Proposed Large Scale Residential Development at Rathgowan, Mullingar, Co. Westmeath

Applicant: Marina Quarter Ltd.

CHAPTER 13 Material Assets: Service Infrastructure & Utilities

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Volume III

Appendices

August 2023

McCutcheon Halley
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Appendix 13.1 Civil Works Design Report

August 2023

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Marina Quarter Ltd.

Proposed Residential Development, Rathgowan, Mullingar, Co. Westmeath.

Civil Works Design Report

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1. INTRODUCTION

TOBIN Consulting Engineers were appointed to provide engineering consultancy services for the proposed residential development at Rathgowan, Mullingar in Co. Westmeath.

This report has been prepared to detail the civil works planning submission element of the proposed development. This report details the foul & storm drainage design and connection details, SuDS design and details, watermain design and connection details and the roads design for the development. It should be read in conjunction with the watermain, roads, drainage and SuDS design drawings as outlined and noted herein.

The proposed development will consist of the following:

1. Construction of 181 no. residential units comprising of:
    - 18 no. 1 bed units
    - 81 no. 2 bed units
    - 74 no. 3 bed units and
    - 8 no. 4 bed semi-detached units

Provision of shared communal and private open space, car and bicycle parking, site landscaping and public lighting, services, resident car parking, vehicular access from the R394, (known locally as the C-Link Road), and associated site development works.

Vehicular access to the proposed development will be via the existing roundabout at the site boundary from the R394. The proposed access road width is 6m with 2m wide footpaths on both sides. The footpath on the right-hand side entering from the R394 roundabout is offset 3m from the road edge to accommodate a two-way cycle facility. This will create a corridor for cyclists through the development that will stretch to the south onto Ashe Road. The Access to the development here is to be a pedestrian/cyclist only access. All internal roads have been designed in accordance with the requirements of Design Manual for Urban Roads and Streets and the Recommendations for Site Development Works for Housing Areas.

A watermain connection to the existing 400mm watermain, running along the R394 is proposed for the development. The water supply required for the proposed development shall be delivered via a 150mm spine watermain, running parallel with the main arterial street, and 100mm watermain branches from the main spine servicing dwellings on link streets.

An existing 225mm diameter foul sewer runs within the site along a section of the site southern boundary. It is proposed that wastewater generated from 99no. units of the proposed development will discharge to this sewer via a gravity. Due to site topography, and as requested from Uisce Eireann, the remaining 82no. units will be pumped via a rising main to an existing 525mm foul sewer, circa. 80m north of the development on the R394. A pump station, located in the northern area of the development is to cater for the discharge of wastewater from these 82 units. The pump station has been previously granted by Westmeath County Council for a residential development across the R394 to the north of this development, (planning reference 22515), and the additional units from this development has been considered in its design.

The following sections of this report outline the P.E.'s and wastewater flow rates, the proposed surface water drainage design, the proposed water main details and the proposed road network design.

The site location and proposed development indicative site layout are presented in Figure 1 and Figure 2 below, respectively.

Figure 1.1: Site Location

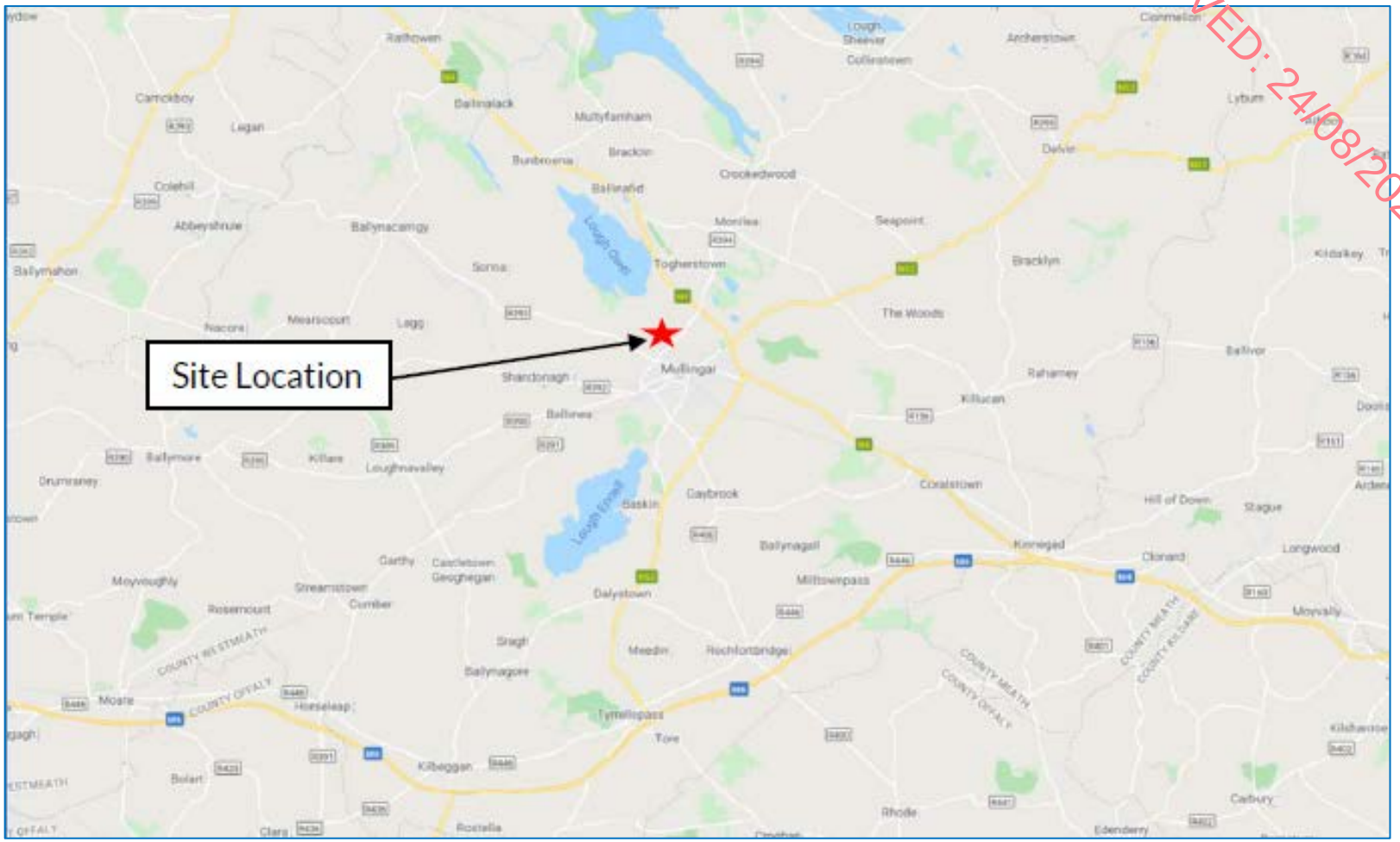


Figure 1.2: Proposed Development Indicative Site Layout

1.1 WASTEWATER DRAINAGE SYSTEM OVERVIEW

It is proposed that wastewater generated from circa. 99no. units of the proposed development will discharge via gravity to an existing 225mm Uisce Eireann foul sewer which runs within a small section of the site along the southern boundary. A new manhole will be constructed on the existing sewer at the point of connection.

The remaining units, due to the site topography will be pumped northwards, via a 110mm PE Rising Main, along the R394 to an existing 525mm Uisce Eireann foul sewer. A pumping station is proposed in the north of the site to raise the wastewater generated from the circa. 82 units. The pump station has been granted planning as part of a separate application, submitted to Westmeath County Council, (planning reference: 22515). The pump station is to cater for a development on the opposite side of the R394 to the one described in this report. The 82no. units from this development have been considered in the design for sizing the pump station.

A feasible connection of wastewater services for up to 200 houses has been confirmed by Uisce Eireann at the respective proposed connection locations.

The foul sewer network was designed using Causeway Flow modelling software. Outputs from the foul sewer design can be found in Appendix B of this document. The proposed foul sewer network is presented graphically on drawing no. 10906-2503 & 10906-2504.

It is proposed that all gravity foul sewer pipes within the network will be thermoplastic structured wall pipes. The maximum proposed gravity pipe diameter is 225mm and the minimum proposed gravity pipe diameter is 150mm. The maximum and minimum gradients shall be between 1/25 and 1/200 respectively. All flow velocities within the proposed gravity foul drainage network fall within the limits of 0.75 and 2.5m/sec as set out in Irish Water Code of Practice for Wastewater Infrastructure.

The proposed rising main is to be of PE construction in line with Section 3.14 of the Irish Water Codes of Practice for Wastewater Infrastructure.

1.2 STORM WATER DRAINAGE SYSTEM OVERVIEW

The storm water drainage infrastructure incorporates the philosophies of nature-based SuDS to manage surface water runoff quantity and quality. However, in accordance with the CIRIA SuDS guidelines, exceedance measures have been provided in that seasonal under-performance or outright failure of surface SuDS features can be accommodated by a conventional drainage network design, and in the instance that any or all surface SUDS features are overwhelmed, exceedance flow is directed back into the piped network. The piped network has been sized to achieve controlled outflows without the presence of surface SuDS features, thereby providing an additional factor of safety to the stormwater management system.

The proposed site topography has been designed to prevent isolated low points which would give rise to a risk of localised ponding and flooding. Surface water will be directed away from proposed dwellings and along the internal site road network where it will be collected in gullies or discharged to surface SuDS features. The surface water runoff will be attenuated in the proposed soakaway units prior to discharging at a controlled rate to the public storm sewer running north of the site on the R394. The proposed storm water drainage network and SuDS have been designed considering the landscape masterplan to ensure proposed planting of trees and hedging/shrubs has sufficient separation from the drainage system and has been integrated with the SuDS design.

The proposed stormwater drainage system has been designed to cater for all surface water runoff from hard surfaces within the development including roadways, roofs etc. All surface water generated onsite will pass through oil/petrol interceptors designed to separate

hydrocarbons from clean water before discharging to one of the 4no. proposed soakaway units. Controlled overflow from the soakaway units will be allowed to flow via gravity to the northern boundary of the site where it will tie into a new link associated with the approved Phase 3, (Planning reference number 22515), to be routed along the R394 to an existing boxed storm culvert located to the north-east of the site.

The maximum pipe diameter is to be 375mm, with a maximum and minimum gradient of 1/40 and 1/255. All flow velocities within the network fall within the limits of 0.8 and 3m/sec as set out in "Recommendations for Site Development Works" as published by the Department of Environment.

1.3 WATERMAIN OVERVIEW

A watermain connection to the existing 400mm watermain, running along the R394 is proposed for the development. The water supply required for the proposed development shall be delivered via a 150mm spine watermain, running parallel with the main arterial street, and 100mm watermain branches from the main spine servicing dwellings on link streets.

All watermain designs will be fully vetted by Uisce Eireann prior to receiving an offer to connect.

Details of the watermain arrangement for the proposed development is presented in this report and in drawing no. 10906-2501 & 2502.

A Pre-connection enquiry for 200 units was submitted to Uisce Eireann, and a positive Confirmation of Feasibility was provided. See Appendix E.

1.4 ROADS OVERVIEW

Vehicular access to the proposed development will be via the existing roundabout located on R394. It is proposed to provide a shared footpath and cycle path along the Ashe Road boundary which will connect to the existing cycle path located outside the south-east corner of the site. Additional access points (pedestrian only) are proposed in the southern area of the site, which will connect pedestrian access from the site to Ashe Road.

The proposed access road width is 6m with 2m wide footpaths on both sides. The footpath on the right-hand side entering from the R394 roundabout is offset 3m from the road edge to accommodate a two-way cycle facility. This will create a corridor for cyclists through the development that will stretch to the south onto Ashe Road. The access to the development at this location on Ashe Road is to be a pedestrian/cyclist only access. All internal roads have been designed in accordance with the requirements of Design Manual for Urban Roads and Streets and the Recommendations for Site Development Works for Housing Areas.

All internal roads have been designed in accordance with the requirements of Design Manual for Urban Roads and Streets.

External connectivity has been enhanced with the proposal of new and/or maintenance of existing tactiles strategically located around the development. Raised junctions, raised pedestrian crossings, shared surface areas and a pedestrian only 'Plaza' area in the southwest corner will provide full linkage for the visually impaired and less-able pedestrians while also prioritising pedestrian movements over vehicular movements.

2. WASTEWATER DRAINAGE DESIGN

2.1 INTRODUCTION

Due to the topography of the site the foul network has been split into 2No. networks; Gravity and pumped. The gravity network will convey the wastewater form circa. 99No. units to an existing Uisce Eireann owned 225mm sewer to the south of the development. The remaining 82No. unit's wastewater will discharge via gravity, northwards to a permitted pump station and then pumped via rising main north on the R394 to an existing 525mm Uisce Eireann owned foul sewer.

The proposed foul network has been designed using Causeway Flow software with a capacity of six times the dry weather flow in accordance with the Uisce Eireann Code of practice and standard details.

Output details can be found in Appendix B of this report and the proposed foul sewer network is graphically represented on the drainage layout drawings and the foul drainage & manhole schedule drawing that accompany this application.

2.2 LOADING RATES

In accordance with Section 3.6 of the Uisce Eireann Code of Practice for Wastewater Infrastructure IW-CDS-5030-03, dry weather flow (DWF) for domestic wastewater is 450 litres per dwelling. This equates to 2.7 P.E. per unit accounting for a 10% infiltration rate and rounded-up. This loading rate has been applied to all dwellings in the Causeway Flow designs presented in Appendix B of this report. The total P.E. associated with the residential component of the proposed development is calculated as follows:

Dwelling P.E. = (2.7 P.E. per Dwelling) x (No. of Dwellings)

= 489P.E. => 500P.E.

2.3 WASTEWATER DESIGN

Pipework design of the foul sewers was undertaken using Causeway Flow software. The design is presented graphically on the drainage layout and schedule drawings that accompany this application. All pipework has been designed in accordance with Uisce Eireann Code of Practice for Wastewater Infrastructure IW-CDS-5030-03.

It is proposed that all pipes in the network will be thermoplastic structured wall pipes. The maximum pipe diameter is to be 225mm with maximum and minimum gradients of 1/60 and 1/200 respectively. All velocities within the foul network comply with Uisce Eireann Code of Practice for Wastewater Infrastructure requirement for flow velocities greater than self-cleansing velocity (0.75m/sec) and less than 2.5m/s as per Section 3.6 of the Uisce Eireann Code of Practice for Wastewater Infrastructure.

The proposed rising main is to be of PE construction in line with Section 3.14 of the Irish Water Codes of Practice for Wastewater Infrastructure.

A pre-connection application was submitted to Uisce Eireann for the connection of 200 units to the wastewater network. A Confirmation of Feasibility from Uisce Eireann was obtained for this

demand and is provided in Appendix E of this report. The confirmation of feasibility for the wastewater states that a connection is feasible 'subject to upgrades'. These are minor upgrades and involves the construction of a Risin Main of approximately 470m northwards along the R394. All upgrade works will be fully funded by the developer.

2.4 WASTEWATER DISCHARGE

It is proposed that wastewater generated from circa. 99no. units of the proposed development will discharge via gravity to an existing 225mm Uisce Eireann foul sewer which runs within a small section of the site along the southern boundary. A new manhole will be constructed on the existing sewer at the point of connection in the southwest corner.

The remaining units, due to the site topography will be pumped northwards, via a 110mm PE Rising Main, along the R394 to an existing 525mm Uisce Eireann foul sewer. A pumping station is permitted in the north of the site to raise the wastewater generated from the circa. 82 units. The pumping station and rising main have both been granted planning under a previous application, reference number 22515, by Westmeath County Council. Wastewater generated from this proposed development was considered in the design of both rising main and pump station.

2.5 PUMPING STATION DESIGN

A typical detail of the pumping station can be found on drawing no. 10906-2522. The pumping station has been designed in accordance with the requirements set out in the Irish Water specification for wastewater systems IW-CDS-5030-03. The pumping station will be 15m from the boundary of the nearest property in accordance with Irish Water requirements as shown on dwg. no. 10906-2504. The layout design includes for a 4.0m wide pull in area to allow for an occasional small tanker or service vehicles to be parked outside the pumping station. It is estimated that tanker movements to the site would be minimal and subject to the operational efficiencies of the pumping station. However, it would be anticipated that no more than 2 to 4 tanker visits would be required per annum.

Irish Water - Code of Practice for Wastewater Infrastructure – Doc ref (IW-CDS_5030-03) section 5.2 General Requirements notes that emergency storage capacity of 24-hours Dry Weather Flow (DWF) is required for smaller developments of up to 250 units.

Section 3.6 Hydraulic design for gravity Sewers notes that DWF should be taken as 446 litres per dwelling (2.7 persons per house and a per capita Wastewater flow of 150 litres per head per day along with a 10%-unit consumption allowance in line with Section 3.6.3 and Section 1.2.4 of Appendix B) (rounded up to 450 litres).

The pumping station has been designed to allow for the connection of developments in the adjacent land ownership on the north of the R394 as well as this development and previously granted as stated in this report. Providing the required storage capacity at the initial stage ensures the pumping station is future proofed and all infrastructure works would be completed. Should future phases come online only the upgrade of the pumps would be required to cater for the additional volumes.

3. STORM WATER DRAINAGE

3.1 INTRODUCTION

The stormwater drainage design has been undertaken using Causeway Flow modelling software. The analysis considered the 30-year and 100-year return period plus an additional 10% and 20% respectively to account for the effects of climate change. The design inputs, results and outputs from the Causeway Flow analysis are shown in Appendix C of this report.

Surface water from all hard surfaces in the proposed development including roadways and roofs, will flow by gravity to soakaways and SuDS measures strategically located throughout the development. Controlled overflow from the attenuation/soakaway tanks will be allowed to flow via gravity to the northern boundary of the site where it will tie into a new link associated with the approved Phase 3, (Planning reference number 22515), to be routed along the R394 to the existing boxed storm culvert located to the north-east of the site.

The oil/petrol interceptors proposed at the inlet to the soakaway unit will serve to prevent hydrocarbons entering the tank and infiltrating the ground.

3.2 SUSTAINABLE URBAN DRAINAGE SYSTEMS

The existing site primarily consists of a greenfield with no existing drainage or SuDS measures in place. To maintain surface water runoff from the site to those of the current state, the surface water drainage for the proposed development will be designed in accordance with the principles of Sustainable Urban Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimise the impact of urbanisation by replicating the runoff characteristics of the greenfield site.

The requirements of SuDS are typically addressed by provision of the following:

- ✓ Interception storage
- ✓ Treatment storage (not required if interception storage is provided)
- ✓ Attenuation storage
- ✓ Long term storage (if this is not required growth rates should not be applied to Q_{Bar})

In the case of the subject site, interception and attenuation storage has been proposed by implementing infiltration tanks with calculated holding volume. Growth factors will not be applied to the allowable discharge for the 100-year event. This means that both treatment storage and long-term storage (neither of which would be practical on this site) are not required. All SuDS measures will be designed with due reference to the recommendation set out in the EPA's document entitled 'Guidance on Authorisation of Discharges to Groundwater 2011'.

SuDS measures proposed would be a combination of water butts (not reflected on the SuDS layout), rain gardens, tree pits, permeable paving, and drainage kerbs with infiltration trenches/swales. These measures would seek to achieve interception storage. Storage capacity has been calculated and provided in discharge soakaways as though no interception storage were provided. Thereby is mitigated any seasonal performance of interception storage measures.

SuDS objectives relate to:

1. Water Quality
2. Water Quantity
3. Amenity
4. Biodiversity

3.2.1 Water Quality

Water quality is managed in the form of the proposed petrol interceptors. Since spatial restraints limit the use of nature-based SuDS measures specifically for water treatment, the use of a petrol interceptor has been proposed as a general SuDS measure to meet this requirement. In addition, the drainage kerbs and infiltration trench/swale garden combination allow for isolation of hydrocarbons for nature-based treatment within appropriate green zones.

3.2.2 Water Quantity

Spatial restraints limit the use of large-scale SuDS measures but the employment of interception storage measures at source (as mentioned above) and soakaway structures achieve this requirement. The main drainage system is also designed to achieve the required thresholds in the event of localized exceedance of SuDS measures, or seasonally sensitive capacity reductions, thereby ensuring that greenfield run-off rates are maintained.

3.2.3 Amenity

The proposed rain gardens and tree pits integrate with the broader landscaping strategy to meet this requirement. However, the details of these measures are to be developed during the detailed design stage.

3.2.4 Biodiversity

The landscaping design requires further development in the detailed design stage to accommodate further SuDS measures to leverage opportunities for biodiversity. However, the SuDS measures already proposed support the landscaping measures as might be employed to meet the biodiversity goals of the development.

3.3 PROPOSED STORM DRAINAGE

The storm water drainage design has been undertaken using Causeway Flow modelling software. The design inputs, results and outputs from the analysis are shown in Appendix C of this report. The analysis considered the 100-year return period plus an additional 10% to account for the effects of climate change.

A dedicated storm water drainage system will be provided for the development and will pick up surface water run-off from impermeable surfaces such as roadways, carparks, footways, and roofs. The proposed development has been divided into 4 catchment areas: Networks A, B, C and D. These networks will each direct flow through a petrol interceptor before discharging into the proposed soakaway units. All proposed soakaways have been optimally located to cater for the associated catchment area.

External upgrade works are proposed to accommodate the new development, (at the main entrance junction, cycle and pedestrian facility along Ashe Road), with surface water drainage considered for these works. Precast concrete gullies including lockable cast iron grating and frame connected to a piped system will be provided to collect run-off from these areas and at all

proposed gully locations within the development. The proposed pipe diameters and gradients will range within the limits set out in 'Recommendations for Site Development Works' as published by the Department for the Environment. Gullies are proposed to be installed outside the main entrance of the development.

All flow velocities within the network fall within the limits set out in "Recommendations for Site Development Works" as published by the Department of Environment.

The details of the Causeway Flow outputs and associated long sections for each network are outlined at Appendix C of this report and the proposed storm water network can be found presented graphically on drawing no. 10906-2503 & 2504 and the overflow connection on drawing no. 10906-2505.

3.4 SOAKAWAY (BRE 365)

The soakaway system is proposed to discharge surface water run-off from the site to the ground. The required storage requirements have been designed in accordance with the requirements of BRE Digest 365, Soakaway Design, 2007 Edition and based on the infiltration properties of the existing ground which were determined through infiltration tests carried out at the site.

All storm water generated from impermeable areas will be discharged to 4No. soakaways on the site. Accumulated stormwater will discharge to ground via underground soakaways comprising cellular units or similar approved systems. 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. The locations of the soakaways, along with the volumes and invert levels of each are shown on drawing nos. 10906-2503 & 2504 and a typical soakaway detail shown on drawing no. 10906-2524.

Infiltration tests were carried out by IGSL in accordance with BRE Digest 365:2016 to establish the achievable infiltration rates on site and these rates joint with the impermeable factor (access roads & carparks - 0.9) were used in drainage calculations to determine suitable soakaway volumes and invert levels.

The infiltration rates obtained from field tests, and calculated volumes, are found below:

- **Soakaway Network A (Petrol Interceptor NSBE030 or similar)**
  Volume- 720 m^3
  f value used (0.001m/min) taken from SA07 cycle 2
- **Soakaway Network B (Petrol Interceptor NSBE020 or similar)**
  Volume- 276 m^3
  f value used (0.001m/min) taken from SA07 cycle 2
- **Soakaway Network C (Petrol Interceptor NSBE010 or similar)**
  Volume- 255 m^3
  f value used (0.000125m/min) taken from SA06 cycle 2
- **Soakaway Network D (Petrol Interceptor NSBE010 or similar)**
  Volume- 225 m^3
  f value used (0.000125m/min) taken from SA06 cycle 2

All Soakaways are to be constructed with a hydrobrake outfall manhole to allow for an overflow of water in the event the water level surcharges above the top of the soakaway . The outfall manhole will release water at a controlled rate to the next network downstream with a high-level overflow as an extra pre-cautionary factor. The invert of the hydrobrake on soakaways A and B is proposed slightly lower to allow for a controlled discharge to the overflow network,

granted by Westmeath County Council under planning application reference no. 22515, as well as infiltration. Results of the calculations and long sections from the Causeway Flow modelling software can be found in Appendix C along with the soakaway testing results from the IGSL site Investigation.

3.5 PETROL INTERCEPTOR

It is proposed to install a bypass Petrol Interceptor prior to outfall to each proposed soakaway unit. Locations of the interceptors can be seen graphically on drawing nos. 10906-2503 & 2504.

Stormwater entering each soakaways unit will include run-off from the roadways and parking areas throughout the site and therefore may contain hydrocarbons. These hydrocarbon pollutants require removal and are not to be discharged back into the environment. The separators have been sized to cater for roads, footways, and driveway areas of each catchment area.

The selection tables in the Separator Product Brochure can be found in Appendix D.

- Soakaway A – NSBE030
- Soakaway B – NSBE020
- Soakaway C – NSBE010
- Soakaway D – NSBE010

4. WATERMAIN

4.1 EXISTING WATERMAIN

A 400mm AC watermain is located on the western side of the R394. This traverses around the roundabout to the southwest of the site and heads east along Ashe Road on the opposite side of the development for approximately 100m before terminating at a sluice valve. Additionally for a 100mm PVC watermain is located along the southern boundary on the nearside of the development along Ashe Road.

4.2 PROPOSED WATERMAIN

The watermain layout is presented in drawings no. 10906-2501 & 2502. The watermain layout has been designed in accordance with Uisce Eireann Code of Practice for Watermain Infrastructure IW-CDS-5020-03.

The water supply required for the proposed development shall be via a 150mm spine watermain as per Irish Water requirements. A 100mm PE Watermain will breach off this spine main to service the smaller areas of the development. It is proposed to connect to the 400mm Asbestos watermain located within the R394, north-west of the proposed site entrance.

In accordance with Local authority/Irish Water standards, a water meter and Logging Device (Larson Type) are proposed at the connections into the proposed site. A sluice valve, strainer and 150mm/100mm by-pass arrangement is also proposed to allow for possible disconnection of water meters by the Local Authority/Irish Water.

Hydrants will be positioned within the site as shown in the drawing nos. 10906-2501 & 2502. All watermains are to be commissioned and pressure tested. The typical construction details and the meter details are shown on drawing no. 10906-2518.

A pre-connection application was submitted to Uisce Eireann for the connection of 200 units to the wastewater network. A Confirmation of Feasibility from Uisce Eireann was obtained for this demand and is provided in Appendix E of this report.

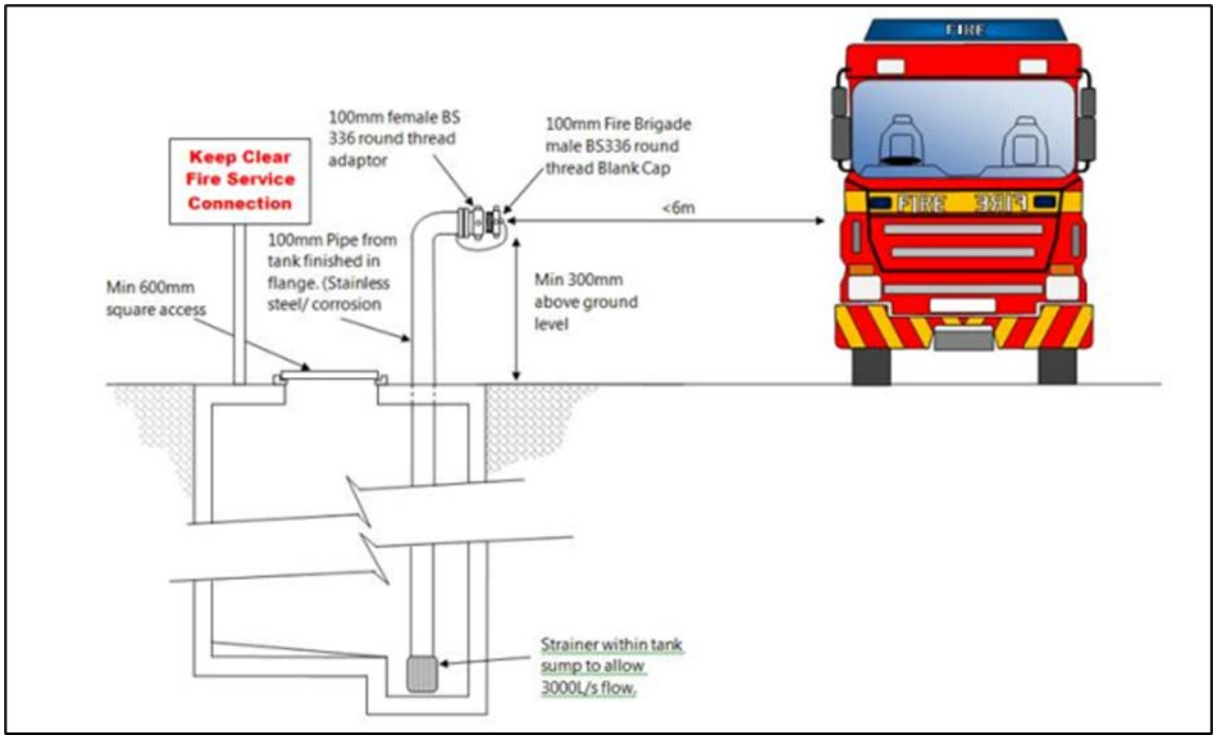
5. FIRE FIGHTING FLOWS

To meet required fire flow requirements, it is proposed to install below ground static storage capacity within the site, as per Figure 5.1. This is required as, in general, Uisce Eireann will not guarantee available fire flow within the hydrants located on site. It is proposed to provide an underground storage tank capable a minimum of supplying 20 l/s of flow for a 1-hour period. This equates to a minimum volume required for the site of 72m3.

The fire-fighting flow of 20 l/s is derived from the 'National Guidance Document on the provisions of water for Firefighting – Water UK 3rd Edition'. The tank is to be located within a grassed area and easily accessible by fire tenders and tankers should they need access. An 80mm diameter top up supply for tank will be provided from the main watermain which will include a shut-off valve should the supply need to be switched off for maintenance or in an emergency. The location of the tank is shown graphically on drawing no. 10906-2501.

It is noted that in addition to the static storage tank, a significant volume of water will still be available from hydrants located throughout the development. Any specific requirements as requested by the local fire authority when applying for the Fire Certification will be incorporated at the detail design stage. It is also noted that should the hydrants be proven to be able to supply 20l/s or more for a 1-hour period, the tank may be omitted from the development at the discretion of the local fire authority.

Figure 5.1: Typical detail of a below ground static storage tank.



6. ROAD DESIGN

All internal roads of the proposed development have been designed in accordance with the requirements of Design Manual for Urban Roads and Streets and the Recommendations for Site Development Works. The proposed internal roads are min. 5.5m wide.

Autotrack Vehicle Swept Path Analysis has been completed for the proposed site layout for Large Car, Coaches and Fire Tender, drawing no.s 10906-2512 to 2517, respectively, to ensure the vehicles can safely manoeuvre around the site.

Road levels for the site have been derived taking cognisance of the existing topography, ground conditions and neighbouring developments. All roads shall be constructed on a suitable bearing with a road construction makeup as per detail shown on drawing 10906-2523. All roads will include a 1:40 camber from the centre of the road, and longitudinal gradients of road sections lie between 1:21 and 1:200 to ensure adequate surface water drainage is achieved.

Gullies are located, at a minimum, every 200m^2 with local low points allowing for double gullies as per Recommendations for Site Development Works to mitigate the effect of local blockage.

The use of shared surfaces, raised junctions, raised pedestrian crossings along with strategically positioned drop kerbs and blister tactile paving will allow for full linkage for visually impaired and less-able pedestrians while also prioritising pedestrian movements over vehicular movements. All footways and shared cycle facilities are interconnected within the site, with links to each block of residential units and/or cul-de-sacs and green open space areas, creating significant inter-connectivity for the development. Raised and Stop junctions will provide traffic calming measures throughout the development to slow vehicular movement.

In addition, a Road Safety Audit, a Traffic and Transport Assessment and a DMURS street Design Audit have been carried out as updates to the original approval and the final reports are included within the application package as separate documents.

7. REFERENCES

Uisce Eireann Code of Practice for Wastewater Infrastructure IW-CDS-5030-03, Revision 2, July 2020

Uisce Eireann Code of Practice for Water Infrastructure IW-CDS-5020-03, Revision 2, July 2020

Design Manual for Urban Roads and Streets, Department of Transport, Tourism and Sport/Department of Housing, Planning and Local Government

National Guidance Document on the Provision of Water for Fire Fighting, 3rd Edition, January 2007, Local Government Association/Water UK

Recommendations for Site Development works for Housing Areas, October 1998, Government of Ireland

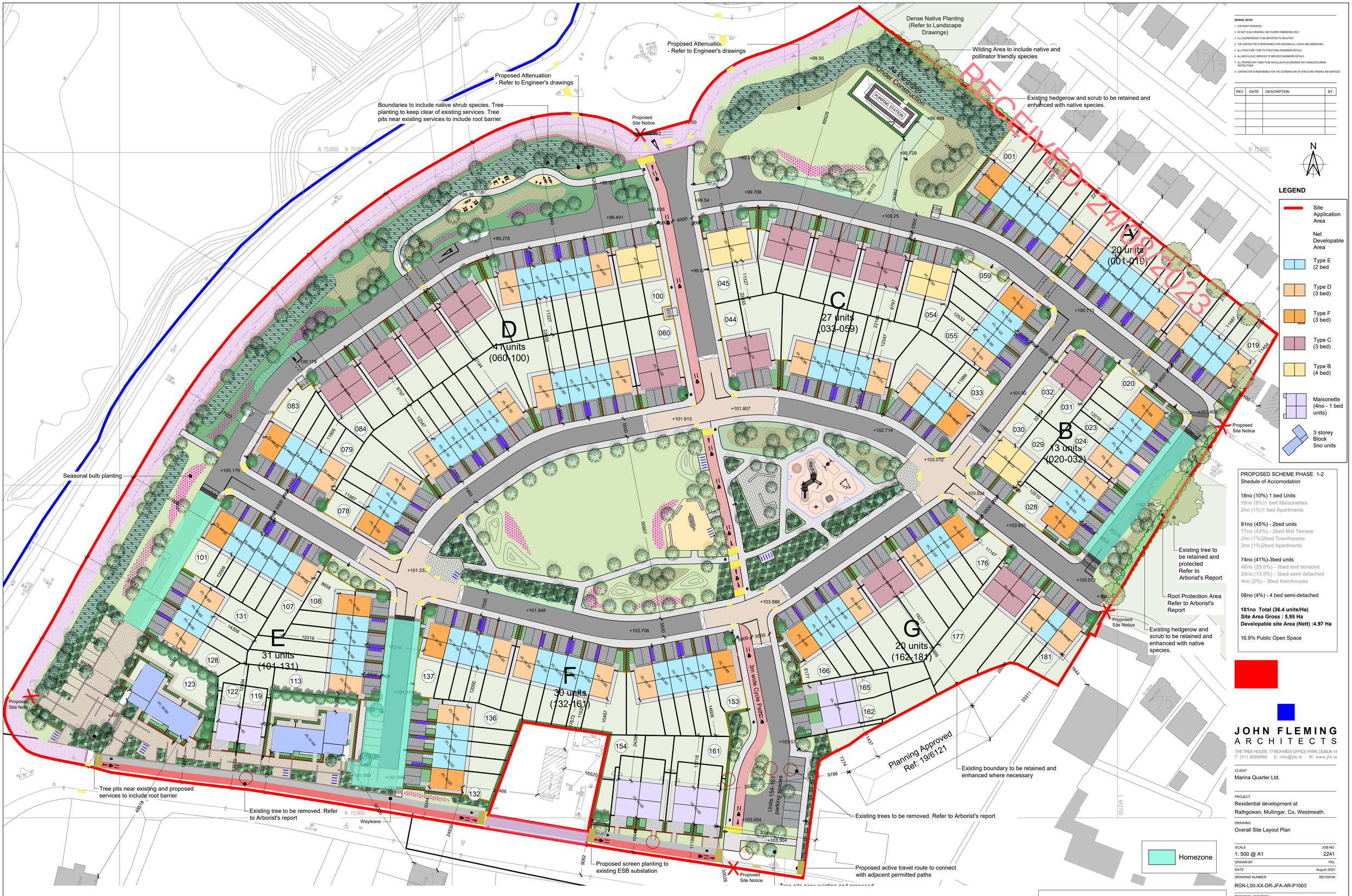
Public Health and Plumbing Engineering CIBSE Guide G: 2014, Chartered Institute of Building Services Engineers

Traffic Signs Manual, August 2019, Department of Transport, Tourism and Sport

The SuDS Manual C753, 2015, CIRIA

BRE Digest 365, Building Research Establishment

Appendix A SITE DEVELOPMENT PLAN



Overall Site Layout Plan

Scale 1:500 @ A1

X Proposed Location of Site Notice

Lands in Westmeath County Council Ownership

[m] 0 10 20 30 40 50

GENERAL NOTES

1. COPYRIGHT RESERVED
2. DO NOT SCALE DRAWING. USE FIGURED DIMENSIONS ONLY.
3. ALL DISCREPENCIES TO BE REPORTED TO ARCHITECT.
4. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL LEVELS AND DIMENSIONS.
5. ALL STRUCTURE TO BE TO STRUCTURAL ENGINEERS DETAILS.
6. ALL MECH & ELEC SERVICES TO SERVICES ENGINEERS DETAILS.
7. ALL PROPRIETARY ITEMS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
8. CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION OF STRUCTURE FINISHES AND SERVICES.

REV	DATE	DESCRIPTION	BY

N

LEGEND

- Site Application Area
- Net Developable Area
- Type E (2 bed
- Type D (3 bed)
- Type F (3 bed)
- Type C (3 bed)
- Type B (4 bed)
- Maisonette (4no - 1 bed units)
- 3 storey Block 5no units

PROPOSED SCHEME PHASE 1-2
Shedule of Accomodation

18no (10%) 1 bed Units
16no (9%)1 bed Maisonettes
2no (1%)1 bed Apartments

81no (45%) - 2bed units
77no (43%) - 2bed Mid Terrace
2no (1%)2bed Townhouses
2no (1%)2bed Apartments

74no (41%)-3bed units
46no (25.5%) - 3bed end terraced
24no (13.5%) - 3bed semi detached
4no (2%) - 3bed townhouses

08no (4%) - 4 bed semi-detached

181no Total (36.4 units/Ha)
Site Area Gross : 5.95 Ha
Developable site Area (Nett) :4.97 Ha

16.9% Public Open Space

JOHN FLEMING
ARCHITECTS
THE TREE HOUSE, 17 RICHVIEW OFFICE PARK, DUBLIN 14
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CLIENT
Marina Quarter Ltd.

PROJECT
Residential development at
Rathgowan, Mullingar, Co, Westmeath.

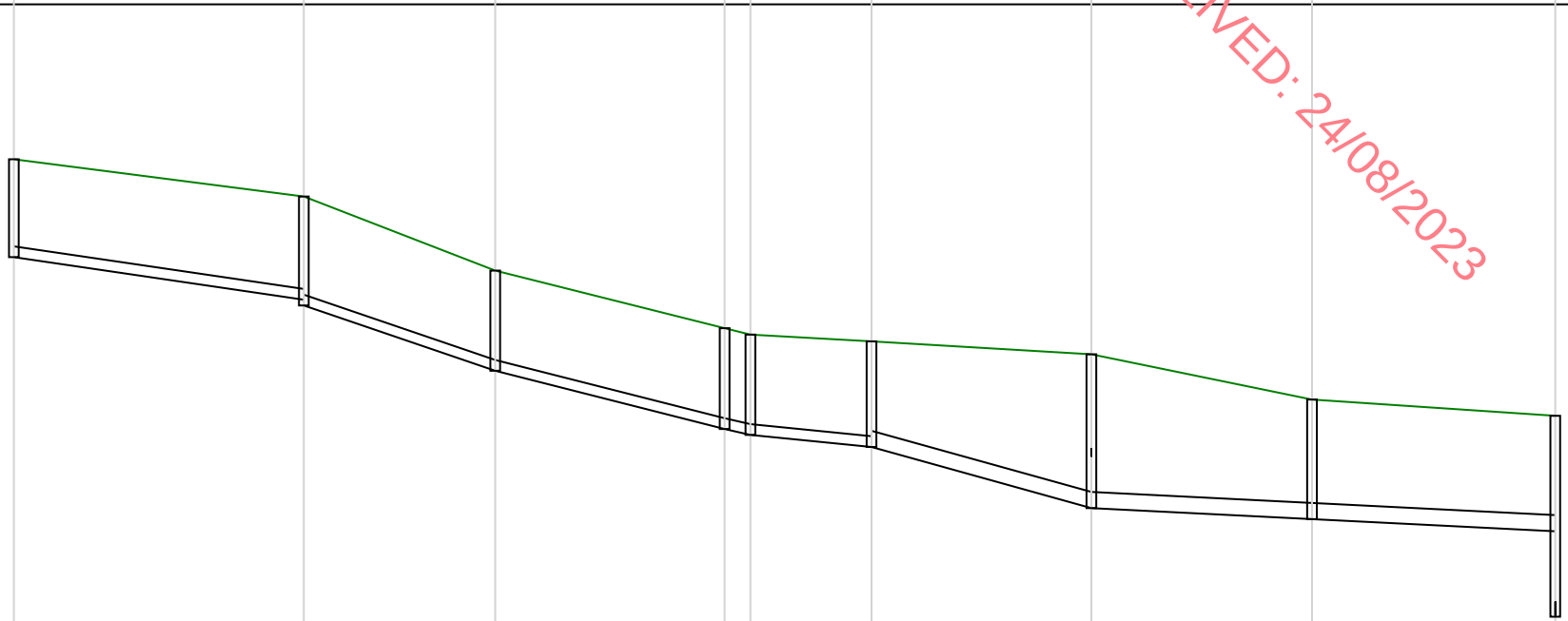
DRAWING
Overall Site Layout Plan

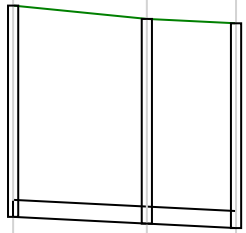
SCALE	JOB NO.
1: 500 @ A1	2241
DRAWN BY	PKL
DATE	August 2023
DRAWING NUMBER	REVISION
RGN-L00-XX-DR-JFA-AR-P1003	

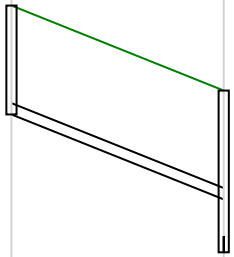
DRAWING LOCATION
\\dublinjobs\22 jobs\224100-current drawings\pln\pl\ate

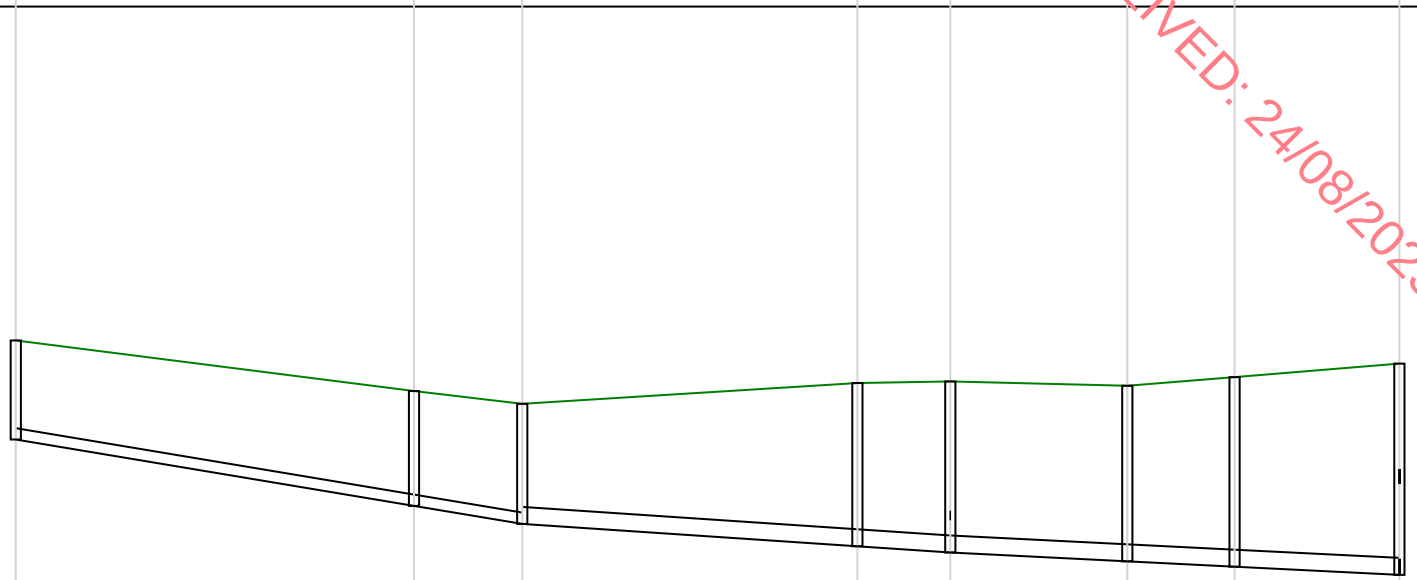
DRAWING STATUS
Planning

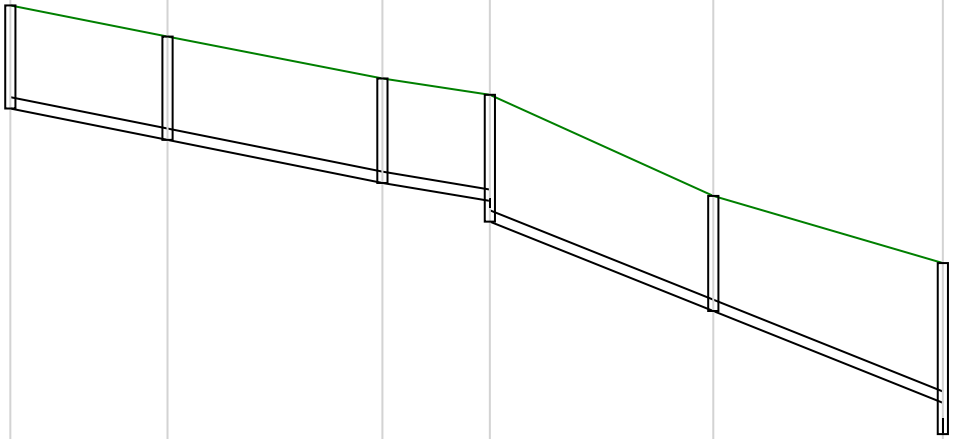
Appendix B FOUL DRAINAGE CALCULATION SHEETS

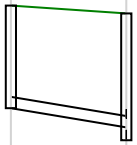
Node Name	FA 1	FA 2	FA 3	FA 4	FA 5	FA 6	FA 7	FA 8	FA 21
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000									
Link Name	1.000	1.001	1.002	1.0	1.004	1.005	1.006	1.007	
Section Type	150mm	150mm	150mm	15	150mm	225mm	225mm	225mm	
Slope (1:X)	68.1	29.3	39.4	43	100.2	36.0	200.4	200.0	
Cover Level (m)	103.351	102.833	101.803	101.002	100.913	100.819	100.639	100.010	99.784
Invert Level (m)	101.990 / 101.398	101.318 / 100.410	100.410 / 99.600	99.600 / 99.518	99.518 / 99.350	99.350 / 98.500	98.500 / 98.347	98.347 / 98.178	
Length (m)	40.301	26.602	31.882	3.5	16.831	30.559	30.661	33.808	

Node Name		FA 21	FA 22	ABF 4
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 93.000				
Link Name		1.008	1.009	
Section Type		225mm	225mm	
Slope (1:X)		198.7	199.9	
Cover Level (m)		99.784	99.608	99.550
Invert Level (m)		96.990 96.901	96.901 96.842	
Length (m)		17.682	11.796	

Node Name		FA 7.1	FA 7
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000			
Link Name		2.000	
Section Type		150mm	
Slope (1:X)		25.0	
Cover Level (m)		101.763	100.639
Invert Level (m)		100.323	99.200
Length (m)		28.067	

Node Name	FA 9	FA 10	FA 11	FA 12	FA 18	FA 19	FA 20	FA 21
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 93.000								
Link Name	3.000	3.001	3.002	3.003	3.004	3.005	3.006	
Section Type	150mm	150mm	225mm	225mm	225mm	225mm	225mm	
Slope (1:X)	60.0	60.1	149.7	149.9	200.0	199.7	201.8	
Cover Level (m)	100.090	99.421	99.252	99.527	99.548	99.491	99.605	99.784
Invert Level (m)	98.780	97.902 / 97.902	97.664 / 97.664	97.368 / 97.368	97.286 / 97.286	97.169 / 97.169	97.098 / 97.098	96.990
Length (m)	52.659	14.314	44.318	12.288	23.404	14.182	21.797	

Node Name	FA 13	FA 14	FA 15	FA 16	FA 17	FA 18
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000						
Link Name	4.000	4.001	4.002	4.003	4.004	
Section Type	150mm	150mm	150mm	150mm	150mm	
Slope (1:X)	50.1	49.9	59.9	25.0	25.0	
Cover Level (m)	102.955	102.543	101.989	101.773	100.436	99.548
Invert Level (m)	101.592	101.177 / 101.177	100.607 / 100.607	100.370 / 100.096	98.914 / 98.914	97.700
Length (m)	20.787	28.415	14.208	29.548	30.354	

Node Name		FA 16.1	FA 16
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000			
Link Name		5.000	
Section Type		150mm	
Slope (1:X)		60.1	
Cover Level (m)		101.877	101.773
Invert Level (m)		100.520	100.266
Length (m)		15.261	

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	450	Connection Type	Level Inverts
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.005
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Units	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
FA 1	5.0	103.351	Adoptable	642656.301	753498.146	1.361
FA 2	6.0	102.833	Adoptable	642688.133	753473.431	1.515
FA 3	5.0	101.803	Adoptable	642704.444	753494.447	1.393
FA 4	1.0	101.002	Adoptable	642723.971	753519.649	1.402
FA 5	3.0	100.913	Adoptable	642722.645	753522.977	1.395
FA 6	8.0	100.819	Adoptable	642709.363	753533.316	1.469
FA 7.1	5.0	101.763	Adoptable	642668.066	753530.099	1.440
FA 7	6.0	100.639	Adoptable	642685.348	753552.214	2.139
FA 8	7.0	100.010	Adoptable	642661.160	753571.055	1.663
FA 9	8.0	100.090	Adoptable	642457.946	753538.548	1.310
FA 10	1.0	99.421	Adoptable	642501.001	753568.867	1.519
FA 11	8.0	99.252	Adoptable	642514.666	753573.127	1.588
FA 12		99.527	Adoptable	642558.228	753581.278	2.159
FA 13	5.0	102.955	Adoptable	642641.733	753509.451	1.363
FA 14	5.0	102.543	Adoptable	642623.415	753519.277	1.366
FA 15	2.0	101.989	Adoptable	642595.637	753525.255	1.382
FA 16.1	1.0	101.877	Adoptable	642566.504	753521.445	1.357
FA 16		101.773	Adoptable	642581.446	753524.550	1.677
FA 17		100.436	Adoptable	642575.962	753553.584	1.522
FA 18	2.0	99.548	Adoptable	642570.329	753583.411	2.262
FA 19	2.0	99.491	Adoptable	642593.378	753587.474	2.322
FA 20	2.0	99.605	Adoptable	642607.366	753585.131	2.507
FA 21		99.784	Adoptable	642628.458	753579.634	2.794
FA 22		99.608	Adoptable	642632.769	753596.782	2.707
ABF 4		99.550	Adoptable	642631.172	753608.470	2.708

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	FA 1	FA 2	40.301	1.500	101.990	101.398	0.592	68.1	150
1.001	FA 2	FA 3	26.602	1.500	101.318	100.410	0.908	29.3	150
1.002	FA 3	FA 4	31.882	1.500	100.410	99.600	0.810	39.4	150
1.003	FA 4	FA 5	3.583	1.500	99.600	99.518	0.082	43.7	150
1.004	FA 5	FA 6	16.831	1.500	99.518	99.350	0.168	100.2	150

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.407	1.062	18.8	1.1	1.211	1.285	0.000	0	5.0	0.0	25	0.573
1.001	0.623	1.622	28.7	1.7	1.365	1.243	0.000	0	11.0	0.0	25	0.876
1.002	0.593	1.399	24.7	2.0	1.243	1.252	0.000	0	16.0	0.0	29	0.832
1.003	0.576	1.327	23.5	2.1	1.252	1.245	0.000	0	17.0	0.0	30	0.809
1.004	0.442	0.875	15.5	2.2	1.245	1.319	0.000	0	20.0	0.0	39	0.622

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.005	FA 6	FA 7	30.559	1.500	99.350	98.500	0.850	36.0	225
2.000	FA 7.1	FA 7	28.067	1.500	100.323	99.200	1.123	25.0	150
1.006	FA 7	FA 8	30.661	1.500	98.500	98.347	0.153	200.4	225
1.007	FA 8	FA 21	33.808	1.500	98.347	98.178	0.169	200.0	225
3.000	FA 9	FA 10	52.659	1.500	98.780	97.902	0.878	60.0	150
3.001	FA 10	FA 11	14.314	1.500	97.902	97.664	0.238	60.1	150
3.002	FA 11	FA 12	44.318	1.500	97.664	97.368	0.296	149.7	225
3.003	FA 12	FA 18	12.288	1.500	97.368	97.286	0.082	149.9	225
4.000	FA 13	FA 14	20.787	1.500	101.592	101.177	0.415	50.1	150
4.001	FA 14	FA 15	28.415	1.500	101.177	100.607	0.570	49.9	150
4.002	FA 15	FA 16	14.208	1.500	100.607	100.370	0.237	59.9	150
5.000	FA 16.1	FA 16	15.261	1.500	100.520	100.266	0.254	60.1	150
4.003	FA 16	FA 17	29.548	1.500	100.096	98.914	1.182	25.0	150
4.004	FA 17	FA 18	30.354	1.500	98.914	97.700	1.214	25.0	150
3.004	FA 18	FA 19	23.404	1.500	97.286	97.169	0.117	200.0	225
3.005	FA 19	FA 20	14.182	1.500	97.169	97.098	0.071	199.7	225
3.006	FA 20	FA 21	21.797	1.500	97.098	96.990	0.108	201.8	225
1.008	FA 21	FA 22	17.682	1.500	96.990	96.901	0.089	198.7	225
1.009	FA 22	ABF 4	11.796	1.500	96.901	96.842	0.059	199.9	225

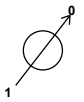
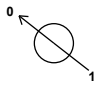
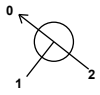
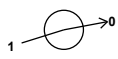
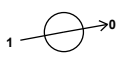
Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.005	0.626	1.918	76.2	2.6	1.244	1.914	0.000	0	28.0	0.0	29	0.883
2.000	0.580	1.757	31.0	1.1	1.290	1.289	0.000	0	5.0	0.0	20	0.813
1.006	0.363	0.809	32.2	3.1	1.914	1.438	0.000	0	39.0	0.0	47	0.509
1.007	0.379	0.810	32.2	3.4	1.438	1.381	0.000	0	46.0	0.0	50	0.526
3.000	0.457	1.132	20.0	1.4	1.160	1.369	0.000	0	8.0	0.0	27	0.647
3.001	0.468	1.131	20.0	1.5	1.369	1.438	0.000	0	9.0	0.0	28	0.655
3.002	0.356	0.937	37.3	2.1	1.363	1.934	0.000	0	17.0	0.0	36	0.503
3.003	0.356	0.937	37.2	2.1	1.934	2.037	0.000	0	17.0	0.0	36	0.503
4.000	0.449	1.239	21.9	1.1	1.213	1.216	0.000	0	5.0	0.0	23	0.638
4.001	0.502	1.242	22.0	1.6	1.216	1.232	0.000	0	10.0	0.0	27	0.710
4.002	0.491	1.133	20.0	1.7	1.232	1.253	0.000	0	12.0	0.0	30	0.690
5.000	0.332	1.131	20.0	0.5	1.207	1.357	0.000	0	1.0	0.0	17	0.468
4.003	0.675	1.757	31.0	1.8	1.527	1.372	0.000	0	13.0	0.0	25	0.949
4.004	0.675	1.757	31.0	1.8	1.372	1.698	0.000	0	13.0	0.0	25	0.949
3.004	0.356	0.810	32.2	2.8	2.037	2.097	0.000	0	32.0	0.0	45	0.497
3.005	0.356	0.811	32.2	2.9	2.097	2.282	0.000	0	34.0	0.0	46	0.504
3.006	0.362	0.806	32.1	3.0	2.282	2.569	0.000	0	36.0	0.0	47	0.507
1.008	0.409	0.813	32.3	4.5	2.569	2.482	0.000	0	82.0	0.0	57	0.571
1.009	0.408	0.810	32.2	4.5	2.482	2.483	0.000	0	82.0	0.0	57	0.569

Pipeline Schedule

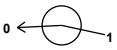
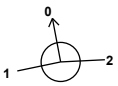
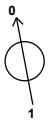
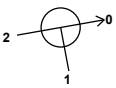
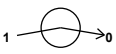
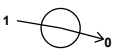
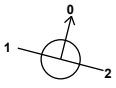
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	40.301	68.1	150	Circular	103.351	101.990	1.211	102.833	101.398	1.285
1.001	26.602	29.3	150	Circular	102.833	101.318	1.365	101.803	100.410	1.243
1.002	31.882	39.4	150	Circular	101.803	100.410	1.243	101.002	99.600	1.252
1.003	3.583	43.7	150	Circular	101.002	99.600	1.252	100.913	99.518	1.245
1.004	16.831	100.2	150	Circular	100.913	99.518	1.245	100.819	99.350	1.319
1.005	30.559	36.0	225	Circular	100.819	99.350	1.244	100.639	98.500	1.914
2.000	28.067	25.0	150	Circular	101.763	100.323	1.290	100.639	99.200	1.289
1.006	30.661	200.4	225	Circular	100.639	98.500	1.914	100.010	98.347	1.438
1.007	33.808	200.0	225	Circular	100.010	98.347	1.438	99.784	98.178	1.381
3.000	52.659	60.0	150	Circular	100.090	98.780	1.160	99.421	97.902	1.369
3.001	14.314	60.1	150	Circular	99.421	97.902	1.369	99.252	97.664	1.438
3.002	44.318	149.7	225	Circular	99.252	97.664	1.363	99.527	97.368	1.934
3.003	12.288	149.9	225	Circular	99.527	97.368	1.934	99.548	97.286	2.037
4.000	20.787	50.1	150	Circular	102.955	101.592	1.213	102.543	101.177	1.216
4.001	28.415	49.9	150	Circular	102.543	101.177	1.216	101.989	100.607	1.232
4.002	14.208	59.9	150	Circular	101.989	100.607	1.232	101.773	100.370	1.253
5.000	15.261	60.1	150	Circular	101.877	100.520	1.207	101.773	100.266	1.357
4.003	29.548	25.0	150	Circular	101.773	100.096	1.527	100.436	98.914	1.372
4.004	30.354	25.0	150	Circular	100.436	98.914	1.372	99.548	97.700	1.698
3.004	23.404	200.0	225	Circular	99.548	97.286	2.037	99.491	97.169	2.097
3.005	14.182	199.7	225	Circular	99.491	97.169	2.097	99.605	97.098	2.282
3.006	21.797	201.8	225	Circular	99.605	97.098	2.282	99.784	96.990	2.569
1.008	17.682	198.7	225	Circular	99.784	96.990	2.569	99.608	96.901	2.482
1.009	11.796	199.9	225	Circular	99.608	96.901	2.482	99.550	96.842	2.483

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	FA 1	1350	Manhole	Adoptable	FA 2	1350	Manhole	Adoptable
1.001	FA 2	1350	Manhole	Adoptable	FA 3	1350	Manhole	Adoptable
1.002	FA 3	1350	Manhole	Adoptable	FA 4	1350	Manhole	Adoptable
1.003	FA 4	1350	Manhole	Adoptable	FA 5	1350	Manhole	Adoptable
1.004	FA 5	1350	Manhole	Adoptable	FA 6	1350	Manhole	Adoptable
1.005	FA 6	1350	Manhole	Adoptable	FA 7	1350	Manhole	Adoptable
2.000	FA 7.1	1350	Manhole	Adoptable	FA 7	1350	Manhole	Adoptable
1.006	FA 7	1350	Manhole	Adoptable	FA 8	1350	Manhole	Adoptable
1.007	FA 8	1350	Manhole	Adoptable	FA 21	1350	Manhole	Adoptable
3.000	FA 9	1350	Manhole	Adoptable	FA 10	1350	Manhole	Adoptable
3.001	FA 10	1350	Manhole	Adoptable	FA 11	1350	Manhole	Adoptable
3.002	FA 11	1350	Manhole	Adoptable	FA 12	1350	Manhole	Adoptable
3.003	FA 12	1350	Manhole	Adoptable	FA 18	1350	Manhole	Adoptable
4.000	FA 13	1350	Manhole	Adoptable	FA 14	1350	Manhole	Adoptable
4.001	FA 14	1350	Manhole	Adoptable	FA 15	1350	Manhole	Adoptable
4.002	FA 15	1350	Manhole	Adoptable	FA 16	1350	Manhole	Adoptable
5.000	FA 16.1	1350	Manhole	Adoptable	FA 16	1350	Manhole	Adoptable
4.003	FA 16	1350	Manhole	Adoptable	FA 17	1350	Manhole	Adoptable
4.004	FA 17	1350	Manhole	Adoptable	FA 18	1350	Manhole	Adoptable
3.004	FA 18	1350	Manhole	Adoptable	FA 19	1350	Manhole	Adoptable
3.005	FA 19	1350	Manhole	Adoptable	FA 20	1350	Manhole	Adoptable
3.006	FA 20	1350	Manhole	Adoptable	FA 21	1350	Manhole	Adoptable
1.008	FA 21	1350	Manhole	Adoptable	FA 22	1350	Manhole	Adoptable
1.009	FA 22	1350	Manhole	Adoptable	ABF 4	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
FA 1	642656.301	753498.146	103.351	1.361	1350		0 1.000	101.990	150
FA 2	642688.133	753473.431	102.833	1.515	1350		1 1.000	101.398	150
							0 1.001	101.318	150
FA 3	642704.444	753494.447	101.803	1.393	1350		1 1.001	100.410	150
							0 1.002	100.410	150
FA 4	642723.971	753519.649	101.002	1.402	1350		1 1.002	99.600	150
							0 1.003	99.600	150
FA 5	642722.645	753522.977	100.913	1.395	1350		1 1.003	99.518	150
							0 1.004	99.518	150
FA 6	642709.363	753533.316	100.819	1.469	1350		1 1.004	99.350	150
							0 1.005	99.350	225
FA 7.1	642668.066	753530.099	101.763	1.440	1350		0 2.000	100.323	150
FA 7	642685.348	753552.214	100.639	2.139	1350		1 2.000	99.200	150
							2 1.005	98.500	225
							0 1.006	98.500	225
FA 8	642661.160	753571.055	100.010	1.663	1350		1 1.006	98.347	225
							0 1.007	98.347	225
FA 9	642457.946	753538.548	100.090	1.310	1350		0 3.000	98.780	150
FA 10	642501.001	753568.867	99.421	1.519	1350		1 3.000	97.902	150
							0 3.001	97.902	150
FA 11	642514.666	753573.127	99.252	1.588	1350		1 3.001	97.664	150
							0 3.002	97.664	225
FA 12	642558.228	753581.278	99.527	2.159	1350		1 3.002	97.368	225
							0 3.003	97.368	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
FA 13	642641.733	753509.451	102.955	1.363	1350		0 4.000	101.592	150
FA 14	642623.415	753519.277	102.543	1.366	1350		1 4.000 0 4.001	101.177 101.177	150 150
FA 15	642595.637	753525.255	101.989	1.382	1350		1 4.001 0 4.002	100.607 100.607	150 150
FA 16.1	642566.504	753521.445	101.877	1.357	1350		0 5.000	100.520	150
FA 16	642581.446	753524.550	101.773	1.677	1350		1 5.000 2 4.002 0 4.003	100.266 100.370 100.096	150 150 150
FA 17	642575.962	753553.584	100.436	1.522	1350		1 4.003 0 4.004	98.914 98.914	150 150
FA 18	642570.329	753583.411	99.548	2.262	1350		1 4.004 2 3.003 0 3.004	97.700 97.286 97.286	150 225 225
FA 19	642593.378	753587.474	99.491	2.322	1350		1 3.004 0 3.005	97.169 97.169	225 225
FA 20	642607.366	753585.131	99.605	2.507	1350		1 3.005 0 3.006	97.098 97.098	225 225
FA 21	642628.458	753579.634	99.784	2.794	1350		1 3.006 2 1.007 0 1.008	96.990 98.178 96.990	225 225 225
FA 22	642632.769	753596.782	99.608	2.707	1350		1 1.008 0 1.009	96.901 96.901	225 225
ABF 4	642631.172	753608.470	99.550	2.708	1350		1 1.009	96.842	225

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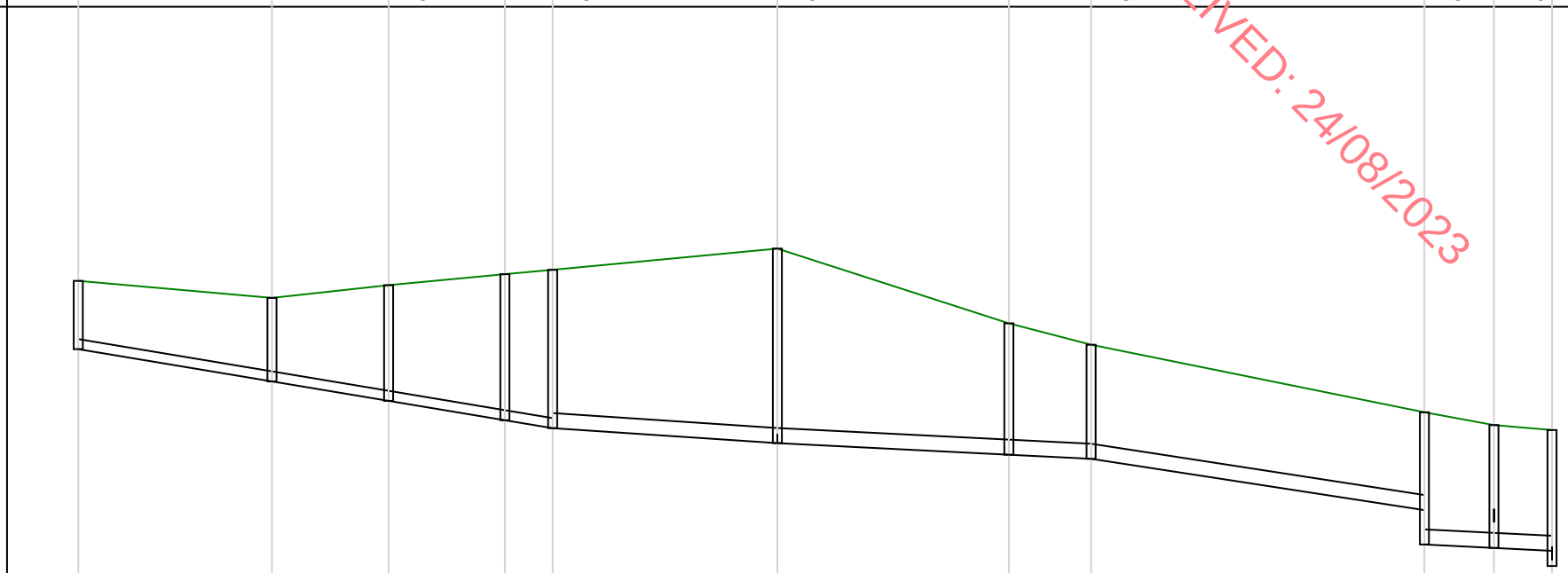
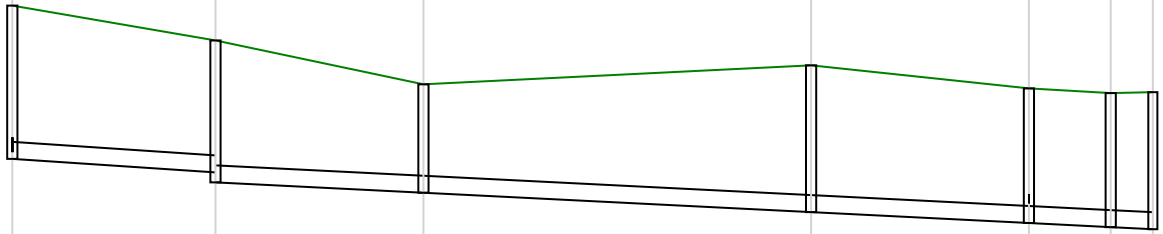
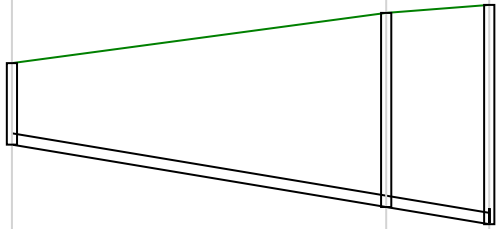
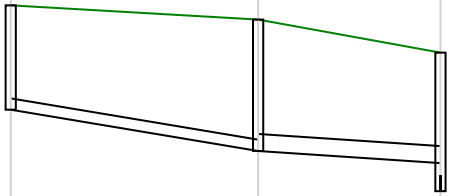
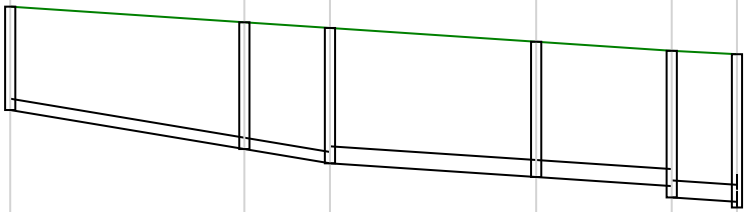
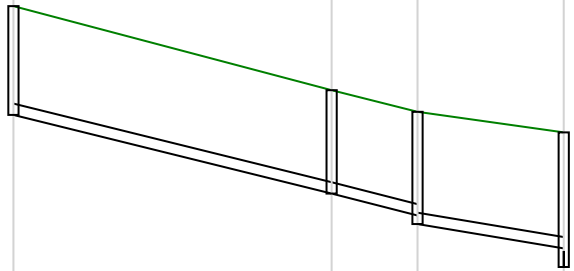
Node Name	FB 1		FB 2		FB 3		FB 4		FB 5		FB 6		FB 7		FB 8		FB 9		FB 10	FB 16
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 96.000																				
Link Name	1.000		1.001		1.002		1.003		1.004		1.005		1.006		1.007		1.008		1.009	
Section Type	150mm		150mm		150mm		150m		225mm		225mm		225mm		225mm		225mm		225m	
Slope (1:X)	60.0		59.9		60.0		60.3		150.2		199.4		200.9		64.9		199.2		201.3	
Cover Level (m)	103.418		103.164		103.354		103.518		103.583		103.899		102.785		102.466		101.459		101.268	101.194
Invert Level (m)	102.400	101.919	101.919	101.629	101.629	101.340	101.340	101.222	101.222	100.999	100.999	100.826	100.826	100.765	100.765	100.000	99.488	99.436	99.436	99.393
Length (m)	28.866		17.384		17.326		7.116		33.486		34.498		12.256		49.670		10.359		8.655	

Node Name	FB 16	FB 17	FB 18	FB 19	FB 23	FB 24	Ex. F 3
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000							
Link Name	1.010	1.011	1.012	1.013	1.014	1.01	
Section Type	225mm	225mm	225mm	225mm	225mm	225	
Slope (1:X)	150.1	200.7	200.2	200.0	196.7	206	
Cover Level (m)	101.194	100.733	100.153	100.404	100.099	100.037	100.049
Invert Level (m)	99.167	98.988	98.856	98.719	98.719	98.463	98.463	98.319	98.319	98.264	98.257		
Length (m)	26.865	27.500	51.262	28.804	10.817	5.57	

Node Name		FB 6.2	FB 6.1	FB 6
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 97.000				
Link Name		2.000	2.001	
Section Type		150mm	150mm	
Slope (1:X)		60.0	60.0	
Cover Level (m)		103.129	103.793	103.899
Invert Level (m)		102.051	101.226 / 101.226	100.999
Length (m)		49.490	13.627	

Node Name		FB 10.2	FB 10.1	FB 10
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000				
Link Name		3.000	3.001	
Section Type		150mm	225mm	
Slope (1:X)		59.9	150.7	
Cover Level (m)		101.893	101.705	101.268
Invert Level (m)		100.513	99.967 / 99.967	99.807
Length (m)		32.717	24.109	

Node Name		FB 11		FB 12	FB 13	FB 14		FB 15	FB 16
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000									
Link Name		4.000		4.001	4.002	4.003		4.004	
Section Type		150mm		150mm	225mm	225mm		225m	
Slope (1:X)		60.0		59.9	150.7	149.4		148.7	
Cover Level (m)		101.823		101.616	101.541	101.359		101.239	101.194
Invert Level (m)		100.456	99.940	99.940	99.751	99.570	99.450	99.300	99.242
Length (m)		30.964		11.319	27.268	17.925		8.627	

Node Name		FB 20		FB 21	FB 22	FB 23	
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000							
Link Name		5.000		5.001	5.002		
Section Type		150mm		150mm	150mm		
Slope (1:X)		40.5		39.2	60.0		
Cover Level (m)		101.769		100.657	100.371	100.099	
Invert Level (m)		100.330	99.290	99.290	99.000 98.887	98.565	
Length (m)		42.075		11.358	19.335		

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	450	Connection Type	Level Inverts
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.005
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Units	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
FB 1	8.0	103.418	Adoptable	642553.563	753395.675	1.018
FB 2		103.164	Adoptable	642582.264	753392.595	1.245
FB 3		103.354	Adoptable	642595.395	753403.988	1.725
FB 4	2.0	103.518	Adoptable	642597.312	753421.208	2.178
FB 5	2.0	103.583	Adoptable	642596.008	753428.203	2.361
FB 6.2	9.0	103.129	Adoptable	642642.412	753495.768	1.078
FB 6.1	2.0	103.793	Adoptable	642601.809	753467.471	2.567
FB 6	5.0	103.899	Adoptable	642589.763	753461.102	2.900
FB 7	2.0	102.785	Adoptable	642555.839	753454.831	1.959
FB 8	10.0	102.466	Adoptable	642543.617	753455.734	1.701
FB 9		101.459	Adoptable	642495.441	753467.825	1.971
FB 10.2	9.0	101.893	Adoptable	642478.897	753413.895	1.380
FB 10.1	4.0	101.705	Adoptable	642482.473	753446.416	1.738
FB 10		101.268	Adoptable	642485.394	753470.347	1.832
FB 11	7.0	101.823	Adoptable	642558.537	753519.927	1.367
FB 12	2.0	101.616	Adoptable	642528.333	753513.107	1.676
FB 13	6.0	101.541	Adoptable	642518.300	753507.867	1.790
FB 14	3.0	101.359	Adoptable	642496.623	753491.325	1.789
FB 15		101.239	Adoptable	642486.335	753476.646	1.939
FB 16	2.0	101.194	Adoptable	642477.926	753474.722	2.027
FB 17	10.0	100.733	Adoptable	642454.745	753488.302	1.877
FB 18	4.0	100.153	Adoptable	642431.118	753502.372	1.434
FB 19	2.0	100.404	Adoptable	642405.008	753458.258	1.941
FB 20	7.0	101.769	Adoptable	642458.957	753413.423	1.439
FB 21	1.0	100.657	Adoptable	642417.282	753419.219	1.367
FB 22	2.0	100.371	Adoptable	642407.467	753424.934	1.484
FB 23		100.099	Adoptable	642390.168	753433.571	1.780
FB 24		100.037	Adoptable	642380.619	753428.490	1.773
Ex. F 3		100.049	Adoptable	642378.189	753423.475	1.812
Ex. F 3		100.049		642378.189	753423.475	

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	FB 1	FB 2	28.866	1.500	102.400	101.919	0.481	60.0	150
1.001	FB 2	FB 3	17.384	1.500	101.919	101.629	0.290	59.9	150
1.002	FB 3	FB 4	17.326	1.500	101.629	101.340	0.289	60.0	150
1.003	FB 4	FB 5	7.116	1.500	101.340	101.222	0.118	60.3	150
1.004	FB 5	FB 6	33.486	1.500	101.222	100.999	0.223	150.2	225
2.000	FB 6.2	FB 6.1	49.490	1.500	102.051	101.226	0.825	60.0	150
2.001	FB 6.1	FB 6	13.627	1.500	101.226	100.999	0.227	60.0	150
1.005	FB 6	FB 7	34.498	1.500	100.999	100.826	0.173	199.4	225
1.006	FB 7	FB 8	12.256	1.500	100.826	100.765	0.061	200.9	225
1.007	FB 8	FB 9	49.670	1.500	100.765	100.000	0.765	64.9	225
1.008	FB 9	FB 10	10.359	1.500	99.488	99.436	0.052	199.2	225
3.000	FB 10.2	FB 10.1	32.717	1.500	100.513	99.967	0.546	59.9	150
3.001	FB 10.1	FB 10	24.109	1.500	99.967	99.807	0.160	150.7	225
1.009	FB 10	FB 16	8.655	1.500	99.436	99.393	0.043	201.3	225
4.000	FB 11	FB 12	30.964	1.500	100.456	99.940	0.516	60.0	150
4.001	FB 12	FB 13	11.319	1.500	99.940	99.751	0.189	59.9	150
4.002	FB 13	FB 14	27.268	1.500	99.751	99.570	0.181	150.7	225
4.003	FB 14	FB 15	17.925	1.500	99.570	99.450	0.120	149.4	225
4.004	FB 15	FB 16	8.627	1.500	99.300	99.242	0.058	148.7	225
1.010	FB 16	FB 17	26.865	1.500	99.167	98.988	0.179	150.1	225
1.011	FB 17	FB 18	27.500	1.500	98.856	98.719	0.137	200.7	225
1.012	FB 18	FB 19	51.262	1.500	98.719	98.463	0.256	200.2	225
1.013	FB 19	FB 23	28.804	1.500	98.463	98.319	0.144	200.0	225
5.000	FB 20	FB 21	42.075	1.500	100.330	99.290	1.040	40.5	150

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.457	1.132	20.0	1.4	0.868	1.095	0.000	0	8.0	0.0	27	0.647
1.001	0.457	1.133	20.0	1.4	1.095	1.575	0.000	0	8.0	0.0	27	0.647
1.002	0.457	1.133	20.0	1.4	1.575	2.028	0.000	0	8.0	0.0	27	0.647
1.003	0.478	1.129	20.0	1.6	2.028	2.211	0.000	0	10.0	0.0	29	0.671
1.004	0.335	0.936	37.2	1.7	2.136	2.675	0.000	0	12.0	0.0	33	0.471
2.000	0.469	1.132	20.0	1.5	0.928	2.417	0.000	0	9.0	0.0	28	0.656
2.001	0.480	1.132	20.0	1.7	2.417	2.750	0.000	0	11.0	0.0	30	0.681
1.005	0.349	0.811	32.3	2.6	2.675	1.734	0.000	0	28.0	0.0	44	0.486
1.006	0.347	0.808	32.1	2.7	1.734	1.476	0.000	0	30.0	0.0	44	0.490
1.007	0.543	1.426	56.7	3.2	1.476	1.234	0.000	0	40.0	0.0	36	0.767
1.008	0.365	0.812	32.3	3.2	1.746	1.607	0.000	0	40.0	0.0	48	0.516
3.000	0.469	1.133	20.0	1.5	1.230	1.588	0.000	0	9.0	0.0	28	0.656
3.001	0.345	0.934	37.1	1.8	1.513	1.236	0.000	0	13.0	0.0	34	0.478
1.009	0.385	0.807	32.1	3.6	1.607	1.576	0.000	0	53.0	0.0	51	0.535
4.000	0.446	1.132	20.0	1.3	1.217	1.526	0.000	0	7.0	0.0	26	0.629
4.001	0.469	1.133	20.0	1.5	1.526	1.640	0.000	0	9.0	0.0	28	0.656
4.002	0.345	0.934	37.1	1.9	1.565	1.564	0.000	0	15.0	0.0	35	0.486
4.003	0.356	0.938	37.3	2.1	1.564	1.564	0.000	0	18.0	0.0	36	0.504
4.004	0.357	0.940	37.4	2.1	1.714	1.727	0.000	0	18.0	0.0	36	0.505
1.010	0.447	0.936	37.2	4.3	1.802	1.520	0.000	0	73.0	0.0	51	0.621
1.011	0.414	0.809	32.1	4.6	1.652	1.209	0.000	0	83.0	0.0	58	0.573
1.012	0.414	0.810	32.2	4.7	1.209	1.716	0.000	0	87.0	0.0	58	0.574
1.013	0.415	0.810	32.2	4.7	1.716	1.555	0.000	0	89.0	0.0	58	0.579
5.000	0.515	1.380	24.4	1.3	1.289	1.217	0.000	0	7.0	0.0	24	0.722

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
5.001	FB 21	FB 22	11.358	1.500	99.290	99.000	0.290	39.2	150
5.002	FB 22	FB 23	19.335	1.500	98.887	98.565	0.322	60.0	150
1.014	FB 23	FB 24	10.817	1.500	98.319	98.264	0.055	196.7	225
1.015	FB 24	Ex. F 3	5.572	1.500	98.264	98.237	0.027	206.4	225

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
5.001	0.524	1.402	24.8	1.4	1.217	1.221	0.000	0	8.0	0.0	24	0.746
5.002	0.479	1.132	20.0	1.6	1.334	1.384	0.000	0	10.0	0.0	29	0.673
1.014	0.425	0.817	32.5	5.0	1.555	1.548	0.000	0	99.0	0.0	59	0.589
1.015	0.415	0.797	31.7	5.0	1.548	1.587	0.000	0	99.0	0.0	60	0.580

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.866	60.0	150	Circular	103.418	102.400	0.868	103.164	101.919	1.095
1.001	17.384	59.9	150	Circular	103.164	101.919	1.095	103.354	101.629	1.575
1.002	17.326	60.0	150	Circular	103.354	101.629	1.575	103.518	101.340	2.028
1.003	7.116	60.3	150	Circular	103.518	101.340	2.028	103.583	101.222	2.211
1.004	33.486	150.2	225	Circular	103.583	101.222	2.136	103.899	100.999	2.675
2.000	49.490	60.0	150	Circular	103.129	102.051	0.928	103.793	101.226	2.417
2.001	13.627	60.0	150	Circular	103.793	101.226	2.417	103.899	100.999	2.750
1.005	34.498	199.4	225	Circular	103.899	100.999	2.675	102.785	100.826	1.734
1.006	12.256	200.9	225	Circular	102.785	100.826	1.734	102.466	100.765	1.476
1.007	49.670	64.9	225	Circular	102.466	100.765	1.476	101.459	100.000	1.234
1.008	10.359	199.2	225	Circular	101.459	99.488	1.746	101.268	99.436	1.607
3.000	32.717	59.9	150	Circular	101.893	100.513	1.230	101.705	99.967	1.588
3.001	24.109	150.7	225	Circular	101.705	99.967	1.513	101.268	99.807	1.236
1.009	8.655	201.3	225	Circular	101.268	99.436	1.607	101.194	99.393	1.576
4.000	30.964	60.0	150	Circular	101.823	100.456	1.217	101.616	99.940	1.526
4.001	11.319	59.9	150	Circular	101.616	99.940	1.526	101.541	99.751	1.640

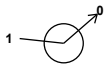
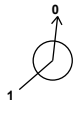
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	FB 1	1350	Manhole	Adoptable	FB 2	1350	Manhole	Adoptable
1.001	FB 2	1350	Manhole	Adoptable	FB 3	1350	Manhole	Adoptable
1.002	FB 3	1350	Manhole	Adoptable	FB 4	1350	Manhole	Adoptable
1.003	FB 4	1350	Manhole	Adoptable	FB 5	1350	Manhole	Adoptable
1.004	FB 5	1350	Manhole	Adoptable	FB 6	1350	Manhole	Adoptable
2.000	FB 6.2	1350	Manhole	Adoptable	FB 6.1	1350	Manhole	Adoptable
2.001	FB 6.1	1350	Manhole	Adoptable	FB 6	1350	Manhole	Adoptable
1.005	FB 6	1350	Manhole	Adoptable	FB 7	1350	Manhole	Adoptable
1.006	FB 7	1350	Manhole	Adoptable	FB 8	1350	Manhole	Adoptable
1.007	FB 8	1350	Manhole	Adoptable	FB 9	1350	Manhole	Adoptable
1.008	FB 9	1350	Manhole	Adoptable	FB 10	1350	Manhole	Adoptable
3.000	FB 10.2	1350	Manhole	Adoptable	FB 10.1	1350	Manhole	Adoptable
3.001	FB 10.1	1350	Manhole	Adoptable	FB 10	1350	Manhole	Adoptable
1.009	FB 10	1350	Manhole	Adoptable	FB 16	1350	Manhole	Adoptable
4.000	FB 11	1350	Manhole	Adoptable	FB 12	1350	Manhole	Adoptable
4.001	FB 12	1350	Manhole	Adoptable	FB 13	1350	Manhole	Adoptable

Pipeline Schedule

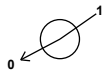
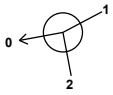
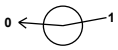
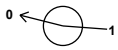
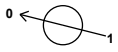
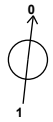
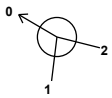
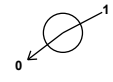
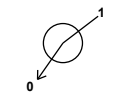
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.002	27.268	150.7	225	Circular	101.541	99.751	1.565	101.359	99.570	1.564
4.003	17.925	149.4	225	Circular	101.359	99.570	1.564	101.239	99.450	1.564
4.004	8.627	148.7	225	Circular	101.239	99.300	1.714	101.194	99.242	1.727
1.010	26.865	150.1	225	Circular	101.194	99.167	1.802	100.733	98.988	1.520
1.011	27.500	200.7	225	Circular	100.733	98.856	1.652	100.153	98.719	1.209
1.012	51.262	200.2	225	Circular	100.153	98.719	1.209	100.404	98.463	1.716
1.013	28.804	200.0	225	Circular	100.404	98.463	1.716	100.099	98.319	1.555
5.000	42.075	40.5	150	Circular	101.769	100.330	1.289	100.657	99.290	1.217
5.001	11.358	39.2	150	Circular	100.657	99.290	1.217	100.371	99.000	1.221
5.002	19.335	60.0	150	Circular	100.371	98.887	1.334	100.099	98.565	1.384
1.014	10.817	196.7	225	Circular	100.099	98.319	1.555	100.037	98.264	1.548
1.015	5.572	206.4	225	Circular	100.037	98.264	1.548	100.049	98.237	1.587

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.002	FB 13	1350	Manhole	Adoptable	FB 14	1350	Manhole	Adoptable
4.003	FB 14	1350	Manhole	Adoptable	FB 15	1350	Manhole	Adoptable
4.004	FB 15	1350	Manhole	Adoptable	FB 16	1350	Manhole	Adoptable
1.010	FB 16	1350	Manhole	Adoptable	FB 17	1350	Manhole	Adoptable
1.011	FB 17	1350	Manhole	Adoptable	FB 18	1350	Manhole	Adoptable
1.012	FB 18	1350	Manhole	Adoptable	FB 19	1350	Manhole	Adoptable
1.013	FB 19	1350	Manhole	Adoptable	FB 23	1350	Manhole	Adoptable
5.000	FB 20	1350	Manhole	Adoptable	FB 21	1350	Manhole	Adoptable
5.001	FB 21	1350	Manhole	Adoptable	FB 22	1350	Manhole	Adoptable
5.002	FB 22	1350	Manhole	Adoptable	FB 23	1350	Manhole	Adoptable
1.014	FB 23	1350	Manhole	Adoptable	FB 24	1350	Manhole	Adoptable
1.015	FB 24	1350	Manhole	Adoptable	Ex. F 3	1200	Manhole	Adoptable

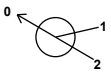
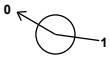
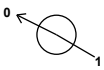
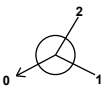
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
FB 1	642553.563	753395.675	103.418	1.018	1350				
							0	1.000	102.400	150
FB 2	642582.264	753392.595	103.164	1.245	1350		1	1.000	101.919	150
							0	1.001	101.919	150
FB 3	642595.395	753403.988	103.354	1.725	1350		1	1.001	101.629	150
							0	1.002	101.629	150
FB 4	642597.312	753421.208	103.518	2.178	1350		1	1.002	101.340	150
							0	1.003	101.340	150
FB 5	642596.008	753428.203	103.583	2.361	1350		1	1.003	101.222	150
							0	1.004	101.222	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
FB 6.2	642642.412	753495.768	103.129	1.078	1350		0	2.000	102.051	150
FB 6.1	642601.809	753467.471	103.793	2.567	1350		1	2.000	101.226	150
							0	2.001	101.226	150
FB 6	642589.763	753461.102	103.899	2.900	1350		1	2.001	100.999	150
							2	1.004	100.999	225
							0	1.005	100.999	225
FB 7	642555.839	753454.831	102.785	1.959	1350		1	1.005	100.826	225
							0	1.006	100.826	225
FB 8	642543.617	753455.734	102.466	1.701	1350		1	1.006	100.765	225
							0	1.007	100.765	225
FB 9	642495.441	753467.825	101.459	1.971	1350		1	1.007	100.000	225
							0	1.008	99.488	225
FB 10.2	642478.897	753413.895	101.893	1.380	1350		0	3.000	100.513	150
FB 10.1	642482.473	753446.416	101.705	1.738	1350		1	3.000	99.967	150
							0	3.001	99.967	225
FB 10	642485.394	753470.347	101.268	1.832	1350		1	3.001	99.807	225
							2	1.008	99.436	225
							0	1.009	99.436	225
FB 11	642558.537	753519.927	101.823	1.367	1350		0	4.000	100.456	150
FB 12	642528.333	753513.107	101.616	1.676	1350		1	4.000	99.940	150
							0	4.001	99.940	150
FB 13	642518.300	753507.867	101.541	1.790	1350		1	4.001	99.751	150
							0	4.002	99.751	225
FB 14	642496.623	753491.325	101.359	1.789	1350		1	4.002	99.570	225
							0	4.003	99.570	225

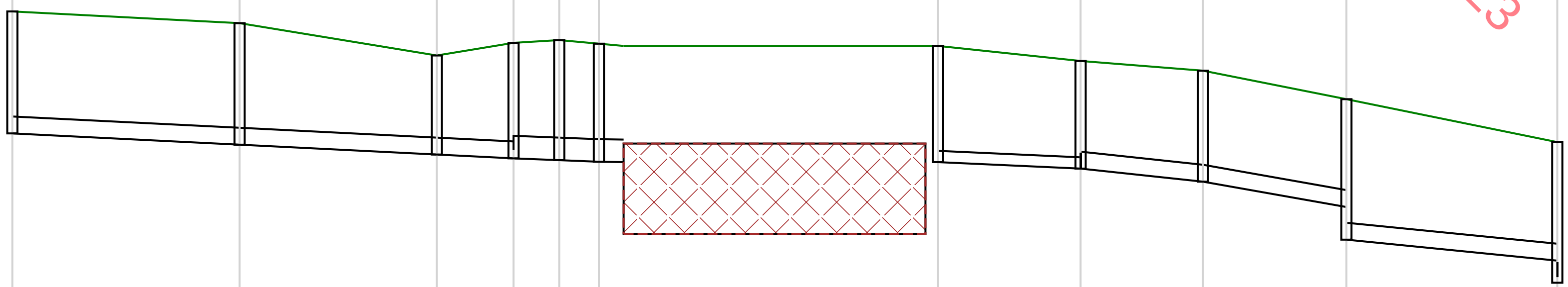
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
FB 15	642486.335	753476.646	101.239	1.939	1350		1	4.003	99.450	225
							0	4.004	99.300	225
FB 16	642477.926	753474.722	101.194	2.027	1350		1	4.004	99.242	225
							2	1.009	99.393	225
							0	1.010	99.167	225
FB 17	642454.745	753488.302	100.733	1.877	1350		1	1.010	98.988	225
							0	1.011	98.856	225
FB 18	642431.118	753502.372	100.153	1.434	1350		1	1.011	98.719	225
							0	1.012	98.719	225
FB 19	642405.008	753458.258	100.404	1.941	1350		1	1.012	98.463	225
							0	1.013	98.463	225
FB 20	642458.957	753413.423	101.769	1.439	1350		0	5.000	100.330	150
FB 21	642417.282	753419.219	100.657	1.367	1350		1	5.000	99.290	150
							0	5.001	99.290	150
FB 22	642407.467	753424.934	100.371	1.484	1350		1	5.001	99.000	150
							0	5.002	98.887	150
FB 23	642390.168	753433.571	100.099	1.780	1350		1	5.002	98.565	150
							2	1.013	98.319	225
							0	1.014	98.319	225
FB 24	642380.619	753428.490	100.037	1.773	1350		1	1.014	98.264	225
							0	1.015	98.264	225
Ex. F 3	642378.189	753423.475	100.049	1.812	1200		1	1.015	98.237	225
Ex. F 3	642378.189	753423.475	100.049		1200					

Appendix C STORM DRAINAGE CALCULATION SHEETS

RECEIVED: 24/08/2023

Node Name	SC 1	SC 2	SC 3	SC 7	SC 8	SC 9	OC 1	SB 8	SB 9	SB 10	SB 5

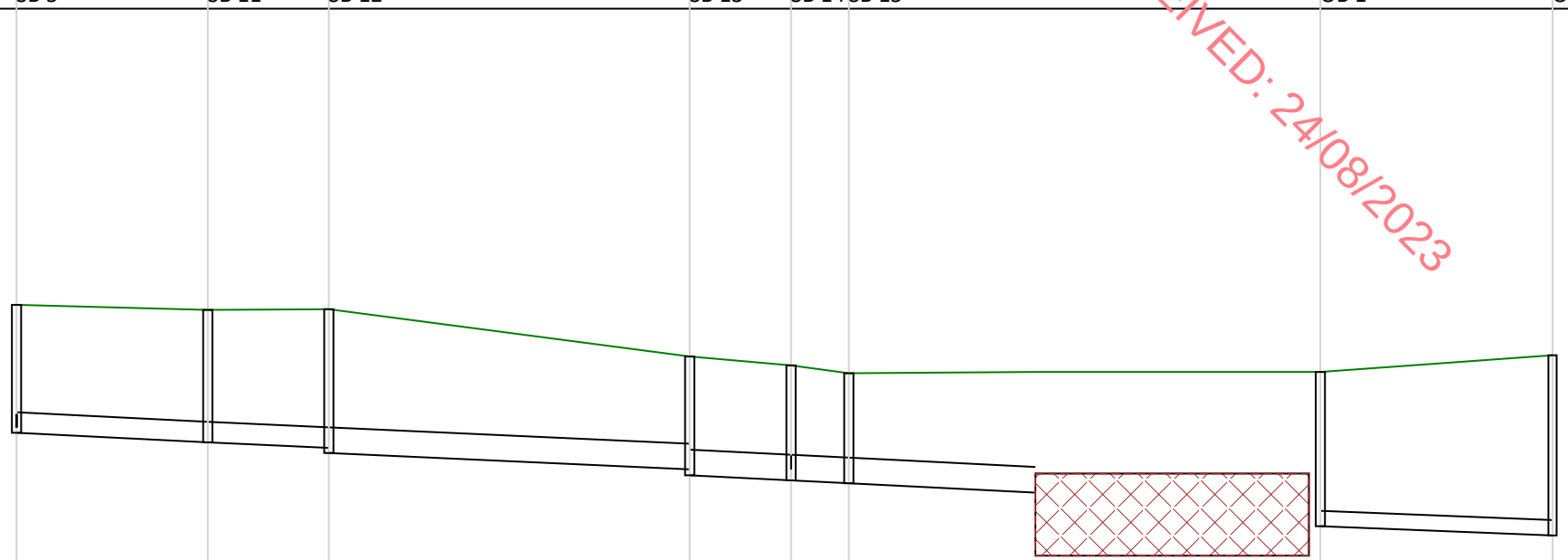


A4 drawing

Hor Scale 1000
Ver Scale 100

Datum (m) 94.000

Link Name	SC 1-SC 2	SC 2-SC 3	SC 3-SC	SC 7	SC 8	SC	OC 1-SB 8	SB 8-SB 9	SB 9-SB 10	SB 10-SB 5	
Section Type	225mm	225mm	225mm	300	300	30	150mm	225mm	225mm	225mm	
Slope (1:X)	200.7	199.5	199.4	252.2	50	65	219.6	93.2	56.4	100.1	
Cover Level (m)	101.914	101.758	101.328	101.496	101.533	101.485	101.455	101.255	101.126	100.747	100.176
Invert Level (m)	100.292	100.142 / 100.142	100.011 / 100.011	99.960 / 99.960 / 99.936	99.936 / 99.919	99.919 / 99.919	99.910	99.824 / 99.824	99.650 / 99.650	99.313 / 98.879	98.600
Length (m)	30.111	26.133	10.171	6.05	5.2	3.	18.885	16.221	19.005	27.941	

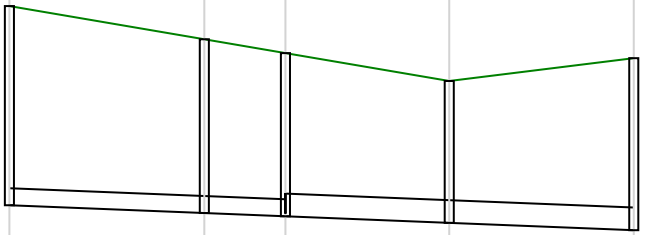


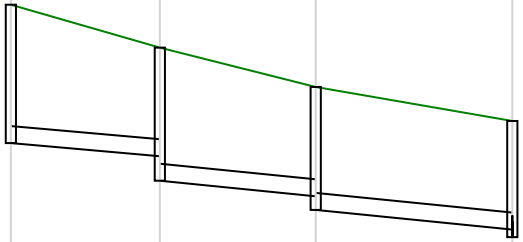
A4 drawing

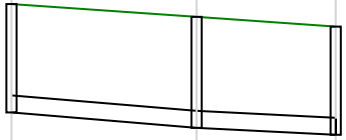
Hor Scale 1000
Ver Scale 100

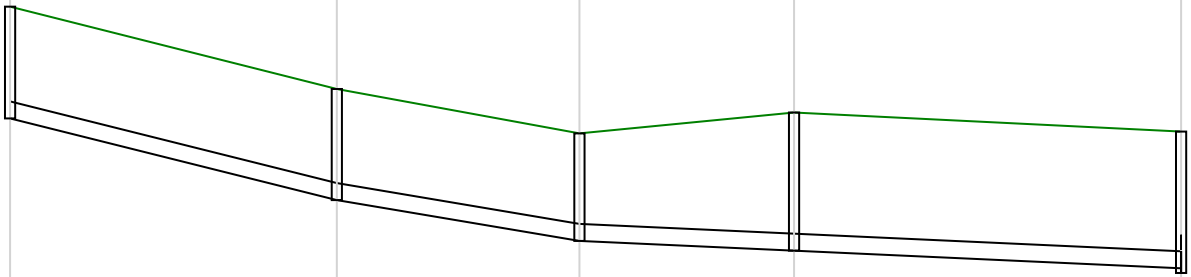
Datum (m) 93.000

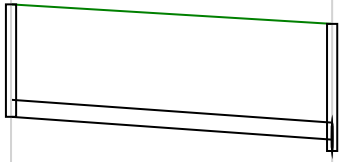
Node Name	SB 5	SB 11	SB 12	SB 13	SB 14	SB 15	OB 1	OB 2
Link Name	SB 5-SB 11	SB 11-SB 12	SB 12-SB 13	SB 13-SB 1	SB 14	SB 15-OB 1	OB 1-OB 2	
Section Type	300mm	300mm	375mm	375mm	375m	375mm	225mm	
Slope (1:X)	199.8	218.5	220.8	200.2	201.2	199.1	251.5	
Cover Level (m)	100.176	100.102	100.112	99.421	99.291	99.176	99.195	99.439
Invert Level (m)	98.306	98.166	98.166	98.085	98.010	97.771	97.684	97.610	97.610	97.568	97.568	97.431	96.940	96.805
Length (m)	27.967		17.702		52.771		14.818	8.451	27.281		33.953	

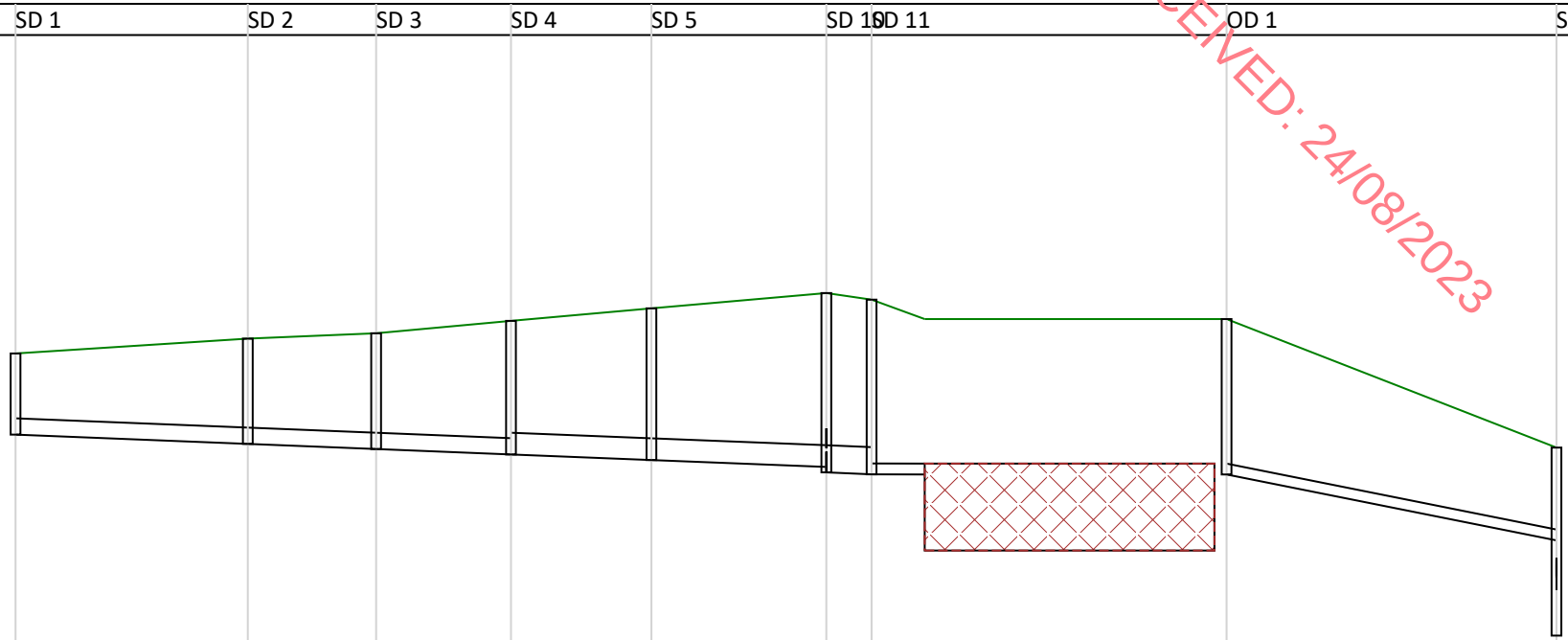
Node Name		OB 2	OB 3	OB 4	S Outfall	ABS 1
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 92.000						
Link Name		OB 2-OB 3	OB 3-O	OB 4-S Outfall	S Outfall-ABS 1	
Section Type		225mm	225mm	300mm	300mm	
Slope (1:X)		250.2	249.5	249.0	251.6	
Cover Level (m)		99.439	99.000	98.817	98.448	98.750
Invert Level (m)		96.805 96.702	96.702 96.659	96.659 96.572	96.572 96.475	
Length (m)		25.775	10.727	21.661	24.401	

Node Name		SC 4	SC 5	SC 6	SC 7
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 96.000					
Link Name		SC 4-SC 5	SC 5-SC 6	SC 6-SC 7	
Section Type		225mm	225mm	225mm	
Slope (1:X)		113.2	100.1	100.0	
Cover Level (m)		103.034	102.466	101.946	101.496
Invert Level (m)		101.204 / 101.030	100.706 / 100.500	100.320 / 100.060	
Length (m)		19.698	20.614	25.997	

Node Name		SB 6	SB 7	SB 8
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000				
Link Name		SB 6-SB 7	SB 7-SB 8	
Section Type		225mm	225mm	
Slope (1:X)		120.0	199.9	
Cover Level (m)		101.553	101.384	101.255
Invert Level (m)		100.120 / 99.916	99.916 / 99.824	
Length (m)		24.478	18.395	

Node Name	SB 1		SB 2		SB 3		SB 4		SB 5
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 94.000									
Link Name		SB 1-SB 2		SB 2-SB 3		SB 3-SB 4		SB 4-SB 5	
Section Type		225mm		225mm		225mm		225mm	
Slope (1:X)		40.0		59.4		220.0		219.7	
Cover Level (m)	101.828		100.739		100.152		100.428		100.176
Invert Level (m)	100.350	99.270	99.270	98.730	98.730	98.601	98.601	98.368	
Length (m)		43.207		32.082		28.381		51.180	

Node Name		SB 14.1	SB 14	
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 93.000				
Link Name		SB 14.1-SB 14		
Section Type		225mm		
Slope (1:X)		140.6		
Cover Level (m)		99.549	99.291	
Invert Level (m)		98.062	97.760	
Length (m)		42.463		

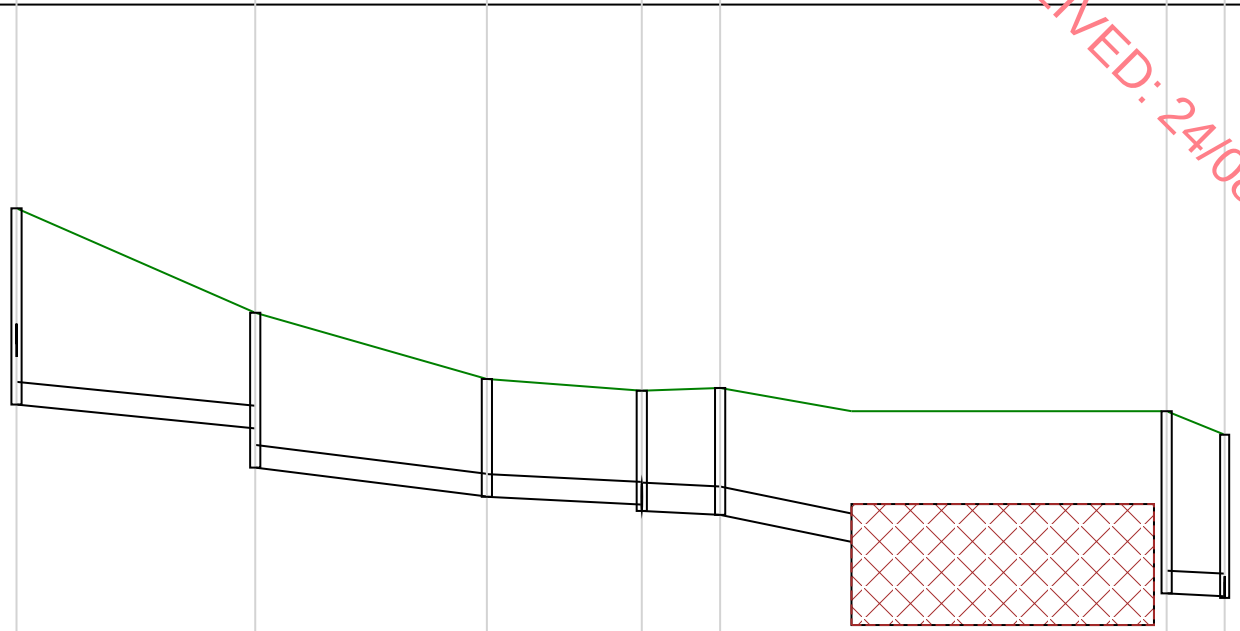


A4 drawing

Hor Scale 1000
Ver Scale 100

Datum (m) 96.000

Node Name	SD 1	SD 2	SD 3	SD 4	SD 5	SD 10	SD 11	OD 1	SA 20
Link Name	SD 1-SD 2	SD 2-SD 3	SD 3-SD 4	SD 4-SD 5	SD 5-SD 10	SD 1	SD 11	OD 1-SA 20	
Section Type	225mm	225mm	225mm	300mm	300mm	375r	150r	150mm	
Slope (1:X)	250.5	249.5	248.2	251.8	254.2	231.3	667	50.0	
Cover Level (m)	103.110	103.315	103.389	103.560	103.733	103.944	103.853	103.585	101.811
Invert Level (m)	101.990	101.862	101.862	101.791	101.791	101.716	101.716	101.639	101.639	101.544	101.469	101.442	101.442	101.440	101.440	100.530
Length (m)	32.067		17.714		18.618		19.387		24.148		6.247	7.334		45.543	

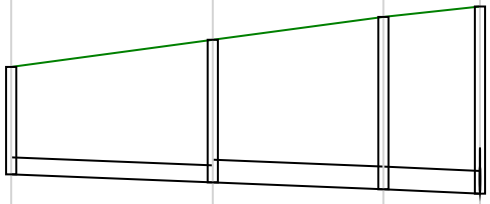


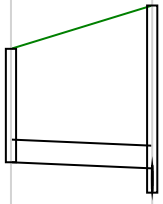
A4 drawing

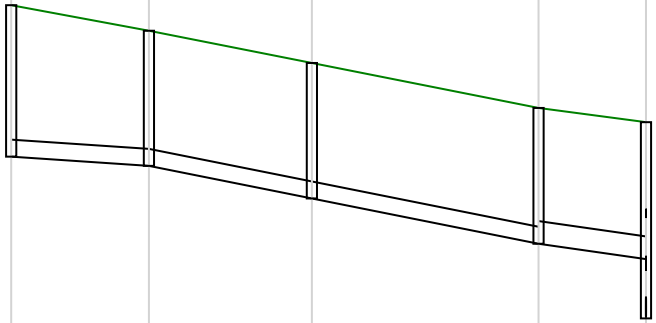
Hor Scale 1000
Ver Scale 100

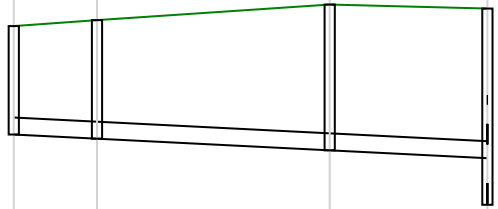
Datum (m) 93.000

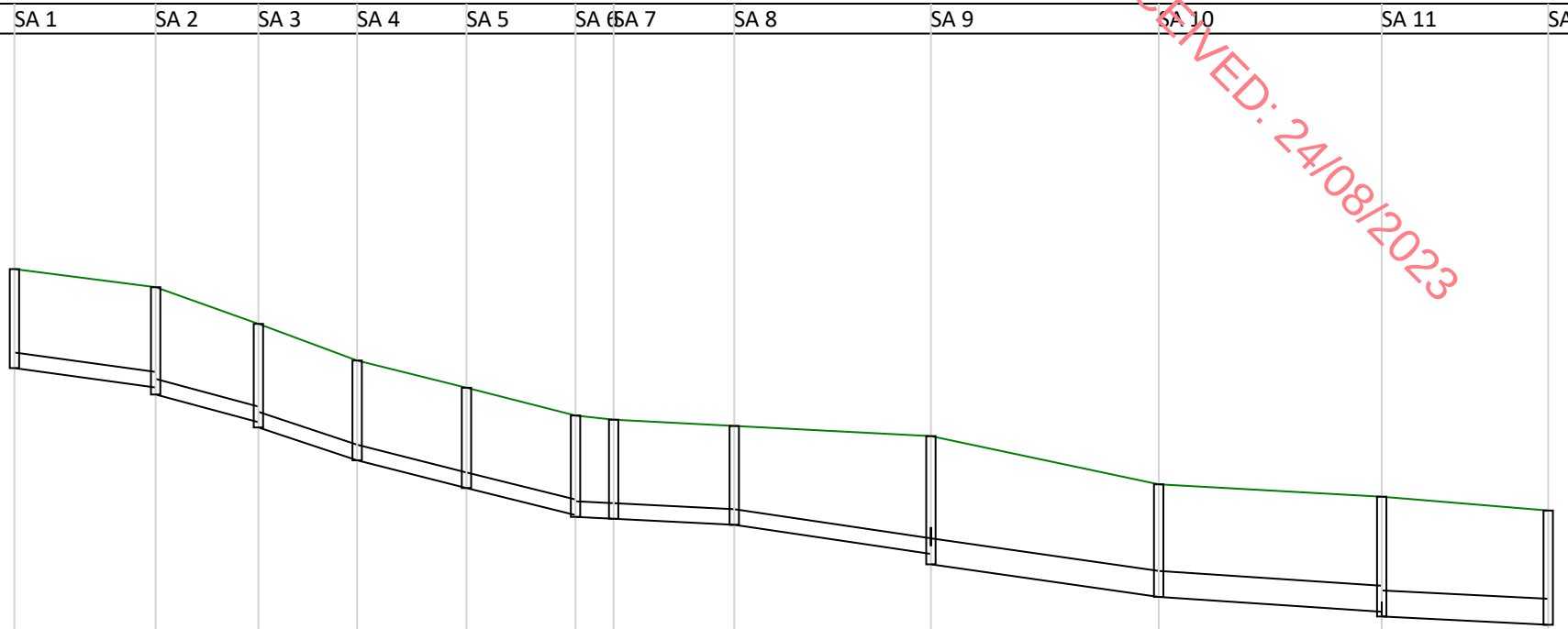
Node Name	SA 20	SA 21	SA 22	SA 23	SA 24	OA 1	OB 4
Link Name	SA 20-SA 21	SA 21-SA 22	SA 22-SA 23	SA 23-S	SA 24-OA 1	OA 1-	
Section Type	300mm	300mm	300mm	375mm	375mm	300m	
Slope (1:X)	99.9	80.2	198.9	199.2	48.7	196.7	
Cover Level (m)	101.811	100.430	99.554	99.399	99.435	99.128	98.817
Invert Level (m)	99.216	98.900 / 98.382	98.000 / 97.996	97.893 / 97.809	97.757 / 97.757	97.400	96.719 / 96.680
Length (m)	31.567	30.632	20.484	10.360	17.370	7.672	

Node Name		SD 6		SD 7		SD 8	SD 10
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 97.000							
Link Name		SD 6-SD 7		SD 7-SD 8		SD 8-SD 1	
Section Type		225mm		300mm		300mm	
Slope (1:X)		251.5		248.0		220.1	
Cover Level (m)		103.145		103.504		103.806	103.944
Invert Level (m)		101.724	101.618	101.618	101.527	101.527	101.469
Length (m)		26.656		22.567		12.766	

Node Name		SD 9	SD 10
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 97.000			
Link Name		SD 9-SD 10	
Section Type		300mm	
Slope (1:X)		230.6	
Cover Level (m)		103.371	103.944
Invert Level (m)		101.871	101.790
Length (m)		18.676	

Node Name		SA 13	SA 14	SA 15	SA 16	SA 20
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 96.000						
Link Name		SA 13-SA 14	SA 14-SA 15	SA 15-SA 16	SA 16-SA 1	
Section Type		225mm	225mm	225mm	300mm	
Slope (1:X)		149.3	50.0	50.0	70.0	
Cover Level (m)		103.358	103.020	102.594	101.999	101.811
Invert Level (m)		101.355 / 101.233	101.233 / 100.802	100.802 / 100.203	100.203 / 100.000	
Length (m)		18.213	21.549	29.972	14.208	

Node Name		SA 17	SA 18	SA 19	SA 20
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000					
Link Name		SA 17-S	SA 18-SA 19	SA 19-SA 20	
Section Type		225mm	225mm	225mm	
Slope (1:X)		200.1	199.8	200.5	
Cover Level (m)		101.579	101.658	101.864	101.811
Invert Level (m)		100.145 100.090	100.090 99.936	99.936 99.832	
Length (m)		11.005	30.771	20.854	

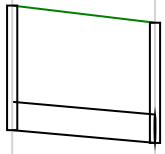


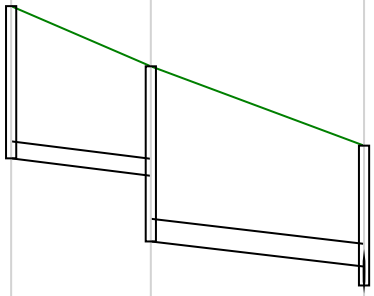
A4 drawing

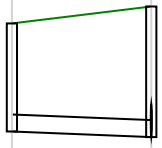
Hor Scale 1000
Ver Scale 100

Datum (m) 95.000

Node Name	SA 1	SA 2	SA 3	SA 4	SA 5	SA 6	SA 7	SA 8	SA 9	SA 10	SA 11	SA 12
Link Name	SA 1-SA 2	SA 2-SA 3	SA 3-SA 4	SA 4-SA 5	SA 5-SA 6	SA 6	SA 7-SA 8	SA 8-SA 9	SA 9-SA 10	SA 10-SA 11	SA 11-SA 12	
Section Type	225mm	225mm	225mm	225mm	225mm	225	225mm	225mm	375mm	375mm	375mm	
Slope (1:X)	72.7	37.1	30.0	39.4	40.3	203	199.8	67.5	69.8	150.2	200.0	
Cover Level (m)	103.108	102.847	102.318	101.789	101.397	100.996	100.936	100.846	100.699	100.004	99.825	99.626
Invert Level (m)	101.680	101.299	100.824	100.350	99.950	99.560	99.507	99.420	99.000	98.380	98.166	98.098
	101.400	100.900	100.350	99.950	99.560	99.534	99.420	99.000	98.850	98.380	98.098	97.978
Length (m)	20.351	14.812	14.230	15.756	15.720	5.49	17.383	28.346	32.825	32.148	23.996	

Node Name		SA 12	SA 23
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 93.000			
Link Name		SA 12-SA 23	
Section Type		375mm	
Slope (1:X)		112.4	
Cover Level (m)		99.626	99.399
Invert Level (m)		97.978	97.810
Length (m)		18.886	

Node Name		SA 9.2	SA 9.1	SA 9
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 95.000				
Link Name		SA 9.2-SA 9.1	SA 9.1-SA 9	
Section Type		225mm	300mm	
Slope (1:X)		80.0	84.9	
Cover Level (m)		102.544	101.748	100.699
Invert Level (m)		100.531 / 100.300	99.432	99.100
Length (m)		18.472	28.195	

Node Name		SA 11.1	SA 11
A4 drawing Hor Scale 1000 Ver Scale 100 Datum (m) 93.000			
Link Name		SA 11.1-SA 1	
Section Type		225mm	
Slope (1:X)		249.0	
Cover Level (m)		99.601	99.825
Invert Level (m)		98.172	98.098
Length (m)		18.429	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	0.75
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	15.600	Minimum Backdrop Height (m)	0.005
Ratio-R	0.275	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
ABS 1			98.750	1200	642603.186	753653.334	2.275
SA 4	0.035	5.00	101.789	1350	642706.205	753494.729	1.439
SA 6	0.014	5.00	100.996	1350	642725.561	753519.549	1.462
SA 7	0.047	5.00	100.936	1350	642723.353	753524.575	1.429
SA 8	0.079	5.00	100.846	1350	642709.375	753534.908	1.426
SA 9	0.075	5.00	100.699	1350	642687.061	753552.390	1.849
SA 10	0.093	5.00	100.004	1350	642661.096	753572.472	1.624
SA 11	0.035	5.00	99.825	1350	642629.983	753580.566	1.727
SA 12	0.031	5.00	99.626	1350	642606.728	753586.482	1.648
SA 23	0.007	5.00	99.399	1350	642588.375	753590.937	1.590
SA 9.1	0.064	5.00	101.748	1350	642669.679	753530.324	2.316
SA 9.2	0.030	5.00	102.544	1350	642658.343	753515.606	2.013
SD 1	0.040	5.00	103.110	1350	642552.357	753394.592	1.120
SD 2	0.029	5.00	103.315	1350	642584.241	753391.168	1.453
SD 3	0.036	5.00	103.389	1350	642596.814	753403.646	1.598
SD 4	0.048	5.00	103.560	1350	642598.589	753422.179	1.844
SD 5	0.029	5.00	103.733	1350	642594.776	753441.187	2.094
SD 10			103.944	1350	642590.152	753464.888	2.475
SC 4	0.068	5.00	103.034	1350	642562.331	753457.218	1.830
SC 5	0.045	5.00	102.466	1350	642542.633	753457.263	1.760
SC 7			101.496	1350	642497.568	753469.151	1.536
SC 8			101.533	1350	642498.986	753475.040	1.597
SC 9			101.485	1350	642504.196	753475.702	1.570
SC 1	0.113	5.00	101.914	1350	642480.201	753415.337	1.622
SC 2	0.055	5.00	101.758	1350	642483.608	753445.255	1.616
SC 3	0.006	5.00	101.328	1350	642487.582	753471.084	1.317
SD 8	0.026	5.00	103.806	1350	642602.173	753469.184	2.279
SD 6	0.067	5.00	103.145	1350	642642.488	753497.426	1.421
SB 1	0.036	5.00	101.828	1350	642461.105	753415.259	1.478
SB 2	0.018	5.00	100.739	1350	642418.263	753420.860	1.469
SB 3	0.040	5.00	100.152	1350	642389.874	753435.807	1.422
SB 4	0.069	5.00	100.428	1350	642404.613	753460.061	1.827
SB 5	0.020	5.00	100.176	1350	642430.730	753504.076	1.870
SB 11	0.022	5.00	100.102	1350	642444.689	753528.310	1.936
SB 12	0.100	5.00	100.112	1350	642457.874	753540.123	2.102
SB 13	0.020	5.00	99.421	1350	642501.098	753570.394	1.737
SB 14			99.291	1350	642515.309	753574.592	1.681
SB 15			99.176	1350	642513.737	753582.896	1.608
SB 9	0.031	5.00	101.126	1350	642471.102	753480.117	1.476
SD 7	0.051	5.00	103.504	1350	642620.656	753482.132	1.886
SD 11			103.853	1350	642588.570	753470.930	2.411

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SA 2	0.017	5.00	102.847	1350	642688.355	753471.820	1.548
SA 13	0.047	5.00	103.358	1350	642656.989	753496.081	2.003
SA 14	0.049	5.00	103.020	1350	642642.812	753507.515	1.787
SA 15	0.068	5.00	102.594	1350	642623.838	753517.731	1.792
SA 16	0.029	5.00	101.999	1350	642594.549	753524.096	1.796
SA 20	0.037	5.00	101.811	1350	642580.372	753523.163	2.595
SA 21	0.080	5.00	100.430	1350	642574.569	753554.192	2.048
SA 22	0.031	5.00	99.554	1350	642568.991	753584.312	1.558
OD 1			103.585	1350	642587.661	753478.208	2.145
SA 1	0.067	5.00	103.108	1350	642672.288	753484.310	1.428
SA 5	0.026	5.00	101.397	1350	642715.826	753507.206	1.447
SA 3	0.031	5.00	102.318	1350	642697.392	753483.556	1.494
SD 9	0.029	5.00	103.371	1350	642572.400	753459.085	1.500
S Outfall			98.448	1200	642614.540	753631.736	1.876
SB 14.1	0.100	5.00	99.549	1350	642557.088	753582.184	1.487
SA 18	0.069	5.00	101.658	1350	642529.902	753512.306	1.568
OC 1			101.455	1350	642504.860	753478.910	1.545
SB 10	0.102	5.00	100.747	1350	642454.759	753489.816	1.868
SA 19	0.034	5.00	101.864	1350	642559.971	753518.839	1.928
SA 17	0.025	5.00	101.579	1350	642519.989	753507.526	1.434
SB 6	0.057	5.00	101.553	1350	642516.354	753504.809	1.433
SB 7	0.048	5.00	101.384	1350	642496.949	753489.889	1.468
SB 8	0.015	5.00	101.255	1350	642486.427	753474.800	1.431
OB 1			99.195	1350	642540.443	753588.466	2.255
OB 2			99.439	1200	642573.916	753594.157	2.634
OB 3			99.000	1200	642585.702	753617.079	2.298
SA 24			99.435	1350	642586.857	753601.186	1.678
OA 1			99.128	1350	642598.428	753614.140	2.409
SA 11.1	0.013	5.00	99.601	1350	642634.377	753598.464	1.429
OB 4			98.817	1200	642595.579	753621.263	2.158
SC 6	0.058	5.00	101.946	1350	642522.626	753462.229	1.626

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
SC 1-SC 2	SC 1	SC 2	30.111	0.600	100.292	100.142	0.150	200.7	225	5.55	36.9
SC 2-SC 3	SC 2	SC 3	26.133	0.600	100.142	100.011	0.131	199.5	225	6.02	35.7
SC 3-SC 7	SC 3	SC 7	10.171	0.600	100.011	99.960	0.051	199.4	225	6.20	35.3
SC 4-SC 5	SC 4	SC 5	19.698	0.600	101.204	101.030	0.174	113.2	225	5.27	37.6
SC 5-SC 6	SC 5	SC 6	20.614	0.600	100.706	100.500	0.206	100.1	225	5.53	36.9
SC 6-SC 7	SC 6	SC 7	25.997	0.600	100.320	100.060	0.260	100.0	225	5.86	36.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
SC 1-SC 2	0.919	36.5	11.3	1.397	1.391	0.113	0.0	86	0.812
SC 2-SC 3	0.922	36.7	16.3	1.391	1.092	0.168	0.0	105	0.895
SC 3-SC 7	0.922	36.7	16.7	1.092	1.311	0.174	0.0	106	0.899
SC 4-SC 5	1.228	48.8	6.9	1.605	1.211	0.068	0.0	57	0.871
SC 5-SC 6	1.307	52.0	11.3	1.535	1.221	0.113	0.0	71	1.047
SC 6-SC 7	1.307	52.0	16.7	1.401	1.211	0.171	0.0	87	1.167

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
SC 7-SC 8	SC 7	SC 8	6.058	0.600	99.960	99.936	0.024	252.4	300	6.30	35.1
SC 8-SC 9	SC 8	SC 9	5.252	0.600	99.936	99.915	0.021	250.1	300	6.38	34.9
SC 9-OC 1	SC 9	OC 1	3.276	0.600	99.915	99.910	0.005	655.2	300	6.48	34.7
OC 1-SB 8	OC 1	SB 8	18.885	0.600	99.910	99.824	0.086	219.6	150	6.95	33.7
SB 6-SB 7	SB 6	SB 7	24.478	0.600	100.120	99.916	0.204	120.0	225	5.34	37.4
SB 7-SB 8	SB 7	SB 8	18.395	0.600	99.916	99.824	0.092	199.9	225	5.68	36.5
SB 8-SB 9	SB 8	SB 9	16.221	0.600	99.824	99.650	0.174	93.2	225	7.15	33.3
SB 9-SB 10	SB 9	SB 10	19.005	0.600	99.650	99.313	0.337	56.4	225	7.33	33.0
SB 10-SB 5	SB 10	SB 5	27.941	0.600	98.879	98.600	0.279	100.1	225	7.69	32.3
SB 1-SB 2	SB 1	SB 2	43.207	0.600	100.350	99.270	1.080	40.0	225	5.35	37.4
SB 2-SB 3	SB 2	SB 3	32.082	0.600	99.270	98.730	0.540	59.4	225	5.66	36.6
SB 3-SB 4	SB 3	SB 4	28.381	0.600	98.730	98.601	0.129	220.0	225	6.20	35.3
SB 4-SB 5	SB 4	SB 5	51.180	0.600	98.601	98.368	0.233	219.7	225	7.17	33.3
SB 5-SB 11	SB 5	SB 11	27.967	0.600	98.306	98.166	0.140	199.8	300	8.11	31.6
SB 11-SB 12	SB 11	SB 12	17.702	0.600	98.166	98.085	0.081	218.5	300	8.39	31.1
SB 12-SB 13	SB 12	SB 13	52.771	0.600	98.010	97.771	0.239	220.8	375	9.11	30.0
SB 13-SB 14	SB 13	SB 14	14.818	0.600	97.684	97.610	0.074	200.2	375	9.30	29.7
SB 14.1-SB 14	SB 14.1	SB 14	42.463	0.600	98.062	97.760	0.302	140.6	225	5.64	36.6
SB 14-SB 15	SB 14	SB 15	8.451	0.600	97.610	97.568	0.042	201.2	375	9.42	29.6
SB 15-OB 1	SB 15	OB 1	27.281	0.600	97.568	97.431	0.137	199.1	375	9.77	29.1
OB 1-OB 2	OB 1	OB 2	33.953	0.600	96.940	96.805	0.135	251.5	225	10.46	28.2
OB 2-OB 3	OB 2	OB 3	25.775	0.600	96.805	96.702	0.103	250.2	225	10.98	27.5
OB 3-OB 4	OB 3	OB 4	10.727	0.600	96.702	96.659	0.043	249.5	225	11.20	27.3
SD 1-SD 2	SD 1	SD 2	32.067	0.600	101.990	101.862	0.128	250.5	225	5.65	36.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
SC 7-SC 8	0.985	69.6	32.8	1.236	1.297	0.345	0.0	145	0.971
SC 8-SC 9	0.989	69.9	32.6	1.297	1.270	0.345	0.0	144	0.972
SC 9-OC 1	0.607	42.9	32.4	1.270	1.245	0.345	0.0	195	0.665
OC 1-SB 8	0.674	11.9	31.5	1.395	1.281	0.345	0.0	150	0.687
SB 6-SB 7	1.192	47.4	5.8	1.208	1.243	0.057	0.0	53	0.816
SB 7-SB 8	0.921	36.6	10.4	1.243	1.206	0.105	0.0	82	0.797
SB 8-SB 9	1.354	53.8	42.0	1.206	1.251	0.465	0.0	150	1.493
SB 9-SB 10	1.745	69.4	44.4	1.251	1.209	0.496	0.0	131	1.846
SB 10-SB 5	1.306	51.9	52.4	1.643	1.351	0.598	0.0	188	1.481
SB 1-SB 2	2.074	82.5	3.6	1.253	1.244	0.036	0.0	32	1.052
SB 2-SB 3	1.700	67.6	5.4	1.244	1.197	0.054	0.0	43	1.023
SB 3-SB 4	0.877	34.9	9.0	1.197	1.602	0.094	0.0	78	0.738
SB 4-SB 5	0.878	34.9	14.7	1.602	1.583	0.163	0.0	102	0.840
SB 5-SB 11	1.109	78.4	66.9	1.570	1.636	0.781	0.0	214	1.240
SB 11-SB 12	1.059	74.9	67.8	1.636	1.727	0.803	0.0	225	1.194
SB 12-SB 13	1.215	134.2	73.5	1.727	1.275	0.903	0.0	198	1.242
SB 13-SB 14	1.276	141.0	74.4	1.362	1.306	0.923	0.0	194	1.293
SB 14.1-SB 14	1.100	43.8	9.9	1.262	1.306	0.100	0.0	73	0.893
SB 14-SB 15	1.273	140.6	82.0	1.306	1.233	1.023	0.0	206	1.321
SB 15-OB 1	1.280	141.4	80.7	1.233	1.389	1.023	0.0	203	1.321
OB 1-OB 2	0.820	32.6	78.1	2.030	2.409	1.023	0.0	225	0.835
OB 2-OB 3	0.822	32.7	76.4	2.409	2.073	1.023	0.0	225	0.837
OB 3-OB 4	0.823	32.7	75.7	2.073	1.933	1.023	0.0	225	0.838
SD 1-SD 2	0.821	32.7	4.0	0.895	1.228	0.040	0.0	53	0.561

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
SD 2-SD 3	SD 2	SD 3	17.714	0.600	101.862	101.791	0.071	249.5	225	6.01	35.7
SD 3-SD 4	SD 3	SD 4	18.618	0.600	101.791	101.716	0.075	248.2	225	6.35	34.9
SD 4-SD 5	SD 4	SD 5	19.387	0.600	101.716	101.639	0.077	251.8	300	6.71	34.2
SD 5-SD 10	SD 5	SD 10	24.148	0.600	101.639	101.544	0.095	254.2	300	7.12	33.4
SD 6-SD 7	SD 6	SD 7	26.656	0.600	101.724	101.618	0.106	251.5	225	5.54	36.9
SD 7-SD 8	SD 7	SD 8	22.567	0.600	101.618	101.527	0.091	248.0	300	5.92	36.0
SD 8-SD 10	SD 8	SD 10	12.766	0.600	101.527	101.469	0.058	220.1	300	6.12	35.5
SD 9-SD 10	SD 9	SD 10	18.676	0.600	101.871	101.790	0.081	230.6	300	5.30	37.5
SD 10-SD 11	SD 10	SD 11	6.245	0.600	101.469	101.442	0.027	231.3	375	7.21	33.2
SD 11-OD 1	SD 11	OD 1	7.334	0.600	101.442	101.440	0.002	3667.0	150	7.99	31.8
OD 1-SA 20	OD 1	SA 20	45.543	0.600	101.440	100.530	0.910	50.0	150	8.52	30.9
SA 13-SA 14	SA 13	SA 14	18.213	0.600	101.355	101.233	0.122	149.3	225	5.28	37.5
SA 14-SA 15	SA 14	SA 15	21.549	0.600	101.233	100.802	0.431	50.0	225	5.48	37.0
SA 15-SA 16	SA 15	SA 16	29.972	0.600	100.802	100.203	0.599	50.0	225	5.75	36.4
SA 16-SA 20	SA 16	SA 20	14.208	0.600	100.203	100.000	0.203	70.0	300	5.87	36.1
SA 17-SA 18	SA 17	SA 18	11.005	0.600	100.145	100.090	0.055	200.1	225	5.20	37.8
SA 18-SA 19	SA 18	SA 19	30.771	0.600	100.090	99.936	0.154	199.8	225	5.76	36.3
SA 19-SA 20	SA 19	SA 20	20.854	0.600	99.936	99.832	0.104	200.5	225	6.13	35.5
SA 20-SA 21	SA 20	SA 21	31.567	0.600	99.216	98.900	0.316	99.9	300	8.86	30.4
SA 21-SA 22	SA 21	SA 22	30.632	0.600	98.382	98.000	0.382	80.2	300	9.15	30.0
SA 22-SA 23	SA 22	SA 23	20.484	0.600	97.996	97.893	0.103	198.9	300	9.45	29.5
SA 1-SA 2	SA 1	SA 2	20.351	0.600	101.680	101.400	0.280	72.7	225	5.22	37.7
SA 2-SA 3	SA 2	SA 3	14.812	0.600	101.299	100.900	0.399	37.1	225	5.34	37.4
SA 3-SA 4	SA 3	SA 4	14.230	0.600	100.824	100.350	0.474	30.0	225	5.43	37.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
SD 2-SD 3	0.823	32.7	6.7	1.228	1.373	0.069	0.0	69	0.650
SD 3-SD 4	0.825	32.8	9.9	1.373	1.619	0.105	0.0	85	0.725
SD 4-SD 5	0.986	69.7	14.2	1.544	1.794	0.153	0.0	92	0.779
SD 5-SD 10	0.981	69.4	16.5	1.794	2.100	0.182	0.0	99	0.809
SD 6-SD 7	0.820	32.6	6.7	1.196	1.661	0.067	0.0	69	0.647
SD 7-SD 8	0.994	70.2	11.5	1.586	1.979	0.118	0.0	82	0.738
SD 8-SD 10	1.055	74.6	13.9	1.979	2.175	0.144	0.0	87	0.811
SD 9-SD 10	1.031	72.9	2.9	1.200	1.854	0.029	0.0	41	0.508
SD 10-SD 11	1.187	131.1	32.0	2.100	2.036	0.355	0.0	126	0.986
SD 11-OD 1	0.157	2.8	30.6	2.261	1.995	0.355	0.0	150	0.160
OD 1-SA 20	1.425	25.2	29.8	1.995	1.131	0.355	0.0	150	1.452
SA 13-SA 14	1.068	42.4	4.8	1.778	1.562	0.047	0.0	51	0.709
SA 14-SA 15	1.854	73.7	9.6	1.562	1.567	0.096	0.0	55	1.294
SA 15-SA 16	1.853	73.7	16.2	1.567	1.571	0.164	0.0	72	1.496
SA 16-SA 20	1.881	133.0	18.9	1.496	1.511	0.193	0.0	76	1.344
SA 17-SA 18	0.920	36.6	2.6	1.209	1.343	0.025	0.0	40	0.531
SA 18-SA 19	0.921	36.6	9.3	1.343	1.703	0.094	0.0	77	0.770
SA 19-SA 20	0.919	36.6	12.3	1.703	1.754	0.128	0.0	90	0.832
SA 20-SA 21	1.573	111.2	58.8	2.295	1.230	0.713	0.0	155	1.593
SA 21-SA 22	1.757	124.2	64.4	1.748	1.254	0.793	0.0	153	1.772
SA 22-SA 23	1.111	78.5	66.0	1.258	1.206	0.824	0.0	211	1.240
SA 1-SA 2	1.535	61.1	6.8	1.203	1.222	0.067	0.0	51	1.021
SA 2-SA 3	2.154	85.6	8.5	1.323	1.193	0.084	0.0	48	1.390
SA 3-SA 4	2.396	95.3	11.6	1.269	1.214	0.115	0.0	52	1.627

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
SA 4-SA 5	SA 4	SA 5	15.756	0.600	100.350	99.950	0.400	39.4	225	5.56	36.8
SA 5-SA 6	SA 5	SA 6	15.720	0.600	99.950	99.560	0.390	40.3	225	5.89	36.5
SA 6-SA 7	SA 6	SA 7	5.490	0.600	99.534	99.507	0.027	203.3	225	5.79	36.3
SA 7-SA 8	SA 7	SA 8	17.383	0.600	99.507	99.420	0.087	199.8	225	6.10	35.5
SA 8-SA 9	SA 8	SA 9	28.346	0.600	99.420	99.000	0.420	67.5	225	6.40	34.9
SA 9.2-SA 9.1	SA 9.2	SA 9.1	18.472	0.600	100.531	100.300	0.231	80.0	225	5.21	37.7
SA 9.1-SA 9	SA 9.1	SA 9	28.195	0.600	99.432	99.100	0.332	84.9	300	5.49	37.0
SA 9-SA 10	SA 9	SA 10	32.825	0.600	98.850	98.380	0.470	69.8	375	6.65	34.3
SA 10-SA 11	SA 10	SA 11	32.148	0.600	98.380	98.166	0.214	150.2	375	7.01	33.6
SA 11.1-SA 11	SA 11.1	SA 11	18.429	0.600	98.172	98.098	0.074	249.0	225	5.37	37.3
SA 11-SA 12	SA 11	SA 12	23.996	0.600	98.098	97.978	0.120	200.0	375	7.33	33.0
SA 12-SA 23	SA 12	SA 23	18.886	0.600	97.978	97.810	0.168	112.4	375	7.51	32.7
SA 23-SA 24	SA 23	SA 24	10.360	0.600	97.809	97.757	0.052	199.2	375	9.59	29.3
SA 24-OA 1	SA 24	OA 1	17.370	0.600	97.757	97.400	0.357	48.7	375	9.70	29.2
OA 1-OB 4	OA 1	OB 4	7.672	0.600	96.719	96.680	0.039	196.7	300	9.81	29.0
OB 4-S Outfall	OB 4	S Outfall	21.661	0.600	96.659	96.572	0.087	249.0	300	11.56	26.9
S Outfall-ABS 1	S Outfall	ABS 1	24.401	0.600	96.572	96.475	0.097	251.6	300	11.98	26.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
SA 4-SA 5	2.090	83.1	15.0	1.214	1.222	0.150	0.0	65	1.597
SA 5-SA 6	2.066	82.2	17.4	1.222	1.211	0.176	0.0	70	1.646
SA 6-SA 7	0.913	36.3	18.7	1.237	1.204	0.190	0.0	115	0.920
SA 7-SA 8	0.921	36.6	22.8	1.204	1.201	0.237	0.0	129	0.970
SA 8-SA 9	1.594	63.4	29.9	1.201	1.474	0.316	0.0	109	1.570
SA 9.2-SA 9.1	1.463	58.2	3.1	1.788	1.223	0.030	0.0	35	0.777
SA 9.1-SA 9	1.707	120.7	9.4	2.016	1.299	0.094	0.0	57	1.029
SA 9-SA 10	2.170	239.7	45.1	1.474	1.249	0.485	0.0	109	1.680
SA 10-SA 11	1.476	163.0	52.7	1.249	1.284	0.578	0.0	146	1.321
SA 11.1-SA 11	0.824	32.8	1.3	1.204	1.502	0.013	0.0	30	0.400
SA 11-SA 12	1.277	141.1	56.0	1.352	1.273	0.626	0.0	164	1.205
SA 12-SA 23	1.708	188.6	58.2	1.273	1.214	0.657	0.0	142	1.511
SA 23-SA 24	1.280	141.3	118.3	1.215	1.303	1.488	0.0	263	1.426
SA 24-OA 1	2.603	287.5	117.7	1.303	1.353	1.488	0.0	167	2.476
OA 1-OB 4	1.117	79.0	117.1	2.109	1.837	1.488	0.0	300	1.132
OB 4-S Outfall	0.992	70.1	182.9	1.858	1.576	2.511	0.0	300	1.004
S Outfall-ABS 1	0.986	69.7	179.8	1.576	1.975	2.511	0.0	300	0.999

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
SC 1-SC 2	30.111	200.7	225	Circular	101.914	100.292	1.397	101.758	100.142	1.391
SC 2-SC 3	26.133	199.5	225	Circular	101.758	100.142	1.391	101.328	100.011	1.092
SC 3-SC 7	10.171	199.4	225	Circular	101.328	100.011	1.092	101.496	99.960	1.311
SC 4-SC 5	19.698	113.2	225	Circular	103.034	101.204	1.605	102.466	101.030	1.211
SC 5-SC 6	20.614	100.1	225	Circular	102.466	100.706	1.535	101.946	100.500	1.221
SC 6-SC 7	25.997	100.0	225	Circular	101.946	100.320	1.401	101.496	100.060	1.211
SC 7-SC 8	6.058	252.4	300	Circular	101.496	99.960	1.236	101.533	99.936	1.297
SC 8-SC 9	5.252	250.1	300	Circular	101.533	99.936	1.297	101.485	99.915	1.270
SC 9-OC 1	3.276	655.2	300	Circular	101.485	99.915	1.270	101.455	99.910	1.245
OC 1-SB 8	18.885	219.6	150	Circular	101.455	99.910	1.395	101.255	99.824	1.281
SB 6-SB 7	24.478	120.0	225	Circular	101.553	100.120	1.208	101.384	99.916	1.243
SB 7-SB 8	18.395	199.9	225	Circular	101.384	99.916	1.243	101.255	99.824	1.206
SB 8-SB 9	16.221	93.2	225	Circular	101.255	99.824	1.206	101.126	99.650	1.251
SB 9-SB 10	19.005	56.4	225	Circular	101.126	99.650	1.251	100.747	99.313	1.209
SB 10-SB 5	27.941	100.1	225	Circular	100.747	98.879	1.643	100.176	98.600	1.351
SB 1-SB 2	43.207	40.0	225	Circular	101.828	100.350	1.253	100.739	99.270	1.244
SB 2-SB 3	32.082	59.4	225	Circular	100.739	99.270	1.244	100.152	98.730	1.197
SB 3-SB 4	28.381	220.0	225	Circular	100.152	98.730	1.197	100.428	98.601	1.602
SB 4-SB 5	51.180	219.7	225	Circular	100.428	98.601	1.602	100.176	98.368	1.583
SB 5-SB 11	27.967	199.8	300	Circular	100.176	98.306	1.570	100.102	98.166	1.636
SB 11-SB 12	17.702	218.5	300	Circular	100.102	98.166	1.636	100.112	98.085	1.727
SB 12-SB 13	52.771	220.8	375	Circular	100.112	98.010	1.727	99.421	97.771	1.275
SB 13-SB 14	14.818	200.2	375	Circular	99.421	97.684	1.362	99.291	97.610	1.306
SB 14.1-SB 14	42.463	140.6	225	Circular	99.549	98.062	1.262	99.291	97.760	1.306
SB 14-SB 15	8.451	201.2	375	Circular	99.291	97.610	1.306	99.176	97.568	1.233

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
SC 1-SC 2	SC 1	1350	Manhole	Adoptable	SC 2	1350	Manhole	Adoptable
SC 2-SC 3	SC 2	1350	Manhole	Adoptable	SC 3	1350	Manhole	Adoptable
SC 3-SC 7	SC 3	1350	Manhole	Adoptable	SC 7	1350	Manhole	Adoptable
SC 4-SC 5	SC 4	1350	Manhole	Adoptable	SC 5	1350	Manhole	Adoptable
SC 5-SC 6	SC 5	1350	Manhole	Adoptable	SC 6	1350	Manhole	Adoptable
SC 6-SC 7	SC 6	1350	Manhole	Adoptable	SC 7	1350	Manhole	Adoptable
SC 7-SC 8	SC 7	1350	Manhole	Adoptable	SC 8	1350	Manhole	Adoptable
SC 8-SC 9	SC 8	1350	Manhole	Adoptable	SC 9	1350	Manhole	Adoptable
SC 9-OC 1	SC 9	1350	Manhole	Adoptable	OC 1	1350	Manhole	Adoptable
OC 1-SB 8	OC 1	1350	Manhole	Adoptable	SB 8	1350	Manhole	Adoptable
SB 6-SB 7	SB 6	1350	Manhole	Adoptable	SB 7	1350	Manhole	Adoptable
SB 7-SB 8	SB 7	1350	Manhole	Adoptable	SB 8	1350	Manhole	Adoptable
SB 8-SB 9	SB 8	1350	Manhole	Adoptable	SB 9	1350	Manhole	Adoptable
SB 9-SB 10	SB 9	1350	Manhole	Adoptable	SB 10	1350	Manhole	Adoptable
SB 10-SB 5	SB 10	1350	Manhole	Adoptable	SB 5	1350	Manhole	Adoptable
SB 1-SB 2	SB 1	1350	Manhole	Adoptable	SB 2	1350	Manhole	Adoptable
SB 2-SB 3	SB 2	1350	Manhole	Adoptable	SB 3	1350	Manhole	Adoptable
SB 3-SB 4	SB 3	1350	Manhole	Adoptable	SB 4	1350	Manhole	Adoptable
SB 4-SB 5	SB 4	1350	Manhole	Adoptable	SB 5	1350	Manhole	Adoptable
SB 5-SB 11	SB 5	1350	Manhole	Adoptable	SB 11	1350	Manhole	Adoptable
SB 11-SB 12	SB 11	1350	Manhole	Adoptable	SB 12	1350	Manhole	Adoptable
SB 12-SB 13	SB 12	1350	Manhole	Adoptable	SB 13	1350	Manhole	Adoptable
SB 13-SB 14	SB 13	1350	Manhole	Adoptable	SB 14	1350	Manhole	Adoptable
SB 14.1-SB 14	SB 14.1	1350	Manhole	Adoptable	SB 14	1350	Manhole	Adoptable
SB 14-SB 15	SB 14	1350	Manhole	Adoptable	SB 15	1350	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
SB 15-OB 1	27.281	199.1	375	Circular	99.176	97.568	1.233	99.195	97.431	1.389
OB 1-OB 2	33.953	251.5	225	Circular	99.195	96.940	2.030	99.439	96.805	2.409
OB 2-OB 3	25.775	250.2	225	Circular	99.439	96.805	2.409	99.000	96.702	2.073
OB 3-OB 4	10.727	249.5	225	Circular	99.000	96.702	2.073	98.817	96.659	1.933
SD 1-SD 2	32.067	250.5	225	Circular	103.110	101.990	0.895	103.315	101.862	1.228
SD 2-SD 3	17.714	249.5	225	Circular	103.315	101.862	1.228	103.389	101.791	1.373
SD 3-SD 4	18.618	248.2	225	Circular	103.389	101.791	1.373	103.560	101.716	1.619
SD 4-SD 5	19.387	251.8	300	Circular	103.560	101.716	1.544	103.733	101.639	1.794
SD 5-SD 10	24.148	254.2	300	Circular	103.733	101.639	1.794	103.944	101.544	2.100
SD 6-SD 7	26.656	251.5	225	Circular	103.145	101.724	1.196	103.504	101.618	1.661
SD 7-SD 8	22.567	248.0	300	Circular	103.504	101.618	1.586	103.806	101.527	1.979
SD 8-SD 10	12.766	220.1	300	Circular	103.806	101.527	1.979	103.944	101.469	2.175
SD 9-SD 10	18.676	230.6	300	Circular	103.371	101.871	1.200	103.944	101.790	1.854
SD 10-SD 11	6.245	231.3	375	Circular	103.944	101.469	2.100	103.853	101.442	2.036
SD 11-OD 1	7.334	3667.0	150	Circular	103.853	101.442	2.261	103.585	101.440	1.995
OD 1-SA 20	45.543	50.0	150	Circular	103.585	101.440	1.995	101.811	100.530	1.131
SA 13-SA 14	18.213	149.3	225	Circular	103.358	101.355	1.778	103.020	101.233	1.562
SA 14-SA 15	21.549	50.0	225	Circular	103.020	101.233	1.562	102.594	100.802	1.567
SA 15-SA 16	29.972	50.0	225	Circular	102.594	100.802	1.567	101.999	100.203	1.571
SA 16-SA 20	14.208	70.0	300	Circular	101.999	100.203	1.496	101.811	100.000	1.511
SA 17-SA 18	11.005	200.1	225	Circular	101.579	100.145	1.209	101.658	100.090	1.343
SA 18-SA 19	30.771	199.8	225	Circular	101.658	100.090	1.343	101.864	99.936	1.703
SA 19-SA 20	20.854	200.5	225	Circular	101.864	99.936	1.703	101.811	99.832	1.754
SA 20-SA 21	31.567	99.9	300	Circular	101.811	99.216	2.295	100.430	98.900	1.230
SA 21-SA 22	30.632	80.2	300	Circular	100.430	98.382	1.748	99.554	98.000	1.254

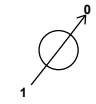
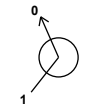
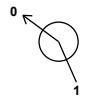
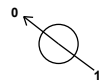
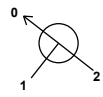
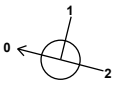
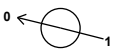
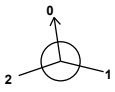
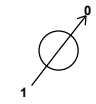
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
SB 15-OB 1	SB 15	1350	Manhole	Adoptable	OB 1	1350	Manhole	Adoptable
OB 1-OB 2	OB 1	1350	Manhole	Adoptable	OB 2	1200	Manhole	Adoptable
OB 2-OB 3	OB 2	1200	Manhole	Adoptable	OB 3	1200	Manhole	Adoptable
OB 3-OB 4	OB 3	1200	Manhole	Adoptable	OB 4	1200	Manhole	Adoptable
SD 1-SD 2	SD 1	1350	Manhole	Adoptable	SD 2	1350	Manhole	Adoptable
SD 2-SD 3	SD 2	1350	Manhole	Adoptable	SD 3	1350	Manhole	Adoptable
SD 3-SD 4	SD 3	1350	Manhole	Adoptable	SD 4	1350	Manhole	Adoptable
SD 4-SD 5	SD 4	1350	Manhole	Adoptable	SD 5	1350	Manhole	Adoptable
SD 5-SD 10	SD 5	1350	Manhole	Adoptable	SD 10	1350	Manhole	Adoptable
SD 6-SD 7	SD 6	1350	Manhole	Adoptable	SD 7	1350	Manhole	Adoptable
SD 7-SD 8	SD 7	1350	Manhole	Adoptable	SD 8	1350	Manhole	Adoptable
SD 8-SD 10	SD 8	1350	Manhole	Adoptable	SD 10	1350	Manhole	Adoptable
SD 9-SD 10	SD 9	1350	Manhole	Adoptable	SD 10	1350	Manhole	Adoptable
SD 10-SD 11	SD 10	1350	Manhole	Adoptable	SD 11	1350	Manhole	Adoptable
SD 11-OD 1	SD 11	1350	Manhole	Adoptable	OD 1	1350	Manhole	Adoptable
OD 1-SA 20	OD 1	1350	Manhole	Adoptable	SA 20	1350	Manhole	Adoptable
SA 13-SA 14	SA 13	1350	Manhole	Adoptable	SA 14	1350	Manhole	Adoptable
SA 14-SA 15	SA 14	1350	Manhole	Adoptable	SA 15	1350	Manhole	Adoptable
SA 15-SA 16	SA 15	1350	Manhole	Adoptable	SA 16	1350	Manhole	Adoptable
SA 16-SA 20	SA 16	1350	Manhole	Adoptable	SA 20	1350	Manhole	Adoptable
SA 17-SA 18	SA 17	1350	Manhole	Adoptable	SA 18	1350	Manhole	Adoptable
SA 18-SA 19	SA 18	1350	Manhole	Adoptable	SA 19	1350	Manhole	Adoptable
SA 19-SA 20	SA 19	1350	Manhole	Adoptable	SA 20	1350	Manhole	Adoptable
SA 20-SA 21	SA 20	1350	Manhole	Adoptable	SA 21	1350	Manhole	Adoptable
SA 21-SA 22	SA 21	1350	Manhole	Adoptable	SA 22	1350	Manhole	Adoptable

Pipeline Schedule

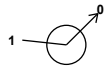
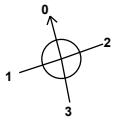
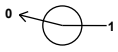
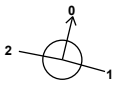
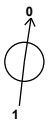
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
SA 22-SA 23	20.484	198.9	300	Circular	99.554	97.996	1.258	99.399	97.893	1.206
SA 1-SA 2	20.351	72.7	225	Circular	103.108	101.680	1.203	102.847	101.400	1.222
SA 2-SA 3	14.812	37.1	225	Circular	102.847	101.299	1.323	102.318	100.900	1.193
SA 3-SA 4	14.230	30.0	225	Circular	102.318	100.824	1.269	101.789	100.350	1.214
SA 4-SA 5	15.756	39.4	225	Circular	101.789	100.350	1.214	101.397	99.950	1.222
SA 5-SA 6	15.720	40.3	225	Circular	101.397	99.950	1.222	100.996	99.560	1.211
SA 6-SA 7	5.490	203.3	225	Circular	100.996	99.534	1.237	100.936	99.507	1.204
SA 7-SA 8	17.383	199.8	225	Circular	100.936	99.507	1.204	100.846	99.420	1.201
SA 8-SA 9	28.346	67.5	225	Circular	100.846	99.420	1.201	100.699	99.000	1.474
SA 9.2-SA 9.1	18.472	80.0	225	Circular	102.544	100.531	1.788	101.748	100.300	1.223
SA 9.1-SA 9	28.195	84.9	300	Circular	101.748	99.432	2.016	100.699	99.100	1.299
SA 9-SA 10	32.825	69.8	375	Circular	100.699	98.850	1.474	100.004	98.380	1.249
SA 10-SA 11	32.148	150.2	375	Circular	100.004	98.380	1.249	99.825	98.166	1.284
SA 11.1-SA 11	18.429	249.0	225	Circular	99.601	98.172	1.204	99.825	98.098	1.502
SA 11-SA 12	23.996	200.0	375	Circular	99.825	98.098	1.352	99.626	97.978	1.273
SA 12-SA 23	18.886	112.4	375	Circular	99.626	97.978	1.273	99.399	97.810	1.214
SA 23-SA 24	10.360	199.2	375	Circular	99.399	97.809	1.215	99.435	97.757	1.303
SA 24-OA 1	17.370	48.7	375	Circular	99.435	97.757	1.303	99.128	97.400	1.353
OA 1-OB 4	7.672	196.7	300	Circular	99.128	96.719	2.109	98.817	96.680	1.837
OB 4-S Outfall	21.661	249.0	300	Circular	98.817	96.659	1.858	98.448	96.572	1.576
S Outfall-ABS 1	24.401	251.6	300	Circular	98.448	96.572	1.576	98.750	96.475	1.975

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
SA 22-SA 23	SA 22	1350	Manhole	Adoptable	SA 23	1350	Manhole	Adoptable
SA 1-SA 2	SA 1	1350	Manhole	Adoptable	SA 2	1350	Manhole	Adoptable
SA 2-SA 3	SA 2	1350	Manhole	Adoptable	SA 3	1350	Manhole	Adoptable
SA 3-SA 4	SA 3	1350	Manhole	Adoptable	SA 4	1350	Manhole	Adoptable
SA 4-SA 5	SA 4	1350	Manhole	Adoptable	SA 5	1350	Manhole	Adoptable
SA 5-SA 6	SA 5	1350	Manhole	Adoptable	SA 6	1350	Manhole	Adoptable
SA 6-SA 7	SA 6	1350	Manhole	Adoptable	SA 7	1350	Manhole	Adoptable
SA 7-SA 8	SA 7	1350	Manhole	Adoptable	SA 8	1350	Manhole	Adoptable
SA 8-SA 9	SA 8	1350	Manhole	Adoptable	SA 9	1350	Manhole	Adoptable
SA 9.2-SA 9.1	SA 9.2	1350	Manhole	Adoptable	SA 9.1	1350	Manhole	Adoptable
SA 9.1-SA 9	SA 9.1	1350	Manhole	Adoptable	SA 9	1350	Manhole	Adoptable
SA 9-SA 10	SA 9	1350	Manhole	Adoptable	SA 10	1350	Manhole	Adoptable
SA 10-SA 11	SA 10	1350	Manhole	Adoptable	SA 11	1350	Manhole	Adoptable
SA 11.1-SA 11	SA 11.1	1350	Manhole	Adoptable	SA 11	1350	Manhole	Adoptable
SA 11-SA 12	SA 11	1350	Manhole	Adoptable	SA 12	1350	Manhole	Adoptable
SA 12-SA 23	SA 12	1350	Manhole	Adoptable	SA 23	1350	Manhole	Adoptable
SA 23-SA 24	SA 23	1350	Manhole	Adoptable	SA 24	1350	Manhole	Adoptable
SA 24-OA 1	SA 24	1350	Manhole	Adoptable	OA 1	1350	Manhole	Adoptable
OA 1-OB 4	OA 1	1350	Manhole	Adoptable	OB 4	1200	Manhole	Adoptable
OB 4-S Outfall	OB 4	1200	Manhole	Adoptable	S Outfall	1200	Manhole	Adoptable
S Outfall-ABS 1	S Outfall	1200	Manhole	Adoptable	ABS 1	1200	Manhole	Adoptable

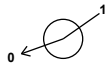
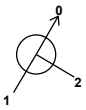
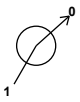
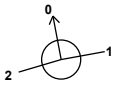
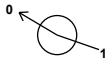
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
ABS 1	642603.186	753653.334	98.750	2.275	1200	 1	S Outfall-ABS 1	96.475	300
SA 4	642706.205	753494.729	101.789	1.439	1350	 1 0	SA 3-SA 4 SA 4-SA 5	100.350 100.350	225 225
SA 6	642725.561	753519.549	100.996	1.462	1350	 1 0	SA 5-SA 6 SA 6-SA 7	99.560 99.534	225 225
SA 7	642723.353	753524.575	100.936	1.429	1350	 1 0	SA 6-SA 7 SA 7-SA 8	99.507 99.507	225 225
SA 8	642709.375	753534.908	100.846	1.426	1350	 1 0	SA 7-SA 8 SA 8-SA 9	99.420 99.420	225 225
SA 9	642687.061	753552.390	100.699	1.849	1350	 1 2 0	SA 9.1-SA 9 SA 8-SA 9 SA 9-SA 10	99.100 99.000 98.850	300 225 375
SA 10	642661.096	753572.472	100.004	1.624	1350	 1 0	SA 9-SA 10 SA 10-SA 11	98.380 98.380	375 375
SA 11	642629.983	753580.566	99.825	1.727	1350	 1 2 0	SA 11.1-SA 11 SA 10-SA 11 SA 11-SA 12	98.098 98.166 98.098	225 375 375
SA 12	642606.728	753586.482	99.626	1.648	1350	 1 0	SA 11-SA 12 SA 12-SA 23	97.978 97.978	375 375
SA 23	642588.375	753590.937	99.399	1.590	1350	 1 2 0	SA 12-SA 23 SA 22-SA 23 SA 23-SA 24	97.810 97.893 97.809	375 300 375
SA 9.1	642669.679	753530.324	101.748	2.316	1350	 1 0	SA 9.2-SA 9.1 SA 9.1-SA 9	100.300 99.432	225 300
SA 9.2	642658.343	753515.606	102.544	2.013	1350	 0	SA 9.2-SA 9.1	100.531	225
SD 1	642552.357	753394.592	103.110	1.120	1350	 0	SD 1-SD 2	101.990	225

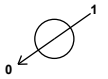
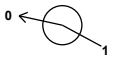
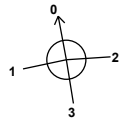
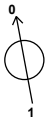
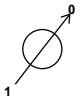
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SD 2	642584.241	753391.168	103.315	1.453	1350	 1	SD 1-SD 2	101.862	225
						0	SD 2-SD 3	101.862	225
SD 3	642596.814	753403.646	103.389	1.598	1350	 1	SD 2-SD 3	101.791	225
						0	SD 3-SD 4	101.791	225
SD 4	642598.589	753422.179	103.560	1.844	1350	 1	SD 3-SD 4	101.716	225
						0	SD 4-SD 5	101.716	300
SD 5	642594.776	753441.187	103.733	2.094	1350	 1	SD 4-SD 5	101.639	300
						0	SD 5-SD 10	101.639	300
SD 10	642590.152	753464.888	103.944	2.475	1350	 1	SD 9-SD 10	101.790	300
						2	SD 8-SD 10	101.469	300
						3	SD 5-SD 10	101.544	300
						0	SD 10-SD 11	101.469	375
SC 4	642562.331	753457.218	103.034	1.830	1350				
						0	SC 4-SC 5	101.204	225
SC 5	642542.633	753457.263	102.466	1.760	1350	 1	SC 4-SC 5	101.030	225
						0	SC 5-SC 6	100.706	225
SC 7	642497.568	753469.151	101.496	1.536	1350	 1	SC 6-SC 7	100.060	225
						2	SC 3-SC 7	99.960	225
						0	SC 7-SC 8	99.960	300
SC 8	642498.986	753475.040	101.533	1.597	1350	 1	SC 7-SC 8	99.936	300
						0	SC 8-SC 9	99.936	300
SC 9	642504.196	753475.702	101.485	1.570	1350	 1	SC 8-SC 9	99.915	300
						0	SC 9-OC 1	99.915	300
SC 1	642480.201	753415.337	101.914	1.622	1350				
						0	SC 1-SC 2	100.292	225
SC 2	642483.608	753445.255	101.758	1.616	1350	 1	SC 1-SC 2	100.142	225
						0	SC 2-SC 3	100.142	225
SC 3	642487.582	753471.084	101.328	1.317	1350	 1	SC 2-SC 3	100.011	225
						0	SC 3-SC 7	100.011	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SD 8	642602.173	753469.184	103.806	2.279	1350	 1	SD 7-SD 8	101.527	300
						0	SD 8-SD 10	101.527	300
SD 6	642642.488	753497.426	103.145	1.421	1350	 0	SD 6-SD 7	101.724	225
SB 1	642461.105	753415.259	101.828	1.478	1350	 0	SB 1-SB 2	100.350	225
SB 2	642418.263	753420.860	100.739	1.469	1350	 1	SB 1-SB 2	99.270	225
						0	SB 2-SB 3	99.270	225
SB 3	642389.874	753435.807	100.152	1.422	1350	 1	SB 2-SB 3	98.730	225
						0	SB 3-SB 4	98.730	225
SB 4	642404.613	753460.061	100.428	1.827	1350	 1	SB 3-SB 4	98.601	225
						0	SB 4-SB 5	98.601	225
SB 5	642430.730	753504.076	100.176	1.870	1350	 1	SB 4-SB 5	98.368	225
						2	SB 10-SB 5	98.600	225
						0	SB 5-SB 11	98.306	300
SB 11	642444.689	753528.310	100.102	1.936	1350	 1	SB 5-SB 11	98.166	300
						0	SB 11-SB 12	98.166	300
SB 12	642457.874	753540.123	100.112	2.102	1350	 1	SB 11-SB 12	98.085	300
						0	SB 12-SB 13	98.010	375
SB 13	642501.098	753570.394	99.421	1.737	1350	 1	SB 12-SB 13	97.771	375
						0	SB 13-SB 14	97.684	375
SB 14	642515.309	753574.592	99.291	1.681	1350	 1	SB 14.1-SB 14	97.760	225
						2	SB 13-SB 14	97.610	375
						0	SB 14-SB 15	97.610	375
SB 15	642513.737	753582.896	99.176	1.608	1350	 1	SB 14-SB 15	97.568	375
						0	SB 15-OB 1	97.568	375
SB 9	642471.102	753480.117	101.126	1.476	1350	 1	SB 8-SB 9	99.650	225
						0	SB 9-SB 10	99.650	225

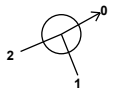
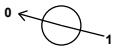
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SD 7	642620.656	753482.132	103.504	1.886	1350	 1	SD 6-SD 7	101.618	225
						0	SD 7-SD 8	101.618	300
SD 11	642588.570	753470.930	103.853	2.411	1350	 1	SD 10-SD 11	101.442	375
						0	SD 11-OD 1	101.442	150
SA 2	642688.355	753471.820	102.847	1.548	1350	 1	SA 1-SA 2	101.400	225
						0	SA 2-SA 3	101.299	225
SA 13	642656.989	753496.081	103.358	2.003	1350				
						0	SA 13-SA 14	101.355	225
SA 14	642642.812	753507.515	103.020	1.787	1350	 1	SA 13-SA 14	101.233	225
						0	SA 14-SA 15	101.233	225
SA 15	642623.838	753517.731	102.594	1.792	1350	 1	SA 14-SA 15	100.802	225
						0	SA 15-SA 16	100.802	225
SA 16	642594.549	753524.096	101.999	1.796	1350	 1	SA 15-SA 16	100.203	225
						0	SA 16-SA 20	100.203	300
SA 20	642580.372	753523.163	101.811	2.595	1350	 1	SA 19-SA 20	99.832	225
						2	SA 16-SA 20	100.000	300
						3	OD 1-SA 20	100.530	150
						0	SA 20-SA 21	99.216	300
SA 21	642574.569	753554.192	100.430	2.048	1350	 1	SA 20-SA 21	98.900	300
						0	SA 21-SA 22	98.382	300
SA 22	642568.991	753584.312	99.554	1.558	1350	 1	SA 21-SA 22	98.000	300
						0	SA 22-SA 23	97.996	300
OD 1	642587.661	753478.208	103.585	2.145	1350	 1	SD 11-OD 1	101.440	150
						0	OD 1-SA 20	101.440	150
SA 1	642672.288	753484.310	103.108	1.428	1350				
						0	SA 1-SA 2	101.680	225
SA 5	642715.826	753507.206	101.397	1.447	1350	 1	SA 4-SA 5	99.950	225
						0	SA 5-SA 6	99.950	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SA 3	642697.392	753483.556	102.318	1.494	1350	1	SA 2-SA 3	100.900	225
						0	SA 3-SA 4	100.824	225
SD 9	642572.400	753459.085	103.371	1.500	1350	0	SD 9-SD 10	101.871	300
S Outfall	642614.540	753631.736	98.448	1.876	1200	1	OB 4-S Outfall	96.572	300
						0	S Outfall-ABS 1	96.572	300
SB 14.1	642557.088	753582.184	99.549	1.487	1350	0	SB 14.1-SB 14	98.062	225
SA 18	642529.902	753512.306	101.658	1.568	1350	1	SA 17-SA 18	100.090	225
						0	SA 18-SA 19	100.090	225
OC 1	642504.860	753478.910	101.455	1.545	1350	1	SC 9-OC 1	99.910	300
						0	OC 1-SB 8	99.910	150
SB 10	642454.759	753489.816	100.747	1.868	1350	1	SB 9-SB 10	99.313	225
						0	SB 10-SB 5	98.879	225
SA 19	642559.971	753518.839	101.864	1.928	1350	1	SA 18-SA 19	99.936	225
						0	SA 19-SA 20	99.936	225
SA 17	642519.989	753507.526	101.579	1.434	1350	0	SA 17-SA 18	100.145	225
SB 6	642516.354	753504.809	101.553	1.433	1350	0	SB 6-SB 7	100.120	225
SB 7	642496.949	753489.889	101.384	1.468	1350	1	SB 6-SB 7	99.916	225
						0	SB 7-SB 8	99.916	225
SB 8	642486.427	753474.800	101.255	1.431	1350	1	SB 7-SB 8	99.824	225
						2	OC 1-SB 8	99.824	150
						0	SB 8-SB 9	99.824	225
OB 1	642540.443	753588.466	99.195	2.255	1350	1	SB 15-OB 1	97.431	375
						0	OB 1-OB 2	96.940	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
OB 2	642573.916	753594.157	99.439	2.634	1200		1 OB 1-OB 2	96.805	225
							0 OB 2-OB 3	96.805	225
OB 3	642585.702	753617.079	99.000	2.298	1200		1 OB 2-OB 3	96.702	225
							0 OB 3-OB 4	96.702	225
SA 24	642586.857	753601.186	99.435	1.678	1350		1 SA 23-SA 24	97.757	375
							0 SA 24-OA 1	97.757	375
OA 1	642598.428	753614.140	99.128	2.409	1350		1 SA 24-OA 1	97.400	375
							0 OA 1-OB 4	96.719	300
SA 11.1	642634.377	753598.464	99.601	1.429	1350		0 SA 11.1-SA 11	98.172	225
OB 4	642595.579	753621.263	98.817	2.158	1200		1 OA 1-OB 4	96.680	300
							2 OB 3-OB 4	96.659	225
							0 OB 4-S Outfall	96.659	300
SC 6	642522.626	753462.229	101.946	1.626	1350		1 SC 5-SC 6	100.500	225
							0 SC 6-SC 7	100.320	225

Node OD 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	101.440	Product Number	CTL-SHE-0067-2000-1000-2000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node OC 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	99.910	Product Number	CTL-SHE-0061-1500-0800-1500
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node OB 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	96.940	Product Number	CTL-SHE-0118-6000-0800-6000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node OA 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	96.719	Product Number	CTL-SHE-0105-4700-0800-4700
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.7	Min Node Diameter (mm)	1200

Node OD 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	100.390	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00750	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	20.000	Number Required	1
Porosity	0.95	Pit Length (m)	10.000		

Node OC 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	98.957	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00750	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	20.000	Number Required	1
Porosity	0.95	Pit Length (m)	10.500		

Node OB 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	96.510	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.06000	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	20.000	Number Required	1
Porosity	0.95	Pit Length (m)	11.500		

Node OA 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	96.300	Depth (m)	1.600
Side Inf Coefficient (m/hr)	0.06000	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	22.500	Number Required	1
Porosity	0.95	Pit Length (m)	20.000		

Appendix D BYPASS PETROL INTERCEPTOR

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS
FOR PEACE OF MIND

Kingspan

Klargester

60 YEARS OF
1955–2015 Expertise & Innovation

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

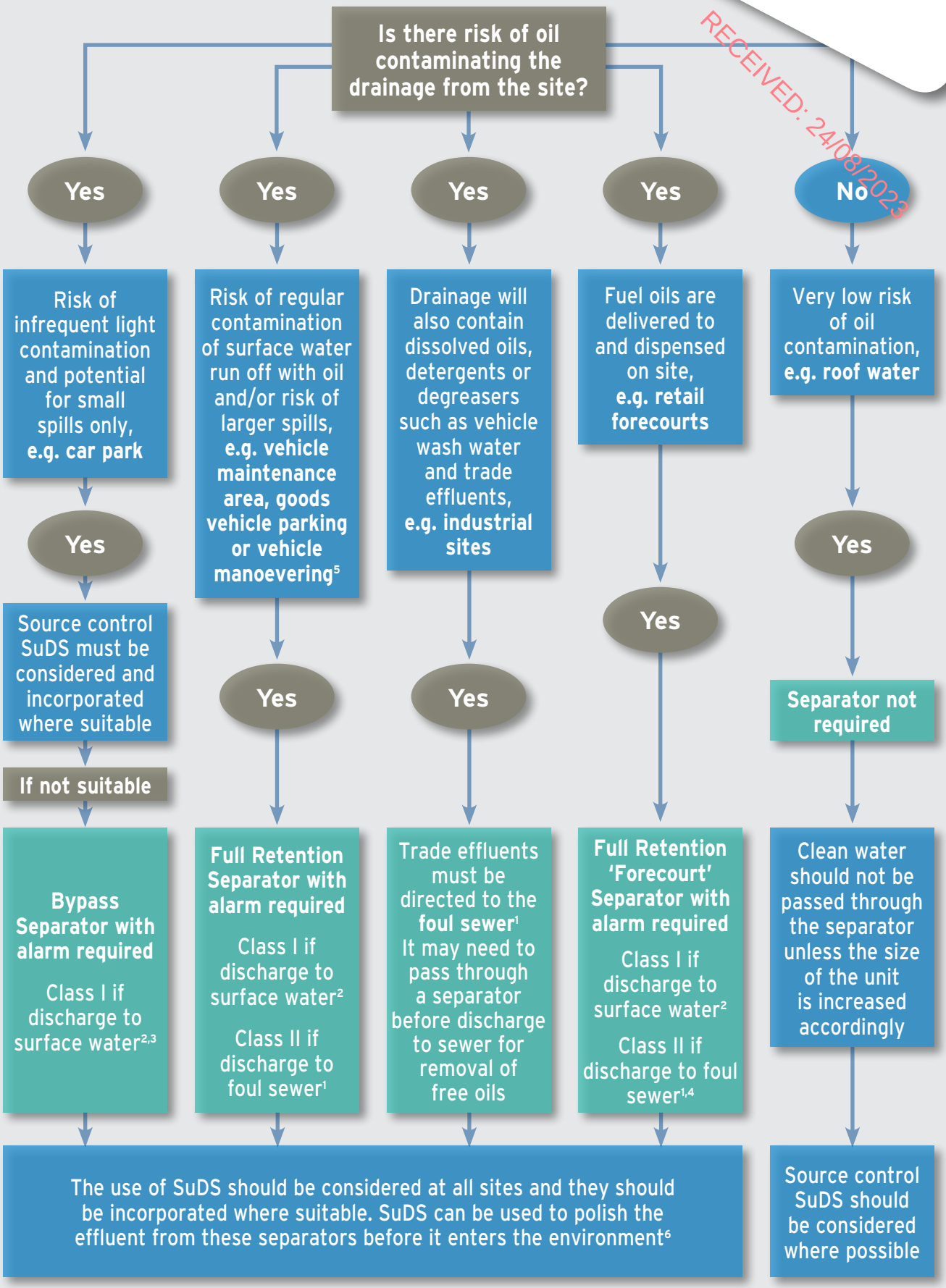
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

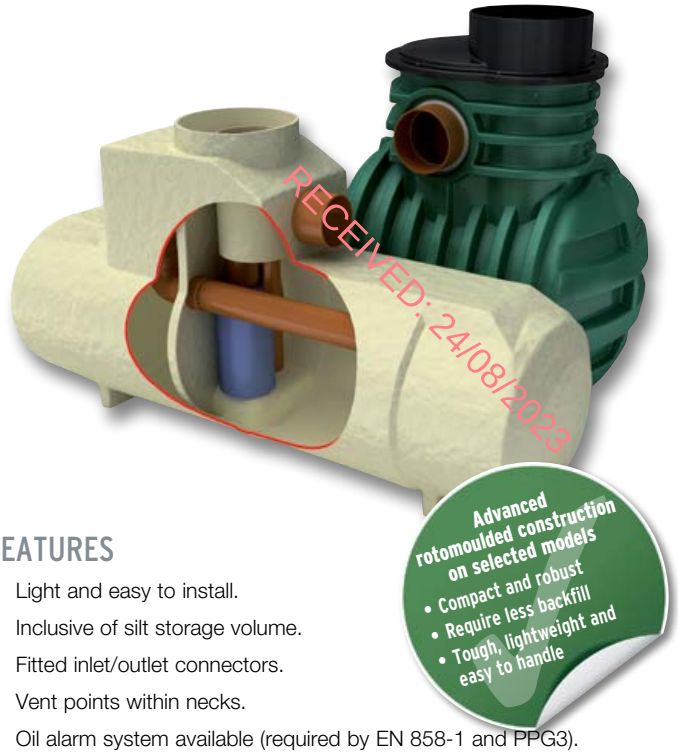
For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

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.
- Oil storage volume.
- Silt storage capacity.
- 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.

Full Retention NSF RANGE

APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

PERFORMANCE

Kingspan Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

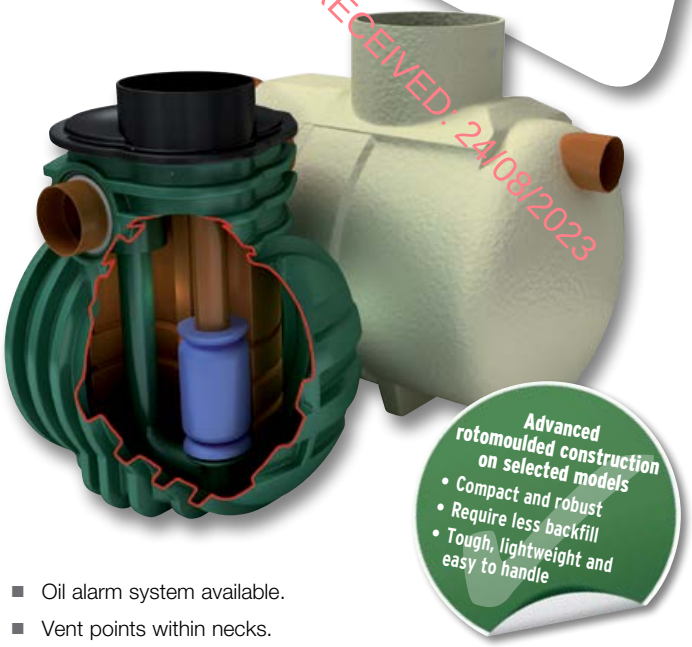
Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.



- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

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

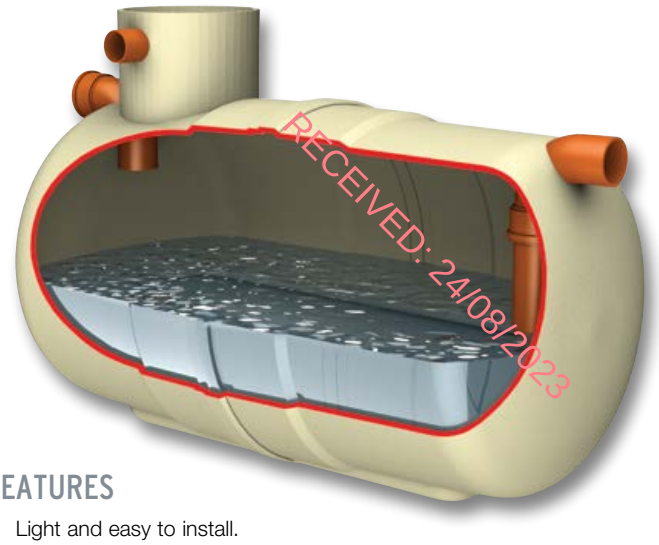
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	DRAINAGE AREA (m^2) PPG-3 (0.018)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	MIN. INLET INLET (mm)	STANDARD PIPEWORK DIA. (mm)
NSFP003	3	170	300	30	1700	1350	1420	1345	500	160
NSFP006	6	335	600	60	1700	1350	1420	1345	500	160
NSFA010	10	555	1000	100	2610	1225	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	1050	1000	500	200
NSFA020	20	1115	2000	200	3200	2010	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	1810	1760	1000	315
NSFA065	65	3610	6500	650	6850	2010	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	2500	2450	1000	300
NSFA100	100	5560	10000	1000	6200	2820	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	2550	2450	1000	600

Rotomoulded chamber construction GRP chamber construction

Washdown & Silt



APPLICATION

This unit can be used in areas such as car wash and other cleaning facilities that discharge directly into a foul drain, which feeds to a municipal treatment facility.

If emulsifiers are present the discharge must not be allowed to enter an NS Class I or Class II unit.

- Car wash.
- Tool hire depots.
- Truck cleansing.
- Construction compounds cleansing points.

PERFORMANCE

Such wash down facilities must not be allowed to discharge directly into surface water but must be directed to a foul connection leading to a municipal treatment works as they utilise emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

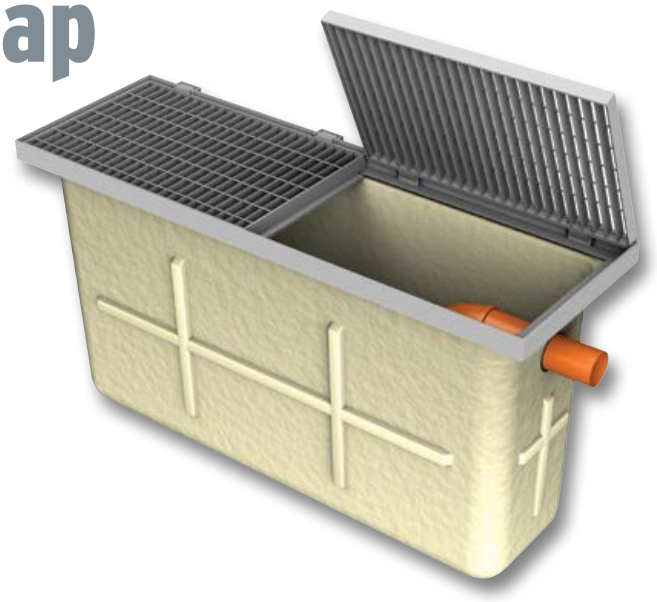
FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.

SIZES AND SPECIFICATIONS

REF.	TOTAL CAPACITY (litres)	MAX. REC. SILT	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STANDARD FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)	APPROX EMPTY (kg)
W1/010	1000	500	3	1123	1225	460	1150	1100	50	500	160	60
W1/020	2000	1000	5	2074	1225	460	1150	1100	50	500	160	120
W1/030	3000	1500	8	2952	1225	460	1150	1100	50	500	160	150
W1/040	4000	2000	11	3898	1225	460	1150	1100	50	500	160	180
W1/060	6000	3000	16	4530	1440	600	1360	1310	50	500	160	320
W1/080	8000	4000	22	3200	2020	600	2005	1955	50	500	160	585
W1/100	10000	5000	27	3915	2020	600	2005	1955	50	500	160	680
W1/120	12000	6000	33	4640	2020	600	2005	1955	50	500	160	770
W1/150	15000	7500	41	5435	2075	600	1940	1890	50	500	160	965
W1/190	19000	9500	52	6865	2075	600	1940	1890	50	500	160	1200

Car Wash Silt Trap



APPLICATION

Car Wash silt trap is designed for use before a separator in car wash applications to ensure effective silt removal.

FEATURES

- FACTA Class B covers.
- Light and easy to install.
- Maintenance from ground level.

Forecourt

APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill. See sales drawing for installation.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

SIZES AND SPECIFICATIONS

ENVIROCEPTOR CLASS	TOTAL CAP. (litres)	DRAINAGE AREA (m^2)	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STD. FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STD. PIPEWORK (mm)	EMPTY WEIGHT (kg)
I	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
II	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
I	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500
II	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500

Alarm Systems

British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

PROFESSIONAL INSTALLERS

Kingspan Klargester Accredited Installers
Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product. This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

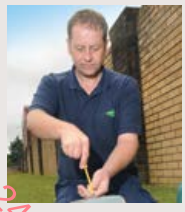
- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.kingspanenviro.com/klargester

Kingspan Klargester Accredited Installer

CARE & MAINTENANCE



Kingspan Environmental Services
Who better to look after your treatment plant than the people who designed and built it?

Kingspan Environmental have a dedicated service division providing maintenance for wastewater products.

Factory trained engineers are available for site visits as part of a planned maintenance contract or on a one-off call out basis.

To find out more about protecting your investment and ensuring peace of mind, call us on:

0844 846 0500

or visit us online:
www.kingspanenvservice.com

Kingspan Environmental Services

Kingspan Klargester

COMMERCIAL WASTEWATER SOLUTIONS

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  HIGH PERFORMANCE SEWAGE TREATMENT SYSTEMS
- PACKAGE PUMP STATIONS
- **PUMPSTOR24** PUMPING SYSTEMS
- OIL/WATER SEPARATORS
- BELOW GROUND STORAGE TANKS
- GREASE & SILT TRAPS

RAINWATER SOLUTIONS

- BELOW GROUND RAINWATER HARVESTING SYSTEMS
- ABOVE GROUND RAINWATER HARVESTING SYSTEMS

Klargester
UK: College Road North, Aston Clinton, Aylesbury, Buckinghamshire HP22 5EW
Tel: +44 (0) 1296 633000 Fax: +44 (0) 1296 633001 Scottish Office: Tel: +44 (0) 1355 248484
email: klargester@kingspan.com

Ireland: Unit 1a, Derryboy Road, Carnbane Business Park, Newry, Co. Down BT35 6QH
NI Tel : +44 (0) 28 302 66799 Fax: +44 (0) 28 302 60046 ROI Tel: 048 302 66799 Fax: 048 302 60046
email: klargesterinfo@kingspan.com

Visit our website **www.kingspanenviro.com/klargester**

Part of Kingspan Environmental

bsi. ISO 9001 Quality Management
bsi. OHSAS 18001 Occupational Health and Safety Management
RIBA Network CPD Providers
BRITISH WATER
UK GREEN BUILDING COUNCIL Founding Member
CIBSE CPD

Issue No. 21: September 2015

Appendix E UISCE EIREANN CORRESPONDENCE

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

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

www.water.ie

Michael Naughton
Tobin Consulting Eng
Fairgreen House
Fairgreen Road
Galway
H91AXK8

3 August 2023

Our Ref: CDS23002571 Pre-Connection Enquiry
Mullingar Western Relief Road, Rathgowan, Mullingar, Westmeath

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 200 unit(s) at Mullingar Western Relief Road, Rathgowan, Mullingar, Westmeath, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	There is sufficient capacity in the water treatment facility to facilitate the proposed development. Please note, the proposed connection point is off the 400AC main to the north of the proposed development. A new meter and PRV will have to be installed. Please note, while flows in excess of your required demand may be achieved in the Uisce Éireann network and could be utilised in the event of a fire, Uisce Éireann cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements you should

	provide adequate fire storage capacity within your development.
Wastewater Connection	We can confirm that there is sufficient capacity in the wastewater treatment facility to cater for this development. The Development can be facilitated at the existing 525mm sewer north west of the site on the R394. This will require a rising main of approximately 470m along the R394. If feasible a gravity connection to the sewer should be considered. If this proposed development proceeds to application when all the foul water entering the pumpstation must be pumped to the north. Please refer to map detailed in Section B for details of the proposed upgrade. Any such network upgrade would have to be entirely funded by the applicant

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Irish Water.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

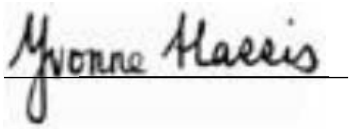
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Irish Water's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Yvonne Harris
Head of Customer Operations

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Irish Water's network(s)?	• Requests for maps showing Irish Water's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• 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,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water Maps email datarequests@water.ie

Wastewater infrastructure

Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Note: The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the

exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Michael Naughton
Fairgreen House
Fairgreen Road
Galway
H91AXK8

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

11 August 2023

Re: Design Submission for Mullingar Western Relief Road, Rathgowan, Mullingar, Westmeath (the "Development")
(the "Design Submission") / Connection Reference No: CDS23002571

Dear Michael Naughton,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: William Hughes
Phone: (087) 348-2505
Email: william.hughes@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- [Proposed Drainage Layout Sheet 1 of 2 10906-2503 Rev. P01]
- [Proposed Drainage Layout Sheet 2 of 2 10906-2504 Rev. P01]
- [Proposed Foul Manhole & Drainage Schedule 10906-2525 Rev. P01]
- [Proposed Watermain Layout Sheet 1 of 2 10906-2501 Rev. P01]
- [Proposed Watermain Layout Sheet 2 of 2 10906-2502 Rev. P01]
- [Network A Long sections]
- [Network B Long sections]

Standard Details/Code of Practice Exemption:

NOT USED

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

Appendix 13.2 Construction and Environmental Management Plan

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

Marina Quarter Ltd.

Proposed Residential Development, Rathgowan, Mullingar, Co. Westmeath.

Preliminary Construction Environmental Management Plan

Document Control Sheet	
Document Reference	10906 – Preliminary CEMP
Client:	Marina Quarter Ltd.
Project Reference	10906

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
P01	Issued for Planning	MN	09/08/2023	RB	09/08/2023	RB	09/08/2023

Table of Contents

List of Figures

1. INTRODUCTION

TOBIN Consulting Engineers (TOBIN) have been requested by Marina Quarter Ltd. to prepare a Preliminary Construction Environmental Management Plan (CEMP) for the proposed residential development at Rathgowan, Mullingar in County Westmeath.

The proposed development is in the administrative area of Westmeath County Council.

1.1 PURPOSE

This CEMP will be provided to the main contractor for implementation during the site clearance and construction stages. It will be considered as a 'Live Document' and will be updated accordingly throughout the project as required.

The purpose of this CEMP is to:

- Identify stakeholder requirements.
- Ensure compliance with the grant of planning.
- Effectively avoid any potential significant adverse environmental effects during site clearance and construction; and
- Translate mitigation measures set out in the planning documentation into committed site procedures.

On appointment, the main contractor is required to implement the mitigation and protective measures set out in this document and maintain environmental monitoring records for the duration of the project which shall be made available to representatives from Westmeath County Council for inspection on request.

2. SITE LOCATION AND LAYOUT

The proposed development is located off the R394, known locally as the C-Link Road, west of the outskirts of Mullingar Town. The site location is illustrated on Figure 2.1 and is located 2km north-west of Mullingar Town Centre. The total developable site area for this application is approx. 5.95Ha and currently comprises of greenfield agricultural lands.

The proposed development will consist of the following:

Construction of 181 no. residential units comprising:

- 18 no. 1 bed units
- 81 no. 2 bed units
- 74 no. 3 bed units and
- 8 no. 4 bed semi-detached units

Provision of shared communal and private open space, car and bicycle parking, site landscaping and public lighting, services, resident car parking, vehicular access from the R394 and associated site development works.

The proposed development layout at time of writing this report is presented in Figure 2.2 below.

Figure 2.1: Site Location

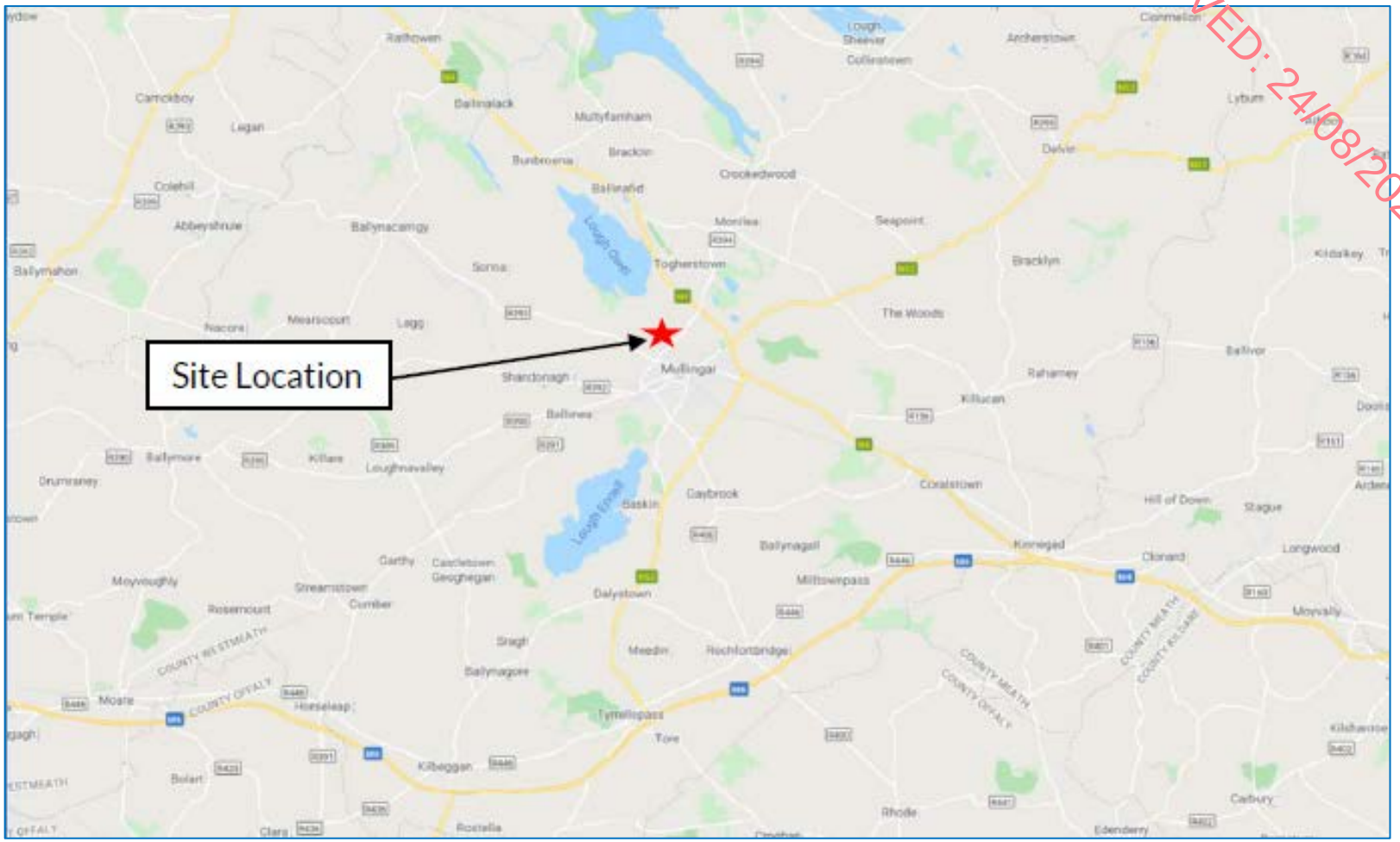


Figure 2.2: Proposed Development Indicative Site Layout

3. CONSTRUCTION LOGISTICS

3.1 SITE CONTACT DETAILS

The Construction Site Contact details will be updated on the event that Planning permission is granted, and the Client progresses to the construction stage of the project:

Site Manager – TBC

Phone No. – TBC

Email – TBC

Out of Hours Contact - TBC

The above contact details will be posted at the site entrance gate and will be clearly displayed for public information. Any changes to the above details during the proposed works will be notified to Westmeath County Council and amended on-site.

3.2 CUT AND FILL

The development has been designed to minimize cut and fill throughout the site, in keeping the proposed finish floor levels of the units and the proposed road levels as close to the existing ground levels as possible. Removal of the existing topsoil layer will be required. It is expected that all stripped topsoil will be reused on site. It is noted that earthworks calculations at this stage of design are high-level estimations and that a full cut and fill exercise would be needed to establish exact volumes.

In areas where existing gradients are very steep or very gradual, a combination of cut and fill is required to maintain a maximum and minimum road gradient of 1/21 and 1/200 respectively, and to ensure that units are level. Throughout the site, maximum fill depths of up to 1.6m is expected, however, fill requirements are typically well below 1m and between 0-0.5m. Cut is required in some areas and will be required in excavation for foundation construction. Maximum cut depths not exceeding 1.2m are expected however the ideal of a balance cut and fill scenario is the target of ongoing design development. These estimates are not taking into consideration the trenches for services throughout the development, which will be a more contained excavation.

As is outlined above the finished floor levels and road levels have been designed to minimize the need for cut and fill. The above notwithstanding, based on similar developments in the area the design is expected to require a nett import of fill of the scale of circa. 5,200m^3 .

The expectation that all cut material will be suitable for fill is, however, idealistic. Some proportion of cut material is likely to be unsuitable. Until actual construction takes place, it is only possible to estimate the proportion of material suitable for re-use. The European Waste Codes and EPA provide published estimates of the various waste types making up the whole waste stream. The estimates derived from these sources which have been applied to this project are that the 'soil and stones' reuse/recovery rate (equivalent to cut-to-fill) is 75% of the total tonnage excavated.

Further optimisation may be possible during later design stages and during construction.

3.3 PHASING PLAN

The proposed development has been divided into two distinct sub-phases. It is expected that each phase would span of the order of 18 months. However, some degree of overlap is expected. With the expected overlap, this development is expected to span around 24 months.

However, the pace of development is largely market driven. Variations to the time frames expressed here could be considerable.

3.4 CONSTRUCTION COMPOUND AND STORAGE AREAS

The construction compound for the development will be located within the area of phase 2 of the development. The compound will include a site office and welfare facilities for construction workers. Portaloo's will be provided in the compound initially with a dedicated toilet block installed later. Due to site levels a connection to the existing public foul sewer is not feasible without a pumping arrangement therefore the toilet facilities will be emptied on regular basis by licenced contractor. Electrical and potable water supply will be provided from the existing connections. Car parking will be located adjacent to the construction compound as shown.

Waste skips will be located adjacent to the site office. Containers and skips used for construction waste handling will be moved close to the work face, as required.

Incoming construction materials will be offloaded and stored in the materials compound.

3.5 SITE ACCESS AND SECURITY

Access to and egress from the construction site will be via the site entrance along the R394. There will be sufficient space for construction vehicles to enter onto the site for delivery of materials and collection of waste without causing an obstruction on the public road network. There will also be sufficient space for HGVs to turn within the site.

Signage will be erected on the R394 (in both directions) to notify motorists of the construction works ahead. Vehicles entering and exiting the site will use the dedicated entrance off the R394. Signage at the site entrance off the roundabout will be provided to ensure members of the public do not enter the site road mistakenly.

The site will be secured using temporary fencing or hoarding at all times to ensure that the ongoing works are separated from the public. Netting will be erected on any fencing used to prevent debris and dust release from the site and provide screening of the construction and works. A secure lockable gate will be erected at the site entrance and visitors to the site will be directed to the adjacent site office. The Site management team will carry out regular inspections and maintenance of the security fencing/ hoarding while also ensuring areas are kept clean.

3.6 CONSTRUCTION PROGRAMME

It is anticipated that the construction works will last for 24 months. This will be confirmed upon appointment of a main contractor. (Refer also to the comments listed above under 3.3 Phasing Plan.)

Insofar as is possible, ground excavation works will be scheduled during periods of dry weather to minimise potential for silt laden run-off from the works or requirements for wheel wash facilities.

3.7 WORKING HOURS

It is proposed that Construction works will be carried out between the hours of 08:00 and 18:00 from Monday to Friday and 08:00 and 14:00 on Saturdays.

No construction works will be carried out on Sundays or Bank Holidays, without the specific agreement of Westmeath County Council.

Workings hours will be confirmed by Westmeath County Council.

3.8 PRE-CONSTRUCTION SURVEYS

Topographical and utility surveys have been carried out for the site. However, the contractor will be responsible for carrying out their own site investigation prior to any work commencing. They are solely responsible to locate and secure all existing services within and around the proposed site boundary.

The Contractor will be required to carry out pre-condition photo survey of the site which will include all perimeter boundaries, footways, existing carriageway on approach to the site. Any damage caused to existing boundaries or elements to be retained will be rectified by the Contractor in accordance with relevant standards.

3.9 OIL AND FUEL STORAGE

Where possible, refuelling of vehicles and equipment will not be carried out on site to minimise the potential for spills or leaks to occur. However, some fuel, lubricants and hydraulic fluids will need to be stored on site during construction works for equipment such as excavators and generators.

Fuelling and lubrication of equipment will only be carried out in a designated area of the site away from any existing manholes or gullies. At present, it is proposed that fuel and lubricants will be stored adjacent to the office compound. Fuels and oils will be contained within a bunded structure with capacity for 110% of the storage capacity of the largest container/tank. This bunded area will be roofed appropriately to exclude rainwater.

The fuel storage area will be properly secured to prevent unauthorised access or vandalism and all triggers will be locked when not in use. Spill kits and drip trays will be used during refuelling to collect any potential spills or overfills. No vehicles or containers will be left unattended during refuelling.

Mobile fuel bowsers may be used for refuelling heavy equipment. Bowsers used will be double skinned and spill kit/drip tray equipment will be used during refuelling which will take place away from any nearby drains or watercourses and from any surface water drainage gullies.

3.10 ENVIRONMENTAL RESPONSE PROCEDURES

Spill kits will be made available on site and identified with signage for use in the event of an environmental spill or leak. A spill kit will be kept near the fuel storage area for use in the event of any incident during refuelling or maintenance works. Heavy machinery used on the site will also be equipped with its own spill kit.

In the event of an environmental incident, the appointed Project Environmental Manager will be notified immediately, and absorbent materials used to prevent the spread of the spill/leak. The contaminated materials will be transferred to leak-proof storage containers and any contaminated soils or gravels excavated and removed off-site. A record of the incident will be kept, and Westmeath County Council will be notified.

3.11 TRAINING AND AWARENESS

All site staff will be required to complete an induction prior to commencement of works on the site. The details of the site induction will be provided by the main contractor in the *Construction Health & Safety Plan*.

As part of the site induction, all site staff will be made aware of the presence of the sensitive ecological areas in the vicinity of the site. Employees will also be informed about the risks associated with stormwater runoff to soakaways on site and will be required to ensure no runoff or chemicals will enter the river or soakaways once installed.

During the project works, the Site Manager or Project Environmental Manager will deliver strategic toolbox talks focused on potential environmental and safety risks associated with the works being carried out at that stage of the project.

3.12 CONTROL OF SOIL EXCAVATION

Site earthworks activities including clearing, stripping, excavation, trenching, backfilling, levelling, and compaction will be required as part of the Works.

- Soils suitable for engineered fills will be reused within the site to meet the cut-to-fill demands of the formation design levels. Soils unsuitable for engineered fill be reused on site as backfill in the grassed areas, where possible. Excess cut material that cannot be re-used on site will be exported from site under strict controls.
- Contractors shall be required to submit and adhere to a method statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.
- Temporary storage of soil and stockpiles will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any open surface water drains. No soil storing will be allowed within 30m of the open water where sufficient working areas are available within the site boundaries, which is in line with Inland Fisheries Ireland guidelines.
- Movement of material will be minimised to reduce disturbance of natural ground, degradation of soil structure and generation of dust.
- Although there is no evidence of historical contamination in the proposed development area, all excavated materials will be visually assessed for signs of possible contamination

such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be disposed of by a licensed waste disposal contractor.

- Overburden material will be protected from exposure to wind by storing the material in sheltered parts of the site, where possible.

3.13 SOURCE OF FILL AND AGGREGATES

All fill and aggregate for the proposed development will be sourced from reputable, approved suppliers. As a minimum, all suppliers will need to :

- Provide aggregate compliance certificates/declarations of conformity for the classes of material specified for the proposed development.
- Provide proof of an acceptable environmental management status; and
- Provide proof of the regulatory and legal compliance status of the company.

4. HEALTH AND SAFETY

The main contractor is required to provide best practice working environments for all employees involved in the construction of the proposed development. This includes a responsibility to take into account all relevant statutory laws and guidelines.

All construction activity will be carried out in accordance with the requirements of the *Safety, Health and Welfare at Work (Construction) Regulations 2013*. The main contractor will be required to prepare a *Construction Health & Safety Plan* prior to commencement of construction activities.

The site will be required to operate in accordance with any government directives as a result of a pandemic, such as that of Covid-19, should it arise during the proposed construction stage.

In the case of an emergency at the site, the following procedures shall be followed:

- Emergency services will be contacted immediately by dialling 112 or 999.
- Exact details of the emergency/incident will be given by the caller to the emergency line operator to allow them to assess the situation and respond in an adequate manner.
- The emergency will then be reported to the Site Manager.
- Where available, trained site first aiders will attend the incident; and
- The Site Manager will maintain contact with the emergency services to ensure they have directions to the site.

In the case of an incident where the emergency services are not required, any persons injured will be taken to the nearest hospital by the Site Manager or other appointed person. The nearest hospital to the site is:

Mullingar Regional Hospital – located 800m to the north-east of the site via R394.

Phone No. – (044) 939 4126

Driving Time – c. 1 minute

Minimum PPE required during the construction works will include protective footwear, high visibility vests, gloves, safety glasses and hard hats. Ear defenders will be used during noise works, as required.

Further details will be set out on the *Construction Health & Safety Plan* to be prepared by the appointed contractor.

Signage will be erected at the site entrance to warn the public of the ongoing construction works. The signage used will be similar to that shown in Figure 4.1.

Figure 4.1: Example of Site safety Signage

5. CONSTRUCTION TRAFFIC MANAGEMENT

The construction traffic coming to and leaving the site will use the R394. There are several quarries located to the north (Owens Quarry Product), northeast (Breedon Ireland Castlepollard Quarries) and south (Hinch Plant Quarries) of the proposed site. Transport of construction material will comprise most HGV traffic movements during the construction works. Similarly, the Contractor will be required to use licenced and permitted waste management facilities within the Eastern-Midlands Waste Management Region which can accept C&D waste which will be generated from the site.

The appointed contractor will determine which facilities will provide construction materials and collect waste from the site. Suitably permitted waste contractors will be appointed to transport any waste off-site.

Construction traffic, delivering to or collecting from the site, will be able to drive into the site from the R394 and turn within the site such that there will be no queuing of traffic on the adjacent road network. Drivers coming to site will be informed of the site working hours and suppliers will not be permitted to park at the site entrance awaiting the gates to open.

The N4 national route provides a link between the site and areas to the east and northwest of the midlands, and to the M4 motorway, which is linked to Dublin. As a result, HGV's will be able to avoid entering the town centre for the most part. HGV's will be required to access the R394 from the N4 at the Cullionbeg Roundabout northeast of the site, where road widths are suitable for HGV vehicular movement.

There will be a noticeable increase in HGV traffic on the road network during the construction stage works as waste materials are removed from site and deliveries brought to site. However, this activity will be of short duration and generally staggered.

Parking will be provided within the site boundary for construction staff and no car parking will be permitted outside of the site boundary.

Visual surveys of the road network approaching the site will be carried out on a regular basis. The main contractor will carry out road sweeping operations, employing a suction sweeper or similar appropriate method, to remove any project related dirt and/or material deposited on the road network by construction/delivery vehicles. The contractor will be required to provide suitable hard standing directly within the site boundary off the main access to minimize spoil being transferred onto the public road. Nonetheless, a wheel wash system will be set up in the event there is a risk of debris deposit on the road.

Waste collection vehicles leaving the site will be required to cover their loads with a canvas to prevent waste or dust emissions from the vehicle on the road network.

6. ENVIRONMENTAL OBJECTIVES AND TARGETS

The key environmental objectives of the construction phase of the proposed development are:

- To ensure there is no deterioration in soil or water quality at the site as a result of construction activities; and
- To ensure there is minimal impact on residents and road users as a result of construction activities.

In terms of waste management, a target of 80% recycling and recovery of C&D waste has been set and waste contractors will be evaluated based on being able to achieve this target and be able to provide evidence of same.

7. ENVIRONMENTAL MANAGEMENT

7.1 AIR QUALITY

Dust will be generated mainly from earthworks activities at the early stage of the project and to a lesser extent from new construction and traffic movements. The closest human receptors are in properties along the north and eastern, (Ashfield residential development), boundaries at approximately 10-15m from the site boundary. There will also be human receptors in close proximity to the south and eastern boundaries due to the footpaths along the R394 and Ashe Road which will stay open throughout.

Measures will be put in place to minimise the impact of dust generated from the works with reference to best practice guidance such as the *Control of Dust from Construction and Demolition Activities* document [1]. These measures will include:

- During periods of dry weather, the site access routes will be kept damp to minimise dust generation from construction traffic.
- Street sweepers will be employed to ensure the adjacent R394 is maintained free of dust.
- Establishing a 10 km/hr speed limit for vehicles on site.
- Minimisation of extent of working areas at any one time.
- Netting and/or hard surface hoarding around the perimeter of the site will minimise dust migration from the site at low levels.
- Stockpiling of imported materials will be limited to the volumes required to practically meet the construction schedule.
- Excavated materials will be removed from site as soon as possible to minimise potential for stockpiles to create windblown dust; and
- Daily inspections by the main contractor will be carried out to identify potential sources of dust generation along with implementation measures to remove causes where found.

It is not proposed to carry out dust deposition monitoring as it is considered that the above measures will be sufficient to ensure that there is no dust impact on local human or ecological receptors.

Contact details for the site manager as outlined in Section 3.1 will be provided at the entrance to the site and local residents/public will be encouraged to report any off-site dust deposition issues. Any air quality complaints made during the works will be logged, investigated and followed up with measures to limit emissions, where appropriate.

There will also be some exhaust emissions generated from use of excavators, HGVs and vibrating rollers during the demolition and construction phase. These impacts will be temporary in duration and are not considered likely to give rise to significant air quality impacts following the implementation of the following measures:

- All machinery will be suitably maintained to ensure that emissions of engine-generated pollutants shall be kept to a minimum in accordance with Measures Against the Emission of Gaseous and Particulate Pollutants from Internal Combustion Engines to be Installed in Non-Road Mobile Machinery (2002/88/EC) and Emissions of Pollutants from Diesel Engines (2005/21/EC).

[1] BRE/DTI, *Control of Dust from Construction and Demolition Activities* (2003)

- Vehicles will not be left unnecessarily idling on the site and trucks removing demolition waste from the site will turn off engines during loading.
- Pre-start checks on all machinery will be conducted daily prior to commencement of activities.
- Low emission fuels will be used insofar as possible; and
- Mains power will be used for small plant and equipment, where possible, in preference to generators.

7.2 NOISE & VIBRATION

All works will be carried out being mindful of potential noise impacts from construction activities. Plant and machinery operating on the site will be the main source of noise during the works most notably during any earthworks, rock breaking etc. The works will be carried out in accordance with the requirements of *BS5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites*.

The primary measure to limit the potential impact of noise from the works will be to limit working hours to the suitable daytime hours outlined in Section 3.7. This will reduce the potential noise impact on the local human receptors by avoiding early morning noise generating activities.

Other measures to control noise emissions from the works will include:

- Ensuring that HGV drivers turn off engines when parked for prolonged periods on the site and turning off engines during loading of demolition waste materials.
- Using minimal impact reversing alerts and avoiding the use of horns, where possible. These alerts, however, are essential safety measures for construction sites and cannot be avoided.
- Choosing equipment with reduced noise output and silencers/dampeners.
- Using radio contact across the site to avoid workers shouting or whistling.
- Maintaining plant and equipment in good condition to ensure noise emissions are as per plant specifications and that all noise attenuation features are in good working order; and
- Use of mains power supply instead of generators insofar as is possible.

Contact details for the site manager as outlined in Section 3.1 will be provided at the entrance to the site and residents/public will be encouraged to report any noise issues. Any noise complaints made during the works will be logged, investigated and followed up with measures to limit noise emissions, where appropriate.

It is not anticipated that there will be any significant vibration impacts from the proposed works. Some minor vibrations will be generated from heavy plant and machinery, but it is anticipated that there will be no piling or significant percussion plant required which could have the potential to cause vibration effects or damage.

7.3 SOIL & GROUNDWATER

The proposed development works will require significant stripping of surface covering for the new development in addition to an element of cut and fill to obtain the necessary site formation levels. The design of the development has endeavoured to maintain proposed ground level to match the existing levels where possible to minimise cut and fill across the site however there will inevitably be a degree of cut & fill required. Excavations to suitable formations for building and roads will be required. It is intended that any excavated soil and stone materials will be reused within the site boundary insofar as possible to minimise the quantity of materials to be removed from site.

Any material that is intended for retention on site for re-use within the site boundary in landscaping will be relocated to this area as soon as possible. The main contractor will minimise the extent of areas of exposed soil at any one time to reduce potential for generation of dust during dry periods or creation of sediment laden run-off during wet periods. Where possible, works will be carried out during dry weather periods.

7.4 SURFACE WATER

Pollution prevention measures will be put in place to avoid release of potential pollutants into the watercourses adjacent to the site. The management of surface water run-off during the construction phase will also be carried out in accordance with the CIRIA C698F publication *Site Handbook for the Construction of SUDS* [2].

Material stockpiles will be kept at least 10m from any watercourses or manholes and silt fences will be erected at the toe of stockpiles to prevent run-off into watercourses. The silt fences will be monitored daily by the main contractor and silt removed where required. Damaged fences will be repaired immediately.

Tarpaulins or polythene sheets will be used to cover stockpiles of material during heavy rainfall to avoid sediment release.

Washout from concrete delivery vehicles will be required on site and will only occur at designated concrete washout areas. This will be allocated by the site manager at the start of the works and relayed to all concrete delivery drivers upon arrival on site. The washout area will not be permitted within areas close to sewers or ground.

No liquids will be permitted to be discharged direct to ground and absorbent socks will be installed around surface water drains to prevent silt entering the drainage network.

Surface water monitoring comprising visual inspections and in-situ testing will be carried out on a regular basis throughout the project to monitor for any changes in water quality of these open water streams. The results of surface water monitoring will be retained on site for inspection.

[2] CIRIA, *Site Handbook for the Construction of SUDS (2007)*

7.5 ECOLOGY

The following measures will be put in place to prevent disturbance of fauna during the construction works:

- Noise control measures such as limited working hours and minimising noise emissions will assist in reducing the disturbance of animals; dusk and dawn is high faunal activity time.
- Plant machinery will be turned off when not in use to reduce noise emissions.
- Illumination of the site will be kept to the minimum required for health and safety purposes and established on a task specific basis to prevent disturbance to local fauna that may occur in the wider area.
- Light spill will be minimised where possible; and
- Operating equipment and machinery will be restricted to the site boundary.

The following mitigation measures will be put in place to avoid significant negative impacts to protected fauna and to accord with The Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations, 2011-2015.

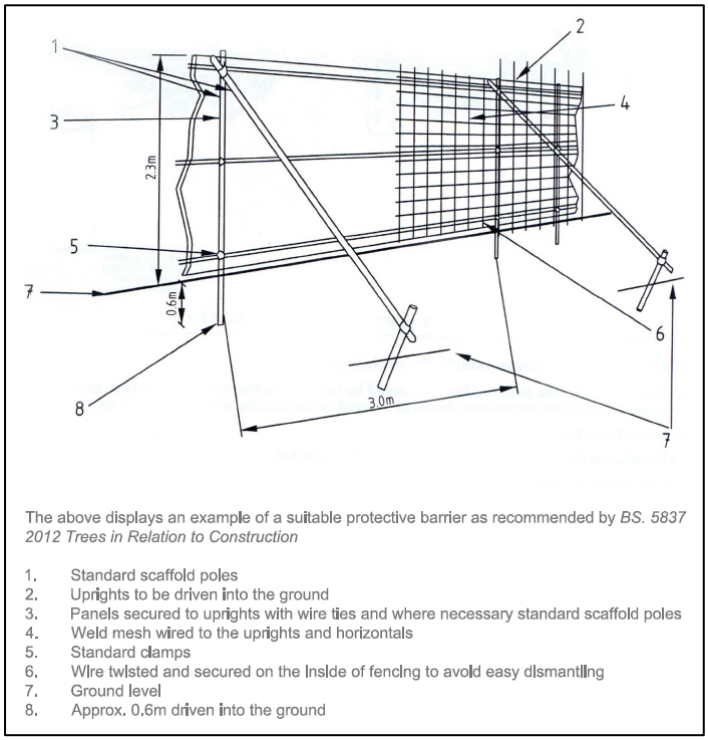
7.5.1 MITIGATION MEASURES FOR BREEDING BIRDS

Site clearance should take place outside the bird breeding season which occurs from March 1st to August 31st inclusive. Where this schedule cannot be accommodated an ecologist will be required to check the vegetation (trees, hedgerows, scrub and grassland) for the presence of nesting birds prior to vegetation clearance. If nesting birds are found to be present, NPWS should be consulted, and appropriate mitigation measures should be put in place to avoid disturbance to nesting birds until the young have fledged.

7.5.2 MITIGATION MEASURES FOR EXISTING TREES

There is very little existing vegetation within the site boundaries, however a tree survey was carried out to establish which vegetation shall be retained and removed. There are at 2no. existing mature Ash trees on the eastern boundary to be retained with existing hedgerow and scrub to be retained in the same location. Existing scrub vegetation to the northwest of the site, (north of the pump station), is also to be retained along with hedgerow in the centre of the site. All vegetation to be retained on site will be protected during construction. The root boundary of each tree will be fenced as a no entry zone to ensure that each tree is protected. An example of a suitable protective tree/hedgerow barrier is shown in Figure 7.1.

Figure 7.1: Example of Suitable Protective Tree Barrier



The above displays an example of a suitable protective barrier as recommended by *BS. 5837 2012 Trees in Relation to Construction*

1. Standard scaffold poles
2. Uprights to be driven into the ground
3. Panels secured to uprights with wire ties and where necessary standard scaffold poles
4. Weld mesh wired to the uprights and horizontals
5. Standard clamps
6. Wire twisted and secured on the inside of fencing to avoid easy dismantling
7. Ground level
8. Approx. 0.6m driven into the ground

7.6 WASTE MANAGEMENT

On-site segregation of materials will be carried out where possible to maximise off-site reuse potential. Skips and haulage trucks will be temporarily stored close to the work areas to facilitate storage prior to moving off-site.

Suitably sized skips will be provided adjacent to the construction compound for general construction wastes and wood/metal/plastic as appropriate. Smaller wheelie bins will be provided for recyclable cardboard and paper waste generated in the site offices and food waste from the canteen. A leak proof container will be made available for storage of contaminated spill kit absorbents.

All non-hazardous and hazardous waste materials will be collected from the site by appropriately permitted waste contractors in accordance with the requirements of the *Waste Management (Collection Permit) Regulations 2007* as amended. Waste will be taken to suitably permitted or licensed waste facilities for recovery or disposal as appropriate.

Hard copies of waste collection permits and waste facility licenses/permits for all the appointed waste hauliers and facilities will be held by the main contractor on site and records of each waste movement off-site will be maintained. Authorised persons in Westmeath County Council will be provided access to inspect and review all waste records at any time.

The Project Environmental Manager will have responsibility for waste management and will ensure maximum segregation of waste materials on-site. The Project Environmental Manager will ensure signage is erected on skips to show what waste types can be placed within and will maintain waste records.

8. RECORD KEEPING

The Site Manager will appoint a competent person(s) to act as Project Environmental Manager and carry out environmental monitoring and maintain records for the duration of the works. The appointed person(s) will be familiar with the environmental mitigation and monitoring measures outlined in this Preliminary CEMP and will carry out the relevant inspections and assessments on a regular basis. The Project Environmental Manager will report to the Site Manager.

Daily inspections of the silt fences and watercourses will be logged and recorded in a site folder. Any water sampling results from field testing and laboratory testing will also be maintained in the site folder.

A record of all waste movements from the site will also be maintained and copies of the waste transfer dockets will be held on site. The Project Environmental Manager will ensure that all waste haulage vehicles are identified on the waste collection permit and that the waste description and associated List of Waste code stated on the waste transfer docket are correct.

Any incidents resulting in a potential negative impact on soils or groundwater will be notified immediately to the Project Environmental Manager and the Site Manager. Spill kits will be used where possible to clean up any release and measures taken to ensure that any release does not reach a watercourse or surface water drain. Westmeath County Council will be notified of any such incident which has the potential to cause a negative impact.

A record of any complaints received in relation to construction works will also be maintained and categorised (e.g., noise, property damage, traffic, dust etc.) within a central Site Complaints Log. The log will include the following key details:

- Name, address and contact details of the complainant (with the complainant's permission).
- Brief outline of the complaint.
- Date of complaint.
- Name of person receiving complaint details; and
- Agreed timeline for response to the complaint.

Any complaints made will be notified to the Site Manager and the Project Environmental Manager immediately and a plan put in place to investigate and seek to resolve the complaint. The Site Manager will also notify the Developer of complaints received. The complainant, Developer and other stakeholders will be kept informed of the progress in resolving the issue.

Hard copy folders will be maintained on site for inspection by the planning authority at any time.

Appendix 13.3 Outline Construction Management Plan

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

Marina Quarter Ltd.

Proposed Residential Development, Rathgowan, Mullingar, Co. Westmeath.

Outline Construction Traffic Management Plan

Document Control Sheet	
Document Reference	10906 – OCTMP
Client:	Marina Quarter Ltd.
Project Reference	10906

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
P01	Issued for Planning	MN	10/08/2023	RB	11/08/2023	RB	11/08/2023

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1. INTRODUCTION

This Outline Construction Traffic Management Plan has been prepared to accompany the planning application for the proposed development at Rathgowan, Mullingar on behalf of the applicant, Marina Quarter Ltd. The purpose of the document is to outline a plan for the management of construction traffic during the proposed duration of the works for the project.

This document has been compiled for Planning Stage purposes and the final Site-Specific Construction Traffic Management Plan will be produced by the appointed Contractor and PSCS in conjunction with the PSDP for the project. This report outlines the preliminary management plan and what will be expected of the Main Contractor's Management Plan at construction stage.

This document has been prepared with reference to the following guidance documents:

- 'Traffic Signs Manual – Chapter 8 – Temporary Traffic Measures and Signs for Roadworks' Department of Transport, August 2019
- 'Temporary Traffic Management Design Guidance' Department of Transport, August 2019
- 'Temporary Traffic Management Operations Guidance' Department of Transport, August 2019
    - Part 0 - Introduction and Background
    - Part 1 – Level 1 Roads – Urban and Low Speed Roads
    - Part 2 – Level 2 Roads – Rural Sigle Carriageway Road
    - Part 3 – Level 3 Roads – Dual Carriageways and Motorways
- 'Guidance for the Control and Management of Traffic at Roadworks (2nd Edition)' – Department of Transport, NRA and Local Government Management Services Board, October 2010.

2. DESCRIPTION OF THE PROJECT

The proposed development is located off the R394, known locally as the C-Link Road, west of the outskirts of Mullingar Town. The site location is illustrated on Figure 2.1 and is located 2km north-west of Mullingar Town Centre. The total developable site area for this application is approx. 5.95Ha and currently comprises of greenfield agricultural lands.

The proposed development will consist of the following:

Construction of 181 no. residential units comprising of:

- 18 no. 1 bed units
- 81 no. 2 bed units
- 74 no. 3 bed units and
- 8 no. 4 bed semi-detached units

Provision of shared communal and private open space, car and bicycle parking, site landscaping and public lighting, services, resident car parking, vehicular access from the R394 and associated site development works. There is also a 2m wide cycle facility and a 2m wide footpath proposed adjacent to Ashe Road along the southern site boundary.

The proposed development layout at time of writing this report is presented in Figure 2.2 below.

Figure 2.1: Site Location

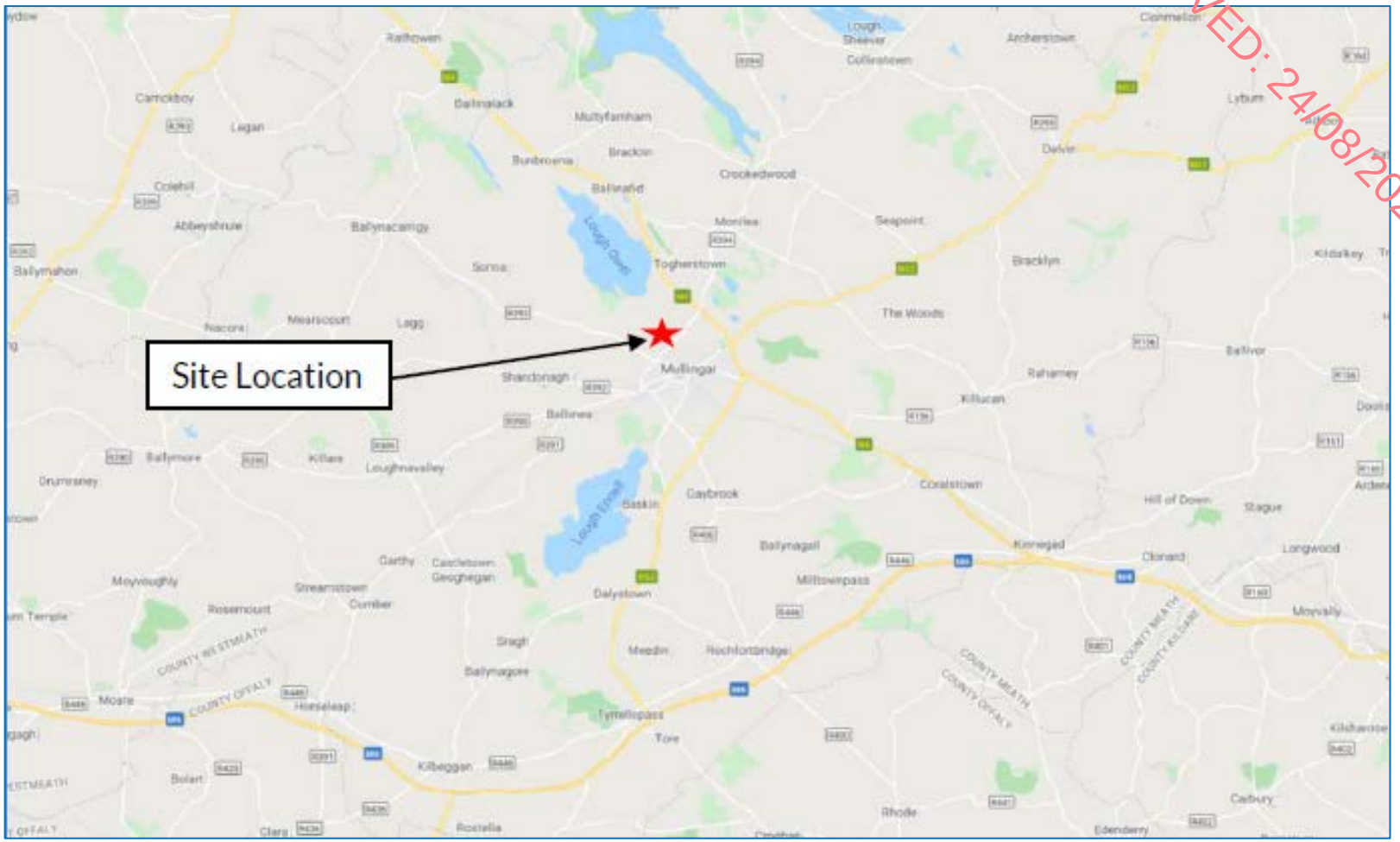

Figure 2.2: Proposed Development Indicative Site Layout

2.1 EXISTING ROAD NETWORK

The existing road network surrounding the site is well established with the site bound by the R394 regional road, also known as the C-Link Road or Western Relief Road, to the east and the R393 Ashe Road to the south. The R394 comprises single lane carriageways in both directions with the existing roundabout consisting of a typical 'Continental' style urban roundabout as shown in section 11.2 of the Traffic Management Guidelines. The R394 is a by-pass of Mullingar Town and links directly to the N4 National Road to the north and Mullingar Business Park to the south. The R393 provides a direct link into Mullingar Town centre.

2.2 PROPOSED DEVELOPMENT ACCESS DETAILS

Due to the well-established arm in existence of the roundabout on the R394 road, it is proposed to utilise this existing entrance for vehicular access to site. An existing splitter island is present on the arm accessing the site which will separate incoming and outgoing lanes. Autotrack assessment have been carried out as part of the overall design for the scheme which demonstrates that large vehicles will be able to access the site comfortably. Access to the site via Ashe Road is proposed to be pedestrian and cyclist access only from the proposed pedestrian/cycle facility.

3. TRANSPORTATION FACILITIES

3.1 ROAD NETWORK AND ACCESS

The site is located off the R394 Regional Road to the west of Mullingar town centre. The site is well serviced by regional roads with an existing formed entrance located of the roundabout on R394 to the northwest of the site. The existing entrance provides good vehicular access to the site resulting in no additional, temporary, access points being required to facilitate the construction stage of the development.

3.2 CAR PARKING

Provision will be made onsite for a construction staff carpark within the Contractor's compound. No parking of vehicles will occur along the existing roads or neighbouring estates.

3.3 PEDESTRIANS & CYCLISTS

3.3.1 PEDESTRIAN FOOTWAYS

Existing continuous pedestrian footways along both sides of the R394 are present, both sides of the existing roundabout. The footpath on the nearside of the site on the R394 terminates at the southeast corner of the site just as its transverses onto Ashe Road. Existing drop kerbs are in place at this location to allow pedestrian crossing to the opposite side of Ashe Road where there is a continuous footpath heading eastwards. As part of the proposed development, the southern boundary running along Ashe Road from the terminated footpath shall be upgraded to provide a 2m pedestrian footpath and a 2m cycle facility as requested by Westmeath County Council. This new facility will tie in with a cycleway and footpath, part of a granted planning application currently in construction opposite Gaelscoil an Mhuillinn, (ref: 19/6121). Additionally, the proposal includes providing new shared footway and plaza areas which will then provide connection to existing footways.

All existing footways are to be maintained adjacent to the boundary of the site. Drop kerbs and tactile paving are present at the existing site entrance utilising the splitter Island. These facilities shall be maintained throughout the duration of the construction stage.

3.3.2 CYCLISTS

The R394 running along the western boundary currently incorporates cycle lanes in both direction on the carriage. As part of the scheme, it is proposed to improve the environment for cyclists by integrating a combined pedestrian/cycle facility to the site boundary which will be off the carriageway.

During the Construction stage of the project advanced warning signs will be required on the approach to the roundabout from both directions indicating access points for Construction traffic. It is not proposed to divert cyclists from their current routes because of the construction phase of the development as the cyclists will be able to maintain the current arrangements along the R394 road.

The current arrangement along Ashe Road includes a dedicated cycle route. The scheme also proposes to improve the cyclist facility by bringing the cyclists off road to a shared facility with the pedestrians. During these works there will likely be some impact to the cycle lane. The Contractor will be required to agree suitable temporary measures with the local authority for the temporary management of the cyclists on Ashe Road until such time as the new shared facility is available for use.

3.4 PUBLIC TRANSPORT

There is currently a local bus service operating in proximity to the development with the nearest bus stop located east of the development on Ashe Road. The route is serviced by the 448 and travels into Mullingar town. The site is also located within 16mins walking distance to the train station which provides regular train times for the Dublin to Sligo route.

4. TRAFFIC MANAGEMENT

4.1 TRAFFIC MANAGEMENT PLAN

This section outlines the content of the final Traffic Management Plan (TMP) which shall be prepared prior to construction of the proposed development. It shall be a requirement of the contract that, prior to construction, the appointed contractor shall liaise with the relevant authorities including Westmeath County Council, TII and Emergency Services for the purpose of finalising the TMP, which will encompass all aspects of this outline Traffic Management Plan. The TMP shall be termed a 'Live Document', such that any changes to construction programme or operations can be incorporated into the TMP.

The contractor will be contractually required to ensure that the elements of this outline TMP shall be incorporated into the final TMP. The principal contractor shall also agree and implement monitoring measures to confirm the effectiveness of the mitigation measures outlined in the TMP. On finalisation of the TMP, the contractor shall adopt the plan and associated monitoring measures. The final TMP shall address the following issues (including all aspects identified in this outline TMP):

- Site Access & Egress.
- Traffic Management Signage.
- Routing of Construction Traffic / Road Closures.
- Timings of Material Deliveries to Site.
- Traffic Management Speed Limits.
- Road Cleaning.
- Road Condition.
- Road Closures.
- Enforcement of Traffic Management Plan
- Details of Working Hours and Days.
- Details of Emergency plan.
- Communication.
- Construction Methodologies; and
- Particular Construction Impacts

4.2 TRAFFIC MANAGEMENT SIGNAGE

The principal contractor shall undertake consultation with the relevant authorities for the purpose of identifying and agreeing signage requirements. Such signage shall be installed prior to works commencing on site. Proposed signage may include warning signs to provide warning to road users of the works access/egress locations and the presence of construction traffic. All signage shall be provided in accordance with the Department of Transport's Traffic Signs Manual, - Chapter 8 – Temporary Traffic Measures and Signs for Roadworks – August 2019. In summary, the contractor will be required to ensure that the following elements are implemented:

- Consultation with the relevant authorities for the purpose of identifying and agreeing signage requirements.

- Provision of temporary signage indicating site access route and locations for contractors and associated suppliers; and
- Provision of general information signage to inform road users and local communities of the nature and locations of the works, including project contact details.

4.3 ROUTING OF CONSTRUCTION TRAFFIC

As outlined in Section 3.1, preferred construction phase access would be from the existing access to site off the roundabout on the R394. The delivery/haulage vehicles will be routed depending on the destination/origin of the materials being delivered.

The use of local roads will be minimised as much as possible, particularly to avoid / minimise the encountering of narrow road widths, poor visibility and unsuitable bearing capacities. As the site is located on the outer areas of Mullingar town centre, it is envisaged that most delivery vehicles shall be able to access site through the N52, N4 and R394 roads which will keep them away from Mullingar town centre and the more built-up areas.

No construction traffic be permitted to park along Ashe Road or the R394 road throughout the construction stage of the development. The main contractor will be required to provide suitable delivery vehicle parking and unloading areas within the site extents.

4.4 PROGRAMMING

In order to reduce impacts on local communities and residents adjacent to the proposed sites, it is proposed that:

- The contractor will be required to liaise with the management of other construction projects and the local authorities to co-ordinate deliveries.
- The contractor will be required to schedule deliveries in such a way that construction activities and deliveries activities do not run concurrently e.g., avoiding pouring of concrete on the same day as material deliveries to reduce the possibility of numbers of construction delivery vehicles arriving at the site simultaneously, resulting in build-up of traffic on road network.
- The contractor will be required to schedule deliveries such that traffic volumes on the surrounding road network is kept to a minimum.
- A construction phase programme of works shall be developed by the contractor in liaison with Westmeath County Council specifically considering potential road repair works that are included in the local authority's road works schedule. Works should be programmed, where possible, such that any road works are carried out following the presence of construction traffic for the proposed development.
- Works along Ashe Road (forming footway/cycle way) to be coordinated and agreed in advance with Westmeath County Council.

- HGV deliveries to the development site will be suspended on the days of any major events, sports events, etc. that have the potential to cause larger than normal traffic volumes.
- The contractor will be required to interact with members of the local community to ensure that deliveries will not conflict with sensitive events such as funerals.
- HGV deliveries will avoid passing schools at opening and closing times where it is reasonably practicable.
- Construction activities will be undertaken during daylight hours for all construction stages. It is not anticipated that construction works will be carried out on Sunday, or Bank Holidays or that any construction works will be carried out in hours of darkness.
- The proposed development has been divided into two distinct sub-phases. It is expected that each phase would span of the order of 18 months. However, some degree of overlap is expected. With the expected overlap, this development is expected to span around 24 months. However, the pace of development is largely market driven. Variations to the time frames expressed here could be considerable.
- The contractor is to compile a phasing plan before initial occupancy of any of phase 1 to ensure construction traffic and operational traffic crossovers are non-existent or kept to a very minimum.

4.5 RECOMMENDED TRAFFIC MANAGEMENT SPEED LIMITS

Adherence to posted / legal speed limits will be emphasised to all staff / suppliers and contractors during induction training. Drivers of construction vehicles / HGVs will be advised that vehicular movements in sensitive locations, such as local community areas, shall be restricted to 50 km/h. Special speed limits of 30 km/h shall be implemented for construction traffic in sensitive areas such as school locations. Such recommended speed limits will only apply to construction traffic and shall not apply to general traffic. It is not proposed to signpost such speed limits in the interest of clarity for local road users.

4.6 RECOMMENDED TRAFFIC MANAGEMENT ROAD MAINTENANCE

It shall be a requirement of the works contract that the main contractor will be required to carry out road sweeping operations to remove any project related dirt and material deposited on the road network by construction / delivery vehicles. Road Sweepers will dispose of material following sweeping of road network, to licensed waste facility.

4.7 VEHICLE CLEANING

It shall be a requirement of the works contract that the main contractor will be required to provide wheel washing facilities, and any other necessary measures to remove mud and organic material from vehicles exiting the site.

4.8 ROAD CONDITION

The extent of the heavy vehicle traffic movements and the nature of the payload may create problems of:

- Fugitive losses from wheels, trailers or tailgates; and
- Localised areas of subgrade and wearing surface failure.

The contractors shall ensure that:

- Loads of materials leaving each site will be evaluated and covered if considered necessary to minimise potential dust impacts during transportation.
- The transportation contractor shall take all reasonable measures while transporting waste or any other materials likely to cause fugitive loses from a vehicle during transportation to and from site, including but not limited to:
    - Covering of all waste or material with suitably secured tarpaulin/ covers to prevent loss; and
    - Utilisation of enclosed units to prevent loss.
- The roads forming part of the haul routes will be monitored visually throughout the construction period and a truck mounted vacuum mechanical sweeper will be assigned to roads along the haul route as required. In addition, the contractor shall, in conjunction with the local authority:
- Throughout the course of the construction of the proposed development, ongoing visual inspections and monitoring of the haul roads will be undertaken to ensure any damage caused by construction traffic is recorded and that the relevant local authority is notified.

Arrangements will be made to repair any such damage to an appropriate standard in a timely manner such that any disruption is minimised. Upon completion of the construction of the proposed development, the surveys carried out at preconstruction phase shall be repeated and a comparison of the pre and post construction surveys carried out. Where such comparative assessments identify a section of road as having been damaged or as having deteriorated because of construction traffic, the road will be repaired to the preconstruction standard or better.

4.9 ROAD CLOSURES

During the works, it is not envisaged that road closures will be required. In areas where existing carriageways are narrowed, it is envisaged that Traffic Management measures such as temporary traffic lights will be utilised to facilitate traffic. This will be particularly relevant along the Ashe Road boundary where the footpath/ cycleway will be formed and where connections to existing services are required.

It is envisaged however that temporary lane closures may be required at guarding locations for the purpose of removal following construction and/or when connecting to existing services. These closures will be short in duration, with road closure times and appropriate measures to be agreed with Westmeath Council and other relevant stakeholders prior to them being implemented.

4.10 ENFORCEMENT OF TRAFFIC MANAGEMENT PLAN

All project staff and material suppliers will be required to adhere to the final TMP. As outlined above, the principal contractor shall agree and implement monitoring measures to confirm the effectiveness of the TMP. Regular inspections / spot checks will also be carried out to ensure that all project staff and material supplies follow the agreed measures adopted in the TMP.

4.11 DETAILS OF WORKING HOURS AND DAYS

Construction of the proposed development is envisaged to be undertaken during daylight hours for all construction stages. It is not anticipated that construction works will be carried out on Sunday, or Bank Holidays or that any construction works will be carried out in hours of darkness. Any deviation from these will need to be agreed in advance with the local authority e.g., road crossing for utility connections.

4.12 EMERGENCY PROCEDURES DURING CONSTRUCTION

The contractor shall ensure that unobstructed access is provided to all emergency vehicles along all routes and site accesses. The contractor shall provide to the local authorities and emergency services, contact details of the contractor's personnel responsible for construction traffic management. In the case of an emergency the following procedure shall be followed:

- Emergency Services will be contacted immediately by dialling 112.
- Exact details of the emergency / incident will be given by the caller to the emergency line operator to allow them to assess the situation and respond in an adequate manner.
- The emergency will then be reported to the Site Team Supervisors and the Safety Officer.
- All construction traffic shall be notified of the incident (where such occurs off site).
- Where required, appointed site first aiders will attend the emergency immediately; and
- The Safety Officer will ensure that the emergency services are on route.

4.13 COMMUNICATION

The contractor shall ensure that close communication with Westmeath County Council and the emergency services shall be maintained throughout the construction phase. Such communications shall include:

- Submissions of proposed traffic management measures for comment and approval.
- Ongoing reporting relating to the condition of the road network and updates to construction programming; and
- Information relating to local and community events that could conflict with proposed traffic management measures and construction traffic to implement alternative measures to avoid such conflicts.

The contractor shall also ensure that the local community is informed of proposed traffic management measures in advance of their implementation. Such information shall be disseminated by posting advertisements in local newspapers and delivering leaflets to houses in the affected areas. Such information shall contain contact information for members of the public to obtain additional information and to provide additional knowledge such as local events, sports fixtures etc. which may conflict with proposed traffic management measures.

5. CONCLUSION

The Construction Traffic Management Plan (CTMP) will form part of the construction contract and will be designed to reduce possible impacts which may occur during the construction of the proposed development. This Outline CTMP shall be used by the appointed contractor as a basis for the preparation of a final CTMP and shall detail, at a minimum, the items detailed in this outline CTMP and any subsequent requirements of the local authorities. The employer shall be responsible for ensuring that the contractor manages the construction activities in accordance with this outline TMP and shall ensure that any conditions of planning are incorporated into the final TMP prepared by the appointed works contractor.

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Appendix 13.4 Construction, Demolition & Operational Waste Management Plan

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

Marina Quarter Ltd.

Proposed Residential Development
At Rathgowan, Mullingar.

Construction Demolition & Operational Waste Management Plan

Document Control Sheet	
Document Reference	P01 – CD&OWMP
Client:	Marina Quarter Ltd.
Project Reference	10906

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
P01	Issued for Planning	EC	4/08/2023	MN	9/08/2023	RB	11/08/2023

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1. INTRODUCTION

Waste Management is an integral requirement essential in the promotion of sustainable development, enhancing good public health and the protection of environment. The following outlines the waste management strategy for the development.

The proposed development will give rise to a variety of waste streams. Given the scale of the development and the volumes of waste that will be generated during construction, it is imperative to ensure that waste management at the site is tightly controlled and has the least possible impact on the surrounding environment.

The purpose of the Construction Demolition and Operational Waste Management Plan (CD&OWMP) will ensure that waste storage and movement within the development takes place in a manner which complies with relevant legislation and has a minimal impact on the nearby existing commercial and residential areas and ensures, where prevention is not possible, that maximum reuse, recycling and recovery of waste with diversion from landfill, wherever possible.

The current legal and industrial standards adopted to generate this document include:

- **Waste Management Act 1996, as amended -**
- **Waste Management (Facility Permit and Registration) Regulations, as amended.**
- **Waste Management (Collection Permit) Regulations, as amended.**
- **European Union (Packaging) Regulations, as amended.**
- **European Union (Waste Electrical and Electronic Equipment) Regulations, as amended.**
- **Waste Management (Hazardous Waste) Regulations, as amended.**

The plan estimates the type and quantity of waste to be generated from the proposed development during the Construction and Operational phases and provides a strategy for managing the different waste streams. Guidance will also be given to ensure appropriate method of transportation of waste is used to prevent littering or other serious environmental pollution.

In preparation of the CD&OWMP, the following publications have been used as references:

- BEST PRACTICE GUIDELINES for the preparation of resource & waste management plans for construction & demolition projects.
- Department of the Environment and local Government 2021.

These guidelines cover issues to be addressed at the preplanning stage right through to project completion and these include:

- Predicted Construction and Demolition wastes.
- Waste disposal/recycling of C&D wastes at the site.
- List of sequence of operations to be followed.
- Provision of training for waste managers and site crew.
- Details of proposed record keeping system.
- Details of waste audit procedures and plans.
- Details of consultation with relevant stakeholders.

1.1 WASTE MANAGEMENT CONTEXT

The primary legislative instrument that governs waste management in Ireland is the Waste Management Act (WMA) 1996, as amended. The WMA is a key instrument which, among others, implements the EU Waste Framework Directive (Directive 2008/98/EC) in Ireland. The WMA provides for a general duty on everyone not to hold, transport, recover or dispose of waste in a manner that causes or is likely to cause environmental pollution. The WMA also sets out the provisions for the collection of waste and for its recovery/disposal.

Any person or contractor engaged in the collection of waste on a commercial basis is required to hold a Waste Collection Permit in accordance with the requirements of the Waste Management (Collection Permit) Regulations, as amended. A Waste Collection Permit is issued to appropriate contractors by the National Waste Collection Permit Office (NWCPO).

Waste materials collected by a suitably permitted waste contractor can only be transported to appropriately permitted or licensed waste facilities. Authorization for receiving waste materials is provided in accordance with the Waste Management (Facility Permit & Registration) Regulations, as amended for waste permits and certificates of registration (COR) granted by the relevant Local Authority. Waste management authorizations granted by the Environmental Protection Agency (EPA) are issued in accordance with the Waste Management (Licensing) Regulations 2004, as amended and the Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013, as amended.

1.2 RELEVANT POLICY

1.2.1 National Policy

Ireland's waste management policy is based on the EU waste hierarchy (Figure 1) and includes a range of measures across five tiers namely, prevention/minimization, reuse, recycling, recovery, and disposal.

National waste management policy is set out in the Waste Action Plan for a Circular Economy (2020 – 2025). It is focused on facilitating the transition to a circular economy (Figure 2) through a suite of actions aimed at capturing the maximum value of all resources across various waste streams. It is consistent with EU policy supporting the transition to a circular economy including the European Green Deal and ties in with the waste hierarchy approach. The Circular Economy Bill 2021 is currently at draft stage and will, when enacted, set out a statutory framework to enable the transition.

Figure 1.1 Waste Management Hierarchy (Source: EPA)

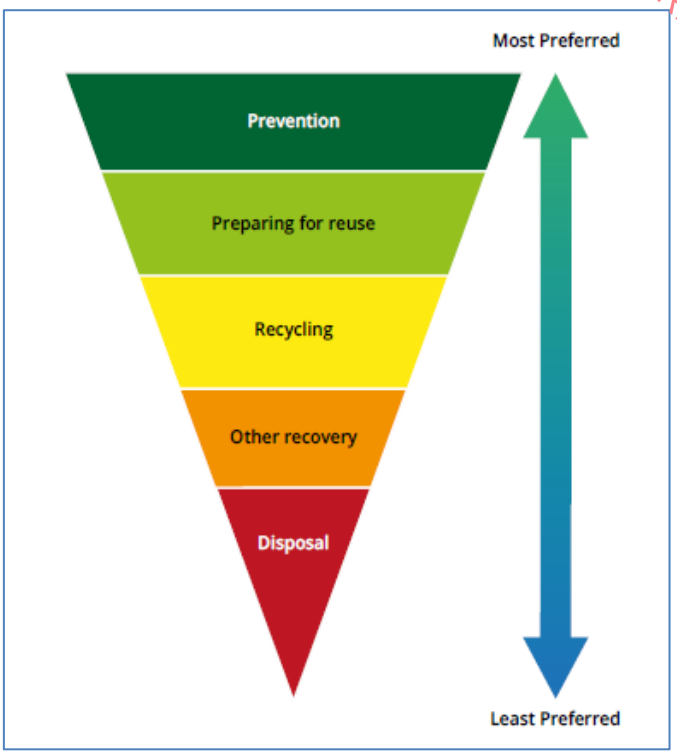
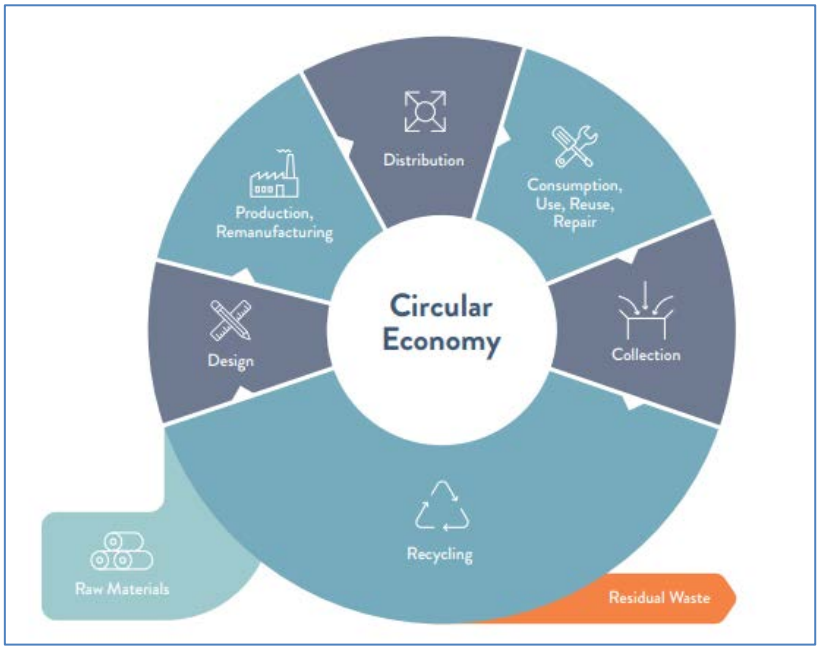


Figure 1.2 The Circular Economy (Source: EPA)



In respect of C&D waste specifically, the plan outlines that a review of producer responsibility initiatives will examine the appropriate financial mechanisms to ensure compliance by producers with their obligations and that those sectors which are generating significant waste, and which do not have successful voluntary initiatives in place, will be considered for specific regulation as part of the review. The document states that specific producer responsibility requirements for construction and demolition projects over a certain threshold will be considered.

1.2.2 Regional Waste Management Plan

For the purposes of waste planning, Ireland has been divided into three waste regions, namely the Eastern-Midlands Waste Region, the Southern Waste Region and the Connacht-Ulster Waste Region.

The proposed development is in the Eastern-Midlands Waste Region (EMWR) which comprises nine local authority areas which are outlined in Table 1.

Eastern-Midlands Waste Region	
Dublin City Council	Offaly County Council
Dún Laoghaire-Rathdown County Council	Longford County Council
Fingal County Council	Westmeath County Council
South Dublin County Council	Kildare County Council
Meath County Council	Wicklow Council
Louth County Council	Laois County Council

Table 1 Local Authority areas in the EMWR

Each of the three waste management regions has developed a waste management plan to provide a framework for the prevention and management of wastes in a safe and sustainable manner. The current waste plan for the EMWR is the Eastern-Midlands Region Waste Management Plan 2015 – 2021.

The strategic vision of the regional waste plan is to rethink Ireland's approach to managing wastes, by viewing waste streams as valuable material resources that can lead to a healthier environment and sustainable commercial opportunities for the economy.

The regional plan also states that *"there is significant potential for recycling of the C&O waste stream given the nature of its characteristics".*

1.2.3 County Development Plan

The Westmeath County Council Development Plan 2021 – 2027 sets out a number of policies and objectives for Westmeath County in line with the objectives of the regional waste management plan. The plan identifies supporting the objectives and targets of the regional waste management plan (except in relation to incineration) as one of the Council's policies. Other waste policy which is relevant to the proposed development includes:

1. Secure the provision of waste management facilities and infrastructure with appropriate provision for minimisation, recovery and recycling of waste and regulate waste operations in a manner which reflects the 'polluter pays' and 'proximity' principles with particular emphasis on large waste producers, in accordance with the objectives of the Eastern-Midlands Regional Waste Plan 2015- 2021, except in relation to incineration and emerging legislation on the transition to a circular economy and the National Waste Action Plan for a Circular Economy 2020-2025.

2. Have a waste management system in the city in line with EU and national policies, which prioritises waste prevention, minimisation, recycling and reuse and accords with the outcomes of the Circular Economy Bill 2021 and the associated strategy.

3. Support the objectives and targets of the Eastern-Midlands Regional Waste Plan 2015-2021 relating to Westmeath and any subsequent Waste Plans.

4. Ensure that adequate recycling facilities and bring facilities are provided within the city, including where those are required in association with the layouts of new residential, industrial and commercial developments and where they comply with the requirements of the Environment Section of the Council.

5. Ensure the sustainable siting of waste facilities in relation to existing and potential surrounding land-uses, transportation and environmental considerations.

6. Promote the implementation of the County Council Litter Management Plan and other litter management initiatives in order to minimise and control the extent of litter pollution in the city.

7. Ensure that development on contaminated lands include appropriate remediation measures.

2. WASTE MANAGEMENT OBJECTIVES

The following waste management objectives are identified for the proposed development:

- Maximize the on-site segregation of demolition and construction wastes.
- Consider all reuse opportunities for material surpluses within the site.
- Avoid oversupply of incoming construction materials which have the potential to become waste; and
- Engage licensed waste contractors that can provide maximum off-site reuse, recovery and recycling of waste materials in preference of disposal throughout construction, demolition and operational phases.

The national target for preparing for reuse, recovery and recycling of C&D waste (excluding soil and stone) is 70% and the waste industry in Ireland is currently achieving 68%.

The Eastern-Midlands Region Waste Management plan 2015-2021 has targeted a recycle rate of 50% of managed municipal waste by 2020.

The target set for C&O waste management for this project is 80% which is expected to be achievable based on the construction waste types outlined in Section 4 below.

The main contractor will be made aware of this project target and will be required to engage suitably permitted waste contractors that will provide a commitment to achieving, or exceeding, this target.

3. PROJECT DESCRIPTION

TOBIN Consulting Engineers were appointed to provide engineering consultancy services for the proposed residential development, Rathgowan, Mullingar

Planning permission is sought by Marina Quarter Ltd. (the applicant) for development on a site which extends to 5.95Ha of lands located along the eastern boundary of the R394.

The proposed development will consist of the following:

Construction of 181 no. residential units comprising of:

- 18 no. 1 bed units
- 81no. 2 bed units
- 74 no. 3 bed units and
- 8 no. 4 bed semi-detached units

Provision of shared communal and private open space, car and bicycle parking, site landscaping and public lighting, services, resident car parking, vehicular access from the R394 and associated site development works.

The proposed site location is shown in Figure 3.1 below.

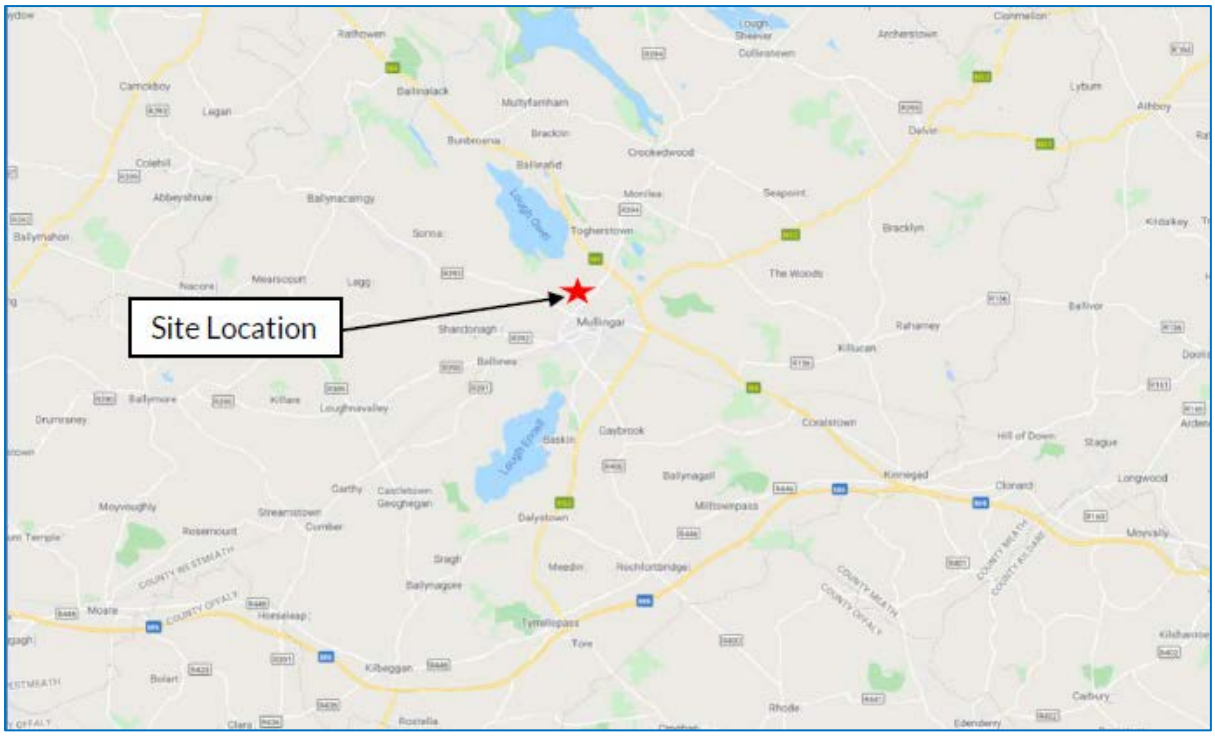


Figure 3.1 Proposed Site Location

4. WASTE ARISINGS

C&D waste statistics from 2019 published by the EPA identify the main waste types generated in the construction industry in Ireland as set out in Table 2.

Prior to the commencement of any demolition, excavation or construction works at the site a full audit of waste that will be generated on site will be carried out. For the purposes of this CD&OWMP a list of expected waste types that may be generated has been drawn up and the European Waste Catalogue Codes pertaining to each waste type is included in the table below which identifies the main waste types generated in the construction industry in Ireland.

Waste Type	% of total (by weight)
Metal	2.20%
Segregated Wood, glass & plastic	0.30%
Bituminous mixtures	1.30%
Mixed waste	4.50%
Concrete, bricks, tiles and similar	6.90%
Soil and stones	84.80%

Table 2 EPA C&D Waste Statistics

As above, soil and stones waste typically make up a significant proportion of C&D waste.

During construction works, waste material will be generated mainly from material off-cuts and packaging. Oversupply of materials can also lead to waste generation. The typical waste materials generated again will be concrete rubble, metals, wood and plastics.

Other waste types generated in smaller quantities on construction sites may include materials such as waste oils, resins, paints and adhesives. Some of these materials may be hazardous and will require specific handling procedures. It is expected that quantities of these materials will be small.

Typical hazardous and non-hazardous wastes that will be generated from the operation of the proposed development include dry mixed recyclables, mixed non-recyclables, organic waste, glass.

In addition to the typical waste materials that will be generated daily, there will be some additional waste types generated in small quantities within the development that will need to be managed separately including:

- Batteries;
- Waste electrical and electronic equipment (WEEE) (both hazardous and non-hazardous);
- Chemicals from cleaning and maintenance;
- Fluorescent tubes and other mercury containing waste;
- Textiles; and
- Furniture (and from time-to-time other bulky wastes).

4.1 DEMOLITION WASTE

Methods for waste reduction will form the basic strategy for demolition waste management from the start. Where possible materials will be re-used. Careful extraction of materials will be undertaken to ensure that the highest proportion of the materials can be re-used. This will reduce the level of new materials required for the proposed site. This in turn reduces the impact on new resources and carbon emissions associated with the extraction, manufacture and transportation of materials to the site. If any of the excavated soil is found to be clean/inert, the site manager will investigate whether nearby construction sites may require clean fill material, to both minimize the costs of transport and to reuse as much material as possible.

To ensure compliance with legislative requirements, only local authority licenced waste hauliers, waste contractors are permitted to collect and remove waste from site. All waste removed from site will be deposited at a licensed waste facility.

Prior to the commencement of any demolition, excavation or construction works at the site a full audit of waste that will be generated on site will be carried out. For the purposes of this CD&OWMP a list of expected waste types that may be generated has been drawn up and the European Waste Catalogue Codes pertaining to each waste type is included in the table below. The lists have been prepared following a visit to the proposed development site.

Materials Type	Example	EPA Code
Soil & Stones	Overburden, soil, subsoil	17 05 04
Concrete	Pillars, wall foundation	17 01 01
Mixture of inert material	Sand, stones, rock	17 01 07
Mixed Metals	Disused Agricultural Fencing/ galvanized sheet roofing	17 04 07

Table 3 Demolition Waste Categories

4.2 EXCAVATION WASTE

The remaining volume of waste material (other than demolition waste) will be segregated according to type into individual skips pending removal by authorized waste collection contractors. The actual waste categories that will be subject to segregation during the site clearance and cut & fill phases will be determined by the expected volumes of specific waste categories which will be assessed by the Waste Manager. Where a category of waste forms a smaller quantity, this will be disposed of in a general waste skip along with other categories of waste the volume of which does not warrant individual segregation This general waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be further sorted into individual waste streams for recycling, recovery or disposal. It is anticipated that most materials will be re-used at the site for landscaping and site restoration purposes.

4.3 Operational Waste

4.3.1 Apartments

Residents in the apartment building and building management staff in the management office will be required to segregate waste into the following main waste streams:

- Dry Mixed Recyclables
- Mixed Non-Recyclables
- Organic (food) Waste
- Glass (segregated by colour)

Segregated pedal bins (or similar) for dry mixed recyclables, mixed non-recyclables and organic (food) waste will be provided within the bin stores area of the apartments by the building management company. Additional bins for segregation of dry mixed recyclables and mixed non-recyclables will also be provided in the common areas, where appropriate. Residents will be required to segregate their waste, as above, into segregated bins within their own home before disposing to the respective bins within the bin stores. Similarly, the building management personnel will be required to segregate their waste into the above waste streams.

All bins/containers will be clearly labelled, and colour coded to avoid cross contamination of the different waste streams. Signage will be posted on or above the bins to show which wastes can be placed in each bin.

The residents will be required to bring full waste receptacles from within their apartments to the allocated waste storage area (WSA) on the ground floor. Building management staff will transfer waste from the communal areas and to the WSA.

Larger waste receptacles will be provided by the building management company in the WSA. All waste receptacles used will comply with the IS EN 840 2012 standard for performance requirements of mobile waste containers, where appropriate. Receptacles here will also be labelled, and colour coded to avoid cross contamination of waste streams and signage will be erected on the walls to advise residents of correct segregation.

4.3.2 Housing Units

Residents in each housing unit will be required to segregate waste into the following main waste streams:

- Dry Mixed Recyclables
- Mixed Non-Recyclables
- Organic (food) Waste
- Glass (segregated by colour)

Segregated wheelie bins (or similar) for dry mixed recyclables, mixed non-recyclables and organic (food) waste will be recommended for each housing unit. Additional bins for segregation of dry mixed recyclables and mixed non-recyclables will also be provided in the common areas, where appropriate. Residents will be required to segregate their waste, as above, into

segregated bins within their own home. The private waste management contractor will collect the respective bin at an arranged collection time period.

All bins/containers will be clearly labelled, and colour coded to avoid cross contamination of the different waste streams.

Bins will be located within the curtilage of each dwelling and would be stored either to the rear of units where rear garden access is available, or in bin stores at the front of the units.

4.3.3 General Comments

Other waste materials such as batteries, printer toner/cartridges and WEEE may be generated infrequently by residents and staff. Residents will be required to dispose of these appropriately in civic amenity areas or building management staff may arrange for collection of these waste types on an infrequent basis.

For the purposes of this CD&OWMP, a list of expected operational waste types that may be generated has been drawn up and the European Waste Catalogue Codes pertaining to each waste type is included in the table below.

Waste Material	LoW Code
Paper and Cardboard	20 01 01
Plastics	20 01 39
Metals	20 01 40
Mixed Municipal Waste	20 03 01
Glass	20 01 02
Biodegradable Kitchen Waste	20 01 08
Oils and Fats*	20 01 25/26*
Textiles	20 01 11
Batteries and accumulators*	20 01 33*/34
Waste electrical and electronic equipment*	20 01 35*/36
Green waste	20 02 01
Chemicals (solvents, pesticides, paints & adhesives, detergents, etc.)*	20 01 13*/19*/27-30
Fluorescent tubes and other mercury containing waste*	20 01 21*
Bulky wastes	20 03 07

Table 4 Typical Wastes Generated and LOW Codes

4.4 RECYCLE/RECOVERY MEASURES

The following waste streams are to be segregated for recycling/recovery off site:

- Uncontaminated excavated spoil/stone, in excess of the quantities required on site, is to be taken off site for reuse at another location. The contractor shall ensure the haulage contractor and the receiving site has the necessary Waste Collection Permit from the local authority. Records of all truck movements in/out of site shall be maintained.
- Mixed packaging waste is to be deposited in recycling skips. This waste will then be removed off site for recycling by the licensed waste contractor.
- Timber waste is to be deposited in timber skips for collection by the licensed waste contractor.
- Mixed metals are to be placed in the appropriate skip for removal off site by the licensed waste contractor.
- Return broken glass to glazing supplier or local recycling point.
- Recyclable Operational Waste is to be separated from other waste by residents and then put in the recycling bin in the bin storage areas.

Depending on the work stage and anticipated waste streams and volumes, Contractor Management have discretion to use one skip for all 'Recyclable Waste'. This waste shall be collected by an approved waste contractor for segregation and recycling at their waste facility.

The contractor shall retain records of all skips collection from site.

5. CATEGORIES OF CONSTRUCTION WASTE GENERATED

In order to provide consistent waste and hazardous waste classifications across the EU, the following were published:

- European Waste Catalogue
- Hazardous Waste List.

These form the basis for national and international waste reporting obligations. The EPA has also published a more concise guide of these. The EPA list of waste codes (LOW) for typical waste materials expected to be generated for this site are tabulated below as follows:

Waste Type	List of Waste Codes*
Metal	17 04 01 to 17 04 11
Glass	17 02 02, 17 02 04
Paper & Cardboard	20 01 01
Plastic	17 02 03, 17 02 04
Wood	17 02 01, 17 02 04
Waste containing PCBs**	17 09 02
Mixed waste	17 09 03, 17 09 04
Mineral waste (concrete, bricks, gypsum)	17 01 01 to 17 01 07
Asbestos	17 06 01, 17 06 05
Soil and stones	17 05 03 to 17 05 08
Residue from treatment of mixed waste	Varies

Table 5 EPA List of Waste Codes - General Construction

6. CONSTRUCTION WASTE

This is anticipated to consist of surplus of materials arising from demolition works and cut-offs of various materials including concrete blocks, bricks, tiles etc. Waste from packaging and oversupply of materials is also expected.

The bulk of waste material generated is expected to be from the demolition of the existing store and covered storage yard and the deep excavation to accommodate the construction associated with the development and to a lesser extent the associated civil works for the development. This is expected to be inert material which may be re-used on site subject to suitability and testing to reduce waste volumes.

The development will include the excavation of approximately 12,020m3 of soil and stones associated with the general site clearance and excavation relating to the bulk dig and installation of housing sub-structures and general civil engineering works. It is intended to reuse excavated materials if deemed suitable in landscape areas and fill to reduce waste volumes.

The following table predicts the construction waste which will be generated based on information currently available:

Waste Type	Quantity (Tonnes)
Metal	624
Segregated Wood, glass & plastic	85
Bituminous mixtures	369
Mixed waste	1,276
Concrete, bricks, tiles and similar	1,956
Soil and stones	24,040
Total	**28,349**

Table 6 Estimated Waste Quantities

Waste Type	Quantity (Tonnes)	Reuse/ Recovery		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Metal	624	5	31	90	561	5	31
Segregated Wood, glass & plastic	85	15	13	65	55	20	17
Bituminous mixtures	369	0	0	25	92	75	276
Mixed waste	1,276	0	0	0	0	100	1,276
Concrete, bricks, tiles and similar	1,956	95	1,858	0	0	5	98
Soil and stones	24,040	75	18,030	0	0	25	6,010
Total	**28,349**		**19,932**		**709**		**7,708**

Table 7 Estimated Off-Site Reuse, Recycle and Disposal for Construction Waste

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

7. WASTE HANDLING

7.1 ON-SITE WASTE MANAGEMENT

To ensure that waste management is given adequate consideration throughout the construction, demolition and operational phases, the main contractor will appoint a Project Environmental Manager who will have overall responsibility for implementing this CD&OWMP, ensuring that the project remains in compliance with waste legislation and striving to achieve, and exceed, the waste management target as set out in Section 2.

As a primary measure, waste generation will be avoided, where possible, by ensuring that an excess supply of building materials is not delivered to the site and that only the minimum materials required to meet the construction schedule are available on-site. This will reduce the potential for damage and re-ordering materials which will save on project costs. The 'Just-in-time' delivery concept will be applied, where possible, to minimize waste creation.

Maximum segregation of waste materials on-site will be carried out to increase the off-site potential for materials. A waste compound will be established adjacent to the site compound. Additional skips of varying sizes may be provided strategically around the site from time to time to promote source segregation and avoid rubbish build-up and potential for off-site littering.

All skips will be maintained in good condition and clearly labelled so that there is no confusion as to what materials are to be placed in which skip. The main contractor will appoint an employee to keep the area around the skips clean and to ensure skips are not overflowing with waste. Waste materials such as gypsum, WEEE, batteries or hazardous waste may require covered skips or containers to prevent contaminated run-off in the event of getting wet. A dedicated bunded storage area will be provided for storage of liquid wastes such as resins, oils, paints etc.

Clean excavated materials will be reused on-site for backfill and landscaping. Groundworks will be monitored by the Project Environmental Manager, and sampling carried out as necessary on any potentially contaminated material.

Waste from apartments will be managed on-site by the residents, who will transfer their waste to the allocated bin storage areas. The building management staff will transfer waste from the communal areas to the WSA.

7.2 OFF-SITE WASTE MANAGEMENT

The main contractor will appoint a suitably permitted waste contractor(s) to collect waste from the site and transfer to appropriately permitted or licensed waste facilities. Any contaminated material encountered will be classified and disposed of, to Local Authority Registered / Council landfill sites.

A suitably permitted waste contractor will be appointed by the management company to provide waste collection services for the building and to bring the waste to a licensed waste facility. All waste receptacles presented for collection must be clearly identified as required by waste legislation. Waste will be presented for collection in a manner that will not endanger health, create a risk to traffic, harm the environment or create a nuisance through odours or litter.

In addition to the typical waste materials that are generated on a daily basis, there will be some additional waste types generated from time to time that will need to be managed separately. A non-exhaustive list is presented below.

Waste Electrical and Electronic Equipment (WEEE)

The *WEEE Directive 2002/96/EC* and associated *Waste Management (WEEE) Regulations 2014* have been enacted to ensure a high level of recycling of electronic and electrical equipment. It is the manufacturers' responsibility to take back the WEEE, regardless of whether a replacement product is purchased or not and retailers are required to take back WEEE where a similar product is purchased. Residents can avail of the one-for-one return scheme at any EEE retailer or bring WEEE waste to their local recycling centre.

Batteries

A take-back service for waste batteries and accumulators (e.g. rechargeable batteries) is in place in order to comply with the *Waste Management (Batteries and Accumulators) Regulations 2014.* Waste batteries must be separately collected for recycling and recovery of resources and the producer is responsible for arranging and financing this. A system for the free take-back of waste batteries from the household waste stream is well established through retail outlets and civic amenity sites.

Fluorescent Tubes (and other mercury containing waste)

Any waste fluorescent tubes generated can be collected for hazardous recovery/disposal by a suitably licenced waste contractor. Any fluorescent tubes generated in the building will typically be from maintenance works carried out by a specialist contractor who will be responsible for the removal off-site and appropriate disposal of any waste materials generated. However, it is noted that modern light fittings are typically LED and non-mercury-containing.

Chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc)

Chemicals (such as solvents, pesticides, paints, etc) are largely generated from building maintenance works. Such works are usually completed by external contractors who are responsible for the removal off-site and appropriate disposal of any waste materials generated.

Textiles

Where possible, waste textiles should be recycled or donated to a charity organisation for reuse. Bring banks and Local Authority amenity centres often provide for collection of waste clothes and other textiles from households.

Furniture (and other bulky wastes)

Furniture and other bulky waste items (such as carpet etc.) may occasionally be generated at the development. This may be from maintenance works carried out by a specialist contractor who will be responsible for the removal off-site and appropriate disposal of any waste materials generated.

Sub-soils/Topsoil's

Given previous green field land use and on-site observations, it is expected to be inert soil and subsoils which will be excavated and reused where possible but if removed from site will be taken to a licensed facility.

Permits issued under the Waste Management (collection permits) regulations 2007 allow the contractor to reuse this for landscaping etc. subject to its terms. Small amount of material excavated if encountered which are deemed hazardous will be stored separately and tested for classification in accordance with Council Decision 2003/33/E, treated if required and disposed of appropriately.

Concrete & concrete blocks and aged stone / rubble.

This clean inert material will be reused where possible by on site crushing as filling material or removed to licensed site.

Plastics / Timber / Scrap Metals / Plaster / Glass.

These highly reusable and/or recyclable materials, if uncontaminated, will be cleaned, segregated and stored in suitable covered skip for collection by licensed contractor.

Every effort will be made in the management of the site to minimize the oversupply of these material.

Hazardous Materials.

Specialist contractor will be employed to carry out environmental clean-up to remove traces of contaminated materials from the site. These should be licensed under Waste Management (Collection Permit regulations 2007). This will be disposed of in a facility licensed under the Waste Management Act 1996, as amended and waste management (Facility Permit and Registration) regulations, as amended.

There are numerous waste transfer stations and treatment facilities in the Midlands Region that can accept C&D waste for reuse, recycling and recovery. Contaminated soils may need to be transferred out of the region for appropriate treatment and disposal. The destination for the waste material will be provided to WCC prior to commencement of site clearance works.

There will be no waste material removed off-site other than to licensed or permitted waste facilities.

Excavated soil and stone material will be tested to provide a classification for off-site recovery or disposal in accordance with the EPA requirements set out in the *Waste Classification* publication.

Alternatively, the EPA approved *HazWasteOnline* application can be used to classify the excavated material as hazardous or non-hazardous. Waste facilities permitted for acceptance of waste materials for landfilling will also require the classification of waste in accordance with the Waste Acceptance Criteria (WAC) set out in *EC Council Decision 2003/33/EC*. Any contaminated soil and stone will be transferred off-site in tipper lorries which will be covered to prevent dust deposition off-site and trailers will be sealed to prevent contaminated run-off leaking from the trailer.

The main construction waste materials such as concrete rubble (including ceramics and bricks), metals, plastics, plasterboard, glass and wood are widely recyclable and will be segregated on site into separate skips insofar as is possible with the space available on-site. These materials will be transferred off-site using dedicated skip lorries to appropriate facilities.

Any WEEE generated will be stored separately (under cover if required) and transferred to suitable facilities for processing and onward recycling of components. Similarly, where possible, cardboard packaging will be segregated to maximize recycling potential off-site.

A mixed C&D waste skip will be required for non-recyclable wastes. The appointed Project Environmental Manager will monitor site segregation to ensure recyclable materials are placed in dedicated skips were provided and not placed in the mixed C&D waste skip. This material will be transferred off-site for processing and further removal of recoverable materials.

Off-site facilities for processing of C&D waste typically generate a 'fines' material which can be recovered as an engineering material in landfill facilities.

Hazardous waste will only be removed from site by waste contractors permitted to handle hazardous waste. Waste oils, resins and paints may be suitable for off-site recovery, and this will be explored with waste contractors.

7.3 WASTE STORAGE AREA DESIGN

The apartments WSA will be designed and fitted-out to meet the requirements of relevant design standards, including:

- a non-slip floor surface;
- suitable mechanical ventilation to reduce the potential for generation of odours (recommended 6-10 air changes per hour);
- suitable lighting (a minimum Lux rating of 220 is recommended);
- a power supply (suitable for a wet environment) for bin washing and disinfecting;
- a hot or cold water supply;
- a floor sloped to a central foul drain to facilitate cleaning and disinfection of bins;
- easy accessibility for people with limited mobility;
- appropriate signage placed above and on bins indicating correct use;
- be provided with restricted access to appropriate personnel only; and
- access for potential control of vermin if required.

8. RECORD KEEPING

Once a waste contractor(s) has been appointed, the Project Environmental Manager will request copies of their waste collection permits which will be held on file at the site office. The waste collection permits must include an up-to-date list of approved vehicle registrations associated with the permit which can be spot checked by the Project Environmental Manager. The waste contractor will also be requested to identify where waste materials will be taken to, and copies of waste licenses/permits for each facility will be requested to hold on file in the site office. The Project Environmental Manager will confirm that the waste collection permits, and facility licenses/permits are appropriate for the waste types proposed.

A waste log will be set up by the Project Environmental Manager to record all outgoing waste movements from the site. The waste collection vehicle driver will be required to supply an individual signed waste docket (waster transfer form for hazardous waste) for each waste movement off-site which must specify the waste collection permit number, waste type, list of waste code, waste treatment, source of the waste and waste destination. The docket provided by the driver may also include the weight of waste where the collection vehicle is equipped with a load cell, or the weight of waste is known. Alternatively, the weight of the waste may be determined from a weighbridge at the receiving facility and the weight of waste provided to the Project Environmental Manager as soon as possible after receipt at the off-site facility. Regardless, the waste contractor must be able to provide an accurate measurement of the waste tonnage to the Project Environmental Manager. The waste contractor will also be required to provide feedback on waste collected identifying the percentage of waste recovered and disposed of.

The waste log will be used to identify the main waste types being generated and can be linked to delivery records to identify the percentage of waste from incoming building materials. The Project Environmental Manager will be able to analyse these records to improve efficiency and seek to reduce wastage. The Project Environmental Manager can also use the information to determine the success of the project against the reuse, recycle and recovery target of 80%.

9. TRAINING, RESPONSIBILITIES & AUDITING

The main contractor will include the waste management objectives outlined in Section 2 as part of the site induction for all new employees on the site. The importance of source segregation and maintaining a clean site will be highlighted and the locations of skips on the site will be provided.

The appointed Project Environmental Manager will be trained in setting up the waste log and checking waste dockets as described in the previous section. The Project Environmental Manager will also be given responsibility for providing toolbox talks on waste management, organizing specific training where required and educating workers throughout the project. The Project Environmental Manager will also liaise with Westmeath County Council to provide details on the waste facilities to be used and provide waste data as required. It is also beneficial for the Project Environmental Manager to provide feedback on waste statistics to the project team on a regular basis to acknowledge good performance or identify areas for improvement.

The Project Environmental Manager will be familiar with the content of this document and will ensure compliance with the measures set out herein for the duration of the project.

The Project Environmental Manager will also establish an audit checklist to inspect skips and waste containers across the site and identify contamination of skips or other waste related issues which may arise. A review of waste records held for each movement of waste off-site should also be carried out. The waste log should be cross-checked with hard copy dockets and any missing details filled in.

The Project Environmental Manager may also carry out an audit of the receiving waste facilities to confirm that the waste sent from the site is being treated as described on the waste dockets, although it is not currently proposed to carry out this audit unless waste issues arise. At completion of the Construction phase a final report will be prepared outlining the results of the Waste Management process and the total reuse, recycling and recovery figures for the site.

The costs associated with waste management should also be reviewed during the project and highlighted to the Project/Site Manager as to where savings can be made, if any. Typically, maximum on-site segregation of waste reduces the costs associated with mixed C&D waste collection which is required to be processed off-site.

10. INTERACTION WITH OTHER BODIES

The Project Environmental Manager will ensure coordination with relevant bodies throughout the project. This will include compliance with the construction traffic management requirements for waste collection vehicles.

Specialist companies, wherever required, will be contacted to determine their suitability and each company record reviewed to ensure relevant current collection permits / licenses are held.

Companies will also be contacted to gather information regarding treatment of hazardous materials if required (although not anticipated for this site), costs of handling and the best methods of transportation for recycling or reuse when hauling off site.

Only an authorized waste collector with a valid waste collection permit must be used for each waste generated. The Project Environmental Manager will provide details to WCC on the destinations of waste materials from the site and will provide waste records to the local authority as required.

We note the following are authorized waste collection permit holders close to the development at the time of writing:

- Mulleadys Ltd., Unit 16/17 Mullingar Business Park, Mullingar, Co. Westmeath, N91 HE2F – (Permit No. WFP-LD-17-0005-02)
- Mulleadys Ltd., Zone C, Clonmore Business Park, Mullingar, Co. Westmeath, N91 X768 – (Permit No. WFP-LD-17-0005-02)
- Allied Recycling, Clonmellon Industrial Estate, Clonmellon, Co. Westmeath, C15 HN81 - (Permit No. WFP-WH-2022-0002-00)

Appendix 13.5 Civil Engineering Layout and Details

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS