flood protection

Infiltration storage is to be provided for the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change). Surface water will infiltrate to ground via an infiltration system designed to meet the requirements of the GDSDS. Refer to **Appendix B** for details of hydraulic modelling calculations of infiltration systems, as carried out using MicroDrainage software by Innovyze Inc.

4 WATER SUPPLY / IW PRE CONNECTION ENQUIRY

RPS completed a Pre-connection enquiry form and submitted this to Irish Water on the 23rd March 2021. RPS received feedback from Irish Water on the 12th May 2021 via a standard confirmation of feasibility, attached in **Appendix E.**

IW database shows a 180mm HDPE watermain on the Sea Road. NCW topographical survey has captured the location of the watermain. It is proposed to tie into this watermain to provide a watermain feed to the proposed buildings. A sluice valve and water meter will be provided prior to connection to the new building as indicated in drawings in **Appendix A**. The water main layout and details including valves, hydrants, metering etc. will be in accordance with Irish Water's Code of Practice and Standard Details for water infrastructure

A looped watermain will service the site with hydrants used to provide hydrant fire cover. This new watermain will be 150mm diameter PE100 HDPE pipe. Individual houses will have their own connections to the looped watermain via service connections and boundary boxes. Individual service boundary boxes will be of the type to suit Irish Water and to facilitate domestic meter installation. Hydrants are provided for firefighting at locations to ensure that each dwelling is within the required Building Regulations distance of a hydrant.

An underground storage tank for firefighting requirements is proposed for the site. This storage tank will be connected to the watermain and will incorporate an automated level control system. The access requirements for fire fighters will be fully agreed with the Local Area Fire Officer prior to construction. The required supply for firefighting purposes comes from the Water UK document "National guidance document on the provision of water for firefighting" which calls for 20 litres/second for a site with an area of between one and two hectares.

The maximum tank volume will be **72m^3,** this caters fully for the requirements of the above regulations. This may be reduced pending results from the testing of watermain and existing fire hydrant capacity. The proposed water main layout is shown on drawing No. **SHB3-FIN-CS-RPS-DR- DA001 in Appendix A.**

5 FLOOD RISK ASSESSMENT

A Site-Specific Flood Risk Assessment has been prepared and is submitted under separate cover with this application.

Appendix A

Drainage Layout, Detailed Drawings

PROPOSED CONNECTION OF TO EXISTING 180mm Ø HDPE WATERMAIN ON SEA ROAD

HYDRANT TESTING UNDERTAKEN BY SES WATER MANAGEMENT IN AUGUST 2021 INDICATED A FLOW RATE OF 26.6l/s WAS ACHIEVED AT EXISTING HYDRANTS ON THE SEA ROAD.

MINIMUM 20l/s FLOW REQUIRED FROM HYDRANTS FOR FIRE FIGHTING PURPOSES AT MULTI-OCCUPIED HOUSING DEVELOPMENTS AS PER "NATIONAL GUIDANCE DOCUMENT FOR THE PROVISION OF WATER FOR FIRE FIGHTING - WATER UK 3rd EDITION". HYDRANTS TO BE TESTED ON COMPLETION OF WATERMAIN. TANK TO BE SIZED BASED ON WATER PRESSURE WITHIN THE NEW NETWORK. IF 20l/S IS ACHIEVED, STATIC WATER MAY NOT BE REQUIRED SUBJECT TO AGREEMENT WITH THE LOCAL AUTHORITY.

72m3 STATIC STORAGE TANK WILL PROVIDE A FLOW OF 20l/s FOR 1 HOUR

NOTE:
FOR APARTMENT BUILDINGS A BOOSTED WATER SUPPLY SYSTEM IS TO BE PROVIDED USING A CONNECTION VIA AN UNRESTRICTED AIR-GAP DEVICE (AA TYPE DEVICE, IS EN 1717) IN ACCORDANCE WITH SECTION 3.13 OF THE WATER CODE OF PRACTICE. METER IS TO BE SELECTED, SUPPLIED AND FITTED BY IW

LEGEND

SITE BOUNDARY	🟥
EXISTING 180mm HDPE WATER MAIN	🟩
PROPOSED 150mm WATERMAIN (STD-W-13)	- - -
PROPOSED SERVICE CONNECTION 25mm HDPE (STD-W-03)	- - -
PROPOSED SERVICE CONNECTION 80mm HDPE (STD-W-03)	- - -
PROPOSED SLUICE VALVE (STD-W-07)	⧗ SV
PROPOSED HYDRANT (STD-W-18 / STD-W-19)	H
PROPOSED AIR VALVE (STD-W-22 / STD-W-23)	◆ AV
PROPOSED SCOUR VALVE (STD-W-30)	◐ ScV
PROPOSED BULK FLOW METER AND ASSOCIATED TELEMETRY SYSTEM (STD-W-26)	M
PROPOSED BOUNDARY BOX (STD-W-03)	◩
PROPOSED THRUST BLOCK	⏢

General Notes:

- (i) Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors from the use of these files, either by human error by the recipient, listing of the un-dimensioned measurements, compatibility with the recipients software, and any errors arising when these files are used to aid the recipients drawing production, or setting out on site.
- (ii) DO NOT SCALE, use figured dimensions only.
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- (iv) Information including topographical survey, geotechnical investigation and utility detail used in the design have been provided by others.
- (v) All Levels refer to Ordnance Survey Datum, Malin Head.

Foul Sewer Notes:

1. All foul sewer works shall be carried out in accordance with Irish Water Standard Details and Code of Practice for Wastewater Infrastructure Document CDS-5030-03.
2. All pipe materials shall comply with Section 3.13 of the Irish Water Code of Practice for Wastewater Infrastructure Document CDS-5030-03.
3. Foul sewer service connections and inspection chambers to each dwelling shall be in accordance with Irish Water standard detail STD-WW-02.
4. All manhole chambers shall be in accordance with Irish Water standard detail STD-WW-10.
5. Trench backfill and bedding shall be in accordance with Irish Water standard detail STD-WW-07.
6. Concrete bed, haunch and surround shall be in accordance with Irish Water standard detail STD-WW-08.
4. Separation distances from other services, boundary walls etc. shall be in accordance with Irish Water standard detail STD-WW-05.
5. Separation distances from trees, shrubs etc. shall be in accordance with Irish Water standard detail STD-WW-06 & 06A.

Storm Sewer Notes:

1. All pipe materials shall comply with Section 3.13 of the Irish Water Code of Practice for Wastewater Infrastructure Document CDS-5030-03.
2. All manhole chambers shall be in accordance with Irish Water standard detail STD-WW-10.
3. Trench backfill and bedding shall be in accordance with Irish Water standard detail STD-WW-07.
4. Concrete bed, haunch and surround shall be in accordance with Irish Water standard detail STD-WW-08.

Watermain Notes:

1. All watermain works shall be carried out in accordance with Irish Water Standard Details and Code of Practice for Water Infrastructure Document CDS-5020-03.
2. All pipe materials shall be in compliance with Section 3.9 of Irish Water Code of Practice Document-CDS-5020-03.
3. Individual water service connections and boundary boxes to each dwelling shall be in compliance with Irish Water standard detail STD-W-02.
4. Separation distances from other services, boundary walls etc. shall be in accordance with Irish Water standard detail STD-W-11.
5. Separation distances from trees, shrubs etc. shall be in accordance with Irish Water standard detail STD-W-12 & 12A.
6. On line and off-line air valve details shall be in accordance with Irish Water standard detail STD-W-22 & STD-W-23 respectively.
7. Sluice valve details shall be in accordance with Irish Water standard detail STD-W-15.
8. On line and off-line hydrant details shall be in accordance with Irish Water standard detail STD-W-18 & STD-W-19 respectively.
9. Scour valve and chamber details shall be in accordance with Irish Water standard detail STD-W-30.

Rev	Date	Drn Chk	Amendment / Issue	App
P05	07.02.22	OS P05	ISSUE FOR PART 10 PLANNING	DK
P04	29.11.21	OS PMGB	ISSUE FOR CLIENT REVIEW	DK
P03	24.09.21	OS DK	ISSUE FOR REVIEW	DK
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P01	16.04.21	DM PMGB	ISSUE FOR INFORMATION	DK

Client

SLIGO
COUNTY COUNCIL
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Project
PPP SOCIAL HOUSING BUNDLE 3
FINISKLIN, CO. SILGO

Title
WATERMAIN LAYOUT

Model File Identifier
SHB3-FIN-CS-RPS-DR-DR001

File Identifier
SHB3-FIN-CS-RPS-DR-DR001-01

Created on	Sheets	
APRIL 2021	01 OF 01	
Scale	**Status**	**Rev**
1:500 @ A1 1:1000 @ A3	S4	P05

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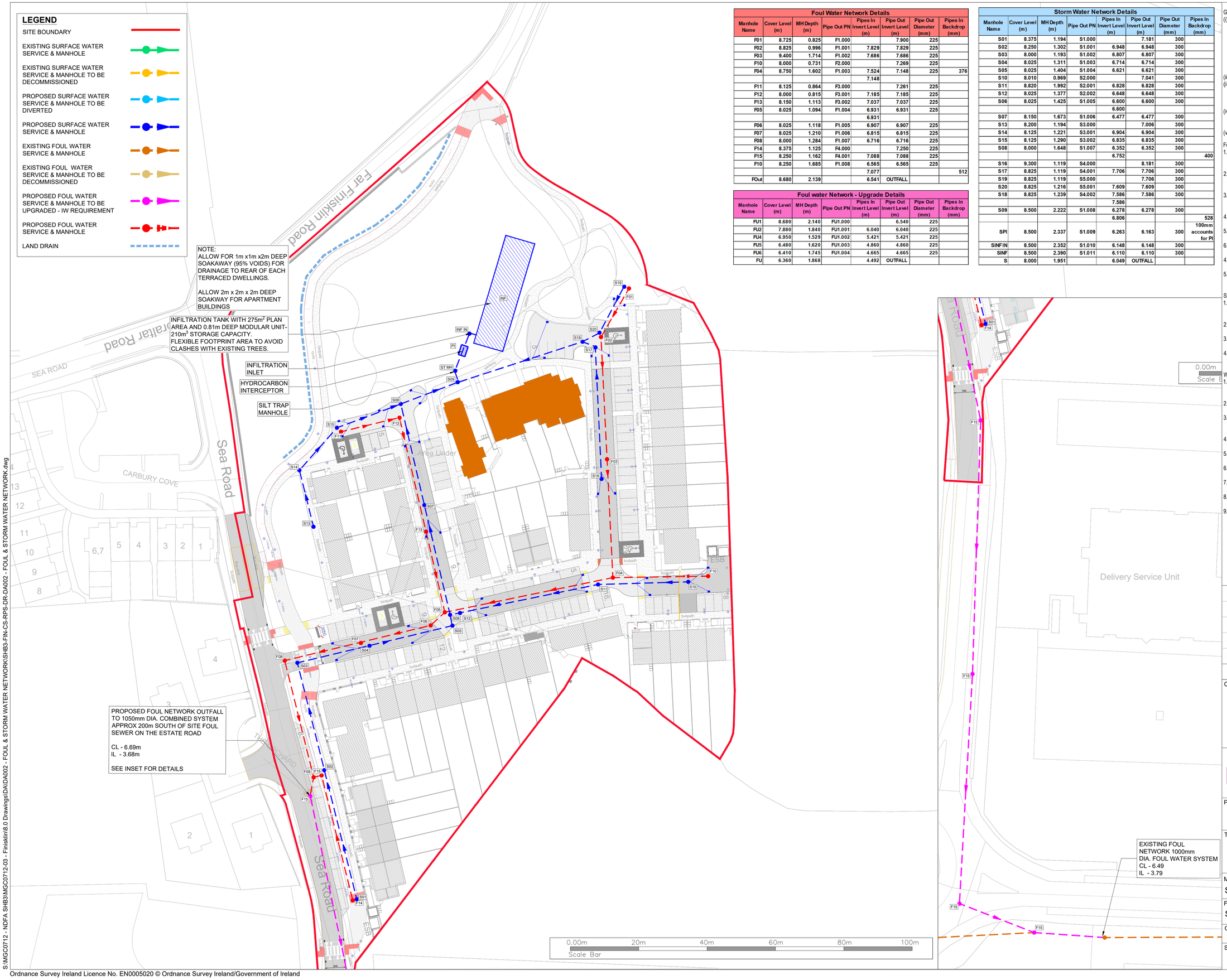
LEGEND

- SITE BOUNDARY
- EXISTING SURFACE WATER SERVICE & MANHOLE
- EXISTING SURFACE WATER SERVICE & MANHOLE TO BE DECOMMISSIONED
- PROPOSED SURFACE WATER SERVICE & MANHOLE TO BE DIVERTED
- PROPOSED SURFACE WATER SERVICE & MANHOLE
- EXISTING FOUL WATER SERVICE & MANHOLE
- EXISTING FOUL WATER SERVICE & MANHOLE TO BE DECOMMISSIONED
- PROPOSED FOUL WATER SERVICE & MANHOLE TO BE UPGRADED - IW REQUIREMENT
- PROPOSED FOUL WATER SERVICE & MANHOLE
- LAND DRAIN



Foul Water Network Details

Manhole Name	Cover Level (m)	MH Depth (m)	Pipe Out PN	Pipes In Invert Level (m)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Backdrop (mm)
F01	8.725	0.825	F1.000		7.900	225	
F02	8.825	0.996	F1.001	7.829	7.829	225	
F03	9.400	1.714	F1.002	7.686	7.686	225	
F10	8.000	0.731	F2.000		7.269	225	
F04	8.750	1.602	F1.003	7.524	7.148	225	376
				7.148			
F11	8.125	0.864	F3.000		7.261	225	
F12	8.000	0.815	F3.001	7.185	7.185	225	
F13	8.150	1.113	F3.002	7.037	7.037	225	
F05	8.025	1.094	F1.004	6.931	6.931	225	
				6.931			
F06	8.025	1.118	F1.005	6.907	6.907	225	
F07	8.025	1.210	F1.006	6.815	6.815	225	
F08	8.000	1.284	F1.007	6.716	6.716	225	
F14	8.375	1.125	F4.000		7.250	225	
F15	8.250	1.162	F4.001	7.088	7.088	225	
F10	8.250	1.685	F1.008	6.565	6.565	225	
				7.077			512
FOut	8.680	2.139		6.541	OUTFALL		

Foul water Network - Upgrade Details

Manhole Name	Cover Level (m)	MH Depth (m)	Pipe Out PN	Pipes In Invert Level (m)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Backdrop (mm)
FU1	8.680	2.140	FU1.000		6.540	225	
FU2	7.880	1.840	FU1.001	6.040	6.040	225	
FU4	6.950	1.529	FU1.002	5.421	5.421	225	
FU5	6.480	1.620	FU1.003	4.860	4.860	225	
FU6	6.410	1.745	FU1.004	4.665	4.665	225	
FU	6.360	1.868		4.492	OUTFALL		

Storm Water Network Details

Manhole Name	Cover Level (m)	MH Depth (m)	Pipe Out PN	Pipes In Invert Level (m)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Backdrop (mm)
S01	8.375	1.194	S1.000		7.181	300	
S02	8.250	1.302	S1.001	6.948	6.948	300	
S03	8.000	1.193	S1.002	6.807	6.807	300	
S04	8.025	1.311	S1.003	6.714	6.714	300	
S05	8.025	1.404	S1.004	6.621	6.621	300	
S10	8.010	0.969	S2.000		7.041	300	
S11	8.820	1.992	S2.001	6.828	6.828	300	
S12	8.025	1.377	S2.002	6.648	6.648	300	
S06	8.025	1.425	S1.005	6.600	6.600	300	
				6.600			
S07	8.150	1.673	S1.006	6.477	6.477	300	
S13	8.200	1.194	S3.000		7.006	300	
S14	8.125	1.221	S3.001	6.904	6.904	300	
S15	8.125	1.290	S3.002	6.835	6.835	300	
S08	8.000	1.648	S1.007	6.352	6.352	300	
				6.752			400
S16	9.300	1.119	S4.000		8.181	300	
S17	8.825	1.119	S4.001	7.706	7.706	300	
S19	8.825	1.119	S5.000		7.706	300	
S20	8.825	1.216	S5.001	7.609	7.609	300	
S18	8.825	1.239	S4.002	7.586	7.586	300	
				7.586			
S09	8.500	2.222	S1.008	6.278	6.278	300	
				6.806			528
SPI	8.500	2.337	S1.009	6.263	6.163	300	100mm accounts for PI
SINFIN	8.500	2.352	S1.010	6.148	6.148	300	
SINF	8.500	2.390	S1.011	6.110	6.110	300	
S	8.000	1.951		6.049	OUTFALL		

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5. Separation distances from trees, shrubs etc. shall be in accordance with Irish Water standard detail STD-WW-06 & 06A.

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Client

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Project
PPP SOCIAL HOUSING BUNDLE 3
FINISKLIN, CO. SILGO

Title
FOUL & STORM WATER NETWORK

Model File Identifier
SHB3-FIN-CS-RPS-DR-DA002

File Identifier
SHB3-FIN-CS-RPS-DR-DA002-01

Created on	Sheets	
APRIL 2021	01 OF 01	
Scale	Status	Rev
1:500 @ A1 1:1000 @ A3	S4	P05

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Appendix B

Design Calculations

Foul Water Design Calculations

Lyrr Building, IDA Business & Technology Park
Mervue
Galway, Ireland

Date 07/02/2022 17:27
File SHB3-FIN-CS-RPS-CA-0001.MDX

Designed by MGB
Checked by DK

Innovyze | Network 2020.1

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Domestic (l/s/ha)	0.00	Maximum Backdrop Height (m)	1.500
Industrial Peak Flow Factor	0.00	Domestic Peak Flow Factor	6.00	Min Design Depth for Optimisation (m)	0.900
Flow Per Person (l/per/day)	150.00	Add Flow / Climate Change (%)	0	Min Vel for Auto Design only (m/s)	0.75
Persons per House	2.70	Minimum Backdrop Height (m)	0.200	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	16.511	0.071	232.6	0.000	15	0.0	1.500	o	225	Pipe/Conduit	
F1.001	32.940	0.143	230.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.002	37.372	0.162	230.7	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F2.000	27.858	0.121	230.2	0.000	7	0.0	1.500	o	225	Pipe/Conduit	
F1.003	50.202	0.217	231.3	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	7.900	0.000	0.0	15	0.0	19	0.26	0.75	29.9	0.4
F1.001	7.829	0.000	0.0	15	0.0	19	0.26	0.75	30.0	0.4
F1.002	7.686	0.000	0.0	15	0.0	19	0.26	0.75	30.0	0.4
F2.000	7.269	0.000	0.0	7	0.0	13	0.20	0.75	30.0	0.2
F1.003	7.148	0.000	0.0	22	0.0	23	0.30	0.75	29.9	0.6

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F3.000	17.594	0.076	231.5	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
F3.001	34.219	0.148	231.2	0.000	8	0.0	1.500	o	225	Pipe/Conduit	
F3.002	24.275	0.106	229.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	5.640	0.024	235.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F1.005	21.175	0.092	230.2	0.000	7	0.0	1.500	o	225	Pipe/Conduit	
F1.006	22.944	0.099	231.8	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.007	35.115	0.151	232.6	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.000	37.676	0.162	232.6	0.000	11	0.0	1.500	o	225	Pipe/Conduit	
F4.001	2.461	0.011	223.7	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	5.596	0.024	231.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F3.000	7.261	0.000	0.0	5	0.0	12	0.18	0.75	29.9	0.1
F3.001	7.185	0.000	0.0	13	0.0	18	0.25	0.75	29.9	0.4
F3.002	7.037	0.000	0.0	13	0.0	18	0.25	0.76	30.1	0.4
F1.004	6.931	0.000	0.0	44	0.0	31	0.36	0.75	29.7	1.2
F1.005	6.907	0.000	0.0	51	0.0	34	0.39	0.75	30.0	1.4
F1.006	6.815	0.000	0.0	51	0.0	34	0.38	0.75	29.9	1.4
F1.007	6.716	0.000	0.0	51	0.0	34	0.38	0.75	29.9	1.4
F4.000	7.250	0.000	0.0	11	0.0	17	0.24	0.75	29.9	0.3
F4.001	7.088	0.000	0.0	11	0.0	16	0.24	0.77	30.4	0.3
F1.008	6.565	0.000	0.0	62	0.0	37	0.41	0.75	30.0	1.7

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
F01	8.725	0.825	Open Manhole	1200	F1.000	7.900	225				
F02	8.825	0.996	Open Manhole	1200	F1.001	7.829	225	F1.000	7.829	225	
F03	9.400	1.714	Open Manhole	1200	F1.002	7.686	225	F1.001	7.686	225	
F09	8.000	0.731	Open Manhole	1200	F2.000	7.269	225				
F04	8.750	1.602	Open Manhole	1200	F1.003	7.148	225	F1.002	7.524	225	376
								F2.000	7.148	225	
F10	8.125	0.864	Open Manhole	1200	F3.000	7.261	225				
F11	8.000	0.815	Open Manhole	1200	F3.001	7.185	225	F3.000	7.185	225	
F12	8.150	1.113	Open Manhole	1200	F3.002	7.037	225	F3.001	7.037	225	
F05	8.025	1.094	Open Manhole	1200	F1.004	6.931	225	F1.003	6.931	225	
								F3.002	6.931	225	
F06	8.025	1.118	Open Manhole	1200	F1.005	6.907	225	F1.004	6.907	225	
F07	8.025	1.210	Open Manhole	1200	F1.006	6.815	225	F1.005	6.815	225	
F08	8.000	1.284	Open Manhole	1200	F1.007	6.716	225	F1.006	6.716	225	
F13	8.375	1.125	Open Manhole	1200	F4.000	7.250	225				
F14	8.250	1.162	Open Manhole	1200	F4.001	7.088	225	F4.000	7.088	225	
F10	8.250	1.685	Open Manhole	1200	F1.008	6.565	225	F1.007	6.565	225	
								F4.001	7.077	225	512
FOut	8.680	2.139	Open Manhole	0		OUTFALL		F1.008	6.541	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F01	567380.994	836919.970	567380.994	836919.970	Required	

Manhole Schedules for Foul - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F02	567372.754	836905.661	567372.754	836905.661	Required	
F03	567374.173	836872.752	567374.173	836872.752	Required	
F09	567404.163	836835.866	567404.163	836835.866	Required	
F04	567376.309	836835.441	567376.309	836835.441	Required	
F10	567296.772	836878.125	567296.772	836878.125	Required	
F11	567313.875	836882.256	567313.875	836882.256	Required	
F12	567321.444	836848.885	567321.444	836848.885	Required	
F05	567327.144	836825.288	567327.144	836825.288	Required	
F06	567323.003	836821.460	567323.003	836821.460	Required	
F07	567302.465	836816.303	567302.465	836816.303	Required	
F08	567280.128	836811.063	567280.128	836811.063	Required	

Manhole Schedules for Foul - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F13	567300.212	836741.018	567300.212	836741.018	Required	
F14	567291.101	836777.575	567291.101	836777.575	Required	
F10	567288.705	836777.011	567288.705	836777.011	Required	
FOut	567287.679	836771.510			No Entry	

Area Summary for Foul - Main

Pipe Number	Gross Area (ha)	Pipe Total (ha)
1.000	0.000	0.000
1.001	0.000	0.000
1.002	0.000	0.000
2.000	0.000	0.000
1.003	0.000	0.000
3.000	0.000	0.000
3.001	0.000	0.000
3.002	0.000	0.000
1.004	0.000	0.000
1.005	0.000	0.000
1.006	0.000	0.000
1.007	0.000	0.000
4.000	0.000	0.000
4.001	0.000	0.000
1.008	0.000	0.000
	Total	Total
	0.000	0.000

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.008	FOut	8.680	6.541	6.540	0	0

Simulation Criteria for Foul - Main

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	17.400	Cv (Summer)	0.750
Return Period (years)	100	Ratio R	0.300	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Storm Water Design Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	30	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	17.400	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	0.900
Ratio R	0.300	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.100		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.291	4-8	0.241

Total Area Contributing (ha) = 0.532

Total Pipe Volume (m³) = 31.882

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	38.944	0.233	167.1	0.036	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	32.364	0.142	228.5	0.035	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	21.586	0.093	231.8	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	25.037	0.093	268.9	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	3.212	0.021	155.2	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	26.385	0.213	123.9	0.045	4.00	0.0	0.600	o	300	Pipe/Conduit	
S2.001	41.226	0.180	229.0	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.002	2.949	0.048	61.4	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	32.980	0.123	268.3	0.012	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	30.393	0.125	244.0	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	17.044	0.102	167.1	0.012	4.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.53	7.181	0.036	0.0	0.0	0.0	1.21	85.8	4.9
S1.001	50.00	5.06	6.948	0.072	0.0	0.0	0.0	1.04	73.2	9.7
S1.002	50.00	5.41	6.807	0.089	0.0	0.0	0.0	1.03	72.7	12.0
S1.003	50.00	5.84	6.714	0.110	0.0	0.0	0.0	0.95	67.4	14.9
S1.004	50.00	5.89	6.621	0.162	0.0	0.0	0.0	1.26	89.0	21.9
S2.000	50.00	4.31	7.041	0.045	0.0	0.0	0.0	1.41	99.8	6.1
S2.001	50.00	4.98	6.828	0.108	0.0	0.0	0.0	1.03	73.1	14.6
S2.002	50.00	5.00	6.648	0.147	0.0	0.0	0.0	2.01	142.0	19.9
S1.005	50.00	6.46	6.600	0.322	0.0	0.0	0.0	0.96	67.5	43.5
S1.006	50.00	6.97	6.477	0.358	0.0	0.0	0.0	1.00	70.8	48.4
S3.000	50.00	4.23	7.006	0.012	0.0	0.0	0.0	1.21	85.8	1.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.001	16.590	0.069	240.4	0.010	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	19.932	0.083	240.1	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	17.876	0.074	241.1	0.010	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	38.532	0.475	81.1	0.029	4.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	4.166	0.120	34.7	0.035	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	15.181	0.097	156.5	0.006	4.00	0.0	0.600	o	300	Pipe/Conduit	
S5.001	5.582	0.023	242.7	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	38.358	0.780	49.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	3.491	0.015	232.7	0.029	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.001	50.00	4.51	6.904	0.022	0.0	0.0	0.0	1.01	71.4	2.9
S3.002	50.00	4.84	6.835	0.043	0.0	0.0	0.0	1.01	71.4	5.8
S1.007	50.00	7.26	6.352	0.410	0.0	0.0	0.0	1.01	71.3	55.6
S4.000	50.00	4.37	8.181	0.029	0.0	0.0	0.0	1.75	123.5	3.9
S4.001	50.00	4.39	7.706	0.063	0.0	0.0	0.0	2.68	189.3	8.5
S5.000	50.00	4.20	7.706	0.006	0.0	0.0	0.0	1.25	88.7	0.8
S5.001	50.00	4.29	7.609	0.029	0.0	0.0	0.0	1.00	71.0	3.9
S4.002	50.00	4.68	7.586	0.092	0.0	0.0	0.0	2.25	158.9	12.5
S1.008	50.00	7.32	6.278	0.532	0.0	0.0	0.0	1.03	72.5	72.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.009	3.491	0.015	232.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.010	8.871	0.038	233.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.011	6.842	0.061	112.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.009	50.00	7.38	6.163	0.532	0.0	0.0	0.0	1.03	72.5	72.0
S1.010	50.00	7.52	6.148	0.532	0.0	0.0	0.0	1.02	72.4	72.0
S1.011	50.00	7.60	6.110	0.532	0.0	0.0	0.0	1.48	104.9	72.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S01	8.375	1.194	Open Manhole	1200	S1.000	7.181	300				
S02	8.250	1.302	Open Manhole	1200	S1.001	6.948	300	S1.000	6.948	300	
S03	8.000	1.193	Open Manhole	1200	S1.002	6.807	300	S1.001	6.807	300	
S04	8.025	1.311	Open Manhole	1200	S1.003	6.714	300	S1.002	6.714	300	
S05	8.025	1.404	Open Manhole	1200	S1.004	6.621	300	S1.003	6.621	300	
S10	8.010	0.969	Open Manhole	1200	S2.000	7.041	300				
S11	8.820	1.992	Open Manhole	1200	S2.001	6.828	300	S2.000	6.828	300	
S12	8.025	1.377	Open Manhole	1200	S2.002	6.648	300	S2.001	6.648	300	
S06	8.025	1.425	Open Manhole	1200	S1.005	6.600	300	S1.004	6.600	300	
								S2.002	6.600	300	
S07	8.150	1.673	Open Manhole	1200	S1.006	6.477	300	S1.005	6.477	300	
S13	8.200	1.194	Open Manhole	1200	S3.000	7.006	300				
S14	8.125	1.221	Open Manhole	1200	S3.001	6.904	300	S3.000	6.904	300	
S15	8.125	1.290	Open Manhole	1200	S3.002	6.835	300	S3.001	6.835	300	
S08	8.000	1.648	Open Manhole	1200	S1.007	6.352	300	S1.006	6.352	300	
								S3.002	6.752	300	400
S16	9.300	1.119	Open Manhole	1200	S4.000	8.181	300				
S17	8.825	1.119	Open Manhole	1200	S4.001	7.706	300	S4.000	7.706	300	
S19	8.825	1.119	Open Manhole	1200	S5.000	7.706	300				
S20	8.825	1.216	Open Manhole	1200	S5.001	7.609	300	S5.000	7.609	300	
S18	8.825	1.239	Open Manhole	1200	S4.002	7.586	300	S4.001	7.586	300	
								S5.001	7.586	300	
S09	8.500	2.222	Open Manhole	1200	S1.008	6.278	300	S1.007	6.278	300	
								S4.002	6.806	300	528
SPI	8.500	2.337	Open Manhole	1200	S1.009	6.163	300	S1.008	6.263	300	100

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SINF IN	8.500	2.352	Open Manhole	1200	S1.010	6.148	300	S1.009	6.148	300	
SINF	8.500	2.390	Open Manhole	1200	S1.011	6.110	300	S1.010	6.110	300	
S	8.000	1.951	Open Manhole	0		OUTFALL		S1.011	6.049	300	

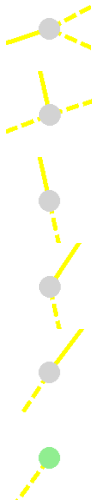
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S01	567301.396	836741.348	567301.396	836741.348	Required	
S02	567291.866	836779.108	567291.866	836779.108	Required	
S03	567284.014	836810.505	567284.014	836810.505	Required	
S04	567305.047	836815.359	567305.047	836815.359	Required	
S05	567329.345	836821.399	567329.345	836821.399	Required	
S10	567398.339	836834.196	567398.339	836834.196	Required	
S11	567371.965	836833.434	567371.965	836833.434	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12	567331.583	836825.131	567331.583	836825.131	Required	
S06	567328.693	836824.544	567328.693	836824.544	Required	
S07	567321.166	836856.654	567321.166	836856.654	Required	
S13	567288.734	836850.317	567288.734	836850.317	Required	
S14	567284.604	836866.853	567284.604	836866.853	Required	
S15	567295.590	836879.285	567295.590	836879.285	Required	
S08	567314.265	836886.253	567314.265	836886.253	Required	
S16	567373.101	836864.309	567373.101	836864.309	Required	
S17	567371.251	836902.797	567371.251	836902.797	Required	
S19	567379.613	836920.440	567379.613	836920.440	Required	
S20	567372.381	836907.092	567372.381	836907.092	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S18	567367.444	836904.489	567367.444	836904.489	Required	
S09	567330.966	836892.625	567330.966	836892.625	Required	
SPI	567330.202	836896.032	567330.202	836896.032	Required	
SINF IN	567329.437	836899.438	567329.437	836899.438	Required	
SINF	567334.341	836906.830	567334.341	836906.830	Required	
S	567338.449	836912.301			No Entry	



Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Permeable Pavement	60	0.009	0.006	0.006
	Classification	pavement	75	0.019	0.014	0.020
	Classification	Pitched Roof	90	0.018	0.016	0.036
1.001	Classification	Permeable Pavement	60	0.008	0.005	0.005
	Classification	pavement	75	0.028	0.021	0.025
	Classification	Pitched Roof	90	0.011	0.010	0.035
1.002	Classification	pavement	75	0.020	0.015	0.015
	Classification	pavement	75	0.003	0.002	0.017
1.003	Classification	Pitched Roof	90	0.017	0.015	0.015
	Classification	Pitched Roof	90	0.004	0.003	0.019
	Classification	Pitched Roof	90	0.004	0.003	0.022
1.004	Classification	Permeable Pavement	60	0.027	0.016	0.016
	Classification	Permeable Pavement	60	0.027	0.016	0.032
	Classification	pavement	75	0.019	0.014	0.046
	Classification	Pitched Roof	90	0.006	0.006	0.052
2.000	Classification	pavement	75	0.016	0.012	0.012
	Classification	Permeable Pavement	60	0.023	0.014	0.026
	Classification	Pitched Roof	90	0.014	0.013	0.039
	Classification	Pitched Roof	90	0.007	0.006	0.045
2.001	Classification	Permeable Pavement	60	0.013	0.008	0.008
	Classification	Permeable Pavement	60	0.008	0.005	0.013
	Classification	pavement	75	0.007	0.005	0.018
	Classification	pavement	75	0.023	0.017	0.035
	Classification	Permeable Pavement	60	0.014	0.008	0.043
	Classification	Pitched Roof	90	0.008	0.007	0.051
	Classification	Pitched Roof	90	0.006	0.005	0.056
	Classification	Pitched Roof	90	0.008	0.007	0.063
2.002	Classification	Permeable Pavement	60	0.029	0.018	0.018
	Classification	Permeable Pavement	60	0.009	0.005	0.023
	Classification	pavement	75	0.014	0.010	0.034
	Classification	Pitched Roof	90	0.006	0.005	0.039
1.005	Classification	pavement	75	0.011	0.008	0.008
	Classification	pavement	75	0.006	0.004	0.012
1.006	Classification	Permeable Pavement	60	0.012	0.007	0.007
	Classification	pavement	75	0.019	0.014	0.022

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Pitched Roof	90	0.008	0.007	0.029
	Classification	Pitched Roof	90	0.008	0.007	0.036
3.000	Classification	Pitched Roof	90	0.008	0.007	0.007
	Classification	Permeable Pavement	60	0.008	0.005	0.012
3.001	Classification	Pitched Roof	90	0.005	0.005	0.005
	Classification	Pitched Roof	90	0.005	0.005	0.010
3.002	Classification	Permeable Pavement	60	0.014	0.008	0.008
	Classification	pavement	75	0.018	0.013	0.021
1.007	Classification	Permeable Pavement	60	0.005	0.003	0.003
	Classification	pavement	75	0.009	0.007	0.010
4.000	Classification	Permeable Pavement	60	0.013	0.008	0.008
	Classification	pavement	75	0.014	0.011	0.018
	Classification	Pitched Roof	90	0.011	0.010	0.029
4.001	Classification	Permeable Pavement	60	0.021	0.012	0.012
	Classification	pavement	75	0.018	0.014	0.026
	Classification	Pitched Roof	90	0.010	0.009	0.035
5.000	Classification	pavement	75	0.008	0.006	0.006
5.001	Classification	pavement	75	0.023	0.017	0.017
	Classification	Pitched Roof	90	0.007	0.006	0.023
4.002	-	-	100	0.000	0.000	0.000
1.008	Classification	Pitched Roof	90	0.032	0.029	0.029
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.716	0.532	0.532

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	S	8.000	6.049	6.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	17.400	Cv (Summer)	0.750
Return Period (years)	100	Ratio R	0.300	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Storage Structures for Storm

Infiltration Basin Manhole: SINF, DS/PN: S1.011

Invert Level (m) 5.310 Infiltration Coefficient Side (m/hr) 0.13500 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.13500 Safety Factor 2.0

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	275.0	0.800	275.0	0.801	0.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.100 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.300 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Event	First (Y) Flood	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S01	15 minute 100 year Winter I+20%		8.375	7.591	0.110	0.19	0.458	7.050		15.2	SURCHARGED
S1.001	S02	15 minute 100 year Winter I+20%		8.250	7.580	0.332	0.36	3.377	13.959		24.2	SURCHARGED
S1.002	S03	15 minute 100 year Winter I+20%		8.000	7.560	0.454	0.42	3.049	17.226		26.8	SURCHARGED
S1.003	S04	15 minute 100 year Winter I+20%		8.025	7.540	0.527	0.51	2.370	21.461		30.5	SURCHARGED
S1.004	S05	15 minute 100 year Winter I+20%		8.025	7.515	0.595	0.67	2.691	31.510		34.7	SURCHARGED
S2.000	S10	15 minute 100 year Winter I+20%		8.010	7.564	0.223	0.21	0.586	8.719		18.5	SURCHARGED
S2.001	S11	15 minute 100 year Winter I+20%		8.820	7.553	0.425	0.48	2.594	20.985		32.5	SURCHARGED
S2.002	S12	15 minute 100 year Winter I+20%		8.025	7.516	0.568	0.65	3.806	28.576		39.7	SURCHARGED
S1.005	S06	15 minute 100 year Winter I+20%		8.025	7.506	0.606	1.11	1.285	62.501		68.9	SURCHARGED
S1.006	S07	15 minute 100 year Winter I+20%		8.150	7.349	0.572	1.17	3.227	69.546		75.7	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	First (Y) Flood	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S13	15 minute 100 year Winter I+20%		8.200	7.182	-0.124	0.07	0.194	2.330		5.2	OK
S3.001	S14	15 minute 100 year Winter I+20%		8.125	7.180	-0.024	0.14	1.162	4.194		8.5	OK
S3.002	S15	15 minute 100 year Winter I+20%		8.125	7.177	0.042	0.25	1.421	8.325		15.8	SURCHARGED
S1.007	S08	15 minute 100 year Winter I+20%		8.000	7.171	0.518	1.45	4.307	79.804		88.7	SURCHARGED
S4.000	S16	15 minute 100 year Winter I+20%		9.300	8.247	-0.234	0.11	0.069	5.550		12.7	OK
S4.001	S17	15 minute 100 year Winter I+20%		8.825	7.823	-0.183	0.32	0.227	12.267		28.0	OK
S5.000	S19	15 minute 100 year Summer I+20%		8.825	7.747	-0.259	0.04	0.041	1.073		2.8	OK
S5.001	S20	15 minute 100 year Summer I+20%		8.825	7.714	-0.195	0.27	0.238	5.060		13.0	OK
S4.002	S18	15 minute 100 year Winter I+20%		8.825	7.694	-0.192	0.28	0.198	17.934		40.5	OK
S1.008	S09	15 minute 100 year Winter I+20%		8.500	7.036	0.458	2.32	2.318	103.356		115.6	SURCHARGED
S1.009	SPI	15 minute 100 year Winter I+20%		8.500	6.822	0.359	2.31	0.902	103.361		115.2	SURCHARGED
S1.010	SINF IN	15 minute 100 year Winter I+20%		8.500	6.609	0.161	2.09	0.677	103.368		115.5	SURCHARGED
S1.011	SINF	240 minute 100 year Winter I+20%		8.500	6.080	-0.330	0.00	202.000	0.000	304	0.0	OK

Appendix C

Surface Water Infiltration Design Output and Sizing

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 310 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	5.600	0.339	5.5	88.6	O K
30 min Summer	5.713	0.452	5.7	118.1	O K
60 min Summer	5.814	0.553	5.8	144.6	O K
120 min Summer	5.898	0.637	5.9	166.5	O K
180 min Summer	5.929	0.668	5.9	174.4	O K
240 min Summer	5.937	0.676	5.9	176.5	O K
360 min Summer	5.934	0.673	5.9	175.9	O K
480 min Summer	5.924	0.663	5.9	173.3	O K
600 min Summer	5.912	0.651	5.9	170.1	O K
720 min Summer	5.898	0.637	5.9	166.5	O K
960 min Summer	5.868	0.607	5.8	158.5	O K
1440 min Summer	5.803	0.542	5.8	141.6	O K
2160 min Summer	5.707	0.446	5.6	116.5	O K
2880 min Summer	5.618	0.357	5.6	93.3	O K
4320 min Summer	5.475	0.214	5.4	56.0	O K
5760 min Summer	5.379	0.118	5.3	31.0	O K
7200 min Summer	5.325	0.064	5.2	16.7	O K
8640 min Summer	5.309	0.048	5.0	12.4	O K
10080 min Summer	5.304	0.043	4.5	11.1	O K
15 min Winter	5.643	0.382	5.6	99.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	94.309	0.0	22
30 min Summer	64.057	0.0	36
60 min Summer	40.867	0.0	64
120 min Summer	25.429	0.0	122
180 min Summer	19.116	0.0	182
240 min Summer	15.577	0.0	234
360 min Summer	11.645	0.0	292
480 min Summer	9.462	0.0	356
600 min Summer	8.050	0.0	424
720 min Summer	7.052	0.0	494
960 min Summer	5.721	0.0	630
1440 min Summer	4.260	0.0	908
2160 min Summer	3.170	0.0	1300
2880 min Summer	2.568	0.0	1676
4320 min Summer	1.906	0.0	2384
5760 min Summer	1.542	0.0	3056
7200 min Summer	1.308	0.0	3680
8640 min Summer	1.143	0.0	4392
10080 min Summer	1.019	0.0	5120
15 min Winter	94.309	0.0	22

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	5.772	0.511	5.7	133.4	O K
60 min Winter	5.889	0.628	5.8	164.2	O K
120 min Winter	5.992	0.731	6.0	191.0	O K
180 min Winter	6.035	0.774	6.0	202.1	O K
240 min Winter	6.051	0.790	6.0	206.5	O K
360 min Winter	6.049	0.788	6.0	205.9	O K
480 min Winter	6.035	0.774	6.0	202.1	O K
600 min Winter	6.017	0.756	6.0	197.4	O K
720 min Winter	5.995	0.734	6.0	191.7	O K
960 min Winter	5.945	0.684	5.9	178.7	O K
1440 min Winter	5.840	0.579	5.8	151.2	O K
2160 min Winter	5.687	0.426	5.6	111.4	O K
2880 min Winter	5.554	0.293	5.5	76.6	O K
4320 min Winter	5.363	0.102	5.3	26.5	O K
5760 min Winter	5.307	0.046	4.8	12.1	O K
7200 min Winter	5.300	0.039	4.1	10.3	O K
8640 min Winter	5.295	0.034	3.6	9.0	O K
10080 min Winter	5.292	0.031	3.2	8.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.057	0.0	36
60 min Winter	40.867	0.0	64
120 min Winter	25.429	0.0	120
180 min Winter	19.116	0.0	178
240 min Winter	15.577	0.0	234
360 min Winter	11.645	0.0	336
480 min Winter	9.462	0.0	380
600 min Winter	8.050	0.0	458
720 min Winter	7.052	0.0	536
960 min Winter	5.721	0.0	688
1440 min Winter	4.260	0.0	980
2160 min Winter	3.170	0.0	1388
2880 min Winter	2.568	0.0	1760
4320 min Winter	1.906	0.0	2420
5760 min Winter	1.542	0.0	2936
7200 min Winter	1.308	0.0	3672
8640 min Winter	1.143	0.0	4408
10080 min Winter	1.019	0.0	5080

Model Details

Storage is Online Cover Level (m) 8.000

Infiltration Basin Structure

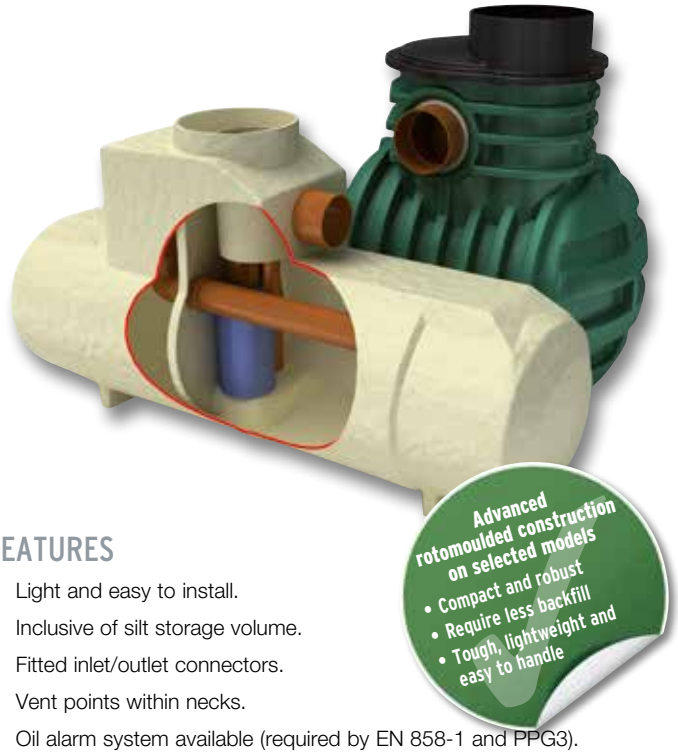
Invert Level (m) 5.261 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.13500 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.13500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	275.0	0.800	275.0	0.801	0.0

Appendix D

Hydrocarbon Interceptor – Brochure

Bypass NSB RANGE



APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

Appendix E

Irish Water – Confirmation of Feasibility

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Padraig Mac Giolla Bhride

RPS
Lyrr 2
IDA Bus & Technology Park
Mervue
Galway
H91 H9CK

12 May 2021

Re: CDS21001920 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 60 unit(s) at Rathellen, Fininklin Road, Sligo

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Rathellen, Fininklin Road, Sligo (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	Please note while flows in excess of your required demand may be achieved in the Irish Water network and could be utilised, Irish Water cannot guarantee a flow rate to meet your requirement. To guarantee a flow to meet your requirements, you should provide adequate storage capacity within your development.
Wastewater Connection	The existing 150mm dia. foul sewer located adjacent to the site does not have sufficient capacity to accommodate the proposed development. A new 225mm dia. foul sewer will be required to serve the proposed development, the distance from the nearest point of the proposed development's red line boundary to the existing Irish Water owned foul sewer (located to the south) is approx. 170m. Please note Irish Water perform all connection related

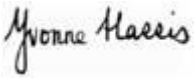
	works including network extensions in the public road, this will be funded by the Developer.
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Cormac Healy from the design team by email to corhealy@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations