Project:

Large-scale Residential Development at Caheranardrish, Limerick, Co. Limerick

Report Title

Surface Water Design Report

Document Reference

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Document Control

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1.0 INTRODUCTION

OSL Butler Consulting Engineers (OSL) has prepared this Surface Water Design Report on behalf of Homeland Projects Ltd., for a proposed Large-Scale Residential Development at Caheranardrish, Limerick, County Limerick on a circa 6-hectare site.

The site is located to the southwest of Limerick City, centred at grid reference E: 553437.955, N: 653504.924 (ITM) as highlighted in Figure 1 below.

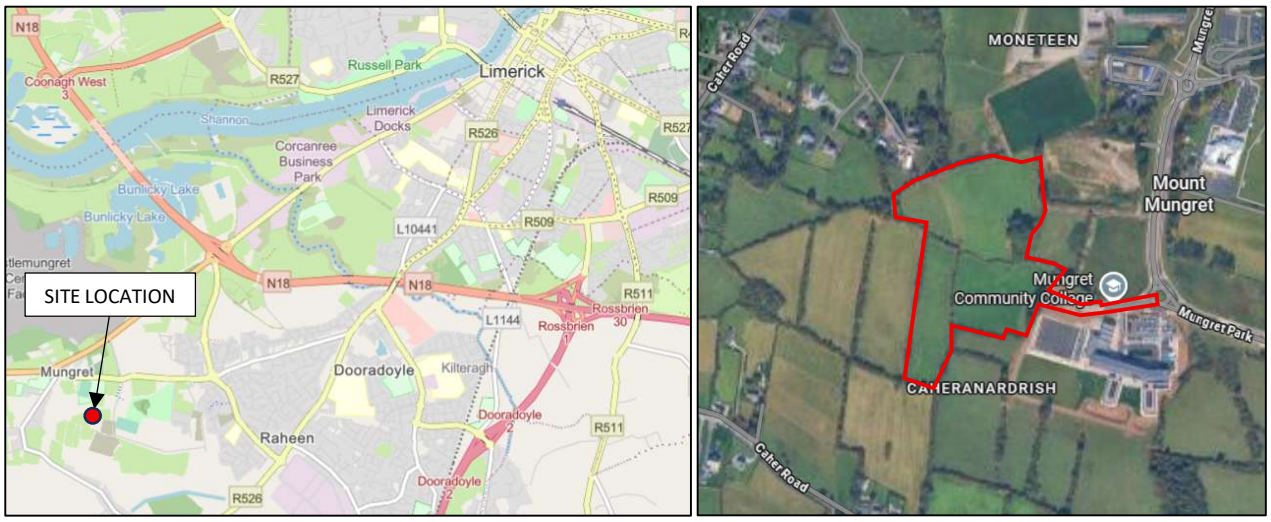


Figure 1: Site Location (Site boundary shown indicatively)

The lands are bound to the north by Mungret St Pauls GAA, to the west, east and south by existing agricultural land and to the southeast by the existing Mungret Community College.

The development will consist of a Largescale Residential Development (LRD), comprising of 182no. residential dwellings as follows: 141no. houses consisting of 104no. detached/semi-detached dwellings (24no. 4-beds, 78no. 3-beds and 2no. 2-beds), 37no. townhouses (18no. 3-beds and 19no. 2-beds) and 41no. apartment units across 1no. triplex unit (2no. 2-beds and 1no. 1-bed) and a five-storey apartment building (13no. 2-beds and 25no. 1-beds) with a crèche with capacity to accommodate 70no. children at ground floor level.

The proposed development will include the provision for car parking, including EV charging points and bicycle parking. The proposed development will also include the provision of private, communal, and public open spaces; internal roads and pathways; pedestrian and cyclist routes; hard and soft landscaping and boundary treatments; waste storage; plant; signage; a new vehicular and pedestrian access onto the Mungret Park Road; public lighting; substations; all associated site development works; and all drainage and foul sewer infrastructure and network works including a pumping station and connections to the existing networks and nature-based suds measures.

Access to the proposed development will be via a proposed vehicular and pedestrian access to the existing Mungret Link Road.

2.0 SITE SPECIFIC FLOOD RISK ASSESSMENT

OSL has prepared a Site Specific Flood Risk Assessment, 24051-OSL-00-RP-C-0007, on behalf of Homeland Projects Ltd. for the proposed development.

A copy of the aforementioned Flood Risk Assessment has been included within Appendix A of this report.

The following is the summary of the flood risk assessment:

- The site including all proposed residential dwellings is located in Flood Zone C as defined by the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.
- Following the Flood Risk Assessment Stage 2 (Initial Flood Risk Assessment), it was determined that a Justification Test was not required.
- To prevent any potential of flooding within the vicinity from the proposed development, it is proposed to implement SuDS measures as discussed in the Infrastructure Report and Drainage Impact Assessment in order to limit the discharge from the site to that of the current greenfield discharge rates. The implementation of these SuDS measures will not increase the risk of flooding elsewhere. It is considered that the proposed development will have a negligible impact on the potential flood regime of the area.

In conclusion, the proposed development is considered to have the required level of flood protection up to and including the 1% AEP storm event.

3.0 SURFACE WATER DRAINAGE DESIGN

3.1 EXISTING SERVICES

There is an existing 300mm diameter surface water sewer located within the Mungret Park Road to the southeast of the subject site. This surface water sewer was installed as part of the Mungret Park Road works (Mungret LIHAF Road) and services the lands adjacent to the Mungret Park Road (Mungret LIHAF Road).

This surface water sewer drains northwards, continuing within the Mungret Park Road, and was designed, as part of the Mungret LIHAF Extension works, to accommodate future development of the lands adjacent to the Mungret Link Road.

3.2 PROPOSED SERVICES

It is proposed to service the proposed development by means of a connection to the existing 300mm diameter surface water pipe located within the Mungret Park Road to the southeast of the subject site, as mentioned previously.

Interception, treatment, attenuation, and discharge control of surface water run off generated by, or as a result of this development is elaborated on further in the text and headings that follow.

Surface water management for the proposed development is designed to comply with the 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document - Volume 2, New Developments, 2005' and the 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005' including the Limerick City and County Council Surface Water/SuDs Specification 2022. CIRIA Design Manuals C753, C697 and C609 have also been consulted to design the surface water drainage system within the site.

The GDSDS guidelines require the following 4 main criteria to be provided by the development's surface water design;

- Criterion 1: River Water Quality Protection - satisfied by providing interception storage and treatment of run-off within the SuDS features e.g. permeable paving, tree pits, swales and detention basins.
- Criterion 2: River Regime Protection – satisfied by attenuating run-off with flow control device prior to discharge to the outfall.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the site being outside the 1000 year coastal and fluvial flood levels. Pluvial flood risk addressed by development designed to accommodate a 100-year storm as per GDSDS. Planned flood routing for storms greater than 100-year level considered in design and development run-off contained within site.
- Criterion 4: River flood protection – attenuation provided within the SuDS features e.g. permeable paving construction, swales, tree pits and detention basin

A new surface water sewer network shall be provided for the proposed development which will be entirely separate from the foul sewer network. Surface water run-off from roof areas and hardstanding areas are designed to be collected by gravity pipe network. Surface water will be collected and discharged via a mixture of traditional and Sustainable Urban Drainage Systems (SuDS). Each unit will have its own independent connection to the surface water network.

Due to the topography of the site, and invert levels of the existing surface water sewer infrastructure mentioned above, it is not possible to connect to the existing infrastructure by means of gravity. It is thus proposed to include a surface water pump station within the development in order to lift surface water through pumping to the existing surface water sewer.

The proposed surface water sewer pumping station, at detailed design stage, will be designed in accordance with Uisce Éireann's *Code of Practice for Wastewater Infrastructure*. The design will incorporate dual submersible pumps operating on a duty/standby arrangement, with ductile iron pipework to IS EN 598. Adequate emergency storage will be provided in line with development scale, together with odour and septicity control measures. A dedicated metered power supply, automated controls, and provision for telemetry/remote monitoring will be included, alongside appropriate alarm and

call-out systems. Safe vehicular access for maintenance, tanker removal of wet well contents, and lifting/handling equipment has been integrated as part of the site layout proposal. Flood risk, site security, fencing, and odour setback requirements will also be addressed to ensure the pumping station is fit for purpose and fully compliant with Uisce Éireann standards.

However, as discussed further in this report, it is not considered appropriate for the pump station and associated mechanical infrastructure to remain inactive for prolonged periods and only operate during emergency conditions. Extended inactivity presents a risk of mechanical degradation or seizure, which could compromise system reliability when operation is required most.

To mitigate this risk, the drainage network has been deliberately configured to maintain a continuous, low-rate discharge to the pump station under normal operating conditions. This ensures regular operation of the pumping infrastructure, thereby maintaining system functionality, verifying operational readiness, and providing resilience in advance of any exceedance or failure scenarios.

Typical details and drawings have been included within Appendix B of this report.These details will be further evolved at detail design stage upon receiving a successful grant of planning.

The minimum diameter of the mainline surface water sewers is 225mm and minimum horizontal and vertical separation distances between proposed drainage and other services are as per the Uisce Éireann Code of Practice and Standard Details.

It is proposed that the surface water will discharge via attenuation tanks, a class 1 bypass separator (with kiosk, alarm/messaging system and vent pipes) and flow control device prior to discharging to the existing surface water network.

The surface water drainage network has been analysed for the risk of flooding for the 1 in 5-year, 1 in 30-year and 1 in 100-year rainfall events by means of simulating such events through hydraulic modelling in InfoDrainage. The InfoDrainage Simulation uses the Wallingford Procedure, time/area full hydrograph methodology, including energy and momentum equations for dynamic analysis of surface water networks. The site drainage network is modelled as one system where all flows, capacities, water levels, surcharged manholes etc are determined throughout the network for each critical storm duration. Therefore, the final combined discharge rate to the existing surface water sewer from the outlet will be kept at (or below) the total permissible discharge rate defined.

An increase of 30% in rainfall has been included to account for climate change and 10% for urban creep.

The hydraulic analysis of the proposed surface water network as designed confirmed;

- No surcharging or flooding in the 1 in 5-year rainfall event
- No flooding in the 1 in 30-year rainfall event
- No flooding and protection of properties in the 1 in 100-year rainfall event

Please refer to drawing 24051-OSL-11-DR-C-1120, Proposed Surface Water Layout, drawings 24051-OSL-11-DR-C-1121 to 1124 for the Proposed Surface Water Longitudinal Sections and Appendix C for the Infodrainage Report for the Critical Storm by Return Period (which includes the 5 year return period results for the design of pipes).

3.3 INFILTRATION TESTING – METHODOLOGY AND RESULTS

To determine the suitability of infiltration techniques as part of the site's surface water drainage strategy, infiltration testing was undertaken in accordance with CIRIA Report 156/BRE Digest 365: Soakaway Design (1991). This method is the standard approach recommended for assessing the infiltration capacity of soils for SuDS systems, including soakaways, infiltration trenches, raingardens, and similar features.

The BRE 365 method requires the excavation of trial pits to the proposed base depth of the infiltration system, typically at least 1m below the invert of the proposed infiltration feature. Each trial pit is then filled with water to simulate real-world conditions and to assess how quickly water infiltrates into the ground. The fall in water level over time is recorded during multiple test repetitions to determine the infiltration rate of the underlying soils. The infiltration rate (expressed as m/s) is then used in the design of infiltration features to ensure sufficient capacity and performance.

In line with BRE 365 requirements:

- The trial pits were excavated to relevant depths based on proposed infiltration system design.
- The tests were conducted over three full test cycles per pit (where possible or allowed) to ensure reliability and consistency.
- Soil conditions, stratigraphy, and groundwater presence were recorded to contextualize infiltration performance.

3.3.1 Test Location and Ground Conditions

3 no. Trial Pits were identified. Their locations were chosen to coincide with SuDS (infiltration) features on site and has been identified in Figure 2 below. Trial pits were dug to 1.0m – 2.0m below ground level and soil characteristics generally found can be described as;

- 0.00 – 0.20m Topsoil – Dark brown, soft, organic
- 0.20 – 1.20m Silty sand – Light brown, soft, occasional gravel
- 1.20 – 2.00m Limestone – Grey, weathered bedrock

No groundwater was evident during testing.

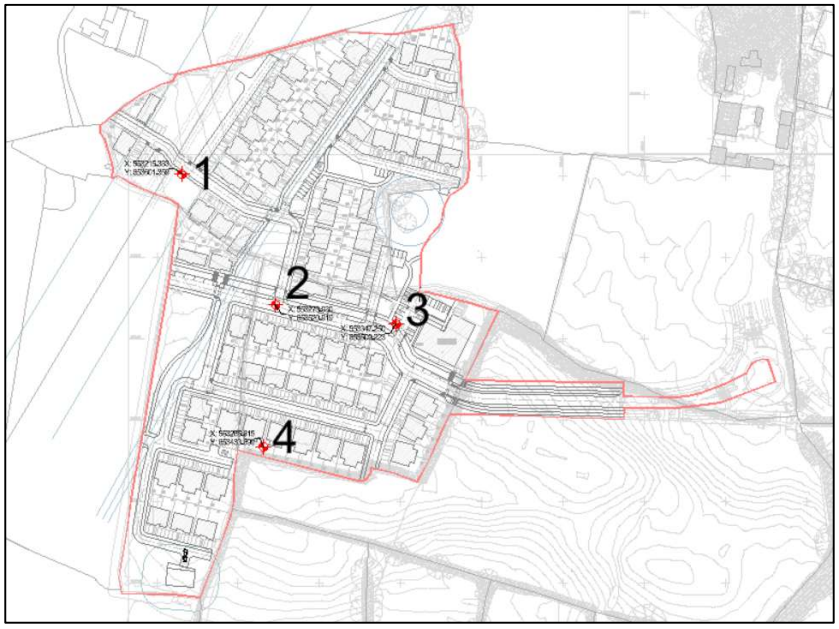


Figure 2: Site Infiltration Test Locations

3.3.2 Summary of Infiltration Test Results

Table 1 below summarises the infiltration test results.

Table 1: Summary of Infiltration Test Results

Trial Pit	Test Depth (m bgl)	Test Cycles Completed	Average Infiltration Rate (m/s)	Average Infiltration Rate (mm/hr)	Comments
1	1.5	1	8.048 x10-6	28.975	Generally suitable for infiltration design (good)
2	1.5	3	7.844 x10-5	282.371	Generally suitable for infiltration design (good)
3	1.5	3	4.727 x10-5	170.171	Generally suitable for infiltration design (good)
4	1.5	2	2.192 x10-5	78.894	Generally suitable for infiltration design (good)

The results indicate that the underlying soils at the site are capable of supporting infiltration-based SuDS features. All infiltration rates fall within typical ranges suitable for soakaway design as per BRE 365 guidance. These findings, combined with the high-vulnerability classification of the aquifer and the inclusion of pollutant removal measures within the drainage design, confirm that infiltration is a feasible and environmentally appropriate drainage solution at this location.

A copy of the Infiltration Tests and Results have been included within Appendix D of this report.

3.4 SURFACE WATER DESIGN CRITERIA

The documents listed below was used as reference documents for the design of the surface water management for the proposed development.

- 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document - Volume 2, New Developments, 2005'
- 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005'
- Limerick City and County Council Surface Water/SuDS Specification 2022
- Limerick City and County Council Surface – Green and Blue Infrastructure Strategy 2021
- Implementation of Urban Nature-based Solutions – Guidance Document for Planners, Developers and Developer Agents, V1.0 November 2024
- CIRIA Design Manuals C753, C697, C644 and C609 have also been consulted to design the surface water drainage system within the site.
- Department of Environment and Local Government - Recommendations for Site Development Works for Housing Areas (1998), Table 3.1.
- IS EN 752:2008 - Drain and Sewer Systems Outside Buildings, Table 2
- Building Regulations (2005) - Section H - Drainage and Wastewater Disposal, Section 1.5.7

Table 2 below describes the surface water design parameters used.

Table 2: Surface Water Drainage Design Parameters

Description	Value
Return Period Target	Hydraulic Pipe Design 1 in 5 years (no surcharging) Network Design 1 in 30 years (no flooding) Network Design 1 in 100 years (no flooding, property protection)
Climate Change	30%
Urban Creep	10%
Freeboard to FFL	500mm
M5-60	16.9 (as per Met Eireann Records)
Ratio R	0.318
SOIL Type	2
Soil Value	0.3
Rainfall Intensity for initial pipe sizing	50 mm/hr
SAAR	990.1mm
Minimum pipe diameter	225mm (150mm for road gully connections)
Minimum pipe velocities	1.0m/s
Roughness	ks 0.6mm (0.15mm for uPVC)
Minimum Depth	1.2m cover under highways 0.9m elsewhere 0.75m with use of Class Z concrete surround
Flow Reduction parameter	2l/s/ha
Controlled Outflow from Development	11.2 l/s
Flow Restriction Method	Flow Control Device (eg. Hydrobrake) and eventual pumping at Flow Reduction Parameter

3.5 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

It is proposed to use a Sustainable Urban Drainage System (SuDS) approach to stormwater management throughout the site where possible. The overall strategy aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement and allow for the maximum collection of rainwater for re-use where possible. In addition, SuDS features aim to replicate the natural characteristics of rainfall runoff for any site by providing control of run-off at source and this has been achieved by the current proposals.

Surface water runoff will be treated by means of the SuDS measures discussed below, prior to entering the below ground attenuation and subsequent surface water system. The proposed SuDS features will reduce the runoff volume through evaporation, transpiration, infiltration and depression storage of the water within each system.

SuDS are a requirement under the 'Regional Code of Practice for Drainage Works' and 'The Greater Dublin Strategic Drainage Study'. Additionally, these systems are recommended under the 2009 guidelines, 'The Planning System and Flood Risk Management'.

The maintenance plan and maintenance schedule for the proposed SuDS features are discussed in Section 3.14 of this report.

The sections that follow indicate how each of the SuDS proposals contributes to reducing and restricting the discharge rate from the site.

3.5.1 Green Roofs

It is proposed to provide Green Roofs for the proposed apartment buildings. The Green Roofs have been designed taking guidance from the Ciria Publications quoted previously.

Green Roofs are a roofing system with a vegetated surface and underlying layers designed to support plant growth while providing sustainable drainage benefits.

The Green Roofs will improve water quality, reduce water quantity being discharged from the site, can offer an amenity to residents and offers a biodiversity element to the site also. This addresses the four pillars of SuDS design.

Typical details of the Green Roof construction build up have been included in Appendix E of this report.

3.5.2 Bypass Interceptors

A proprietary oil/water separator which prevents hazardous chemical and petroleum products from entering watercourses and public sewers. Where deemed appropriate, Class 1 bypass separators have been included and adequately sized as part of the design proposal.

Bypass separators fully treat all flows generated by rainfall rates of up to 6.3mm/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 large spillage and heavy rainfall occurring at the same time is small. Class 1 devices are designed to achieve a concentration of less than 5mg/l of oil under the standard test conditions.

The Petrol Interceptors will be fitted with an alarm/messaging system housed within a kiosk, including vent pipes, all suitably located within the development.

Please refer to drawings 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Details that includes details of the bypass interceptors and vent stack/pipes.

Details of the proposed Bypass Interceptors have been included in Appendix F of this report.

3.5.3 Swales

Broad, shallow drainage channels covered in grass which can treat, convey and attenuate runoff, at source, and can infiltrate to the ground where the subgrade is suitable. Swales also can promote biodiversity.

Swales are proposed along the development's landscaped paved areas where possible. Surface water runoff from these paved areas, including adjacent roofs where suitable, will discharge to this SuDS feature for interception and treatment prior to entering the drainage network. A high-level overflow to the drainage network within the build-up will accommodate removal of water.

CIRIA C753 (The SuDS Manual) Table 24.6 notes that pavements drainage by swales can be considered to provide interception.

Please refer to drawings 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Details that includes details of the swales.

3.5.4 Tree Pits

Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone within soil-filled tree pits, tree planters or structural soils, collecting and storing runoff and providing treatment via filtration and phytoremediation. Tree pits and planters will be designed to collect and attenuate runoff by providing additional storage within the underlying structure. The soils around trees can also be used to filter out pollutants from runoff directly.

Tree pits are proposed to be in green space areas to treat and control runoff, while at the same time providing amenity value to adjacent pedestrian, and residential zones. It is also proposed, where possible to fit tree pits along the estate road to drain and treat surface water runoff from the road network. This will allow for treatment of first flush and low flows while high flows will discharge into the surface water network during extreme rainfall events. Rainwater gullies will still be provided downstream of any tree pit to drain runoff during an extreme rainfall event.

Please refer to drawings 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Details that includes details of the Tree Pits.

3.5.5 Permeable Pavers

Porous surfacing (paving block or open graded material) which can treat rainwater, at source, and allow infiltration through to an underlying porous subbase where water can be stored within the voids of the subbase before being slowly released to the drainage collection system through natural flow via the porous medium. In this development, partial infiltration systems are proposed for those parking spaces that are located an adequate distance away from structures and includes a permeable geotextile at its base as well as an outlet to the surface water system. Sealed systems are proposed for those parking spaces that are considered as being in close proximity to buildings (driveways).

These systems will allow some form of storage/attenuation for small rainfall events, allow infiltration for those with permeable geotextile at its base, water evaporation and adsorption in small quantities, therefore there will be less runoff from these areas in small rainfall events thus mimicking the natural response for this catchment. Permeable Pavers are proposed for the public car park areas (e.g. creche, amenity parking) as well as in private driveways.

They will be connected by means of overflow systems (for partial infiltration systems) and throttled outflow systems (in the case of no infiltration systems) to the development surface water network.

Please refer to drawings 24051-OSL-9010 and 9011 for the Proposed Road Details and 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Details that includes details of the permeable pavers, build-up, overflow and connection to surface water network.

3.5.6 Raised Raingarden Planters

A raised rain garden planter acts like a small rain garden and makes the area around a downspout more attractive. The raised planter typically has drainage holes in the bottom and overflow holes near the top. The bottom of the planter is filled with a suitable gravel with voids (typically 30-40%) which provides for a small attenuation facility with controlled discharge when full.

It is proposed to include raised raingarden planters to the front of dwellings where appropriate.

Please refer to drawings 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Construction Details that includes details of the raised raingarden planters.

3.5.7 Rainwater Harvesting

In relation to rainwater harvesting, an option is to provide a rainwater butts at each individual dwelling. This could be located to the rear of each unit. This rainwater butt will only have the ability to catch the rear sloping side of the dwelling and the reuse would be for watering plants.

The intention would be that these are provided retrospectively by the homeowner and does not currently form part of this surface water design.

3.5.8 Cellular Attenuation System:

Proprietary modular block or arch structure with a maintenance/inspection tunnel for providing underground surface water attenuation storage and can infiltrate run off to the ground where subgrade is suitable.

It is proposed to attenuate surface water from the proposed development with five attenuation tanks, located in open spaces throughout the development. The attenuation tanks have been sized to cater for a 1 in 100 year rainfall event with a 30% climate change allowance and 10% urban creep.

It is proposed that the attenuation tanks will be constructed as pluvial cubes, Wavin Aquacell ECO / Core-R (or similar approved). The attenuation tanks will be designed for site specific conditions (including buoyancy), installed, tested and certified by the approved supplier.

A silt trap manhole with a 450mm deep sump will be provided to intercept and trap silt/sediment, located upstream of each of the attenuation tanks.

The five attenuation systems proposed throughout the proposed development, each responsible for managing a sub-catchment within the larger development. The surface water attenuation design has been further elaborated on in Section 3.9 of this report.

Technical information of the proposed attenuation systems has been included in Appendix G of this report.

3.5.9 Basins, wetlands and ponds:

Basins, wetlands and ponds on any site allows safe and contained storage for excess rain and storm water as it allows for its release over time into the sewer system at a controlled rate. This removes much of the potential flooding risk caused by the inability for excess water to drain safely. Furthermore, basins, wetlands and ponds can treat, convey and attenuate runoff, at source, and can infiltrate to the ground where the subgrade is suitable. It can also promote biodiversity.

It is proposed to incorporate detention basins in green spaces to compliment the SuDs strategy. These are vegetated depressions designed to store runoff on the surface and infiltrate it gradually into the ground. These basins will be dry except in periods of heavy rainfall.

The detention basins proposed will be located in green areas and will cater for some runoff from adjacent roadways and roofs, but primarily the open space areas where they are situated. The surface water design includes for 6 no detention basins as an initial interception measure, prior to entering the main network, for surface water run off management of some of the sub-catchments within the larger development. The detention basins are proposed to be gradually sloped from 0 level to 500mm deep.

CIRIA C753 (The SuDS Manual) Table 24.6 notes that pavements drainage by basins, wetlands and ponds can be considered to provide interception.

We confirm that the design has been undertaken with due regard to safety and risk mitigation, in accordance with the principles and best practices set out in the CIRIA SuDS Manual (C753). The design incorporates features that align with the guidance outlined in Section 36.5 of the manual, which emphasizes the importance of shallow side slopes (not steeper than 1 in 3), appropriate landscaping, controlled access where necessary, and clear visibility to deter unsafe behaviour. These measures ensure the detention basins are safe for all users while still fulfilling their function in surface water management.

3.5.10 Flow Control Device:

It is proposed to provide a flow control device at strategic locations within the sub-catchments to restrict the outflow of water from the subject site. The flow control devices will be fitted with a pull cord bypass and a penstock valve, installed on the inlet to the manhole for maintenance purposes.

Please refer to drawings 24051-OSL-90-DR-C-9020 to 9025 for the Proposed Surface Water Details that includes details of the flow control device manhole.

Details of the proposed Flow Control Device have been included in Appendix H of this report.

3.6 LONG-TERM STORAGE

In addition to limiting the runoff rate through attenuation, the GDSDS requires that runoff volume from the site is limited in extreme events. The objective is to match the runoff volume discharged to the downstream receiving watercourse after development to that which occurred prior to development. This volume is calculated by comparing the 100-year 6-hour event for ‘pre’ and ‘post’ development as is referred to as “Long-Term Storage”.

Where long-term storage is provided, this has a direct effect on the permissible site discharge rate from the site.

Due to the large extent of development within the site, it is not proposed to provide long-term storage, this effects the permissible site discharge and resulting attenuation volumes required. Thus, Criterion 4.3 of the GDSDS has been applied and satisfied in this design in relation to Criterion 4 – River Flood Protection.

3.7 PERMISSIBLE SITE DISCHARGE

According to the GDSDS, the method used for determining peak flow rates for small greenfield catchments is the UK 'Institute of Hydrology Report 124, Flood Estimation for Small Catchments'. This method calculates $Q_{BARrural}$ which is the mean annual flood flow from a rural catchment.

Where long-term storage can be provided or is not necessary, surface water can be discharged at a higher value than $QBAR_{mrai}$, this discharge rate ($QBAR_{growth}$) is dependent on the design return period and the corresponding growth factor from the GDSDS Table 6.6. However, if longterm storage cannot be provided, the GDSDS requires that the on-site discharge rate from the site should be kept to $QBAR_{rural}$ or 2 l/s/ha, whichever is greater.

Limerick City and County Council Surface Water/SuDs Specification 2022 requirements differs with the above GDSDS requirement in that the on-site discharge rate should be kept at the greater restriction between the calculated $QBAR_{rural}$ and 2 l/s/ha. The latter requirement is applicable to the surface water management for this development.

The IH124 method calculates $QBAR_{rural}$ which is the mean annual flood flow from a rural catchment. As the subject site area is less than 50 hectares, the calculated QBAR is to be linearly interpolated from the calculated value to produce a reduced allowable outflow based on the actual site area, as per GDSDS section 6.6.1.

$$QBAR_{rural} = 0.00108 \times (Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$$

Where:

$QBAR_{rural}$ = Mean Annual Flood (m3/s)

Area = Catchment Area (km2)

SAAR = Standard Average Annual Rainfall (mm)

SOIL = SOIL index from Flood Studies Report

The Area used in the $QBAR_{rural}$ calculation is the Net Area Drained and not the Gross Area (red line boundary) of the site. The soil value can be determined from the Flood Studies Report - Winter Rainfall Acceptance Maps (WRAP). A more accurate approach is to use the 'The Classification of Soils from Winter Rainfall Acceptance Rate, Flood Studies Report Table 4.5' to determine soil type and determine the soil value from Table 6.7 from the GDSDS. The latter method is adopted for this site.

Permissible site discharge for the site has been determined as follows:

- Total Net Drained Area = 0.0558 km^2 (5.580 Ha)
- SAAR = 990.1mm (Met Éireann Extreme Rainfall\SAAR 1991-2020, Irish Grid Reference X 153316, Y 153488)
- SOIL Value= 0.30 (for soil type 2 from Table 6.7 from the GDSDS)

The $QBAR_{rural}$ for the development was calculated as 15.2 l/s.

As mentioned previously, in accordance with Limerick City and County Council's Surface Water/SuDS Specification 2022, site discharge levels should not exceed 2 l/s/ha or Qbar whichever is the greater restriction.

Therefore, the permissible site discharge for the development was calculated as 11.2 l/s.

Please refer to Appendix I for the Permissible Site Discharge Calculations.

3.8 SURFACE WATER RUNOFF COEFFICIENTS

As discussed in this report previously, a large proportion of runoff is routed through SuDS features these will have an attenuating effect which reduce the rate of stormwater runoff for every rainfall event.

In accordance with Limerick City and County Council's Surface Water/SuDS Specification 2022, the Surface Water Runoff coefficients utilised for this site has been applied as follows:

- Hard surfaces inclusive of roofs, roads, footpaths and any other hard standing area = 1.00
- Green areas or park land = 0.20

When applying the run-off coefficients to the contributing areas, the Effective Catchment Runoff Coefficient was calculated as 0.59 (rounded up). This factor was applied to catchments and inflows within the Infodrainage hydraulic model and analysis.

Please refer to drawing 24051-OSL-11-DR-C-1126 for the Surface Water Catchment Characteristics Layout.

3.9 SURFACE WATER CATCHMENT MANAGEMENT

The proposed development catchment has been subdivided into 5 sub-catchments. A diagram, Figure 3, has been included below to illustrate the surface water network catchment locations, flow routes, attenuation features and controls.

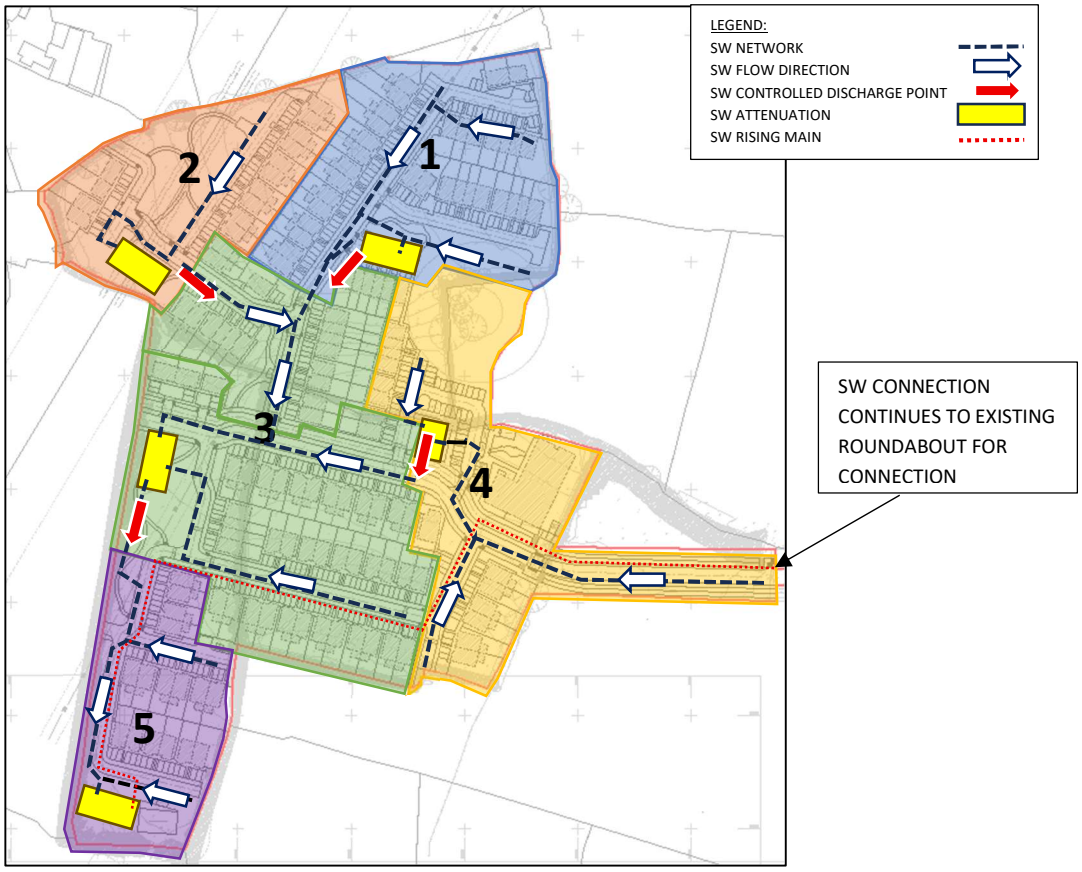


Figure 3: Surface Water Sub-Catchments

Table 3: Surface Water Sub-Catchment Summary

Sub-Catchment	Sub-Catchment Size (Total) m^2	Effective Runoff Coefficient	Sub-Catchment Size (Effective) m^2
1	9253.37	0.59	5476.48
2	7397.83	0.59	4378.3
3	20095.24	0.59	11893.1
4	12133.73	0.59	7181.18
5	6908.93	0.59	4088.95

3.9.1 Surface Water Attenuation

The GDSDS requires flood waters for a 100-year return period to be managed on-site, therefore this return period (+30% Allowance for Climate Change and 10% Urban Creep) has been adopted for attenuation calculations.

The surface water runoff from the catchments will be restricted to greenfield runoff rates using flow control devices as described under heading 3.5.9 above.

The proposed attenuation tanks have been designed to reduce peak runoff from the site primarily through infiltration. These tanks will act as the principal surface water management feature for their respective catchments. Outflows from the tanks are controlled by flow control devices, which are set to maximise infiltration performance while permitting a restricted discharge rate to the downstream network.

This arrangement ensures that the attenuation storage and associated infiltration are fully utilised under normal conditions, with the controlled outflow acting as a secondary, fail-safe mechanism. In the event of reduced infiltration performance or system exceedance, runoff can continue to discharge via the network to the site's surface water pump station. As such, the pump station provides an emergency drainage pathway capable of accommodating more extreme rainfall events.

However, it is not considered appropriate for the pump station and associated mechanical infrastructure to remain inactive for prolonged periods and only operate during emergency conditions. Extended inactivity presents a risk of mechanical degradation or seizure, which could compromise system reliability when operation is required most.

To mitigate this risk, the drainage network has been deliberately configured to maintain a continuous, low-rate discharge to the pump station under normal operating conditions. This ensures regular operation of the pumping infrastructure, thereby maintaining system functionality, verifying operational readiness, and providing resilience in advance of any exceedance or failure scenarios.

The detention basins have been strategically located above these attenuation tanks and forms part of an advance warning system. Should the tanks (infiltration) fail, or the flow control device malfunction, the build-up of surface water (more permanent than what would be typical during heavy rainfall) within the detention basins will be an advance warning sign to the residents and local authorities of possible issues within the system below.

In addition to the aforementioned, please refer to drawing 24051-OSL-11-DR-C-1127 for the Surface Water Exceedance Routes available that would allow for surface water to travel overland, only as a last resort when all systems fail, as part of the appropriate flood management measures that are implemented to protect property and infrastructure.

This surface water system has been hydraulically modelled in InfoDrainage to ensure that the overall discharge at the end of the hydraulic system (i.e. the outlets to the existing surface water network) is at, or below, the greenfield runoff rate.

The InfoDrainage Simulation uses the Wallingford Procedure, time/area full hydrograph methodology, including energy and momentum equations for dynamic analysis of surface water networks. The site drainage network is modelled as one system where all flows, capacities, water levels, surcharged manholes etc are determined throughout the network for each critical storm duration. Therefore, the final combined discharge rate to the existing sewer from the outlet will be kept at (or below) the total permissible discharge rate defined above.

Maximum rainfall data from Extreme Rainfall Return Period values produced by Met Eireann was used to input into InfoDrainage to determine maximum flood volumes and ensure protection of properties against flooding. Rainfall data for the site was sourced from an Annual Average Rainfall (AAR) Grid (1981-2010) and a Depth Duration Frequency model

produced by Met Eireann (Available from: http://www.met.ie/climate/products03.asp). The design criteria that have been set out in the sections above was input into InfoDrainage.

Table 4 below summaries the attenuation facilities provided, max water level results, freeboard provided to finished floor levels and discharge control proposed.

Table 4: Attenuation and Discharge Control Summary

Sub-Catchment	Critical Storm Event	Max Water Level During Critical Storm Event (m)	Facility Provided	Freeboard to adjacent/nearby properties (mm)	Volume of Attenuation Provided (m^3)	Flow Controlled via Flow Control Device (l/s)
1	100 years: +30%; 600 mins Winter	18.243	Attenuation Tank 1	1057	277.489	2.0
2	100 years: +30%; 600 mins Winter	16.191	Attenuation Tank 2	1209	256.185	2.0
3	100 years: +30%; 240 mins Winter	13.118	Attenuation Tank 3	2982	472.544	6.0
4	100 years: +30%; 180 mins Winter	13.845	Attenuation Tank 4	1805	259.348	8.0
5	100 years: +30%; 240 mins Winter	13.105	Attenuation Tank 5	1645	156.729	11.2 (pumped)

The InfoDrainage design summary reports have been included within Appendix C of this report.

3.10 INTERCEPTION VOLUME

The GDSDS requires that no run-off should directly pass to the receiving watercourse for rainfall depths of up to 5mm, therefore interception should be provided at source where practicable. The volume of interception required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas as defined in the GDSDS (Appendix E section E2.1.1).

The interception volume attributable to each SuDS feature (swales, permeable paving, tree pits etc.) consists of the volume of water that can infiltrate to the ground, what will evaporate into the atmosphere and what can transpirate through plants and vegetation. Additionally, there will some losses of water due to absorption and wetting of stone and soil media.

Not all SuDS features will be able to achieve infiltration, evaporation, transpiration and losses due to absorption/wetting. The limits for each SuDS feature type are considered when calculating interception volumes. The interception storage attributable to the losses in stone and soil media, such as the stone media used in filter drains was not included in the calculations.

The total interception volume required (as calculated) for the site is 132.073 m3. The interception volume provided for the site by means of swales, permeable paving, tree pits etc. equates to 847.7 m3 and exceeds the requirement.

Please refer to Appendix J for the SuDs Calculations and Summary Sheets.

Please refer to Appendix K for the Interception Volume Calculations and Appendix.

3.11 TREATMENT VOLUME

The GDSDS requires that a "treatment volume" (Vt) be provided in order to prevent any pollutants or sediments discharging into river systems, additionally a 'treatment train' stormwater runoff management system is required.

According to CIRIA document C697 the following treatment train approach is necessary:

- Roofs – 1 Treatment Stage
- Road Areas – 2 Treatment Stages
- Paved Areas excluding Roads - 1 Treatment Stage

The treatment volume is based on treatment of 15mm of rainfall depth from 80% of the runoff from impermeable areas as defined in the GDSDS (Appendix E section E2.1.2).

All run-off areas will pass through the required number of treatment stages prior to discharging to the downstream outfall.

The total treatment volume required (as calculated) for the site is 396.22 m3. The treatment volume provided for the site by means of swales, permeable paving, tree pits etc. equates to 757 m3 and exceeds the requirement.

Please refer to Appendix J for the SuDs Calculations and Summary Sheets

Please refer to Appendix K for the Interception Volume Calculations.

3.12 SURFACE WATER SEWERS

As mentioned previously, surface water from the proposed development will be discharged, after attenuation and discharge control, to the existing 300mm diameter surface water sewer.

Surface water sewers are designed in InfoDrainage using the Modified Rational Method with design criteria as established in the section above. Effective runoff coefficients for each pipe catchment have been determined based on the runoff characteristics for each surface contributing to flows within the catchment.

Values for roughness of uPVC pipes were obtained from Wallingford "Tables for the Hydraulic Design of Pipes, Sewers and Channels" and Wavinsewer systems catalogue.

All gullies will be positioned and designed in accordance with 'The recommendations for site development works for housing areas' published by the Department of the Environment'.

Please refer to Appendix C for the Infodrainage Report for the Critical Storm by Return Period (which includes the 5 year return period results for the design of pipes).

4.0 POLLUTION HAZARDS INDICES BASED ON THE SIMPLE INDEX APPROACH

The method used is guided by the land use and SuDS performance evidence. The design criteria for the Simple Index Approach are for the Total SuDS mitigation index (for each contaminant type) ≥ pollution hazard index (for each contaminant type). As shown below, in all cases the mitigation index is greater than the pollution index for each contaminant.

4.1.1 Step 1: Define Pollution Hazard Indices

Pollution hazard indices are presented in Table 26.2 of the CIRIA SuDS Manual (reproduced in Figure 4 below). These specify the hazard index for each contaminant type for different types of land use.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

Figure 4: CIRIA SuDS Manual - Pollution hazard indices for different land use classifications

The proposed site consists of the following land uses;

- Residential Roads
- Individual property driveways, residential car parks and low traffic roads and non-residential car parking with infrequent change

4.1.2 Step 2: Determine SuDS Pollution Mitigation Indices

Indicative SuDS mitigation indices are presented in Table 26.3 of the CIRIA SuDS Manual (reproduced in Figure 5 below). These specific the mitigation index for each contaminant type for different types of SuDS measures.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yuj7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

Figure 5 - Indicative SuDS mitigation indices for discharges to surface water

The proposed SuDS measures consist of swales, raised garden planters, tree pits, permeable pavement and detention basins. The raised raingarden planters, tree pits, detention basins and green roofs are considered as bioretention systems. Table 5 below summarises the risk indices for the development and Table 6 summarises the mitigation indices provided by the proposed SuDS measures.

Table 5 - Summary of Hazard indices for subject site

		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Hazard Indices	Residential Roofs	0.2	0.2	0.05
	Individual property driveways, residential car parks and low traffic roads and non-residential car parking with infrequent change	0.5	0.4	0.4

Table 6 - Summary of Mitigation indices for subject site

		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Mitigation Indices	Swales	0.5	0.6	0.6
	Permeable Pavement	0.7	0.6	0.7
	Bioretention Systems	0.8	0.8	0.08
	Detention Basins	0.5	0.5	0.6

The sections that follow summarises the specific SuDS measures proposed for each land use type.

4.1.3 Residential Roofs

The proposed development is a residential development and therefore the majority of roofs within the development will be classified as residential roofs. Run-off generated from the house/dwelling roofs within the development will be drained via raised raingarden planters (where feasible) and permeable paving.

Apartment roofs will be drained via green roofs, which is considered a bioretention system.

As shown in Table 7 below, these SuDS measures provide greater mitigation indices than the hazard indices and as such the proposed SuDS are deemed appropriate.

Table 7 – Comparison of Hazard and Mitigation indices for Residential Roofs

		TSS	Metals	Hydrocarbons
Hazard Indices	Residential Roofs	0.2	0.2	0.05
Mitigation Indices	Bioretention Systems	0.8	0.8	0.08
	Permeable Pavement	0.7	0.6	0.7

4.1.4 Driveways, car parks and low traffic roads

As mentioned previously, the proposed development is a residential development. The development includes parking areas and private driveways for the individual properties. The roads within the development can be classified as being low traffic roads.

These areas within the development will be drained via permeable paving and swales (where feasible). As shown in Table 8 below, these SuDS measures provide greater mitigation indices than the hazard indices and as such the proposed SuDS are deemed appropriate.

Table 8 – Comparison of Hazard and Mitigation indices for Other Roofs

		TSS	Metals	Hydrocarbons
Hazard Indices	Individual property driveways, residential car parks and low traffic roads and non-residential car parking with infrequent change	0.5	0.4	0.4
Mitigation Indices	Permeable Pavement	0.8	0.8	0.08
	Swales	0.5	0.6	0.6

4.1.5 Simple Index Approach Conclusion

The design criteria for the Simple Index approach are for the Total SuDS Mitigation Index (for each contaminant type) ≥ pollution hazard index (for each contaminant).

As shown above in all cases, the mitigation index is greater than the pollution index for each contaminant type. Therefore, the range of SuDS measures proposed satisfies the Simple Index Approach and provides adequate mitigation for the site.

5.0 MAINTENANCE PLAN AND MAINTENANCE SCHEDULES

Table 9 below sets out the proposed maintenance plan and maintenance schedules associated with the proposed surface water infrastructure.

Table 9: Proposed Maintenance Plan and Maintenance Schedule Summary

Item	Inspection Frequency	Inspection Type	Cleaning Mechanism	Cleaning Frequency
Road Gullies	Quarterly or after major storm event	Visual	Remove silt and solids by hand	Minimum every 2 years
Surface Water Manholes	Quarterly or after major storm event	Visual	Open manhole cover. Remove any debris.	Minimum every 2 years
Bypass Interceptor	Every 6 months or in the event of a spill	Visual	Petrol Interceptor to be emptied.	Yearly
Flow Control Device (Hydrobrake)	The aperture is to be checked for obstructions quarterly or after major storm events.	Visual	Remove silt and solids by hand.	Yearly
Green Roofs	Every 6 months	Visual	Inspect all components including soil substrate, vegation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability.	Yearly
Permeable Pavement	Every 3 months	Visual	Brushing and vacuuming	Yearly
Swales	Every 6 months	Visual	Grass cutting.	Monthly during growing season
Attenuation Tanks	To be checked for debris or silt quarterly or after major storm event	Visual	Open inlet and outlet manhole cover. Remove any debris.	Yearly

6.0 AQUIFER VULNERABILITY ASSESSMENT AND JUSTIFICATION FOR INFILTRATION MEASURES

The Geological Survey Ireland (GSI) classifies the aquifer vulnerability in the area of the proposed development varies from "high" to “extreme” with some areas noted as having “rock at or near Surface or Karst”.

According to GSI's national methodology for assessing groundwater vulnerability, a high or extreme rating suggests that contaminants can reach the water table relatively easily due to moderate subsoil thickness or permeability. However, this does not preclude the use of infiltration-based drainage solutions—it instead necessitates the integration of appropriate source control and pollutant attenuation measures to ensure protection of the groundwater resource.

Our surface water management strategy has been designed in alignment with best practice guidelines and incorporates a robust SuDS (Sustainable Drainage Systems) train, including (but not limited to) swales, detention basins and underground storage tanks with infiltration capabilities. These components provide significant water quality treatment by promoting sedimentation, filtration, and biological uptake of potential pollutants. Furthermore, bypass separators have been specified to intercept hydrocarbons and other gross pollutants at source, thereby substantially reducing the risk of contamination entering the infiltration system.

GSI guidance recognises that when appropriate treatment systems are in place—especially those that offer multiple stages of attenuation and pollutant removal—infiltration can be suitable even in areas of high aquifer vulnerability. Our proposed system ensures that only sufficiently treated surface water is discharged to ground, offering both environmental protection and compliance with groundwater protection principles under the Water Framework Directive.

Given the high level of treatment incorporated and the nature of the surface water runoff (predominantly from low-risk areas such as roofs and landscaped surfaces), we are confident that infiltration to the underlying aquifer is an appropriate and sustainable approach in this context.

In addition to the aformentioned, a Hydrological & Hydrogeological Assessment (by IE Consulting) was commissioned by the applicant. This Assessment is uncluded as part of this application under separate cover. The assessment investigated the risks that activities associated with the proposed development, during construction and operation might impact the nearby proposed Natural Heritage Area (pNHA) of Loughmore Turlough. This Assessment concludes that there will be no significant effect on water recharge to the Turlough from the proposed development.

7.0 SUMMARY

This report has outlined the Surface Water Design for the proposed Large-Scale Residential Development at Caheranardrish, Limerick, County Limerick on a circa 6-hectare site.

The findings are summarised as follows:

- In relation to Flooding, under the OPW Planning System and Flood Risk Management Guidelines published in November 2009, the proposed development is considered appropriate and located within Flood Zone C.
- The Infiltration Test Results indicate that the underlying soils at the site are capable of supporting infiltration-based SuDS features. All infiltration rates fall within typical ranges suitable for soakaway design as per BRE 365 guidance.
- Due to the topography of the site, and invert levels of the existing surface water sewer infrastructure mentioned above, it is not possible to connect to the existing infrastructure by means of gravity. It is thus proposed to include a surface water pump station within the development in order to lift surface water through pumping to the existing surface water sewer. The proposed surface water sewer pumping station, at detailed design stage, will be designed in accordance with Uisce Éireann's *Code of Practice for Wastewater Infrastructure.*
- The proposed development will be serviced by new surface water infrastructure and connect to the existing surface water sewer, by means of a surface water pump station mentioned above, located in Mungret Park Road.
- Surface water from the site will be collected and attenuated on site, with a peak discharge rate of 11.2l/s (2l/s/ha as per the LCCC Surface Water/SuDs Specification 2022) for the 1 in 100 Year rainfall event (including an allowance of 30% for climate change and 10% Urban Creep).
- As part of the development, a number of different SuDS measures will be provided to minimise the impact on water quality and water quantity of the runoff and maximise the amenity and biodiversity opportunities within the site.
- The Risk and Mitigation Indices for proposed development areas and the pollution typically generated was assess through the Simple Index Approach. For all areas/cases assessed, the mitigation index is greater than the pollution index for each contaminant type. Therefore, the range of SuDS measures proposed satisfies the Simple Index Approach and provides adequate mitigation for the site.
- The Geological Survey Ireland (GSI) classifies the aquifer vulnerability in the area of the proposed development as "high" to "extreme". Given the high level of treatment incorporated and the nature of the surface water runoff (predominantly from low-risk areas such as roofs and landscaped surfaces), we are confident that infiltration to the underlying aquifer is an appropriate and sustainable approach in this context

Appendix A – Flood Risk Assessment

Project:

Large-scale Residential Development at Caheranardrish, Limerick, Co. Limerick

Report Title

Site Specific Flood Risk Assessment

Document Reference

24051-OSL-00-RP-C-0007

OSL·BUTLER CONSULTING ENGINEERS

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APRIL 2026

Document Control

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P02	S2 – For Information	13/10/25	For Information	BJM	DB	DB
P03	S2 – For Information	04/03/26	For Review	BJM	DB	DB
P04	S2 – For Information	03/04/26	For Planning	BJM	DB	DB

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Appendix A – Historic Flood Reports
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1.0 INTRODUCTION

OSL Butler Consulting Engineers (OSL) has prepared this Site Specific Flood Risk Assessment on behalf of Homeland Projects Ltd., for a proposed residential development at Caheranardrish, Limerick, County Limerick on a circa 6-hectare site.

1.1 OBJECTIVES

The aim of the FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development and its impact on the receiving waters.

The FRA has been carried out in accordance with 'The Planning System and Flood Risk Management Guidelines' (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW) and the report assesses the site in accordance with the requirements of "The Planning System and Flood Risk Management Guidelines for Planning Authorities".

1.2 EXISTING SITE

The site is located to the southwest of Limerick City, centred at grid reference E: 553437.955, N: 653504.924 (ITM) as highlighted in Figure 1 below.

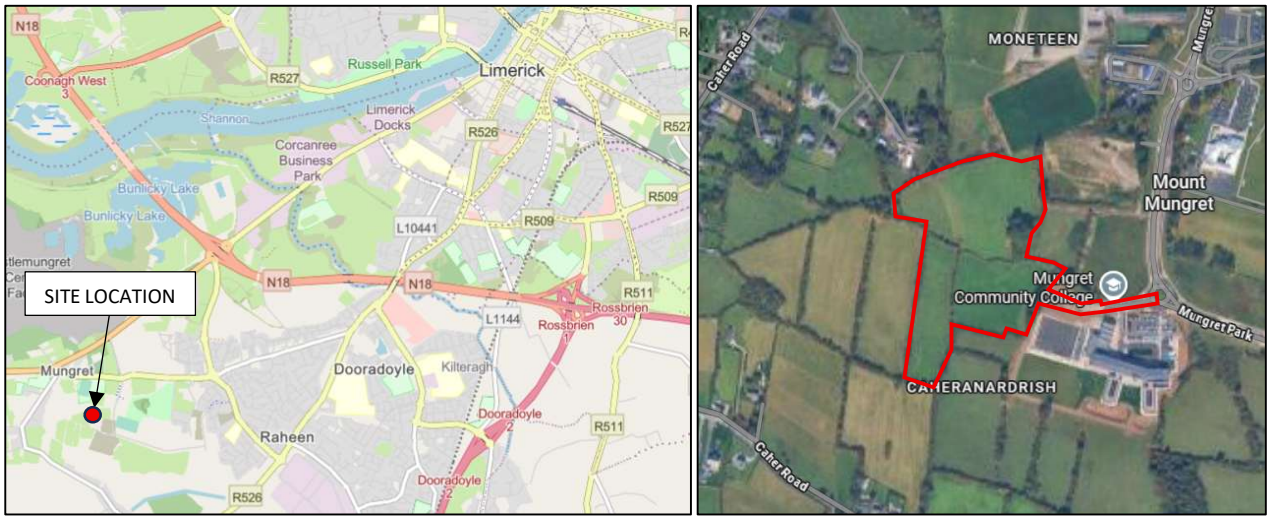


Figure 1: Site Location (Site boundary shown indicatively)

The lands are bound to the north by Mungret St Pauls GAA, to the west, east and south by existing agricultural land and to the southeast by the existing Mungret Community College.

1.3 SITE TOPOGRAPHY

Within the subject lands, ground levels predominantly fall in a southerly direction but undulates with crests and valleys in between. The site falls across the site from circa 19.86m OD from the north to the southern boundary at an elevation of approximately 13.60m OD.



Figure 2: Site Topography

1.4 PROPOSED DEVELOPMENT

The development will consist of a Largescale Residential Development (LRD), comprising of 182no. residential dwellings as follows: 141no. houses consisting of 104no. detached/semi-detached dwellings (24no. 4-beds, 78no. 3-beds and 2no. 2-beds), 37no. townhouses (18no. 3-beds and 19no. 2-beds) and 41no. apartment units across 1no. triplex unit (2no. 2-beds and 1no. 1-bed) and a five-storey apartment building (13no. 2-beds and 25no. 1-beds) with a crèche with capacity to accommodate 70no. children at ground floor level.

The proposed development will include the provision for car parking, including EV charging points and bicycle parking. The proposed development will also include the provision of private, communal, and public open spaces; internal roads and pathways; pedestrian and cyclist routes; hard and soft landscaping and boundary treatments; waste storage; plant; signage; a new vehicular and pedestrian access onto the Mungret Park Road; public lighting; substations; all associated site development works; and all drainage and foul sewer infrastructure and network works including a pumping station and connections to the existing networks and nature-based suds measures.

Access to the proposed development will be via a proposed vehicular and pedestrian access to the existing Mungret Link Road.

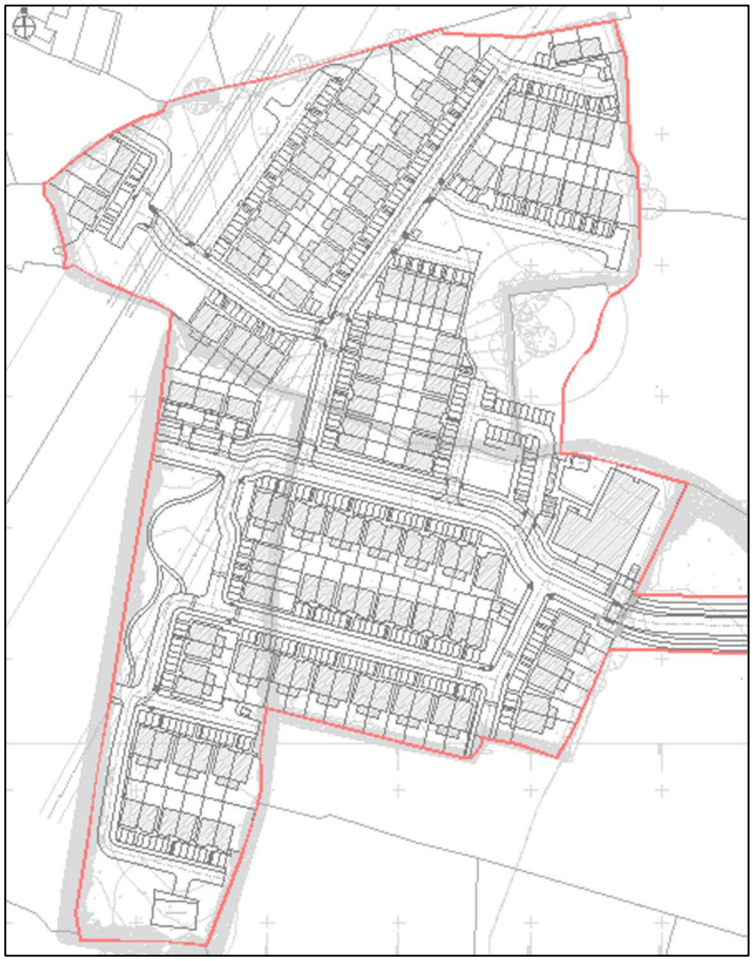


Figure 3: Proposed Site Layout

2.0 FLOOD RISK ASSESSMENT METHODOLOGY

2.1 METHODOLOGY

The methodology used for the flood risk assessment for the proposed development is based on 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009)'. The FRM Guidelines require the planning system at national, regional and local levels to:

- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development.
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 4 below) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.

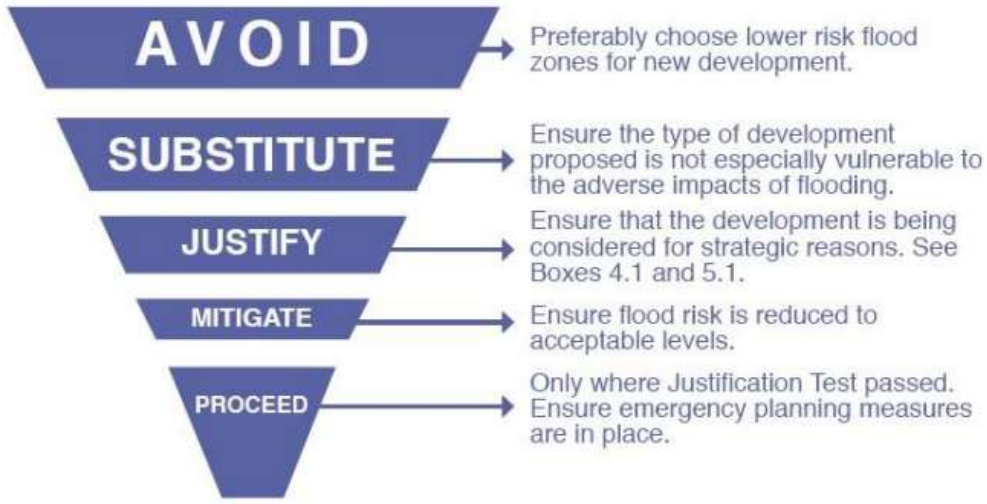


Figure 4: Sequential Approach Principles in Flood Risk Management (Extract of Figure 3.1 of the FRM Guidelines)

While Figure 3.1 of The FRM Guidelines (Figure 4 above) sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 3.2 of the Guidelines (Figure 5 below) describes the mechanism of the sequential approach for use in the planning process.

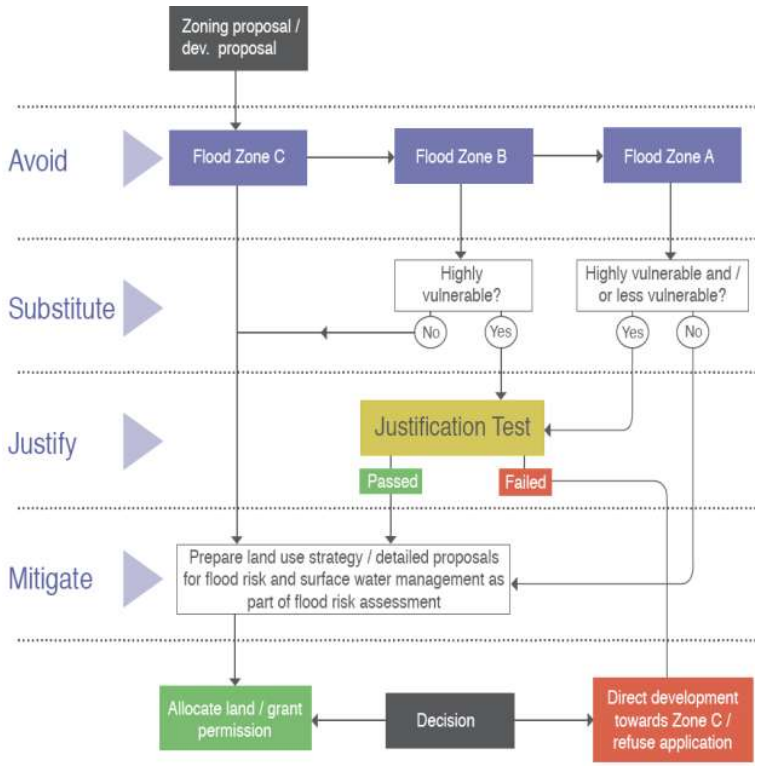


Figure 5: Sequential Approach Mechanism in the Planning Process (Extract of Figure 3.2 of the FRM Guidelines)

According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three Flood Zones, namely,

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Flood Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Table 3.1 of the FRM Guidelines (Figure 6 below) shows the classification of the vulnerability to flooding of different types of development.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Figure 6: Classification of Vulnerability of Different Types of Development (Extract of Table 3.1 of FRM Guidelines)

Table 3.2 of the FRM Guidelines (Figure 7 below) identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since dwelling houses are classified as Highly vulnerable development' the section highlighted below presents the required actions for each flood zone.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Figure 7: Matrix of Vulnerability versus Flood Zone (Extract of Table 3.2 of FRM Guidelines)

The FRM Guidelines (Chapter 2) outlines the following three stages of flood risk assessment:

- Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.
- Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.
- Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

2.2 DATA COLLECTION

Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic flood data was obtained from the National Flood Hazard Mapping website www.floodmaps.ie;
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website www.gsi.ie;
- National CFRAM Study;
- Greater Dublin Strategic Drainage Study

3.0 EXISTING HYDROLOGICAL ENVIRONMENT

3.1 RELEVANT HYDROLOGICAL FEATURES

A review of Historical Ordinance Survey Ireland information (www.osi.ie) as well as the Environmental Protection Agency (EPA) Maps, was conducted to determine if the OSI 6- inch Maps indicated historic water courses / surface water features within the site.

The subject site is located within the Ballynaclogh_10 WFD River Sub Basin. The maps indicate existing watercourses to the south and west (Barnakyle, EPA Code 24B05) and to the east (Ballynaclogh, EPA Code 24B04) of the subject site. The River Shannon is located approximately 2.5km to the north and the River Maigue approximately 5.2km to the west of the subject site. These waterbodies are the main hydrological features in close proximity to the site.

There is no formal surface water network within the subject lands.

Figure 8 below illustrates the main hydrological features associated with the area in the vicinity of the site.

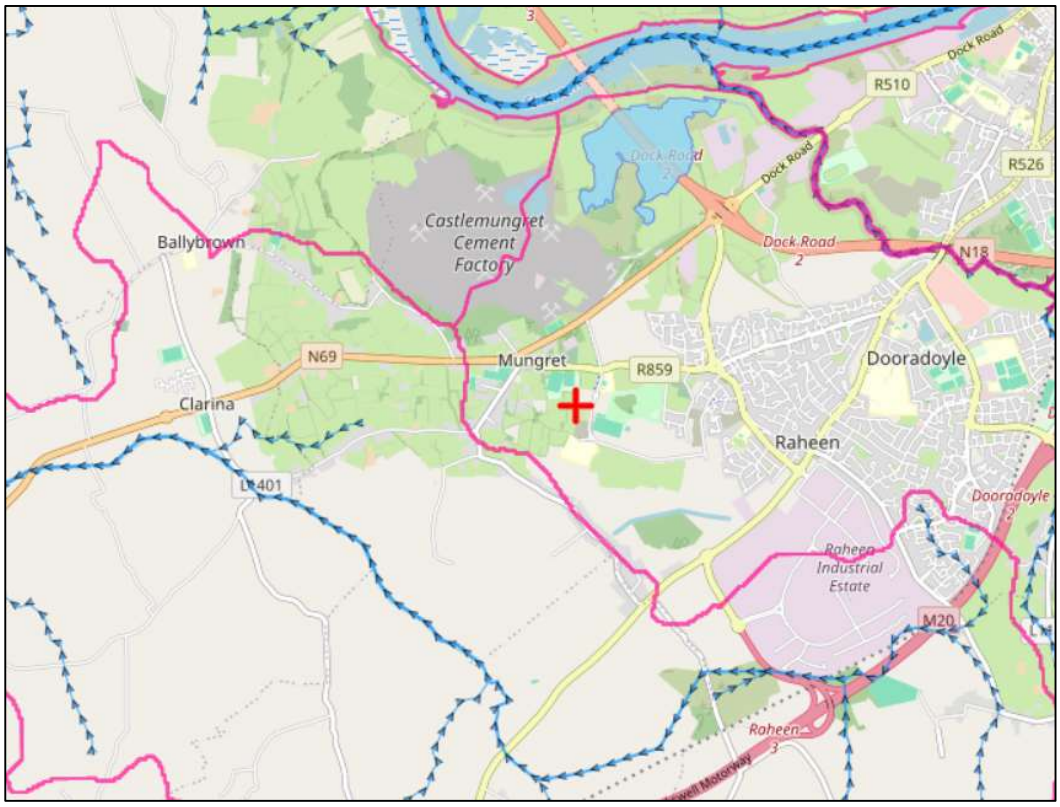


Figure 8: Hydrological Features, Geological Survey of Ireland (GSI)

3.2 EXISTING GEOLOGY AND HYDROGEOLOGY OF THE AREA

The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at www.gsi.ie on aquifer vulnerability. The map presented in Figure 9 depicts the aquifer vulnerability for the proposed development site.

The interactive web-mapping site classifies the aquifer vulnerability in the area of the proposed development varies from "high" to “extreme” with some areas noted as having “rock at or near Surface or Karst”. The GSI state that “Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities”. The GSI further describes that the vulnerability of groundwater depends on:

- The time of travel of infiltrating water (and contaminants);
- The relative quantity of contaminants that can reach the groundwater; and
- The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate.



Figure 9: Extract from Geological Survey of Ireland (GSI)

4.0 EXISTING FLOOD STUDIES

4.1 HISTORIC FLOODING

The National Flood Hazard Mapping Website www.floodmaps.ie does not show any records of historic flooding occurring at the proposed development site. The nearest recoded flooding event is to the north, in Mungret Village which is approximately 0.6km the subject site.

The Historic Flood Record Reports have been included in Appendix A of this report



Figure 10: Extract from floodmaps.ie

4.2 CFRAM STUDY

The OPW, as lead agency for flood risk management in Ireland, is producing Flood Risk Management Plans (FRMP), in line with National Flood Policy and the requirements of the EU Floods Directive. Draft FRMP's are currently being produced by the OPW under the CFRAM Study. The Draft FRMP's make use of the information provided through the flood maps that have previously been produced under the CFRAMS Programme and previous parallel projects. The Draft FRMP's set out a range of proposed measures and actions to manage and reduce flood risk within the catchments and coastal reaches covered by each Draft Plan, focusing on the 300 areas of potentially significant flood risk around Ireland that were identified under the PFRA.

Having review the maps from the CFRAMS Flood extent maps there is no history of flooding on the site and in the vicinity of the site. The maps show that the flood extent does not extend to the proposed development site and demonstrates that the site lies outside of the 0.1% Fluvial AEP event and is therefore located within Flood Zone C.

The Flood Maps associated with the FRMP's have been included in Appendix B of this report.

5.0 FLOOD RISK ASSESSMENT

As outlined in Section 2 of this report the FRM guidelines identifies three stages of Flood Risk Assessment namely;

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

5.1 STAGE 1 - FLOOD RISK IDENTIFICATION

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk-based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

5.1.1 Tidal Flood Risk

The CFRAMS Maps indicates that the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within Flood Zone C for tidal flood risk, where the risk of flooding is low.

5.1.2 Fluvial Flood Risk

The CFRAMS Maps indicates that the proposed development site lies outside of the 0.1% AEP fluvial flood event and hence is located within Flood Zone C for fluvial flood risk, where the risk of flooding is low.

5.1.3 Groundwater Flood Risk

The aquifer vulnerability map (refer to Figure 9) classifies the site as having varied vulnerability ranging from "high" to “extreme” with some areas noted as having “rock at or near Surface or Karst”. There is historical evidence of groundwater flooding approximately 0.5km north of the subject site at Mungret Village. There is no indication on the maps of any springs or wells on this site. Groundwater risk is therefore not considered to be significant.

5.1.4 Pluvial Flood Risk

The Flood Maps data shows no indication of previous pluvial related flooding at the site. During extreme rainfall events the application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network in accordance with the GDSDS. With these mitigation measures in place pluvial flood risk is not considered to be significant.

5.2 STAGE 2 - INITIAL FLOOD RISK ASSESSMENT

The Flood Risk Assessment has identified that there is a low flood risk to the site. Under the sequential approach identified in the FRM Guidelines a three-step approach is required to confirm the appropriateness of the development in terms of flood risk.

Step 1: Identification of the Flood Zone at the proposed development site

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zones for each of the sites were determined.

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year for coastal flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

As discussed above, the proposed development site lies within Flood Zone C – where risk of flooding is lowest.

Modelling hasn't been carried out but in this case is deemed unnecessary. Therefore, in this instance a freeboard well in excess of the GDSDS requirements is provided. No proposed dwellings are located in Flood Zone A or B. The extent of the predicted 1% and 0.1% AEP Flood Events are shown across adjacent lands on the north-western section of the site.

A Justification Test is not required as it falls outside the Flood Zones A and B.

Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines. As described in Section 1.2 above, the proposed development is dwelling houses. This is classified as 'highly vulnerable development'.

Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development

The proposed development site is located in Flood Zone C and is categorised as Highly Vulnerable Development. Table 3.2 of the FRM guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM guidelines) stipulate that a justification test is not required for such a development and is deemed appropriate development for the flood zone categories. Figure 11 below highlights the matrix of vulnerability versus flood zone.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Figure 11: Matrix of Vulnerability versus Flood Zone (Extract of Table 3.2 of FRM Guidelines)

5.3 STAGE 3 - DETAILED FLOOD RISK ASSESSMENT

Surface water runoff from the development will be attenuated to greenfield runoff rates (Q-bar) before discharging to the watercourse to the north of the site.

The proposed surface water drainage network has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS). Surface water discharge rates from the proposed surface water drainage network will be controlled by a Hydrobrake type flow control device (or similar) and associated underground attenuation storage (attenuation tank and oversized pipe). Surface water will also pass through a specified separator (Class 1 Bypass separator or equivalent approved), placed before attenuation systems.

5.3.1 SuDS Methodologies

The following methodologies are being implemented as part of a SuDS treatment train approach:

- Attenuation of the 30 and 100-year return period storms within the attenuation tanks.
- Installation of a vortex flow control device (Hydrobrake or equivalent), limiting surface water discharge from the site to predevelopment runoff.
- Strategically designed and located swales in green areas
- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site and in accordance with IS EN 858).

5.3.2 Surface Water Attenuation Storage

Surface water runoff from the overall development lands will be attenuated to allowable greenfield runoff rate (Qbar). The rate of surface water runoff from the site will be restricted to greenfield runoff rates and the attenuation system sized accordingly.

5.3.3 Flood Exceedance

For storms greater than the 1% AEP, the development's drainage network design will be exceeded and areas with low ground levels may begin to flood. Generally, proposed road levels fall towards the site's southern boundary and overland flow is therefore directed towards the existing agricultural lands and ditches.

5.3.4 Impact on Adjacent Areas

The proposed development layout was designed to minimize the impact on adjacent areas. The development's storm-water drainage design attenuates discharges to green-field run-off rates in accordance with the GDSDS accepted design guidelines. Storms greater that the 1% AEP (exceeding the design capacity of the site's drainage system) may result in overland flow being directed toward the adjoining lands to the south.

5.3.5 Climate Change

The potential impact of climate change has been allowed for as follows:

- Pluvial flood risk - drainage system and attenuation storage design allow for increase in rainfall intensities, 30% allowance for climate change and 10% for urban creep.

5.3.6 Access and Egress for Emergency Services During Flood Events

Access and egress to the site is provided primarily by way of the proposed connection to Mungret Link Road located to the southeast of the site.

All of the estate roads will be located in Flood Zone C. It is expected that the proposed dwellings can be safely accessed during storm events up to 0.1% AEP event from the development road network.

5.3.7 Residual Risk

Remaining residual flood risks, following the detailed assessment include the following:

1. Pluvial flooding from the private drainage system related to a pipe blockage, flood exceedance or mechanical failure;
2. Pluvial flooding from the development's drainage system for storms in excess of the 1% AEP storm event

6.0 MITIGATION MEASURES

The proposed mitigation measures to address residual flood risks are summaries below.

Table 1: Proposed Flood Risk Mitigation Measures

M1	Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.
M2	In the event of storms exceeding the 1% AEP design capacity of the attenuation system, possible overland flow routing towards open space areas should not be blocked. At these locations the site's boundaries should be permeable to facilitate flood routing onto adjacent public spaces
M3	Proposed residential development shall be set above the Flood Zone B (0.1% AEP) including an appropriate freeboard

6.1 EFFECTIVENESS OF MITIGATION MEASURE

It is considered that the flood risk mitigation measures if implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur.

Should extreme pluvial flooding occur that is in excess of the development's attenuation capacity (i.e., greater than 1% AEP), then overland flow routes directed towards open space areas are provided in order to protect the proposed development.

7.0 CONCLUSION

A flood risk assessment for the proposed residential development at Caheranardrish, Limerick, Co. Limerick has been undertaken in accordance with the methodology recommended in the FRM Guidelines.

The following is the summary of the flood risk assessment:

- The site including all proposed residential dwellings is located in Flood Zone C as defined by the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.
- Following the Flood Risk Assessment Stage 2 (Initial Flood Risk Assessment), it was determined that a Justification Test was not required.
- To prevent any potential of flooding within the vicinity from the proposed development, it is proposed to implement SuDS measures as discussed in the Infrastructure Report and Drainage Impact Assessment in order to limit the discharge from the site to that of the current greenfield discharge rates. The implementation of these SuDS measures will not increase the risk of flooding elsewhere. It is considered that the proposed development will have a negligible impact on the potential flood regime of the area.

In conclusion, the proposed development is considered to have the required level of flood protection up to and including the 1% AEP storm event.

Appendix A – Historical Flood Reports

Recurring Flooding at Mungret Village, Mungret, Co. Limerick

The information contained in this report has been extracted from a report submitted to The Office Of Public Works (OPW) by Limerick County Council.

- **Location and date of flood event:**

Location: Main Street, Mungret, Co Limerick
National Grid Reference:
Irish Grid Co-ordinates – 153,096 – 154,019

This flooding event is a recurring event.

- **Source and cause:**

The source of the floodwaters was ground and surface water (and the cause was prolonged rainfall).

- **Flood data:**

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)			
Flood Flow (m^3/s)			
Flood Velocity (m/s)			

Flooding has occurred at this location before – occassionally

- **Impacts of flooding event:**

It was recorded that this flooding event had the following impacts.

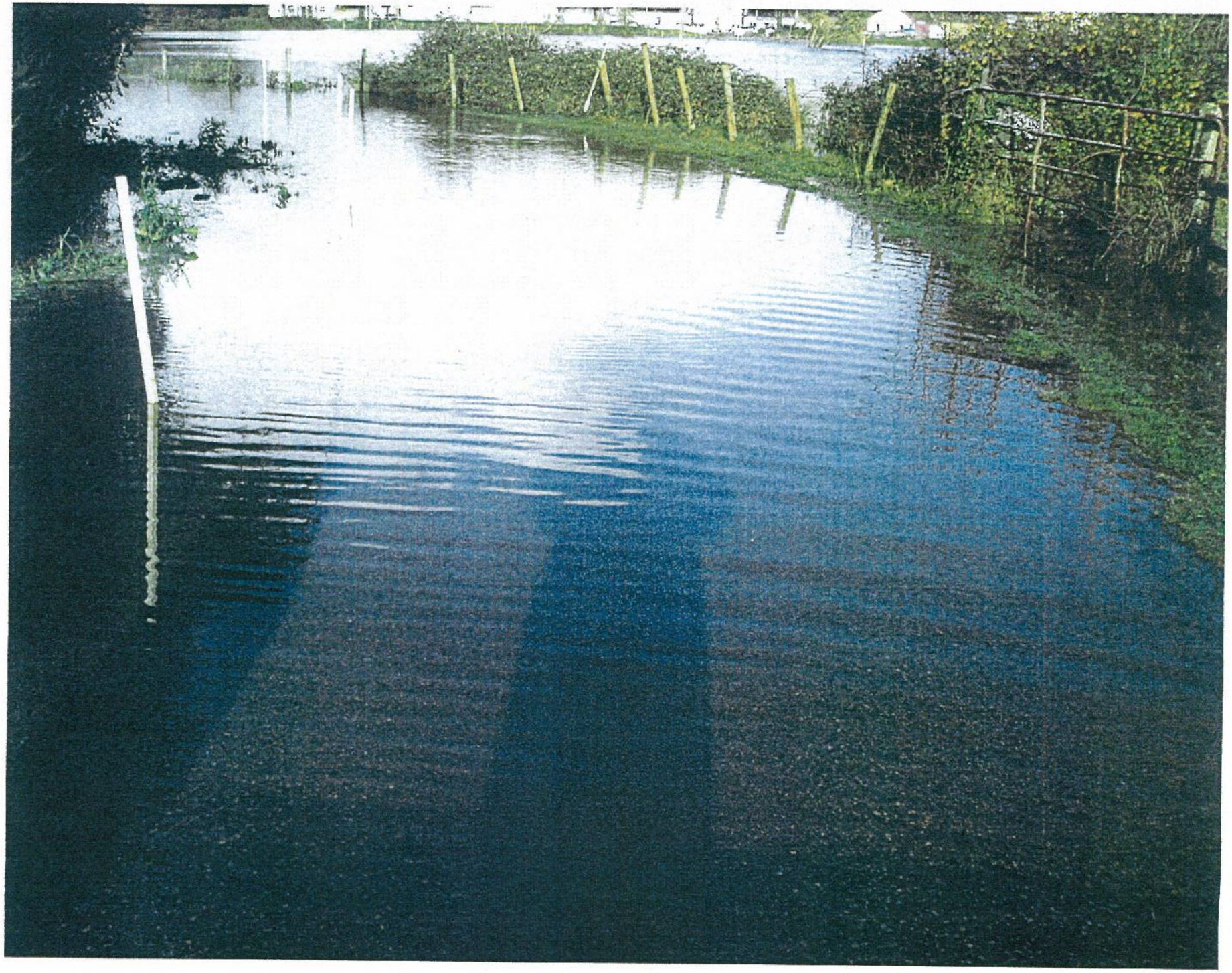
Impacts to property:
Residential – *Several Units at Risk*
Commercial – *Few units a risk*

Impacts to transport infrastructure:
Road – local access road flooded















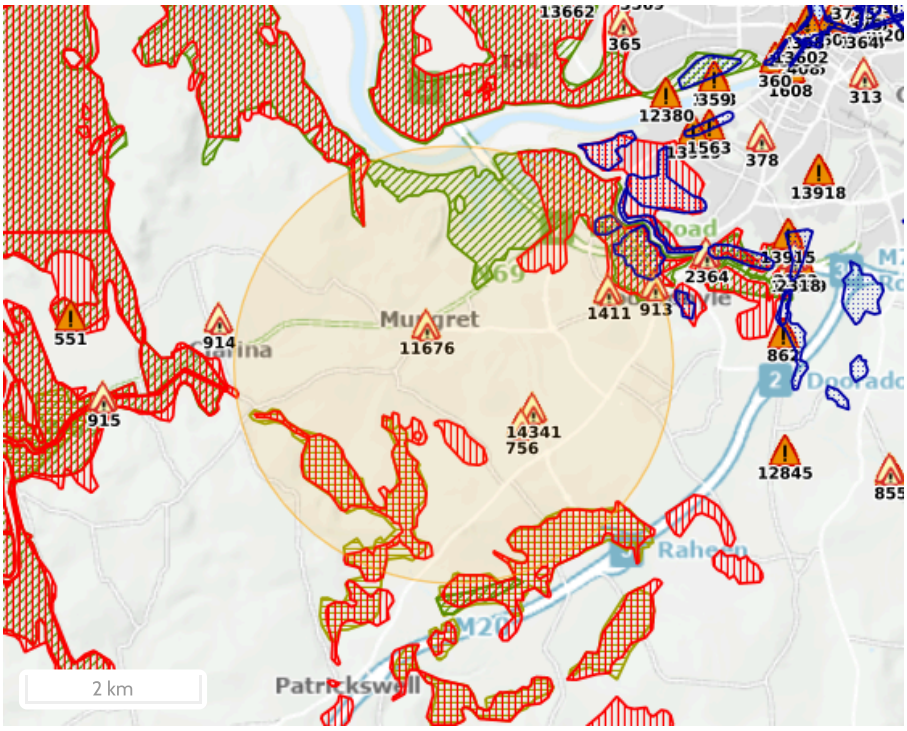


Past Flood Event Local Area Summary Report

Report Produced: **27/9/2025 22:37**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

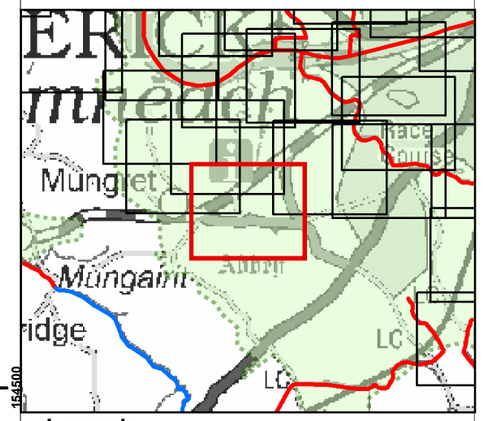
5 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Baunacloka-Loughmore Recurring (ID-14341)	29/09/2023	Approximate Point
	Additional Information: Reports (6) Press Archive (0)		
2.	Mungret Village, Co. Limerick (ID-11676)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
3.	Raheen Dooradoyle, Limerick Feb 1990 (ID-541)	01/02/1990	Area
	Additional Information: Reports (1) Press Archive (0)		
4.	Turlough - Loughmore Common Limerick (ID-756)	n/a	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
5.	Dooradoyle Limerick recurring (ID-1411)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

Appendix B – Flood Maps



Location Plan:



Legend:

- Nodes
- Model Reach
- AFA Boundary
- Flood Defence: Wall
- Flood Defence: Embankment
- Defended Area

10% AEP Coastal Flood Extent
(1 in 10 chance in any given year)

0.5% AEP Coastal Flood Extent
(1 in 200 chance in any given year)

0.1% AEP Coastal Flood Extent
(1 in 1000 chance in any given year)

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath
C15 NX36

Merrion House
Merrion Road
Dublin 4
D04 R2C5

Project:		SHANNON CFRAM STUDY
Map Type:		EXTENT
Source:		COASTAL - TIDAL
Area:		LIMERICK
Scenario:		EXISTING
Drawn by:	EH	Date: June 2016
Checked by:	KM	Date: June 2016
Reviewed by:	MC	Date: June 2016
Approved by:	PS	Date: June 2016
Map No.:		S2526LIK_EXCCD_F1_63
Sheet: 63 of 65		Revision: 0
Map Scale: 1: 5000		Plot Scale: 1:1 @ A3

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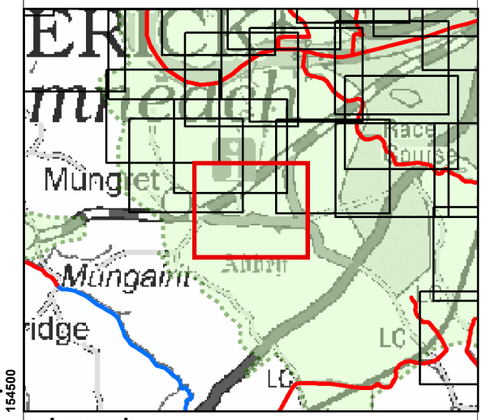
153500 154000 154500

154500 154000 153500

SKEHACREGGAUN
Sceach An Chreagáin

MONETEEN

Location Plan:



Legend:

- Nodes
- Model Reach
- AFA Boundary
- Flood Defence: Wall
- Flood Defence: Embankment
- Defended Area

10% AEP Fluvial Flood Extent
(1 in 10 chance in any given year)

1% AEP Fluvial Flood Extent
(1 in 100 chance in any given year)

0.1% AEP Fluvial Flood Extent
(1 in 1000 chance in any given year)

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

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Jonathan Swift Street
Trim
Co. Meath
C15 NX36

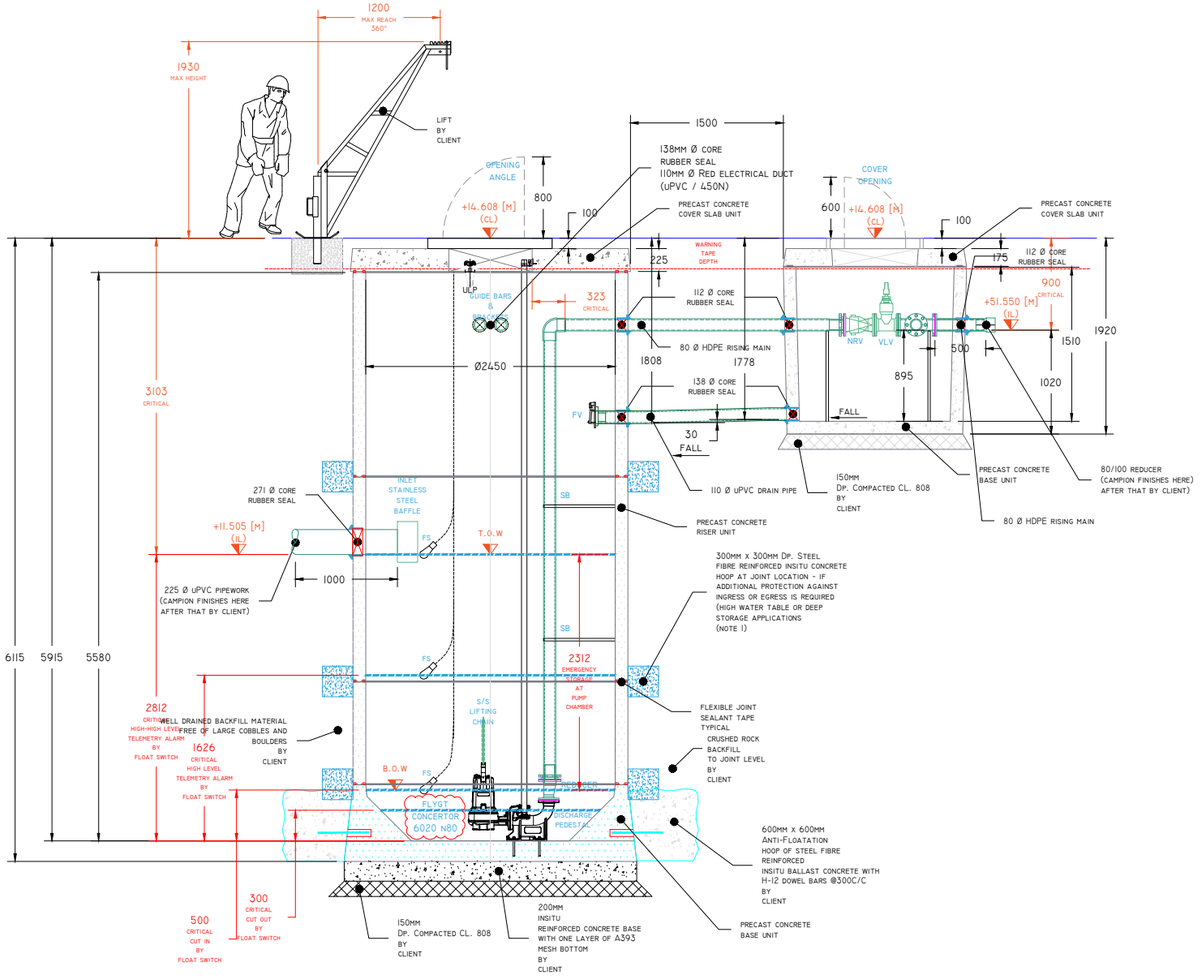
Merrion House
Merrion Road
Dublin 4
D04 R2C5

Project:	SHANNON CFRAM STUDY
Map Type:	EXTENT
Source:	FLUVIAL
Area:	LIMERICK
Scenario:	EXISTING
Drawn by: EH	Date: June 2016
Checked by: KM	Date: June 2016
Reviewed by: MC	Date: June 2016
Approved by: PS	Date: June 2016
Map No.:	S2526LIK_EXFCD_F1_63
Sheet: 63 of 65	Revision: 0
Map Scale: 1: 5000	Plot Scale: 1:1 @ A3

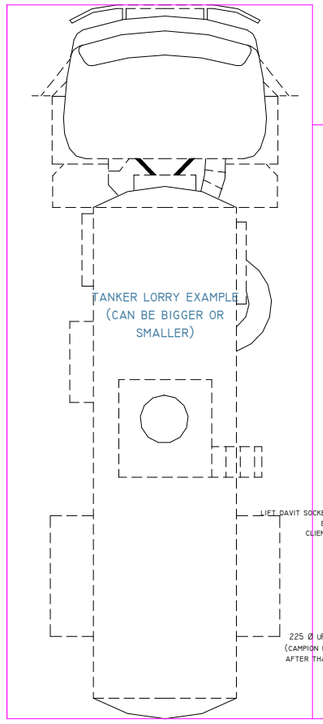
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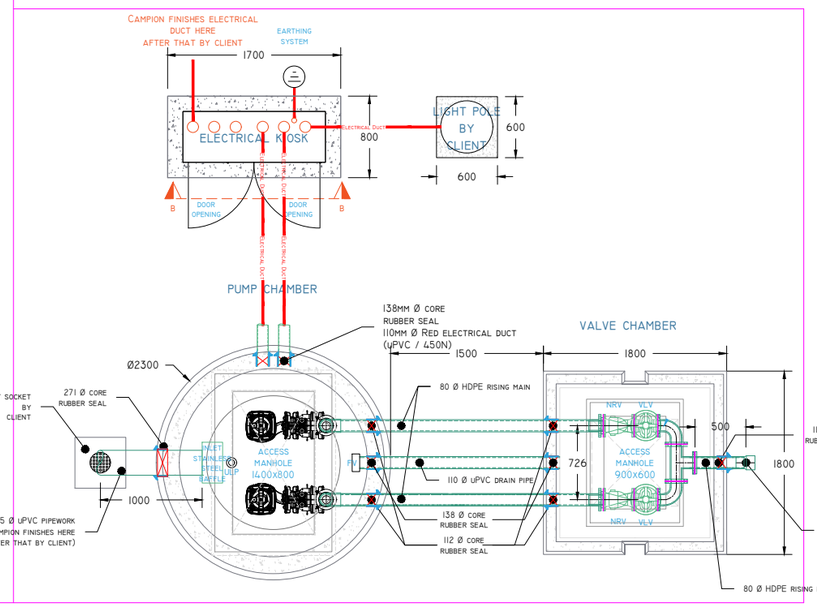
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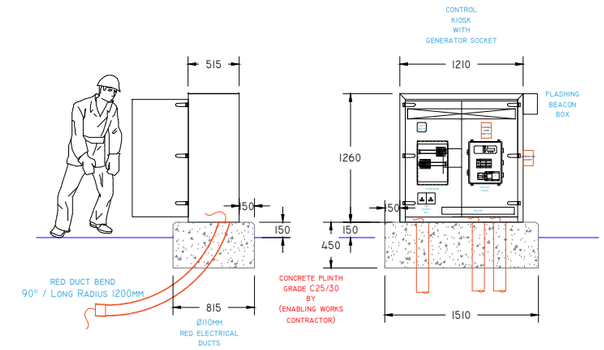
Appendix B – Surface Water Pump Station Details



PUMP CHAMBER
SECTION VIEW







CONTROL KIOSK
(DIRECTION MUST BE CONFIRMED ON LAYOUT PROJECT)

TITLE:

OVERALL PUMPING STATION SKETCH DRAWING

PROJECT:

SURFACE WATER - MUNGRET PARK ROAD, CAHERANARDRISH, CO. LIMERICK

DRAWN	LUCAS GUEDES	DATE	05/03/26
CHK'D	CONOR BERGIN	REVISION	(00)
APR'D	MARTIN CAMPION	SHEET	01/01

CAMPION
THE POWER BEHIND WATER

Appendix C –Surface Water Critical Storm by Return Period



C2-1

Type : Catchment Area

Area (km²)	0.00041

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-2

Type : Catchment Area

Area (km²)	0.00041

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-3

Type : Catchment Area

Area (km²)	0.00094

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-4

Type : Catchment Area

Area (km²)	0.00087

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-5

Type : Catchment Area

Area (km²)	0.00197

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-6

Type : Catchment Area

Area (km²)	0.00069

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C2-7

Type : Catchment Area

Area (km²)	0.00225

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-1

Type : Catchment Area

Area (km²)	0.00173

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-2

Type : Catchment Area

Area (km²)	0.00079

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-3

Type : Catchment Area

Area (km²)	0.00164

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-4

Type : Catchment Area

Area (km²)	0.00029

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-5

Type : Catchment Area

Area (km²)	0.00173

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-6

Type : Catchment Area

Area (km²)	0.00144

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C1-7

Type : Catchment Area

Area (km²)	0.00098

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-1

Type : Catchment Area

Area (km²)	0.00114

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-2

Type : Catchment Area

Area (km²)	0.00088

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-3

Type : Catchment Area

Area (km²)	0.00077

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-4

Type : Catchment Area

Area (km²)	0.00138

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-5

Type : Catchment Area

Area (km²)	0.00103

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-6

Type : Catchment Area

Area (km²)	0.00241

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-7

Type : Catchment Area

Area (km²)	0.00105

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-8

Type : Catchment Area

Area (km²)	0.0006

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-9

Type : Catchment Area

Area (km²)	0.00034

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-10

Type : Catchment Area

Area (km²)	0.00168

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-11

Type : Catchment Area

Area (km²)	0.00025

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C3-12

Type : Catchment Area

Area (km²)	0.00063

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-1

Type : Catchment Area

Area (km²)	0.00292

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-2

Type : Catchment Area

Area (km²)	0.00183

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-3

Type : Catchment Area

Area (km²)	0.00165

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-4

Type : Catchment Area

Area (km²)	0.00146

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-5

Type : Catchment Area

Area (km²)	0.00093

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-6

Type : Catchment Area

Area (km²)	0.00046

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-7

Type : Catchment Area

Area (km²)	0.00108

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-8

Type : Catchment Area

Area (km²)	0.00011

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-9

Type : Catchment Area

Area (km²)	0.00134

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-10

Type : Catchment Area

Area (km²)	0.00076

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-11

Type : Catchment Area

Area (km²)	0.00031

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-12

Type : Catchment Area

Area (km²)	0.00065

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-13

Type : Catchment Area

Area (km²)	0.00152

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-14

Type : Catchment Area

Area (km²)	0.00086

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-15

Type : Catchment Area

Area (km²)	0.00042

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-16

Type : Catchment Area

Area (km²)	0.00077

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-17

Type : Catchment Area

Area (km²)	0.00157

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C4-18

Type : Catchment Area

Area (km²)	0.00081

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-1

Type : Catchment Area

Area (km²)	0.0012

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-2

Type : Catchment Area

Area (km²)	0.0011

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-3

Type : Catchment Area

Area (km²)	0.0017

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-4

Type : Catchment Area

Area (km²)	0.00033

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-5

Type : Catchment Area

Area (km²)	0.00224

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59



C5-6

Type : Catchment Area

Area (km²)	0.00119

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	59

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Junctions Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

Name	Junction Type	Easting (m)	Northing (m)	Cover Elevation (m)	Depth (m)	Invert Elevation (m)	Chamber Shape	Diameter (m)
S2-6.2	Manhole	553211.508	653637.814	17.016	1.551	15.465	Circular	1.200
S2-6	Manhole	553201.627	653621.579	17.115	1.712	15.403	Circular	1.200
S2-7	Manhole	553194.226	653609.232	17.055	1.700	15.355	Circular	1.200
S3-6.1 Hydrobrake	Manhole	553222.998	653592.014	16.987	1.785	15.202	Circular	1.200
S3-6.2	Manhole	553228.496	653599.907	17.082	1.912	15.170	Circular	1.200
S3-6.3	Manhole	553255.202	653581.107	17.330	2.269	15.061	Circular	1.200
S3-6	Manhole	553275.331	653575.674	17.883	3.009	14.874	Circular	1.200
S4-2	Manhole	553434.005	653463.489	16.155	1.537	14.618	Circular	1.200
S4-7	Manhole	553352.319	653514.680	15.236	2.297	12.939	Circular	1.200
S3-11	Manhole	553217.859	653527.155	14.976	2.768	12.208	Circular	1.200
S5-1 Hydrobrake	Manhole	553210.914	653500.828	15.450	3.366	12.084	Circular	1.200
S5-2	Manhole	553200.605	653459.572	15.424	3.461	11.963	Circular	1.200
S5-3	Manhole	553206.769	653456.014	15.737	3.798	11.939	Circular	1.200
S5-4	Manhole	553201.841	653437.059	15.547	3.673	11.874	Circular	1.200
S5-5	Manhole	553196.494	653436.124	15.487	3.635	11.852	Circular	1.200
S5-6	Manhole	553191.508	653416.830	15.298	3.512	11.786	Circular	1.200
S5-7	Manhole	553184.977	653376.925	14.878	3.227	11.651	Circular	1.200
S5-8 Hydrobrake	Manhole	553199.847	653366.103	14.608	3.103	11.505	Circular	1.200
S2-5	Manhole	553207.200	653618.174	17.080	1.655	15.425	Circular	1.200
S2-4	Manhole	553214.156	653609.734	17.027	1.566	15.461	Circular	1.200
S2-3	Manhole	553221.467	653604.654	17.017	1.525	15.492	Circular	1.200
S2-2	Manhole	553248.367	653643.178	18.500	1.678	16.822	Circular	1.200
S2-1	Manhole	553268.622	653672.312	18.678	1.500	17.178	Circular	1.200
S1-3.1	Manhole	553313.335	653638.286	19.600	1.425	18.175	Circular	1.200
S1-3.2	Manhole	553339.650	653676.027	19.289	1.421	17.868	Circular	1.200
S1-2	Manhole	553347.275	653676.211	19.215	1.620	17.595	Circular	1.200
S1-1	Manhole	553378.004	653668.252	19.044	1.344	17.700	Circular	1.200
S1-4	Manhole	553314.485	653629.420	19.611	2.206	17.405	Circular	1.200
S1-5	Manhole	553329.204	653619.187	19.398	2.053	17.345	Circular	1.200
S1-5.1	Manhole	553382.877	653605.354	18.848	1.319	17.529	Circular	1.200
S3-1 Hydrobrake	Manhole	553325.087	653603.153	19.245	2.097	17.148	Circular	1.200
S3-2	Manhole	553300.434	653609.463	19.427	2.777	16.650	Circular	1.200
S3-3	Manhole	553287.279	653590.233	19.130	2.868	16.262	Circular	1.200
S3-3.2	Manhole	553282.349	653593.915	18.980	1.127	17.853	Circular	1.200
S3-3.1	Manhole	553303.153	653623.727	19.644	1.610	18.034	Circular	1.200
S1-3	Manhole	553344.679	653672.484	19.199	1.619	17.580	Circular	1.200
S5-7.1	Manhole	553227.778	653366.025	14.501	1.505	12.996	Circular	1.200
S5-4.1	Manhole	553243.215	653426.442	15.855	1.425	14.430	Circular	1.200
S3-12	Manhole	553329.151	653445.302	15.962	1.500	14.462	Circular	1.200
S3-13	Manhole	553282.870	653457.341	16.200	1.976	14.224	Circular	1.200
S3-14	Manhole	553227.489	653471.495	15.909	2.047	13.862	Circular	1.200
S3-15	Manhole	553234.624	653499.565	15.714	3.488	12.226	Circular	1.200
S3-7.3	Manhole	553296.375	653513.910	15.102	2.540	12.562	Circular	1.200
S3-7.2	Manhole	553330.958	653505.096	15.152	2.412	12.740	Circular	1.200
S3-7.1 Hydrobrake	Manhole	553333.244	653513.639	15.171	2.386	12.785	Circular	1.200
S4-9	Manhole	553323.369	653522.050	15.228	2.054	13.174	Circular	1.200
S4-8	Manhole	553331.210	653552.206	16.065	1.321	14.744	Circular	1.200
S4-7.1	Manhole	553341.601	653539.062	15.574	1.425	14.149	Circular	1.200
S4-5	Manhole	553345.045	653493.153	15.270	2.255	13.015	Circular	1.200
S4-6	Manhole	553350.945	653508.360	15.170	2.209	12.961	Circular	1.200
S4-4	Manhole	553354.733	653481.809	15.327	1.886	13.441	Circular	1.200
S4-3.2	Manhole	553337.086	653444.766	16.021	1.412	14.609	Circular	1.200
S4-4.1	Manhole	553331.992	653424.702	16.545	1.514	15.031	Circular	1.200
S4-3	Manhole	553391.283	653464.594	15.730	1.614	14.116	Circular	1.200
S4-1	Manhole	553476.943	653462.379	17.143	2.310	14.833	Circular	1.200
Outfall Manhole	Manhole	553204.091	653365.297	14.600	3.109	11.491	Circular	1.200
S2-6.1	Manhole	553209.931	653645.358	16.983	1.492	15.491	Circular	1.200

S3-4	Manhole	553282.444	653583.578	18.532	2.407	16.125	Circular	1.200
S3-5	Manhole	553280.144	653574.605	17.883	2.221	15.662	Circular	1.200
S3-7	Manhole	553271.955	653562.585	16.660	1.854	14.806	Circular	1.200
S4-7.2	Manhole	553356.684	653535.226	15.426	1.434	13.992	Circular	1.200
S3-8	Manhole	553261.802	653522.933	15.548	3.165	12.383	Circular	1.200
S3-9	Manhole	553250.583	653525.983	15.689	3.344	12.345	Circular	1.200
S3-10	Manhole	553232.956	653523.636	15.886	3.601	12.285	Circular	1.200
BP1	Manhole	553328.742	653617.215	19.346	2.108	17.238	Circular	1.200
BP2	Manhole	553196.518	653607.869	17.036	1.790	15.246	Circular	1.200
BP 4.2	Manhole	553325.234	653521.532	15.189	2.203	12.986	Circular	1.200
BP 4.1	Manhole	553345.134	653516.728	15.181	2.366	12.815	Circular	1.200
BP 3.2	Manhole	553226.048	653501.411	15.450	3.353	12.097	Circular	1.200
BP 3.1	Manhole	553218.403	653523.347	15.095	3.000	12.095	Circular	1.200
BP 5	Manhole	553185.297	653374.233	14.829	3.285	11.544	Circular	1.200

Name	Lock	Bend Loss
S2-6.2	All	0.00
S2-6	All	0.00
S2-7	All	0.00
S3-6.1 Hydrobrake	All	0.00
S3-6.2	All	0.00
S3-6.3	All	0.00
S3-6	All	0.00
S4-2	All	0.00
S4-7	All	0.00
S3-11	All	0.00
S5-1 Hydrobrake	All	0.00
S5-2	All	0.00
S5-3	All	0.00
S5-4	All	0.00
S5-5	All	0.00
S5-6	All	0.00
S5-7	All	0.00
S5-8 Hydrobrake	All	0.00
S2-5	All	0.00
S2-4	All	0.00
S2-3	All	0.00
S2-2	All	0.00
S2-1	All	0.00
S1-3.1	All	0.00
S1-3.2	All	0.00
S1-2	All	0.00
S1-1	All	0.00
S1-4	All	0.00
S1-5	All	0.00
S1-5.1	All	0.00
S3-1 Hydrobrake	All	0.00
S3-2	All	0.00
S3-3	All	0.00
S3-3.2	All	0.00
S3-3.1	All	0.00
S1-3	All	0.00
S5-7.1	All	0.00
S5-4.1	All	0.00
S3-12	All	0.00
S3-13	All	0.00
S3-14	All	0.00
S3-15	All	0.00
S3-7.3	All	0.00
S3-7.2	All	0.00
S3-7.1 Hydrobrake	All	0.00

S4-9	All	0.00
S4-8	All	0.00
S4-7.1	All	0.00
S4-5	All	0.00
S4-6	All	0.00
S4-4	All	0.00
S4-3.2	All	0.00
S4-4.1	All	0.00
S4-3	All	0.00
S4-1	All	0.00
Outfall Manhole	All	0.00
S2-6.1	All	0.00
S3-4	All	0.00
S3-5	All	0.00
S3-7	All	0.00
S4-7.2	All	0.00
S3-8	All	0.00
S3-9	All	0.00
S3-10	All	0.00
BP1	None	0.00
BP2	None	0.00
BP 4.2	None	0.00
BP 4.1	None	0.00
BP 3.2	None	0.00
BP 3.1	All	0.00
BP 5	All	0.00

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
S2-6.2	Inlet	C2-4	(None)	No Restriction
	Inlet (1)	S2-2.000	(None)	No Restriction
S2-6	Inlet	S2-2.001	(None)	No Restriction
	Inlet (1)	S2-1.004	(None)	No Restriction
	Inlet (2)	C2-3	(None)	No Restriction
S2-7	Inlet	S2-1.005	(None)	No Restriction
S3-6.1 Hydrobrake	Inlet	S3-3.000	(None)	No Restriction
S3-6.2	Inlet	S3-3.001 C4-9	(None)	No Restriction
S3-6.3	Inlet	S3-3.002	(None)	No Restriction
	Inlet (1)	C4-10	(None)	No Restriction
S3-6	Inlet	S3-3.003	(None)	No Restriction
	Inlet (1)	S3-1.005	(None)	No Restriction
	Inlet (2)	C4-11	(None)	No Restriction
S4-2	Inlet	S4-1.000	(None)	No Restriction
	Inlet (1)	C3-2	(None)	No Restriction
S4-7	Inlet	S4-1.005	(None)	No Restriction
	Inlet (1)	S4-3.001	(None)	No Restriction
	Inlet (2)	C3-10	(None)	No Restriction
S3-11	Inlet	S3-1.010	(None)	No Restriction
	Inlet (1)	C4-16	(None)	No Restriction
S5-1 Hydrobrake	Inlet	S6-1.000A	(None)	No Restriction
S5-2	Inlet	S5-1.001 C5-1	(None)	No Restriction
S5-3	Inlet	S5-1.002	(None)	No Restriction
	Inlet (1)	C5-2	(None)	No Restriction
S5-4	Inlet	S5-1.003 S6-2.000	(None)	No Restriction
S5-5	Inlet	S5-1.004	(None)	No Restriction
	Inlet (1)	C5-4	(None)	No Restriction

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by: RP	Checked by: BM	Approved By: DB
Report Details: Type: Junctions Storm Phase: Phase	OSL Butler: 38 Eastgate Drive, Little Island, Cork T45 YO49		

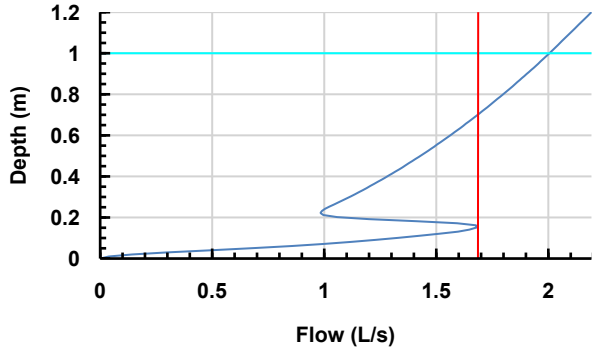
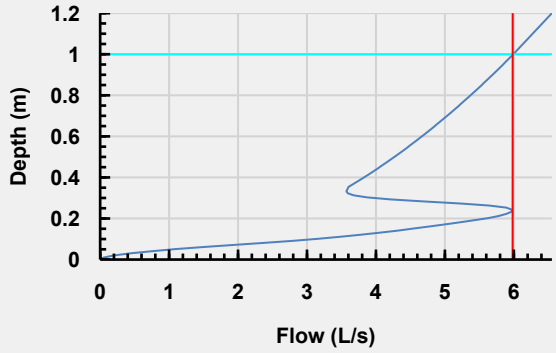
Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
S5-6	Inlet	S5-1.005 C5-6	(None)	No Restriction
S5-7	Inlet	S5-1.006 S5-3.000	(None)	No Restriction
S5-8 Hydrobrake	Inlet	S5-1.009	(None)	No Restriction
S2-5	Inlet	C2-2	(None)	No Restriction
	Inlet (1)	S2-1.003	(None)	No Restriction
S2-4	Inlet	C2-1	(None)	No Restriction
	Inlet (1)	S2-1.002	(None)	No Restriction
S2-3	Inlet (1)	S2-1.001	(None)	No Restriction
S2-2	Inlet	S2-1.000	(None)	No Restriction
	Inlet (1)	C2-5	(None)	No Restriction
S2-1	Inlet	C2-7	(None)	No Restriction
S1-3.1	Inlet (1)	C1-1	(None)	No Restriction
S1-3.2	Inlet	S1-2.000	(None)	No Restriction
	Inlet (1)	C1-4	(None)	No Restriction
S1-2	Inlet	C1-2	(None)	No Restriction
	Inlet (1)	S1-1.000	(None)	No Restriction
S1-1	Inlet (1)	C1-3	(None)	No Restriction
S1-4	Inlet	S1-1.002 C1-7	(None)	No Restriction
S1-5	Inlet	S1-1.003 S1-3.000	(None)	No Restriction
	Inlet (1)	C1-6	(None)	No Restriction
S1-5.1	Inlet	C1-5	(None)	No Restriction
S3-1 Hydrobrake	Inlet	S3-1.000	(None)	No Restriction
S3-2	Inlet	S3-1.001	(None)	No Restriction
	Inlet (1)	C4-7	(None)	No Restriction
S3-3	Inlet	S3-2.001	(None)	No Restriction
	Inlet (1)	S3-1.002	(None)	No Restriction
	Inlet (2)	C4-8	(None)	No Restriction
S3-3.2	Inlet	C4-6	(None)	No Restriction
	Inlet (1)	S3-2.000	(None)	No Restriction
S3-3.1	Inlet	C4-5	(None)	No Restriction
S1-3	Inlet	S1-1.001	(None)	No Restriction
	Inlet (1)	S1-2.001	(None)	No Restriction
S5-7.1	Inlet	C5-5	(None)	No Restriction
S5-4.1	Inlet	C5-3	(None)	No Restriction
S3-12	Inlet	C4-1	(None)	No Restriction
S3-13	Inlet	S3-5.000	(None)	No Restriction
	Inlet (1)	C4-2	(None)	No Restriction
S3-14	Inlet	S3-5.001	(None)	No Restriction
	Inlet (1)	C4-17	(None)	No Restriction
S3-15	Inlet	S5-5.002	(None)	No Restriction
	Inlet (1)	C4-18	(None)	No Restriction
S3-7.3	Inlet	S3-4.002	(None)	No Restriction
	Inlet (1)	C4-4	(None)	No Restriction
S3-7.2	Inlet	S3-4.001	(None)	No Restriction
	Inlet (1)	C4-3	(None)	No Restriction
S3-7.1 Hydrobrake	Inlet (1)	S5-1.000A	(None)	No Restriction
S4-9	Inlet	S4-4.000	(None)	No Restriction
	Inlet (1)	C3-7	(None)	No Restriction
S4-8	Inlet	C3-6	(None)	No Restriction
S4-7.1	Inlet	C3-8	(None)	No Restriction
S4-5	Inlet (2)	S4-1.003	(None)	No Restriction
S4-6	Inlet	C3-12	(None)	No Restriction
	Inlet (1)	S4-1.004	(None)	No Restriction

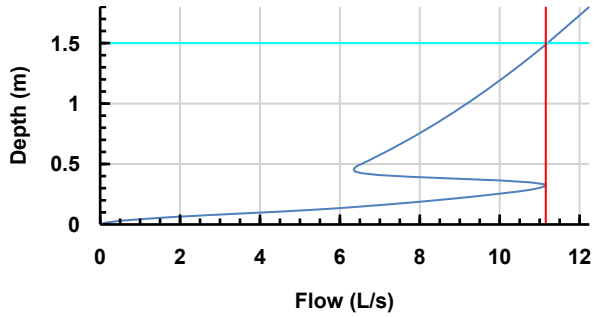
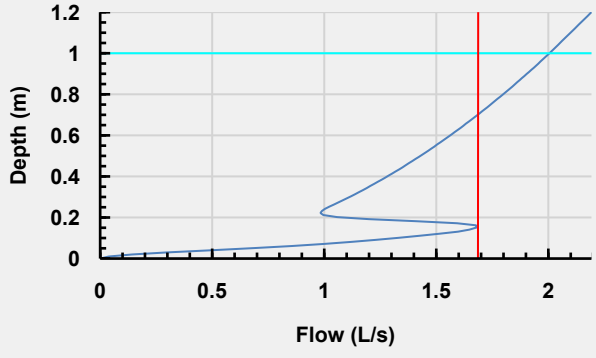
Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Junctions Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
S4-4	Inlet	S4-2.001 S4.1.002	(None)	No Restriction
	Inlet (1)	C3-11	(None)	No Restriction
S4-3.2	Inlet	S4-2.000	(None)	No Restriction
	Inlet (1)	C3-4	(None)	No Restriction
S4-4.1	Inlet	C3-3	(None)	No Restriction
S4-3	Inlet	S4-1.001	(None)	No Restriction
	Inlet (1)	C3-5	(None)	No Restriction
S4-1	Inlet	C3-1	(None)	No Restriction
Outfall Manhole	Inlet	S5-1.010	(None)	No Restriction
S2-6.1	Inlet	C2-6	(None)	No Restriction
S3-4	Inlet	S3-1.003	(None)	No Restriction
S3-5	Inlet	S3-1.004 C4-12	(None)	No Restriction
S3-7	Inlet	S3-1.006	(None)	No Restriction
	Inlet (1)	C4-13	(None)	No Restriction
S4-7.2	Inlet	S4-3.000 C3-9	(None)	No Restriction
S3-8	Inlet	S3-4.003 C4-14	(None)	No Restriction
	Inlet (1)	S3-1.007	(None)	No Restriction
S3-9	Inlet	S3-1.008	(None)	No Restriction
S3-10	Inlet	S3-1.009	(None)	No Restriction
	Inlet (1)	C4-15	(None)	No Restriction
BP1	Inlet	S1-1.004	(None)	No Restriction
BP2	Inlet	S2-1.006	(None)	No Restriction
BP 4.2	Inlet	S4-4.001	(None)	No Restriction
BP 4.1	Inlet	S4-1.006	(None)	No Restriction
BP 3.2	Inlet	S3-5.003	(None)	No Restriction
BP 3.1	Inlet	S3-1.011	(None)	No Restriction
BP 5	Inlet	S5-1.007	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
S2-6.2	Outlet	S2-2.001	Free Discharge
S2-6	Outlet	S2-1.005	Free Discharge
S2-7	Outlet	S2-1.006	Free Discharge
	Outlet	S3-3.001	Hydro-Brake®

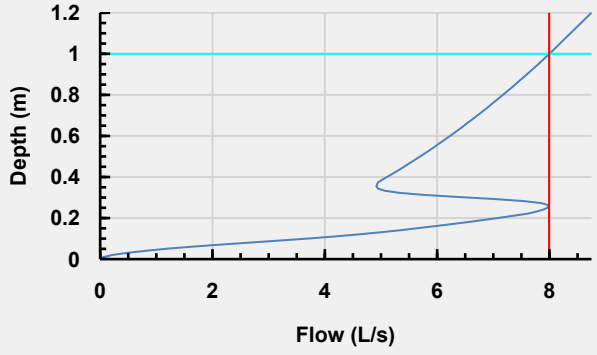
Junction	Outlet Name	Outgoing Connection	Outlet Type
S3-6.1 Hydrobrake	Invert Elevation (m)	15.202	
	Design Depth (m)	1.000	
	Design Flow (L/s)	2.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0064-2000-1000-2000	
			
S3-6.2	Outlet	S3-3.002	Free Discharge
S3-6.3	Outlet	S3-3.003	Free Discharge
S3-6	Outlet	S3-1.006	Free Discharge
S4-2	Outlet	S4-1.001	Free Discharge
S4-7	Outlet	S4-1.006	Free Discharge
S3-11	Outlet	S3-1.011	Free Discharge
S5-1 Hydrobrake	Outlet	S5-1.001	Hydro-Brake®
	Invert Elevation (m)	12.084	
	Design Depth (m)	1.000	
	Design Flow (L/s)	6.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0110-6000-1000-6000	
			
S5-2	Outlet	S5-1.002	Free Discharge
S5-3	Outlet	S5-1.003	Free Discharge
S5-4	Outlet	S5-1.004	Free Discharge
S5-5	Outlet	S5-1.005	Free Discharge
S5-6	Outlet	S5-1.006	Free Discharge
S5-7	Outlet	S5-1.007	Free Discharge
	Outlet (1)	S5-1.010	Hydro-Brake®

Junction	Outlet Name	Outgoing Connection	Outlet Type
S5-8 Hydrobrake	Invert Elevation (m)	11.505	
	Design Depth (m)	1.500	
	Design Flow (L/s)	11.2	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0138-1120-1500-1120	
			
S2-5	Outlet	S2-1.004	Free Discharge
S2-4	Outlet	S2-1.003	Free Discharge
S2-3	Outlet	S2-1.002	Free Discharge
S2-2	Outlet	S2-1.001	Free Discharge
S2-1	Outlet	S2-1.000	Free Discharge
S1-3.1	Outlet	S1-2.000	Free Discharge
S1-3.2	Outlet	S1-2.001	Free Discharge
S1-2	Outlet	S1-1.001	Free Discharge
S1-1	Outlet	S1-1.000	Free Discharge
S1-4	Outlet	S1-1.003	Free Discharge
S1-5	Outlet	S1-1.004	Free Discharge
S1-5.1	Outlet	S1-3.000	Free Discharge
S3-1 Hydrobrake	Outlet	S3-1.001	Hydro-Brake®
	Invert Elevation (m)	17.148	
	Design Depth (m)	1.000	
	Design Flow (L/s)	2.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0064-2000-1000-2000	
			
S3-2	Outlet	S3-1.002	Free Discharge
S3-3	Outlet	S3-1.003	Free Discharge
S3-3.2	Outlet	S3-2.001	Free Discharge
S3-3.1	Outlet	S3-2.000	Free Discharge

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Junctions Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

Junction	Outlet Name	Outgoing Connection	Outlet Type
S1-3	Outlet	S1-1.002	Free Discharge
S5-7.1	Outlet	S5-3.000	Free Discharge
S5-4.1	Outlet	S6-2.000	Free Discharge
S3-12	Outlet	S3-5.000	Free Discharge
S3-13	Outlet	S3-5.001	Free Discharge
S3-14	Outlet	S5-5.002	Free Discharge
S3-15	Outlet	S3-5.003	Free Discharge
S3-7.3	Outlet	S3-4.003	Free Discharge
S3-7.2	Outlet	S3-4.002	Free Discharge
S3-7.1 Hydrobrake	Outlet	S3-4.001	Hydro-Brake®

Invert Elevation (m)	12.785
Design Depth (m)	1.000
Design Flow (L/s)	8.0
Objective	Minimize Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0125-8000-1000-8000



Junction	Outlet Name	Outgoing Connection	Outlet Type
S4-9	Outlet	S4-4.001	Free Discharge
S4-8	Outlet	S4-4.000	Free Discharge
S4-7.1	Outlet	S4-3.000	Free Discharge
S4-5	Outlet	S4-1.004	Free Discharge
S4-6	Outlet	S4-1.005	Free Discharge
S4-4	Outlet	S4-1.003	Free Discharge
S4-3.2	Outlet	S4-2.001	Free Discharge
S4-4.1	Outlet	S4-2.000	Free Discharge
S4-3	Outlet	S4.1.002	Free Discharge
S4-1	Outlet	S4-1.000	Free Discharge
S2-6.1	Outlet	S2-2.000	Free Discharge
S3-4	Outlet	S3-1.004	Free Discharge
S3-5	Outlet	S3-1.005	Free Discharge
S3-7	Outlet	S3-1.007	Free Discharge
S4-7.2	Outlet	S4-3.001	Free Discharge
S3-8	Outlet	S3-1.008	Free Discharge
S3-9	Outlet	S3-1.009	Free Discharge
S3-10	Outlet	S3-1.010	Free Discharge
BP1	Outlet	S1-1.00	Free Discharge
BP2	Outlet	S2-1.007	Free Discharge
BP 4.2	Outlet	S4-4.002	Free Discharge
BP 4.1	Outlet	S4-1.007	Free Discharge
BP 3.2	Outlet	S3-5.004	Free Discharge
BP 3.1	Outlet	Pipe	Free Discharge
BP 5	Outlet	S5-1.008	Free Discharge



C2 - Attenuation Tank

Type : Cellular Storage

Dimensions

Exceedance Elevation (m)	16.987
Depth (m)	1.050
Base Elevation (m)	15.223
Number of Crates Long	22
Number of Crates Wide	18
Number of Crates High	3
Porosity (%)	96
Crate Length (m)	0.8
Crate Width (m)	0.8
Crate Height (m)	0.35
Total Volume (m³)	256.182

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	S2-1.007
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S3-3.000
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.0289
Side Infiltration Rate (m/hr)	0.0289
Safety Factor	2.0



C1 - Attenuation Tank

Type : Cellular Storage

Dimensions

Exceedance Elevation (m)	19.281
Depth (m)	1.050
Base Elevation (m)	17.230
Number of Crates Long	30
Number of Crates Wide	14
Number of Crates High	3
Porosity (%)	98
Crate Length (m)	0.8
Crate Width (m)	0.8
Crate Height (m)	0.35
Total Volume (m³)	277.596

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	S1-1.00
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S3-1.000
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.029
Side Infiltration Rate (m/hr)	0.029
Safety Factor	2.0



C3 - Attenuation Tank

Type : Cellular Storage

Dimensions

Exceedance Elevation (m)	15.412
Depth (m)	1.050
Base Elevation (m)	12.090
Number of Crates Long	27
Number of Crates Wide	27
Number of Crates High	3
Porosity (%)	96
Crate Length (m)	0.8
Crate Width (m)	0.8
Crate Height (m)	0.35
Total Volume (m³)	472.564

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	S3-5.004
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S6-1.000A
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.282
Side Infiltration Rate (m/hr)	0.282
Safety Factor	2.0



C4 - Attenuation Tank

Type : Cellular Storage

Dimensions

Exceedance Elevation (m)	15.150
Depth (m)	1.050
Base Elevation (m)	12.800
Number of Crates Long	20
Number of Crates Wide	20
Number of Crates High	3
Porosity (%)	96
Crate Length (m)	0.8
Crate Width (m)	0.8
Crate Height (m)	0.35
Total Volume (m³)	259.348

Inlets

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	S4-4.002
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	S4-1.007
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S5-1.000A
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.17
Side Infiltration Rate (m/hr)	0.17
Safety Factor	2.0

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Stormwater Controls Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		



C5 - Attenuation Tank

Type : Cellular Storage

Dimensions

Exceedance Elevation (m)	14.550
Depth (m)	1.050
Base Elevation (m)	11.533
Number of Crates Long	16
Number of Crates Wide	15
Number of Crates High	3
Porosity (%)	96
Crate Length (m)	0.8
Crate Width (m)	0.8
Crate Height (m)	0.35
Total Volume (m³)	156.796

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	S5-1.008
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S5-1.009
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.078
Side Infiltration Rate (m/hr)	0.078
Safety Factor	2.0

Flow Options

Peak Flow Calculation	Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimize Excavation
Design Level	Level Crowns
Min. Cover Depth (m)	1.200
Min. Slope (1:x)	1000.00
Max. Slope (1:x)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☑
Reduce Channel Depths	☑

Manhole Options

Apply Offset	☐

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by: RP	Checked by: BM	Approved By: DB
Report Details: Type: Outfall Details Storm Phase: Phase	OSL Butler: 38 Eastgate Drive, Little Island, Cork T45 YO49		

Outfalls

Outfall	Outfall Type	Gated	Fixed Surcharged Elevation (m)	Elevation Curve
Outfall Manhole	Free Discharge			

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	10
Junction Flood Risk Margin (mm)	300
Perform First Flush Analysis	☐

Rainfall

5 Yr

Type: FSR

Region	Scotland and Ireland
M5-60 (mm)	16.9
Ratio R	0.318
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
5.0	30.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

30 Yr

Type: FSR

Region	Scotland and Ireland
M5-60 (mm)	16.9
Ratio R	0.318
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
30.0	30.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

100 Yr

Type: FSR

Region	Scotland and Ireland
M5-60 (mm)	16.9
Ratio R	0.318
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	30.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

5 Yr: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (km^2)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
C2-1	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	6.4	2.960
C2-2	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	6.4	2.942
C2-3	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	14.7	6.768
C2-4	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	13.5	6.216
C2-5	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	30.6	14.120
C2-6	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	10.7	4.957
C2-7	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	35.0	16.160
C1-1	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	26.8	12.390
C1-2	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	12.3	5.658
C1-3	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	25.4	11.737
C1-4	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	4.5	2.087
C1-5	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	26.9	12.402
C1-6	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	22.4	10.354
C1-7	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	15.2	7.011
C3-1	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	17.7	8.153
C3-2	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	13.6	6.300
C3-3	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	12.0	5.538
C3-4	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	21.4	9.883
C3-5	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	16.0	7.365
C3-6	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	37.4	17.284

C3-7	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	16.3	7.506
C3-8	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	9.3	4.297
C3-9	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	5.3	2.468
C3-10	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	26.1	12.027
C3-11	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	3.8	1.763
C3-12	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	9.7	4.489
C4-1	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	45.4	20.969
C4-2	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	28.5	13.164
C4-3	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	25.7	11.868
C4-4	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	22.6	10.438
C4-5	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	14.4	6.645
C4-6	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	7.2	3.322
C4-7	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	16.7	7.724
C4-8	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	1.8	0.819
C4-9	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	20.9	9.644
C4-10	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	11.8	5.433
C4-11	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	4.9	2.258
C4-12	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	10.1	4.663
C4-13	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	23.6	10.894
C4-14	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	13.4	6.165
C4-15	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	6.5	3.005
C4-16	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	12.0	5.547
C4-17	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	24.4	11.242

C4-18	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	12.5	5.775
C5-1	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	18.7	8.615
C5-2	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	17.1	7.880
C5-3	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	26.4	12.186
C5-4	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	5.2	2.399
C5-5	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	34.9	16.091
C5-6	5 Yr: 5 years: +30 %: 15 mins: Winter	0.00	18.5	8.534



30 Yr: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (km²)	Max. Inflow (L/s)	Total Inflow Volume (m³)
C2-1	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	9.5	4.367
C2-2	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	9.4	4.340
C2-3	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	21.7	9.994
C2-4	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	19.9	9.181
C2-5	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	45.2	20.855
C2-6	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	15.9	7.322
C2-7	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	51.7	23.861
C1-1	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	39.6	18.303
C1-2	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	18.1	8.359
C1-3	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	37.5	17.328
C1-4	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	6.7	3.074
C1-5	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	39.7	18.309
C1-6	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	33.1	15.291
C1-7	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	22.4	10.354
C3-1	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	26.1	12.037

C3-2	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	20.2	9.304
C3-3	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	17.7	8.179
C3-4	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	31.6	14.589
C3-5	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	23.6	10.870
C3-6	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	55.3	25.519
C3-7	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	24.0	11.086
C3-8	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	13.7	6.341
C3-9	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	7.9	3.650
C3-10	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	38.5	17.760
C3-11	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	5.6	2.601
C3-12	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	14.4	6.632
C4-1	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	67.1	30.966
C4-2	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	42.1	19.439
C4-3	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	38.0	17.520
C4-4	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	33.4	15.420
C4-5	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	21.2	9.805
C4-6	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	10.6	4.904

C4-7	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	24.7	11.404
C4-8	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	2.6	1.203
C4-9	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	30.9	14.241
C4-10	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	17.4	8.024
C4-11	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	7.2	3.338
C4-12	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	14.9	6.887
C4-13	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	34.8	16.080
C4-14	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	19.7	9.100
C4-15	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	9.6	4.439
C4-16	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	17.7	8.191
C4-17	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	36.0	16.602
C4-18	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	18.5	8.530
C5-1	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	27.6	12.718
C5-2	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	25.2	11.638
C5-3	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	39.0	18.000
C5-4	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	7.7	3.542
C5-5	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	51.5	23.759

C5-6	30 Yr: 30 years: +30 %: 15 mins: Winter	0.00	27.3	12.604



100 Yr: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (km²)	Max. Inflow (L/s)	Total Inflow Volume (m³)
C2-1	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	12.3	5.673
C2-2	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	12.2	5.643
C2-3	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	28.1	12.989
C2-4	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	25.8	11.927
C2-5	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	58.7	27.089
C2-6	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	20.6	9.513
C2-7	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	67.1	31.007
C1-1	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	51.5	23.777
C1-2	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	23.5	10.857
C1-3	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	48.7	22.511
C1-4	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	8.7	3.996
C1-5	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	51.5	23.792
C1-6	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	43.0	19.868
C1-7	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	29.1	13.454
C3-1	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	33.9	15.644

C3-2	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	26.2	12.086
C3-3	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	23.0	10.629
C3-4	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	41.1	18.959
C3-5	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	30.6	14.123
C3-6	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	71.8	33.158
C3-7	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	31.2	14.402
C3-8	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	17.8	8.241
C3-9	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	10.3	4.737
C3-10	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	50.0	23.078
C3-11	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	7.3	3.378
C3-12	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	18.6	8.610
C4-1	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	87.1	40.234
C4-2	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	54.7	25.262
C4-3	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	49.3	22.766
C4-4	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	43.4	20.036
C4-5	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	27.6	12.740
C4-6	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	13.8	6.375

C4-7	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	32.1	14.816
C4-8	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	3.4	1.566
C4-9	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	40.1	18.500
C4-10	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	22.6	10.425
C4-11	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	9.4	4.335
C4-12	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	19.4	8.946
C4-13	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	45.2	20.894
C4-14	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	25.6	11.825
C4-15	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	12.5	5.766
C4-16	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	23.0	10.644
C4-17	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	46.7	21.569
C4-18	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	24.0	11.085
C5-1	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	35.8	16.523
C5-2	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	32.7	15.122
C5-3	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	50.6	23.387
C5-4	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	10.0	4.599
C5-5	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	66.8	30.872

C5-6	100 Yr: 100 years: +30 %: 15 mins: Winter	0.00	35.5	16.376

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Junctions Summary Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

5 Yr: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S2-6.2	5 Yr: 5 years: +30 %: 15 mins: Winter	17.016	15.465	15.766	0.301	20.4	0.340	0.000	16.2	11.170	Surcharged
S2-6	5 Yr: 5 years: +30 %: 15 mins: Winter	17.115	15.403	15.759	0.356	90.8	0.403	0.000	88.1	53.967	Surcharged
S2-7	5 Yr: 5 years: +30 %: 480 mins: Winter	17.055	15.355	15.689	0.334	15.5	0.378	0.000	15.4	178.497	Surcharged
S3-6.1 Hydrobrake	5 Yr: 5 years: +30 %: 480 mins: Winter	16.987	15.202	15.689	0.487	1.8	0.551	0.000	1.7	61.393	Surcharged
S3-6.2	5 Yr: 5 years: +30 %: 15 mins: Winter	17.082	15.170	15.281	0.111	20.9	0.126	0.000	19.5	10.962	OK
S3-6.3	5 Yr: 5 years: +30 %: 15 mins: Winter	17.330	15.061	15.162	0.101	31.3	0.114	0.000	30.0	16.188	OK
S3-6	5 Yr: 5 years: +30 %: 15 mins: Winter	17.883	14.874	15.093	0.219	83.3	0.248	0.000	80.1	42.905	OK
S4-2	5 Yr: 5 years: +30 %: 15 mins: Winter	16.155	14.618	14.727	0.109	30.4	0.123	0.000	28.5	14.436	OK
S4-7	5 Yr: 5 years: +30 %: 15 mins: Winter	15.236	12.939	13.343	0.404	120.4	0.457	0.000	118.8	60.855	Surcharged
S3-11	5 Yr: 5 years: +30 %: 15 mins: Winter	14.976	12.208	12.549	0.341	152.7	0.385	0.000	149.9	95.580	OK
S5-1 Hydrobrake	5 Yr: 5 years: +30 %: 120 mins: Winter	15.450	12.084	12.504	0.420	6.1	0.475	0.000	6.0	50.618	Surcharged
S5-2	5 Yr: 5 years: +30 %: 15 mins: Winter	15.424	11.963	12.136	0.173	18.7	0.195	0.000	13.9	14.219	OK
S5-3	5 Yr: 5 years: +30 %: 15 mins: Winter	15.737	11.939	12.132	0.193	29.0	0.219	0.000	26.3	21.648	OK
S5-4	5 Yr: 5 years: +30 %: 15 mins: Winter	15.547	11.874	12.113	0.239	51.4	0.270	0.000	49.1	33.642	OK
S5-5	5 Yr: 5 years: +30 %: 15 mins: Winter	15.487	11.852	12.086	0.234	54.3	0.265	0.000	51.8	35.855	OK
S5-6	5 Yr: 5 years: +30 %: 180 mins: Winter	15.298	11.786	12.081	0.295	27.0	0.334	0.000	26.9	162.190	OK
S5-7	5 Yr: 5 years: +30 %: 180 mins: Winter	14.878	11.651	12.079	0.428	36.0	0.484	0.000	35.0	201.263	Surcharged
S5-8 Hydrobrake	5 Yr: 5 years: +30 %: 180 mins: Winter	14.608	11.505	12.078	0.573	11.1	0.648	0.000	11.1	137.740	Surcharged
S2-5	5 Yr: 5 years: +30 %: 15 mins: Winter	17.080	15.425	15.793	0.368	62.3	0.416	0.000	60.0	36.116	Surcharged
S2-4	5 Yr: 5 years: +30 %: 15 mins: Winter	17.027	15.461	15.832	0.371	58.9	0.420	0.000	56.0	33.194	Surcharged
S2-3	5 Yr: 5 years: +30 %: 15 mins: Winter	17.017	15.492	15.863	0.371	63.0	0.420	0.000	52.5	30.249	Surcharged
S2-2	5 Yr: 5 years: +30 %: 15 mins: Winter	18.500	16.822	16.931	0.109	64.6	0.123	0.000	63.0	30.278	OK
S2-1	5 Yr: 5 years: +30 %: 15 mins: Winter	18.678	17.178	17.289	0.111	35.0	0.125	0.000	34.0	16.161	OK
S1-3.1	5 Yr: 5 years: +30 %: 15 mins: Winter	19.600	18.175	18.299	0.124	26.8	0.141	0.000	25.6	12.389	OK
S1-3.2	5 Yr: 5 years: +30 %: 15 mins: Winter	19.289	17.868	17.951	0.083	30.1	0.094	0.000	30.1	14.467	OK
S1-2	5 Yr: 5 years: +30 %: 15 mins: Winter	19.215	17.595	17.806	0.211	33.9	0.238	0.000	29.7	17.379	OK
S1-1	5 Yr: 5 years: +30 %: 15 mins: Winter	19.044	17.700	17.837	0.137	25.4	0.156	0.000	21.6	11.747	OK
S1-4	5 Yr: 5 years: +30 %: 15 mins: Winter	19.611	17.405	17.738	0.333	66.9	0.377	0.000	64.2	38.603	Surcharged
S1-5	5 Yr: 5 years: +30 %: 480 mins: Winter	19.398	17.345	17.714	0.369	17.5	0.417	0.000	17.0	202.270	Surcharged
S1-5.1	5 Yr: 5 years: +30 %: 480 mins: Winter	18.848	17.529	17.714	0.185	3.6	0.209	0.000	3.6	41.056	OK

S3-1 Hydrobrake	5 Yr: 5 years: +30 %: 480 mins: Winter	19.245	17.148	17.713	0.565	1.7	0.640	0.000	1.7	72.140	Surcharged
S3-2	5 Yr: 5 years: +30 %: 15 mins: Winter	19.427	16.650	16.716	0.066	18.2	0.074	0.000	17.7	9.234	OK
S3-3	5 Yr: 5 years: +30 %: 15 mins: Winter	19.130	16.262	16.375	0.113	40.2	0.128	0.000	39.1	19.960	OK
S3-3.2	5 Yr: 5 years: +30 %: 15 mins: Winter	18.980	17.853	17.891	0.038	20.9	0.043	0.000	20.7	9.961	OK
S3-3.1	5 Yr: 5 years: +30 %: 15 mins: Winter	19.644	18.034	18.130	0.096	14.4	0.108	0.000	13.7	6.639	OK
S1-3	5 Yr: 5 years: +30 %: 15 mins: Winter	19.199	17.580	17.798	0.218	59.8	0.247	0.000	51.7	31.861	OK
S5-7.1	5 Yr: 5 years: +30 %: 15 mins: Winter	14.501	12.996	13.121	0.125	34.9	0.141	0.000	32.6	16.083	OK
S5-4.1	5 Yr: 5 years: +30 %: 15 mins: Winter	15.855	14.430	14.516	0.086	26.4	0.098	0.000	25.1	12.182	OK
S3-12	5 Yr: 5 years: +30 %: 15 mins: Winter	15.962	14.462	14.617	0.155	45.4	0.175	0.000	43.4	20.984	OK
S3-13	5 Yr: 5 years: +30 %: 15 mins: Winter	16.200	14.224	14.417	0.193	72.0	0.218	0.000	66.4	34.091	OK
S3-14	5 Yr: 5 years: +30 %: 15 mins: Winter	15.909	13.862	13.972	0.110	90.7	0.124	0.000	88.5	45.340	OK
S3-15	5 Yr: 5 years: +30 %: 15 mins: Winter	15.714	12.226	12.559	0.333	101.0	0.376	0.000	96.9	50.427	Surcharged
S3-7.3	5 Yr: 5 years: +30 %: 15 mins: Winter	15.102	12.562	12.925	0.363	38.1	0.410	0.000	33.9	28.986	Surcharged
S3-7.2	5 Yr: 5 years: +30 %: 15 mins: Winter	15.152	12.740	12.956	0.216	25.7	0.245	0.000	16.7	19.498	OK
S3-7.1 Hydrobrake	5 Yr: 5 years: +30 %: 120 mins: Winter	15.171	12.785	13.260	0.475	8.1	0.537	0.000	8.0	66.384	Surcharged
S4-9	5 Yr: 5 years: +30 %: 15 mins: Winter	15.228	13.174	13.381	0.207	53.2	0.234	0.000	51.3	24.778	OK
S4-8	5 Yr: 5 years: +30 %: 15 mins: Winter	16.065	14.744	14.816	0.072	37.4	0.081	0.000	36.9	17.294	OK
S4-7.1	5 Yr: 5 years: +30 %: 15 mins: Winter	15.574	14.149	14.212	0.063	9.3	0.071	0.000	9.1	4.296	OK
S4-5	5 Yr: 5 years: +30 %: 15 mins: Winter	15.270	13.015	13.482	0.467	75.4	0.528	0.000	72.3	38.753	Surcharged
S4-6	5 Yr: 5 years: +30 %: 15 mins: Winter	15.170	12.961	13.401	0.440	82.1	0.497	0.000	80.3	42.855	Surcharged
S4-4	5 Yr: 5 years: +30 %: 15 mins: Winter	15.327	13.441	13.561	0.120	78.6	0.136	0.000	75.4	38.950	OK
S4-3.2	5 Yr: 5 years: +30 %: 15 mins: Winter	16.021	14.609	14.686	0.077	33.2	0.087	0.000	32.3	15.432	OK
S4-4.1	5 Yr: 5 years: +30 %: 15 mins: Winter	16.545	15.031	15.087	0.056	12.0	0.063	0.000	11.8	5.538	OK
S4-3	5 Yr: 5 years: +30 %: 15 mins: Winter	15.730	14.116	14.222	0.106	44.4	0.120	0.000	42.5	21.785	OK
S4-1	5 Yr: 5 years: +30 %: 15 mins: Winter	17.143	14.833	14.936	0.103	17.7	0.117	0.000	16.7	8.154	OK
Outfall Manhole	5 Yr: 5 years: +30 %: 600 mins: Summer	14.600	11.491	11.568	0.078	11.1	0.000	0.000	11.1	181.111	OK
S2-6.1	5 Yr: 5 years: +30 %: 15 mins: Winter	16.983	15.491	15.765	0.274	10.7	0.310	0.000	6.9	4.955	OK
S3-4	5 Yr: 5 years: +30 %: 15 mins: Winter	18.532	16.125	16.208	0.083	39.1	0.094	0.000	38.7	19.932	OK
S3-5	5 Yr: 5 years: +30 %: 15 mins: Winter	17.883	15.662	15.729	0.067	48.8	0.076	0.000	48.4	24.580	OK
S3-7	5 Yr: 5 years: +30 %: 15 mins: Winter	16.660	14.806	14.923	0.117	103.7	0.132	0.000	102.4	53.738	OK
S4-7.2	5 Yr: 5 years: +30 %: 15 mins: Winter	15.426	13.992	14.040	0.048	14.4	0.054	0.000	14.1	6.763	OK
S3-8	5 Yr: 5 years: +30 %: 15 mins: Winter	15.548	12.383	12.781	0.398	149.6	0.451	0.000	143.9	88.234	OK
S3-9	5 Yr: 5 years: +30 %: 15 mins: Winter	15.689	12.345	12.713	0.368	143.9	0.416	0.000	139.1	87.937	OK
S3-10	5 Yr: 5 years: +30 %: 15 mins: Winter	15.886	12.285	12.629	0.344	145.6	0.389	0.000	140.7	90.635	OK

BP1	5 Yr: 5 years: +30 %: 480 mins: Winter	19.346	17.238	17.714	0.476	17.0	0.538	0.000	16.9	201.927	Surcharged
BP2	5 Yr: 5 years: +30 %: 480 mins: Winter	17.036	15.246	15.689	0.443	15.4	0.501	0.000	15.2	178.095	Surcharged
BP 4.2	5 Yr: 5 years: +30 %: 120 mins: Winter	15.189	12.986	13.261	0.274	18.2	0.310	0.000	18.2	53.256	OK
BP 4.1	5 Yr: 5 years: +30 %: 120 mins: Winter	15.181	12.815	13.261	0.446	44.6	0.504	0.000	44.1	133.558	Surcharged
BP 3.2	5 Yr: 5 years: +30 %: 120 mins: Winter	15.450	12.097	12.504	0.407	37.5	0.460	0.000	37.3	109.444	Surcharged
BP 3.1	5 Yr: 5 years: +30 %: 120 mins: Winter	15.095	12.095	12.506	0.411	74.5	0.465	0.000	74.3	286.977	Surcharged
BP 5	5 Yr: 5 years: +30 %: 180 mins: Winter	14.829	11.544	12.079	0.535	35.0	0.605	0.000	34.7	201.028	Surcharged

30 Yr: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S2-6.2	30 Yr: 30 years: +30 %: 15 mins: Winter	17.016	15.465	16.094	0.629	32.3	0.711	0.000	28.8	16.340	Surcharged
S2-6	30 Yr: 30 years: +30 %: 15 mins: Winter	17.115	15.403	16.077	0.674	149.0	0.762	0.000	145.7	78.689	Surcharged
S2-7	30 Yr: 30 years: +30 %: 600 mins: Winter	17.055	15.355	15.947	0.592	17.3	0.670	0.000	17.1	265.542	Surcharged
S3-6.1 Hydrobrake	30 Yr: 30 years: +30 %: 600 mins: Winter	16.987	15.202	15.947	0.745	1.8	0.842	0.000	1.7	94.885	Surcharged
S3-6.2	30 Yr: 30 years: +30 %: 15 mins: Winter	17.082	15.170	15.310	0.140	30.9	0.158	0.000	28.9	15.574	OK
S3-6.3	30 Yr: 30 years: +30 %: 15 mins: Winter	17.330	15.061	15.190	0.129	46.3	0.146	0.000	43.4	23.332	OK
S3-6	30 Yr: 30 years: +30 %: 15 mins: Winter	17.883	14.874	15.158	0.284	122.0	0.321	0.000	118.1	62.319	OK
S4-2	30 Yr: 30 years: +30 %: 15 mins: Winter	16.155	14.618	14.759	0.141	45.0	0.160	0.000	42.2	21.322	OK
S4-7	30 Yr: 30 years: +30 %: 180 mins: Winter	15.236	12.939	13.555	0.616	49.8	0.696	0.000	49.3	219.638	Surcharged
S3-11	30 Yr: 30 years: +30 %: 180 mins: Winter	14.976	12.208	12.809	0.601	79.3	0.679	0.000	78.6	479.441	Surcharged
S5-1 Hydrobrake	30 Yr: 30 years: +30 %: 180 mins: Winter	15.450	12.084	12.805	0.721	6.0	0.816	0.000	5.7	69.156	Surcharged
S5-2	30 Yr: 30 years: +30 %: 180 mins: Winter	15.424	11.963	12.398	0.435	12.9	0.492	0.000	12.8	98.950	Surcharged
S5-3	30 Yr: 30 years: +30 %: 180 mins: Winter	15.737	11.939	12.398	0.459	19.2	0.519	0.000	18.8	126.390	Surcharged
S5-4	30 Yr: 30 years: +30 %: 180 mins: Winter	15.547	11.874	12.397	0.523	28.7	0.592	0.000	28.5	168.792	Surcharged
S5-5	30 Yr: 30 years: +30 %: 180 mins: Winter	15.487	11.852	12.397	0.545	30.5	0.616	0.000	29.5	176.433	Surcharged
S5-6	30 Yr: 30 years: +30 %: 180 mins: Winter	15.298	11.786	12.395	0.609	36.5	0.689	0.000	35.1	204.447	Surcharged
S5-7	30 Yr: 30 years: +30 %: 180 mins: Winter	14.878	11.651	12.392	0.741	48.2	0.838	0.000	47.3	259.071	Surcharged
S5-8 Hydrobrake	30 Yr: 30 years: +30 %: 180 mins: Winter	14.608	11.505	12.391	0.886	11.1	1.002	0.000	10.9	140.051	Surcharged
S2-5	30 Yr: 30 years: +30 %: 15 mins: Winter	17.080	15.425	16.165	0.740	102.4	0.837	0.000	98.6	52.980	Surcharged
S2-4	30 Yr: 30 years: +30 %: 15 mins: Winter	17.027	15.461	16.268	0.807	97.6	0.913	0.000	93.0	48.895	Surcharged
S2-3	30 Yr: 30 years: +30 %: 15 mins: Winter	17.017	15.492	16.350	0.858	93.5	0.970	0.000	88.1	44.612	Surcharged
S2-2	30 Yr: 30 years: +30 %: 15 mins: Winter	18.500	16.822	16.960	0.138	95.5	0.156	0.000	93.5	44.663	OK
S2-1	30 Yr: 30 years: +30 %: 15 mins: Winter	18.678	17.178	17.318	0.140	51.7	0.158	0.000	50.3	23.862	OK
S1-3.1	30 Yr: 30 years: +30 %: 15 mins: Winter	19.600	18.175	18.331	0.156	39.6	0.177	0.000	40.1	18.236	OK
S1-3.2	30 Yr: 30 years: +30 %: 15 mins: Winter	19.289	17.868	18.131	0.263	46.8	0.297	0.000	28.2	21.368	Surcharged
S1-2	30 Yr: 30 years: +30 %: 15 mins: Winter	19.215	17.595	18.093	0.498	49.7	0.563	0.000	43.7	25.672	Surcharged
S1-1	30 Yr: 30 years: +30 %: 15 mins: Winter	19.044	17.700	18.100	0.400	37.5	0.453	0.000	31.6	17.354	Surcharged
S1-4	30 Yr: 30 years: +30 %: 600 mins: Winter	19.611	17.405	17.984	0.579	13.6	0.655	0.000	12.9	191.093	Surcharged
S1-5	30 Yr: 30 years: +30 %: 600 mins: Winter	19.398	17.345	17.984	0.639	20.3	0.723	0.000	19.7	300.741	Surcharged
S1-5.1	30 Yr: 30 years: +30 %: 600 mins: Winter	18.848	17.529	17.984	0.455	4.3	0.515	0.000	4.1	61.025	Surcharged

S3-1 Hydrobrake	30 Yr: 30 years: +30 %: 600 mins: Winter	19.245	17.148	17.984	0.836	1.8	0.945	0.000	1.8	107.506	Surcharged
S3-2	30 Yr: 30 years: +30 %: 15 mins: Winter	19.427	16.650	16.730	0.080	26.4	0.090	0.000	25.6	13.096	OK
S3-3	30 Yr: 30 years: +30 %: 15 mins: Winter	19.130	16.262	16.404	0.142	58.9	0.161	0.000	57.5	28.941	OK
S3-3.2	30 Yr: 30 years: +30 %: 15 mins: Winter	18.980	17.853	17.900	0.047	31.0	0.053	0.000	30.7	14.701	OK
S3-3.1	30 Yr: 30 years: +30 %: 15 mins: Winter	19.644	18.034	18.153	0.119	21.2	0.135	0.000	20.4	9.799	OK
S1-3	30 Yr: 30 years: +30 %: 15 mins: Winter	19.199	17.580	18.083	0.503	71.9	0.569	0.000	65.3	47.128	Surcharged
S5-7.1	30 Yr: 30 years: +30 %: 15 mins: Winter	14.501	12.996	13.161	0.165	51.5	0.187	0.000	48.0	23.749	OK
S5-4.1	30 Yr: 30 years: +30 %: 15 mins: Winter	15.855	14.430	14.539	0.109	39.0	0.123	0.000	37.2	17.995	OK
S3-12	30 Yr: 30 years: +30 %: 15 mins: Winter	15.962	14.462	14.664	0.202	67.1	0.228	0.000	64.2	30.976	OK
S3-13	30 Yr: 30 years: +30 %: 15 mins: Winter	16.200	14.224	14.483	0.259	106.4	0.293	0.000	97.6	50.358	OK
S3-14	30 Yr: 30 years: +30 %: 15 mins: Winter	15.909	13.862	13.998	0.136	133.6	0.154	0.000	131.0	66.977	OK
S3-15	30 Yr: 30 years: +30 %: 180 mins: Winter	15.714	12.226	12.806	0.580	41.8	0.656	0.000	40.7	179.349	Surcharged
S3-7.3	30 Yr: 30 years: +30 %: 15 mins: Winter	15.102	12.562	13.420	0.858	52.8	0.970	0.000	45.7	35.263	Surcharged
S3-7.2	30 Yr: 30 years: +30 %: 15 mins: Winter	15.152	12.740	13.468	0.728	38.0	0.823	0.000	26.0	22.898	Surcharged
S3-7.1 Hydrobrake	30 Yr: 30 years: +30 %: 180 mins: Winter	15.171	12.785	13.552	0.767	8.2	0.868	0.000	8.0	112.163	Surcharged
S4-9	30 Yr: 30 years: +30 %: 180 mins: Winter	15.228	13.174	13.553	0.379	20.2	0.429	0.000	20.2	87.667	Surcharged
S4-8	30 Yr: 30 years: +30 %: 15 mins: Winter	16.065	14.744	14.832	0.088	55.3	0.099	0.000	54.7	25.538	OK
S4-7.1	30 Yr: 30 years: +30 %: 15 mins: Winter	15.574	14.149	14.226	0.077	13.7	0.087	0.000	13.4	6.339	OK
S4-5	30 Yr: 30 years: +30 %: 15 mins: Winter	15.270	13.015	13.651	0.636	83.5	0.719	0.000	80.0	56.387	Surcharged
S4-6	30 Yr: 30 years: +30 %: 180 mins: Winter	15.170	12.961	13.555	0.594	34.9	0.672	0.000	34.5	153.642	Surcharged
S4-4	30 Yr: 30 years: +30 %: 15 mins: Winter	15.327	13.441	13.756	0.315	117.9	0.357	0.000	83.5	57.528	Surcharged
S4-3.2	30 Yr: 30 years: +30 %: 15 mins: Winter	16.021	14.609	14.703	0.094	49.0	0.107	0.000	48.4	22.745	OK
S4-4.1	30 Yr: 30 years: +30 %: 15 mins: Winter	16.545	15.031	15.100	0.069	17.7	0.078	0.000	17.4	8.178	OK
S4-3	30 Yr: 30 years: +30 %: 15 mins: Winter	15.730	14.116	14.244	0.128	65.7	0.145	0.000	63.9	32.126	OK
S4-1	30 Yr: 30 years: +30 %: 15 mins: Winter	17.143	14.833	14.965	0.132	26.1	0.149	0.000	24.8	12.037	OK
Outfall Manhole	30 Yr: 30 years: +30 %: 120 mins: Winter	14.600	11.491	11.568	0.078	11.1	0.000	0.000	11.1	93.771	OK
S2-6.1	30 Yr: 30 years: +30 %: 15 mins: Winter	16.983	15.491	16.096	0.605	15.9	0.684	0.000	12.5	7.290	Surcharged
S3-4	30 Yr: 30 years: +30 %: 15 mins: Winter	18.532	16.125	16.228	0.103	57.5	0.117	0.000	57.0	28.911	OK
S3-5	30 Yr: 30 years: +30 %: 15 mins: Winter	17.883	15.662	15.750	0.088	71.9	0.100	0.000	71.3	35.781	OK
S3-7	30 Yr: 30 years: +30 %: 15 mins: Winter	16.660	14.806	14.953	0.147	152.9	0.166	0.000	151.6	78.286	OK
S4-7.2	30 Yr: 30 years: +30 %: 15 mins: Winter	15.426	13.992	14.051	0.059	21.4	0.066	0.000	21.1	9.971	OK
S3-8	30 Yr: 30 years: +30 %: 15 mins: Winter	15.548	12.383	13.177	0.794	217.0	0.898	0.000	211.6	121.776	Surcharged
S3-9	30 Yr: 30 years: +30 %: 15 mins: Winter	15.689	12.345	13.032	0.687	211.6	0.777	0.000	207.4	121.121	Surcharged
S3-10	30 Yr: 30 years: +30 %: 15 mins: Winter	15.886	12.285	12.856	0.571	217.0	0.646	0.000	213.7	124.409	Surcharged
BP1	30 Yr: 30 years: +30 %: 600 mins: Winter	19.346	17.238	17.984	0.746	19.7	0.844	0.000	19.6	300.153	Surcharged

BP2	30 Yr: 30 years: +30 %: 600 mins: Winter	17.036	15.246	15.947	0.701	17.1	0.793	0.000	17.1	264.851	Surcharged
BP 4.2	30 Yr: 30 years: +30 %: 180 mins: Winter	15.189	12.986	13.553	0.567	20.2	0.641	0.000	19.9	87.631	Surcharged
BP 4.1	30 Yr: 30 years: +30 %: 180 mins: Winter	15.181	12.815	13.554	0.739	49.3	0.835	0.000	49.0	219.317	Surcharged
BP 3.2	30 Yr: 30 years: +30 %: 180 mins: Winter	15.450	12.097	12.806	0.709	40.7	0.801	0.000	40.3	178.708	Surcharged
BP 3.1	30 Yr: 30 years: +30 %: 180 mins: Winter	15.095	12.095	12.808	0.713	78.6	0.806	0.000	78.2	479.226	Surcharged
BP 5	30 Yr: 30 years: +30 %: 180 mins: Winter	14.829	11.544	12.393	0.849	47.3	0.960	0.000	46.8	258.065	Surcharged

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Junctions Summary Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

100 Yr: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S2-6.2	100 Yr: 100 years: +30 %: 15 mins: Winter	17.016	15.465	16.377	0.912	43.1	1.031	0.000	39.7	20.821	Surcharged
S2-6	100 Yr: 100 years: +30 %: 15 mins: Winter	17.115	15.403	16.344	0.941	190.4	1.064	0.000	187.2	101.235	Surcharged
S2-7	100 Yr: 100 years: +30 %: 600 mins: Winter	17.055	15.355	16.191	0.836	22.5	0.945	0.000	22.4	330.254	Surcharged
S3-6.1 Hydrobrake	100 Yr: 100 years: +30 %: 600 mins: Winter	16.987	15.202	16.191	0.989	2.0	1.118	0.000	2.0	110.703	Surcharged
S3-6.2	100 Yr: 100 years: +30 %: 15 mins: Winter	17.082	15.170	15.333	0.163	40.1	0.185	0.000	38.3	20.034	OK
S3-6.3	100 Yr: 100 years: +30 %: 15 mins: Winter	17.330	15.061	15.289	0.228	60.9	0.258	0.000	45.6	29.991	OK
S3-6	100 Yr: 100 years: +30 %: 15 mins: Winter	17.883	14.874	15.259	0.385	148.1	0.436	0.000	147.1	80.326	Surcharged
S4-2	100 Yr: 100 years: +30 %: 15 mins: Winter	16.155	14.618	14.790	0.172	58.4	0.194	0.000	57.4	27.655	OK
S4-7	100 Yr: 100 years: +30 %: 180 mins: Winter	15.236	12.939	13.847	0.908	63.5	1.027	0.000	63.0	278.109	Surcharged
S3-11	100 Yr: 100 years: +30 %: 15 mins: Winter	14.976	12.208	13.347	1.139	263.9	1.289	0.000	257.6	165.626	Surcharged
S5-1 Hydrobrake	100 Yr: 100 years: +30 %: 240 mins: Winter	15.450	12.084	13.118	1.034	6.2	1.169	0.000	5.9	98.560	Surcharged
S5-2	100 Yr: 100 years: +30 %: 240 mins: Winter	15.424	11.963	13.110	1.147	12.0	1.298	0.000	11.8	138.751	Surcharged
S5-3	100 Yr: 100 years: +30 %: 240 mins: Winter	15.737	11.939	13.110	1.171	17.4	1.325	0.000	17.3	175.463	Surcharged
S5-4	100 Yr: 100 years: +30 %: 240 mins: Winter	15.547	11.874	13.110	1.236	25.9	1.398	0.000	25.6	234.303	Surcharged
S5-5	100 Yr: 100 years: +30 %: 240 mins: Winter	15.487	11.852	13.110	1.258	27.3	1.423	0.000	27.0	244.964	Surcharged
S5-6	100 Yr: 100 years: +30 %: 240 mins: Winter	15.298	11.786	13.109	1.323	33.9	1.496	0.000	33.6	284.447	Surcharged
S5-7	100 Yr: 100 years: +30 %: 240 mins: Winter	14.878	11.651	13.106	1.455	46.9	1.645	0.000	46.6	361.041	Surcharged
S5-8 Hydrobrake	100 Yr: 100 years: +30 %: 240 mins: Winter	14.608	11.505	13.104	1.599	11.6	1.809	0.000	11.2	215.308	Surcharged
S2-5	100 Yr: 100 years: +30 %: 15 mins: Winter	17.080	15.425	16.471	1.046	125.4	1.183	0.000	122.6	68.408	Surcharged
S2-4	100 Yr: 100 years: +30 %: 15 mins: Winter	17.027	15.461	16.610	1.149	115.5	1.299	0.000	113.2	63.161	Surcharged

S2-3	100 Yr: 100 years: +30 %: 15 mins: Winter	17.017	15.492	16.712	1.220	105.2	1.380	0.000	103.2	57.585	Surcharged
S2-2	100 Yr: 100 years: +30 %: 15 mins: Winter	18.500	16.822	17.008	0.186	124.0	0.210	0.000	105.2	58.030	OK
S2-1	100 Yr: 100 years: +30 %: 15 mins: Winter	18.678	17.178	17.343	0.165	67.1	0.186	0.000	65.4	30.994	OK
S1-3.1	100 Yr: 100 years: +30 %: 15 mins: Winter	19.600	18.175	18.848	0.673	51.5	0.761	0.000	43.6	23.690	Surcharged
S1-3.2	100 Yr: 100 years: +30 %: 15 mins: Winter	19.289	17.868	18.562	0.694	52.3	0.784	0.000	45.2	27.765	Surcharged
S1-2	100 Yr: 100 years: +30 %: 15 mins: Winter	19.215	17.595	18.522	0.927	64.6	1.049	0.000	57.4	33.325	Surcharged
S1-1	100 Yr: 100 years: +30 %: 15 mins: Winter	19.044	17.700	18.579	0.879	48.7	0.994	0.000	41.1	22.547	Surcharged
S1-4	100 Yr: 100 years: +30 %: 600 mins: Winter	19.611	17.405	18.244	0.839	15.6	0.949	0.000	15.3	236.461	Surcharged
S1-5	100 Yr: 100 years: +30 %: 600 mins: Winter	19.398	17.345	18.244	0.899	24.9	1.016	0.000	24.8	373.462	Surcharged
S1-5.1	100 Yr: 100 years: +30 %: 600 mins: Winter	18.848	17.529	18.244	0.715	5.5	0.808	0.000	5.1	75.763	Surcharged
S3-1 Hydrobrake	100 Yr: 100 years: +30 %: 600 mins: Winter	19.245	17.148	18.243	1.095	2.1	1.239	0.000	2.1	122.493	Surcharged
S3-2	100 Yr: 100 years: +30 %: 15 mins: Winter	19.427	16.650	16.742	0.092	33.4	0.104	0.000	32.6	16.667	OK
S3-3	100 Yr: 100 years: +30 %: 15 mins: Winter	19.130	16.262	16.429	0.167	75.9	0.188	0.000	74.3	37.276	OK
S3-3.2	100 Yr: 100 years: +30 %: 15 mins: Winter	18.980	17.853	17.906	0.053	40.3	0.060	0.000	39.9	19.106	OK
S3-3.1	100 Yr: 100 years: +30 %: 15 mins: Winter	19.644	18.034	18.173	0.139	27.6	0.157	0.000	26.5	12.734	OK
S1-3	100 Yr: 100 years: +30 %: 15 mins: Winter	19.199	17.580	18.495	0.915	102.6	1.035	0.000	95.6	61.098	Surcharged
S5-7.1	100 Yr: 100 years: +30 %: 15 mins: Winter	14.501	12.996	13.213	0.217	66.8	0.245	0.000	60.5	30.858	OK
S5-4.1	100 Yr: 100 years: +30 %: 15 mins: Winter	15.855	14.430	14.559	0.129	50.6	0.145	0.000	48.4	23.381	OK
S3-12	100 Yr: 100 years: +30 %: 15 mins: Winter	15.962	14.462	14.823	0.361	87.1	0.408	0.000	72.3	40.232	Surcharged
S3-13	100 Yr: 100 years: +30 %: 15 mins: Winter	16.200	14.224	14.612	0.388	127.0	0.439	0.000	119.5	65.471	Surcharged
S3-14	100 Yr: 100 years: +30 %: 15 mins: Winter	15.909	13.862	14.018	0.156	166.2	0.177	0.000	164.2	86.986	OK
S3-15	100 Yr: 100 years: +30 %: 240 mins: Winter	15.714	12.226	13.118	0.892	43.8	1.009	0.000	43.1	248.949	Surcharged
S3-7.3	100 Yr: 100 years: +30 %: 15 mins: Winter	15.102	12.562	14.147	1.585	55.4	1.792	0.000	50.2	44.092	Surcharged

S3-7.2	100 Yr: 100 years: +30 %: 15 mins: Winter	15.152	12.740	14.184	1.444	49.3	1.633	0.000	28.9	28.723	Surcharged
S3-7.1 Hydrobrake	100 Yr: 100 years: +30 %: 180 mins: Winter	15.171	12.785	13.845	1.060	7.9	1.198	0.000	7.6	117.011	Surcharged
S4-9	100 Yr: 100 years: +30 %: 180 mins: Winter	15.228	13.174	13.845	0.671	26.0	0.759	0.000	24.6	111.816	Surcharged
S4-8	100 Yr: 100 years: +30 %: 15 mins: Winter	16.065	14.744	14.845	0.101	71.8	0.114	0.000	71.1	33.195	OK
S4-7.1	100 Yr: 100 years: +30 %: 15 mins: Winter	15.574	14.149	14.238	0.089	17.8	0.101	0.000	17.5	8.239	OK
S4-5	100 Yr: 100 years: +30 %: 15 mins: Winter	15.270	13.015	14.111	1.096	115.7	1.240	0.000	112.2	73.121	Surcharged
S4-6	100 Yr: 100 years: +30 %: 15 mins: Winter	15.170	12.961	13.932	0.971	130.9	1.098	0.000	128.5	80.381	Surcharged
S4-4	100 Yr: 100 years: +30 %: 15 mins: Winter	15.327	13.441	14.293	0.852	120.9	0.964	0.000	115.7	74.746	Surcharged
S4-3.2	100 Yr: 100 years: +30 %: 15 mins: Winter	16.021	14.609	14.718	0.109	63.7	0.124	0.000	62.7	29.502	OK
S4-4.1	100 Yr: 100 years: +30 %: 15 mins: Winter	16.545	15.031	15.111	0.080	23.0	0.091	0.000	22.6	10.627	OK
S4-3	100 Yr: 100 years: +30 %: 15 mins: Winter	15.730	14.116	14.379	0.263	87.9	0.297	0.000	50.9	41.728	OK
S4-1	100 Yr: 100 years: +30 %: 15 mins: Winter	17.143	14.833	14.991	0.158	33.9	0.179	0.000	32.2	15.642	OK
Outfall Manhole	100 Yr: 100 years: +30 %: 240 mins: Winter	14.600	11.491	11.569	0.078	11.2	0.000	0.000	11.2	215.229	OK
S2-6.1	100 Yr: 100 years: +30 %: 15 mins: Winter	16.983	15.491	16.381	0.890	20.6	1.007	0.000	17.2	9.334	Surcharged
S3-4	100 Yr: 100 years: +30 %: 15 mins: Winter	18.532	16.125	16.246	0.121	74.3	0.136	0.000	73.5	37.243	OK
S3-5	100 Yr: 100 years: +30 %: 15 mins: Summer	17.883	15.662	15.766	0.104	88.3	0.118	0.000	87.8	41.329	OK
S3-7	100 Yr: 100 years: +30 %: 15 mins: Winter	16.660	14.806	14.976	0.169	192.4	0.192	0.000	190.8	101.065	OK
S4-7.2	100 Yr: 100 years: +30 %: 15 mins: Winter	15.426	13.992	14.059	0.067	27.8	0.076	0.000	27.4	12.929	OK
S3-8	100 Yr: 100 years: +30 %: 15 mins: Winter	15.548	12.383	13.968	1.585	257.3	1.793	0.000	246.1	154.679	Surcharged
S3-9	100 Yr: 100 years: +30 %: 15 mins: Winter	15.689	12.345	13.783	1.438	246.1	1.627	0.000	236.4	153.164	Surcharged
S3-10	100 Yr: 100 years: +30 %: 15 mins: Winter	15.886	12.285	13.562	1.277	248.9	1.444	0.000	240.8	156.856	Surcharged
BP1	100 Yr: 100 years: +30 %: 600 mins: Winter	19.346	17.238	18.243	1.005	24.8	1.137	0.000	24.7	372.510	Surcharged
BP2	100 Yr: 100 years: +30 %: 600 mins: Winter	17.036	15.246	16.191	0.945	22.4	1.068	0.000	22.3	329.322	Surcharged

BP 4.2	100 Yr: 100 years: +30 %: 180 mins: Winter	15.189	12.986	13.845	0.859	24.6	0.972	0.000	24.2	111.369	Surcharged
BP 4.1	100 Yr: 100 years: +30 %: 180 mins: Winter	15.181	12.815	13.846	1.031	63.0	1.166	0.000	62.6	277.224	Surcharged
BP 3.2	100 Yr: 100 years: +30 %: 240 mins: Winter	15.450	12.097	13.118	1.021	43.1	1.155	0.000	42.8	248.079	Surcharged
BP 3.1	100 Yr: 100 years: +30 %: 15 mins: Winter	15.095	12.095	13.209	1.114	257.6	1.260	0.000	252.6	165.245	Surcharged
BP 5	100 Yr: 100 years: +30 %: 240 mins: Winter	14.829	11.544	13.105	1.561	46.6	1.766	0.000	46.3	360.019	Surcharged

5 Yr: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
C2 - Attenuation Tank	5 Yr: 5 years: +30 %: 480 mins: Winter	15.689	15.689	0.466	0.466	15.2	113.324	0.000	62.067	1.8	61.861	55.764	OK
C1 - Attenuation Tank	5 Yr: 5 years: +30 %: 480 mins: Winter	17.714	17.714	0.484	0.484	16.9	127.366	0.000	66.427	1.7	72.601	54.118	OK
C3 - Attenuation Tank	5 Yr: 5 years: +30 %: 120 mins: Winter	12.504	12.504	0.414	0.414	111.6	185.283	0.000	264.373	6.1	50.877	60.792	OK
C4 - Attenuation Tank	5 Yr: 5 years: +30 %: 120 mins: Winter	13.260	13.260	0.460	0.460	62.3	113.101	0.000	90.313	8.1	66.624	56.390	OK
C5 - Attenuation Tank	5 Yr: 5 years: +30 %: 180 mins: Winter	12.079	12.079	0.546	0.546	34.7	80.465	0.000	39.038	11.1	138.019	48.682	OK

30 Yr: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
C2 - Attenuation Tank	30 Yr: 30 years: +30 %: 600 mins: Winter	15.947	15.947	0.724	0.724	17.1	176.116	0.000	80.792	1.8	95.556	31.254	OK
C1 - Attenuation Tank	30 Yr: 30 years: +30 %: 600 mins: Winter	17.984	17.984	0.754	0.754	19.6	198.591	0.000	86.807	1.8	108.156	28.460	OK
C3 - Attenuation Tank	30 Yr: 30 years: +30 %: 180 mins: Winter	12.805	12.805	0.715	0.715	118.1	320.416	0.000	415.275	6.0	69.700	32.196	OK
C4 - Attenuation Tank	30 Yr: 30 years: +30 %: 180 mins: Winter	13.553	13.553	0.753	0.753	68.9	184.977	0.000	141.969	8.2	112.582	28.676	OK
C5 - Attenuation Tank	30 Yr: 30 years: +30 %: 180 mins: Winter	12.392	12.392	0.859	0.859	46.8	126.643	0.000	41.703	11.1	140.772	19.230	OK

100 Yr: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
C2 - Attenuation Tank	100 Yr: 100 years: +30 %: 600 mins: Winter	16.191	16.191	0.968	0.968	22.3	235.412	0.000	84.025	2.0	111.593	8.107	OK
C1 - Attenuation Tank	100 Yr: 100 years: +30 %: 600 mins: Winter	18.243	18.243	1.013	1.013	24.7	266.954	0.000	90.594	2.1	123.380	3.834	OK
C3 - Attenuation Tank	100 Yr: 100 years: +30 %: 240 mins: Winter	13.118	13.118	1.028	1.028	121.8	460.269	0.000	575.250	6.2	98.194	2.602	OK
C4 - Attenuation Tank	100 Yr: 100 years: +30 %: 180 mins: Winter	13.845	13.845	1.045	1.045	86.8	256.806	0.000	149.334	7.9	117.804	0.980	OK
C5 - Attenuation Tank	100 Yr: 100 years: +30 %: 240 mins: Winter	13.105	13.105	1.572	1.572	46.3	155.382	0.000	58.823	11.6	216.105	0.901	OK

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Connections Summary Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

5 Yr: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
S2-2.001	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	S2-6.2	S2-6	17.016	15.730	0.293	9.971	0.3	0.23	16.4	OK
S2-1.005	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-6	S2-7	17.115	15.759	0.300	53.967	1.2	1.2	88.1	Surcharged
S2-1.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-1	S2-2	18.678	17.289	0.110	16.161	1.5	0.26	34.0	OK
S2-1.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-2	S2-3	18.500	16.931	0.240	30.278	1.1	0.29	63.0	OK
S2-1.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-3	S2-4	17.017	15.863	0.300	30.249	0.7	0.7	52.5	Surcharged
S2-1.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-4	S2-5	17.027	15.832	0.300	33.194	0.8	0.77	56.0	Surcharged
S2-1.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-5	S2-6	17.080	15.793	0.300	36.116	0.8	0.81	60.0	Surcharged
S3-3.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-6.1 Hydrobrake	S3-6.2	16.987	15.430	0.095	1.277	0.4	0.02	1.8	OK
S3-3.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-6.2	S3-6.3	17.082	15.281	0.106	10.835	0.9	0.27	19.5	OK
S3-3.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-6.3	S3-6	17.330	15.162	0.160	16.188	0.8	0.25	30.0	OK
S1-2.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-3.2	S1-3	19.289	17.951	0.151	14.467	1.1	0.23	30.1	OK
S1-1.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-1	S1-2	19.044	17.837	0.174	11.747	0.5	0.3	21.6	OK
S1-1.001	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	S1-2	S1-3	19.215	17.795	0.201	15.515	0.6	0.41	30.0	OK
S1-1.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-4	S1-5	19.611	17.738	0.300	38.603	0.9	0.87	64.2	Surcharged
S1-2.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-3.1	S1-3.2	19.600	18.299	0.104	12.389	1.4	0.52	25.6	OK
S1-1.002	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	S1-3	S1-4	19.199	17.782	0.254	28.419	0.8	0.72	53.2	OK
S1-3.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-5.1	S1-5	18.848	17.693	0.244	12.435	0.4	0.27	19.7	OK
S3-1.001	5 Yr: 5 years: +30 %: 960 mins: Winter	Pipe	S3-1 Hydrobrake	S3-2	19.245	17.697	0.024	127.368	0.9	0.02	1.7	Surcharged
S3-1.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-2	S3-3	19.427	16.716	0.089	9.234	1.0	0.11	17.7	OK

S3-2.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-3.2	S3-3	18.980	17.891	0.076	9.961	1.8	0.07	20.7	OK
S3-1.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-3	S3-4	19.130	16.375	0.098	19.960	1.9	0.23	39.1	OK
S3-2.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-3.1	S3-3.2	19.644	18.130	0.067	6.639	1.4	0.32	13.7	OK
S3-1.006	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-6	S3-7	17.883	15.093	0.168	42.905	2.0	0.88	80.1	OK
S4-1.006	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-7	BP 4.1	15.236	13.343	0.300	60.855	1.7	1.62	118.8	Surcharged
S4-3.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-7.2	S4-7	15.426	14.040	0.225	6.763	0.4	0.1	14.1	OK
S4-2.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-4.1	S4-3.2	16.545	15.087	0.066	5.538	1.2	0.13	11.8	OK
S4-2.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-3.2	S4-4	16.021	14.686	0.099	15.432	1.6	0.15	32.3	OK
S4-1.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-1	S4-2	17.143	14.936	0.106	8.154	0.9	0.39	16.7	OK
S4.1.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-3	S4-4	15.730	14.222	0.113	21.785	1.7	0.25	42.5	OK
S4-3.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-7.1	S4-7.2	15.574	14.212	0.055	4.296	1.2	0.15	9.1	OK
S4-1.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-4	S4-5	15.327	13.561	0.294	38.950	1.1	0.34	75.4	OK
S4-1.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-5	S4-6	15.270	13.482	0.300	38.753	1.0	0.99	72.3	Surcharged
S4-4.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-8	S4-9	16.065	14.816	0.139	17.294	1.1	0.13	36.9	OK
S3-4.001	5 Yr: 5 years: +30 %: 120 mins: Summer	Pipe	S3-7.1 Hydrobrake	S3-7.2	15.171	13.196	0.086	59.770	0.8	0.19	8.0	Surcharged
S3-4.002	5 Yr: 5 years: +30 %: 30 mins: Winter	Pipe	S3-7.2	S3-7.3	15.152	12.914	0.225	32.392	0.8	0.49	20.6	OK
S3-1.008	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-8	S3-9	15.548	12.781	0.383	88.234	1.2	0.93	143.9	OK
S3-4.003	5 Yr: 5 years: +30 %: 30 mins: Winter	Pipe	S3-7.3	S3-8	15.102	12.867	0.225	45.880	0.9	0.83	35.4	Surcharged
S3-5.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-12	S3-13	15.962	14.617	0.174	20.984	1.0	0.48	43.4	OK
S3-5.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-13	S3-14	16.200	14.417	0.151	34.091	1.9	0.65	66.4	OK
S5-5.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-14	S3-15	15.909	13.972	0.221	45.340	1.6	0.28	88.5	OK
S5-1.001	5 Yr: 5 years: +30 %: 480 mins: Summer	Pipe	S5-1 Hydrobrake	S5-2	15.450	12.409	0.067	78.052	0.6	0.09	6.0	Surcharged
S5-1.002	5 Yr: 5 years: +30 %: 30 mins: Winter	Pipe	S5-2	S5-3	15.424	12.121	0.166	25.351	0.6	0.22	16.1	OK

S5-1.003	5 Yr: 5 years: +30 %: 30 mins: Winter	Pipe	S5-3	S5-4	15.737	12.114	0.197	35.642	0.6	0.37	27.2	OK
S6-2.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-4.1	S5-4	15.855	14.516	0.084	12.182	1.8	0.29	25.1	OK
S5-1.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-4	S5-5	15.547	12.113	0.236	33.642	0.8	0.6	49.1	OK
S5-1.005	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-5	S5-6	15.487	12.086	0.244	35.855	0.8	0.71	51.8	OK
S5-1.006	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-6	S5-7	15.298	12.040	0.258	44.069	1.0	0.89	65.2	OK
S5-3.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-7.1	S5-7	14.501	13.121	0.120	16.083	1.5	0.54	32.6	OK
S2-1.006	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S2-7	BP2	17.055	15.642	0.257	53.743	1.3	1.17	85.8	OK
S3-3.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	C2 - Attenuation Tank	S3-6.1 Hydrobrake	16.987	15.430	0.218	1.742	0.1	0.03	2.1	OK
S1-1.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S1-5	BP1	19.398	17.669	0.285	60.497	1.5	1.37	100.8	Surcharged
S3-1.000	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	C1 - Attenuation Tank	S3-1 Hydrobrake	19.281	17.445	0.256	2.011	0.1	0.01	2.1	OK
S3-1.011	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-11	BP 3.1	14.976	12.549	0.311	95.580	1.4	0.96	149.9	OK
S6-1.000A	5 Yr: 5 years: +30 %: 60 mins: Winter	Pipe	C3 - Attenuation Tank	S5-1 Hydrobrake	15.412	12.476	0.375	25.302	0.2	0.05	6.3	Surcharged
S3-5.003	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-15	BP 3.2	15.714	12.559	0.287	50.427	1.4	1.32	96.9	Surcharged
S5-1.007	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S5-7	BP 5	14.878	11.912	0.242	58.897	1.2	0.7	95.1	OK
S5-1.009	5 Yr: 5 years: +30 %: 60 mins: Winter	Pipe	C5 - Attenuation Tank	S5-8 Hydrobrake	14.550	12.014	0.300	47.952	0.4	0.09	11.4	Surcharged
S4-1.005	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-6	S4-7	15.170	13.401	0.300	42.855	1.1	1.09	80.3	Surcharged
S5-1.000A	5 Yr: 5 years: +30 %: 240 mins: Summer	Pipe	C4 - Attenuation Tank	S3-7.1 Hydrobrake	15.150	13.179	0.300	74.351	0.2	0.13	8.3	Surcharged
S4-4.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-9	BP 4.2	15.228	13.381	0.191	24.778	1.1	0.7	51.3	OK
S5-1.010	5 Yr: 5 years: +30 %: 600 mins: Summer	Pipe	S5-8 Hydrobrake	Outfall Manhole	14.608	11.913	0.082	181.111	0.7	0.15	11.1	Surcharged
S2-2.000	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	S2-6.1	S2-6.2	16.983	15.731	0.253	4.424	0.3	0.1	7.7	OK
S3-1.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-4	S3-5	18.532	16.208	0.075	19.932	2.8	0.13	38.7	OK
S3-1.005	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-5	S3-6	17.883	15.729	0.143	24.580	1.5	0.09	48.4	OK
S4-1.001	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S4-2	S4-3	16.155	14.727	0.107	14.436	1.5	0.43	28.5	OK

S3-1.009	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-9	S3-10	15.689	12.713	0.356	87.937	1.2	0.88	139.1	OK
S3-1.010	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-10	S3-11	15.886	12.629	0.342	90.635	1.2	0.73	140.7	OK
S3-1.007	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	S3-7	S3-8	16.660	14.923	0.258	53.738	1.6	0.32	102.4	OK
S1-1.00	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	BP1	C1 - Attenuation Tank	19.346	17.506	0.211	60.097	2.8	1.53	112.2	OK
S2-1.007	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	BP2	C2 - Attenuation Tank	17.036	15.479	0.172	47.747	2.3	1.05	76.8	OK
S4-4.002	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	BP 4.2	C4 - Attenuation Tank	15.189	13.192	0.190	24.646	1.1	0.69	50.8	OK
S4-1.007	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	BP 4.1	C4 - Attenuation Tank	15.181	13.196	0.300	60.300	1.7	1.6	117.6	Surcharged
S3-5.004	5 Yr: 5 years: +30 %: 15 mins: Winter	Pipe	BP 3.2	C3 - Attenuation Tank	15.450	12.406	0.275	50.087	1.4	1.31	96.1	Surcharged
Pipe	5 Yr: 5 years: +30 %: 30 mins: Summer	Pipe	BP 3.1	C3 - Attenuation Tank	15.095	12.392	0.287	127.678	2.9	2.54	141.6	OK
S5-1.008	5 Yr: 5 years: +30 %: 15 mins: Summer	Pipe	BP 5	C5 - Attenuation Tank	14.829	11.814	0.276	52.259	2.0	0.93	96.7	OK

30 Yr: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
S2-2.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-6.2	S2-6	17.016	16.094	0.300	16.228	0.4	0.4	28.8	Surcharged
S2-1.005	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-6	S2-7	17.115	16.077	0.300	78.302	2.1	1.98	145.7	Surcharged
S2-1.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-1	S2-2	18.678	17.318	0.139	23.862	1.6	0.39	50.3	OK
S2-1.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-2	S2-3	18.500	16.960	0.300	44.663	1.3	0.43	93.5	OK
S2-1.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-3	S2-4	17.017	16.350	0.300	44.539	1.2	1.17	88.1	Surcharged
S2-1.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-4	S2-5	17.027	16.268	0.300	48.718	1.3	1.27	93.0	Surcharged
S2-1.004	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-5	S2-6	17.080	16.165	0.300	52.759	1.4	1.33	98.6	Surcharged
S3-3.001	30 Yr: 30 years: +30 %: 600 mins: Winter	Pipe	S3-6.1 Hydrobrake	S3-6.2	16.987	15.947	0.041	94.853	0.4	0.02	1.7	Surcharged
S3-3.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-6.2	S3-6.3	17.082	15.310	0.134	15.392	0.9	0.39	28.9	OK
S3-3.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-6.3	S3-6	17.330	15.190	0.206	23.332	0.8	0.36	43.4	OK
S1-2.001	30 Yr: 30 years: +30 %: 30 mins: Winter	Pipe	S1-3.2	S1-3	19.289	18.020	0.225	28.673	1.0	0.23	30.4	OK
S1-1.000	30 Yr: 30 years: +30 %: 15 mins: Summer	Pipe	S1-1	S1-2	19.044	18.086	0.300	15.495	0.5	0.51	37.1	Surcharged
S1-1.001	30 Yr: 30 years: +30 %: 15 mins: Summer	Pipe	S1-2	S1-3	19.215	18.034	0.300	22.914	0.7	0.67	49.1	Surcharged
S1-1.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S1-4	S1-5	19.611	17.904	0.300	56.131	1.2	1.16	85.1	Surcharged

S1-2.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S1-3.1	S1-3.2	19.600	18.331	0.210	18.236	1.3	0.81	40.1	OK
S1-1.002	30 Yr: 30 years: +30 %: 30 mins: Winter	Pipe	S1-3	S1-4	19.199	18.001	0.300	62.698	0.9	0.91	66.6	Surch arged
S1-3.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S1-5.1	S1-5	18.848	17.848	0.300	18.269	0.5	0.5	36.7	Surch arged
S3-1.001	30 Yr: 30 years: +30 %: 600 mins: Winter	Pipe	S3-1 Hydrobr ake	S3-2	19.245	17.984	0.026	107.480	0.9	0.02	1.8	Surch arged
S3-1.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-2	S3-3	19.427	16.730	0.111	13.096	1.1	0.15	25.6	OK
S3-2.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-3.2	S3-3	18.980	17.900	0.094	14.701	1.9	0.1	30.7	OK
S3-1.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-3	S3-4	19.130	16.404	0.123	28.941	2.1	0.34	57.5	OK
S3-2.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-3.1	S3-3.2	19.644	18.153	0.083	9.799	1.5	0.48	20.4	OK
S3-1.006	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-6	S3-7	17.883	15.158	0.215	62.319	2.2	1.3	118.1	OK
S4-1.006	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-7	BP 4.1	15.236	13.475	0.300	87.996	2.1	2.04	149.8	Surch arged
S4-3.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-7.2	S4-7	15.426	14.051	0.225	9.971	0.5	0.15	21.1	OK
S4-2.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-4.1	S4-3.2	16.545	15.100	0.082	8.178	1.3	0.2	17.4	OK
S4-2.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-3.2	S4-4	16.021	14.703	0.205	22.745	1.2	0.22	48.4	OK
S4-1.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-1	S4-2	17.143	14.965	0.136	12.037	1.0	0.58	24.8	OK
S4.1.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-3	S4-4	15.730	14.244	0.222	32.126	1.3	0.38	63.9	OK
S4-3.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-7.1	S4-7.2	15.574	14.226	0.068	6.339	1.3	0.22	13.4	OK
S4-1.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-4	S4-5	15.327	13.756	0.300	57.528	1.2	0.38	83.5	Surch arged

S4-1.004	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-5	S4-6	15.270	13.651	0.300	56.387	1.1	1.09	80.0	Surcharged
S4-4.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-8	S4-9	16.065	14.832	0.176	25.538	1.3	0.19	54.7	OK
S3-4.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-7.1 Hydrobrake	S3-7.2	15.171	13.265	0.225	2.829	0.7	0.25	10.8	Surcharged
S3-4.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-7.2	S3-7.3	15.152	13.468	0.225	20.169	0.7	0.61	26.0	Surcharged
S3-1.008	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-8	S3-9	15.548	13.177	0.400	121.776	1.7	1.36	211.6	Surcharged
S3-4.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-7.3	S3-8	15.102	13.420	0.225	35.263	1.1	1.07	45.7	Surcharged
S3-5.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-12	S3-13	15.962	14.664	0.230	30.976	1.1	0.71	64.2	OK
S3-5.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-13	S3-14	16.200	14.483	0.197	50.358	2.0	0.95	97.6	OK
S5-5.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-14	S3-15	15.909	13.998	0.300	66.977	1.9	0.42	131.0	OK
S5-1.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-1 Hydrobrake	S5-2	15.450	12.481	0.252	3.164	0.5	0.16	11.1	Surcharged
S5-1.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-2	S5-3	15.424	12.291	0.300	15.672	0.5	0.36	26.4	Surcharged
S5-1.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-3	S5-4	15.737	12.291	0.300	27.155	0.6	0.51	37.4	Surcharged
S6-2.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-4.1	S5-4	15.855	14.539	0.105	17.995	2.0	0.43	37.2	OK
S5-1.004	30 Yr: 30 years: +30 %: 30 mins: Winter	Pipe	S5-4	S5-5	15.547	12.261	0.300	64.822	0.8	0.73	59.3	Surcharged
S5-1.005	30 Yr: 30 years: +30 %: 30 mins: Winter	Pipe	S5-5	S5-6	15.487	12.233	0.300	68.486	0.9	0.87	63.9	Surcharged
S5-1.006	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-6	S5-7	15.298	12.180	0.300	58.591	1.2	1.14	83.9	Surcharged
S5-3.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-7.1	S5-7	14.501	13.161	0.156	23.749	1.6	0.79	48.0	OK

S2-1.006	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-7	BP2	17.055	15.782	0.300	77.683	2.0	1.97	144.4	Surcharged
S3-3.000	30 Yr: 30 years: +30 %: 30 mins: Summer	Pipe	C2 - Attenuation Tank	S3-6.1 Hydrobrake	16.987	15.580	0.300	3.829	0.1	0.03	2.5	Surcharged
S1-1.004	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S1-5	BP1	19.398	17.783	0.300	87.563	2.2	2.08	152.8	Surcharged
S3-1.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	C1 - Attenuation Tank	S3-1 Hydrobrake	19.281	17.547	0.300	2.324	0.6	0.01	2.5	Surcharged
S3-1.011	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-11	BP 3.1	14.976	12.688	0.400	131.232	1.8	1.46	229.3	Surcharged
S6-1.000A	30 Yr: 30 years: +30 %: 60 mins: Winter	Pipe	C3 - Attenuation Tank	S5-1 Hydrobrake	15.412	12.708	0.375	24.350	0.1	0.05	6.5	Surcharged
S3-5.003	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-15	BP 3.2	15.714	12.730	0.300	73.755	2.1	1.99	146.5	Surcharged
S5-1.007	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S5-7	BP 5	14.878	11.995	0.347	80.215	1.3	0.97	130.6	OK
S5-1.009	30 Yr: 30 years: +30 %: 30 mins: Winter	Pipe	C5 - Attenuation Tank	S5-8 Hydrobrake	14.550	12.141	0.300	21.151	0.2	0.09	11.8	Surcharged
S4-1.005	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-6	S4-7	15.170	13.551	0.300	61.925	1.3	1.26	92.2	Surcharged
S5-1.000A	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	C4 - Attenuation Tank	S3-7.1 Hydrobrake	15.150	13.265	0.300	3.626	0.2	0.13	8.7	Surcharged
S4-4.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-9	BP 4.2	15.228	13.438	0.239	36.329	1.3	1.04	76.3	OK
S5-1.010	30 Yr: 30 years: +30 %: 120 mins: Winter	Pipe	S5-8 Hydrobrake	Outfall Manhole	14.608	12.367	0.082	93.771	0.7	0.15	11.1	Surcharged
S2-2.000	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S2-6.1	S2-6.2	16.983	16.096	0.300	7.262	0.2	0.17	12.5	Surcharged
S3-1.004	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-4	S3-5	18.532	16.228	0.096	28.911	2.9	0.19	57.0	OK
S3-1.005	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-5	S3-6	17.883	15.750	0.186	35.781	1.5	0.14	71.3	OK
S4-1.001	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S4-2	S4-3	16.155	14.759	0.135	21.322	1.7	0.64	42.2	OK

S3-1.009	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-9	S3-10	15.689	13.032	0.400	121.121	1.7	1.32	207.4	Surcharged
S3-1.010	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-10	S3-11	15.886	12.856	0.400	124.409	1.7	1.11	213.7	Surcharged
S3-1.007	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	S3-7	S3-8	16.660	14.953	0.300	78.286	2.1	0.47	151.6	OK
S1-1.00	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP1	C1 - Attenuation Tank	19.346	17.576	0.300	87.074	3.1	2.23	163.9	Surcharged
S2-1.007	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP2	C2 - Attenuation Tank	17.036	15.544	0.293	77.105	3.0	1.97	145.0	OK
S4-4.002	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP 4.2	C4 - Attenuation Tank	15.189	13.265	0.282	35.937	1.3	1.03	75.6	OK
S4-1.007	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP 4.1	C4 - Attenuation Tank	15.181	13.289	0.300	87.153	2.1	2.03	149.0	Surcharged
S3-5.004	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP 3.2	C3 - Attenuation Tank	15.450	12.514	0.300	73.219	2.1	1.98	145.5	Surcharged
Pipe	30 Yr: 30 years: +30 %: 15 mins: Winter	Pipe	BP 3.1	C3 - Attenuation Tank	15.095	12.548	0.300	131.067	3.2	4.04	225.7	Surcharged
S5-1.008	30 Yr: 30 years: +30 %: 15 mins: Summer	Pipe	BP 5	C5 - Attenuation Tank	14.829	11.944	0.400	72.802	2.1	1.35	140.9	OK

Project: :	Date:		
Large Scale Residential Development at Cahernanardish, Limerick, Co. Limerick	09/01/2026		
	Designed by:	Checked by:	Approved By:
	RP	BM	DB
Report Details:	OSL Butler:		
Type: Connections Summary Storm Phase: Phase	38 Eastgate Drive, Little Island, Cork T45 YO49		

100 Yr: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
S2-2.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-6.2	S2-6	17.016	16.377	0.300	20.592	0.6	0.55	39.7	Surcharged
S2-1.005	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-6	S2-7	17.115	16.344	0.300	99.810	2.6	2.55	187.2	Surcharged
S2-1.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-1	S2-2	18.678	17.343	0.175	30.994	1.5	0.5	65.4	OK
S2-1.001	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S2-2	S2-3	18.500	16.980	0.300	51.788	1.6	0.5	110.7	OK
S2-1.002	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S2-3	S2-4	17.017	16.667	0.300	51.415	1.5	1.42	106.7	Surcharged
S2-1.003	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S2-4	S2-5	17.027	16.556	0.300	56.130	1.6	1.56	113.9	Surcharged
S2-1.004	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-5	S2-6	17.080	16.471	0.300	67.509	1.7	1.66	122.6	Surcharged
S3-3.001	100 Yr: 100 years: +30 %: 600 mins: Winter	Pipe	S3-6.1 Hydrobrake	S3-6.2	16.987	16.191	0.045	110.668	0.4	0.03	2.0	Surcharged
S3-3.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-6.2	S3-6.3	17.082	15.333	0.196	19.645	0.8	0.52	38.3	OK
S3-3.003	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S3-6.3	S3-6	17.330	15.255	0.275	26.918	0.7	0.38	46.3	OK
S1-2.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-3.2	S1-3	19.289	18.562	0.225	27.765	1.1	0.34	45.2	Surcharged
S1-1.000	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S1-1	S1-2	19.044	18.433	0.300	20.139	0.6	0.57	41.5	Surcharged
S1-1.001	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S1-2	S1-3	19.215	18.409	0.300	29.785	0.8	0.79	58.0	Surcharged
S1-1.003	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-4	S1-5	19.611	18.143	0.300	71.743	1.7	1.64	120.9	Surcharged

S1-2.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-3.1	S1-3.2	19.600	18.848	0.225	23.690	1.2	0.89	43.6	Surcharged
S1-1.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-3	S1-4	19.199	18.495	0.300	60.630	1.4	1.3	95.6	Surcharged
S1-3.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-5.1	S1-5	18.848	18.013	0.300	23.040	0.7	0.66	48.5	Surcharged
S3-1.001	100 Yr: 100 years: +30 %: 600 mins: Winter	Pipe	S3-1 Hydrobrake	S3-2	19.245	18.243	0.028	122.463	0.9	0.02	2.1	Surcharged
S3-1.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-2	S3-3	19.427	16.742	0.129	16.667	1.1	0.19	32.6	OK
S3-2.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-3.2	S3-3	18.980	17.906	0.110	19.106	2.1	0.13	39.9	OK
S3-1.003	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-3	S3-4	19.130	16.429	0.144	37.276	2.2	0.44	74.3	OK
S3-2.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-3.1	S3-3.2	19.644	18.173	0.096	12.734	1.6	0.63	26.5	OK
S3-1.006	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-6	S3-7	17.883	15.259	0.277	80.326	2.2	1.62	147.1	Surcharged
S4-1.006	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-7	BP 4.1	15.236	13.791	0.300	114.428	2.9	2.78	204.0	Surcharged
S4-3.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-7.2	S4-7	15.426	14.059	0.225	12.929	0.7	0.2	27.4	OK
S4-2.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-4.1	S4-3.2	16.545	15.111	0.095	10.627	1.4	0.26	22.6	OK
S4-2.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-3.2	S4-4	16.021	14.718	0.300	29.502	1.3	0.28	62.7	OK
S4-1.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-1	S4-2	17.143	14.991	0.165	15.642	1.0	0.76	32.2	OK
S4.1.002	100 Yr: 100 years: +30 %: 30 mins: Summer	Pipe	S4-3	S4-4	15.730	14.239	0.300	50.382	1.6	0.35	58.2	OK
S4-3.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-7.1	S4-7.2	15.574	14.238	0.078	8.239	1.4	0.29	17.5	OK
S4-1.003	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S4-4	S4-5	15.327	14.242	0.300	66.741	1.7	0.55	121.7	Surcharged

S4-1.004	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S4-5	S4-6	15.270	14.055	0.300	65.290	1.6	1.58	115.8	Surcharged
S4-4.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-8	S4-9	16.065	14.845	0.211	33.195	1.3	0.24	71.1	OK
S3-4.001	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S3-7.1 Hydrobrake	S3-7.2	15.171	13.346	0.225	2.146	0.7	0.28	11.9	Surcharged
S3-4.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-7.2	S3-7.3	15.152	14.184	0.225	24.444	0.7	0.68	28.9	Surcharged
S3-1.008	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-8	S3-9	15.548	13.968	0.400	154.679	2.0	1.59	246.1	Surcharged
S3-4.003	100 Yr: 100 years: +30 %: 30 mins: Winter	Pipe	S3-7.3	S3-8	15.102	13.794	0.225	67.644	1.4	1.28	54.5	Surcharged
S3-5.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-12	S3-13	15.962	14.823	0.300	40.232	1.0	0.8	72.3	Surcharged
S3-5.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-13	S3-14	16.200	14.612	0.272	65.471	1.9	1.17	119.5	Surcharged
S5-5.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-14	S3-15	15.909	14.018	0.300	86.986	2.3	0.53	164.2	OK
S5-1.001	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S5-1 Hydrobrake	S5-2	15.450	12.548	0.300	2.739	0.3	0.21	13.9	Surcharged
S5-1.002	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S5-2	S5-3	15.424	12.580	0.300	16.927	0.4	0.39	28.7	Surcharged
S5-1.003	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	S5-3	S5-4	15.737	12.576	0.300	29.957	0.6	0.58	42.9	Surcharged
S6-2.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-4.1	S5-4	15.855	14.559	0.124	23.381	2.2	0.56	48.4	OK
S5-1.004	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-4	S5-5	15.547	12.668	0.300	54.748	1.2	1.02	82.8	Surcharged
S5-1.005	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-5	S5-6	15.487	12.610	0.300	58.206	1.2	1.19	87.4	Surcharged
S5-1.006	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-6	S5-7	15.298	12.473	0.300	71.986	1.7	1.62	119.0	Surcharged
S5-3.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-7.1	S5-7	14.501	13.213	0.197	30.858	1.6	1	60.5	OK

S2-1.006	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-7	BP2	17.055	15.880	0.300	98.870	2.6	2.52	185.2	Surcharged
S3-3.000	100 Yr: 100 years: +30 %: 60 mins: Winter	Pipe	C2 - Attenuation Tank	S3-6.1 Hydrobrake	16.987	15.866	0.300	10.164	0.2	0.03	2.4	Surcharged
S1-1.004	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S1-5	BP1	19.398	17.907	0.300	111.570	3.0	2.86	210.1	Surcharged
S3-1.000	100 Yr: 100 years: +30 %: 15 mins: Summer	Pipe	C1 - Attenuation Tank	S3-1 Hydrobrake	19.281	17.596	0.300	2.451	0.6	0.01	2.6	Surcharged
S3-1.011	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-11	BP 3.1	14.976	13.347	0.400	165.626	2.0	1.64	257.6	Surcharged
S6-1.000A	100 Yr: 100 years: +30 %: 120 mins: Summer	Pipe	C3 - Attenuation Tank	S5-1 Hydrobrake	15.412	12.919	0.375	48.538	0.2	0.05	6.5	Surcharged
S3-5.003	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-15	BP 3.2	15.714	12.930	0.300	95.779	2.6	2.51	184.7	Surcharged
S5-1.007	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S5-7	BP 5	14.878	12.131	0.400	100.445	1.5	1.31	177.5	Surcharged
S5-1.009	100 Yr: 100 years: +30 %: 60 mins: Winter	Pipe	C5 - Attenuation Tank	S5-8 Hydrobrake	14.550	12.515	0.300	52.323	0.2	0.09	11.7	Surcharged
S4-1.005	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-6	S4-7	15.170	13.932	0.300	80.381	1.8	1.75	128.5	Surcharged
S5-1.000A	100 Yr: 100 years: +30 %: 180 mins: Summer	Pipe	C4 - Attenuation Tank	S3-7.1 Hydrobrake	15.150	13.696	0.300	112.175	0.2	0.13	8.3	Surcharged
S4-4.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-9	BP 4.2	15.228	13.495	0.283	46.425	1.4	1.36	99.7	Surcharged
S5-1.010	100 Yr: 100 years: +30 %: 240 mins: Winter	Pipe	S5-8 Hydrobrake	Outfall Manhole	14.608	13.104	0.083	215.229	0.7	0.15	11.2	Surcharged
S2-2.000	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S2-6.1	S2-6.2	16.983	16.381	0.300	9.280	0.2	0.23	17.2	Surcharged
S3-1.004	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-4	S3-5	18.532	16.246	0.110	37.243	3.1	0.25	73.5	OK
S3-1.005	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-5	S3-6	17.883	15.762	0.243	46.164	1.5	0.18	93.1	OK
S4-1.001	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S4-2	S4-3	16.155	14.790	0.217	27.655	1.5	0.87	57.4	OK

S3-1.009	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-9	S3-10	15.689	13.783	0.400	153.164	1.9	1.5	236.4	Surcharged
S3-1.010	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-10	S3-11	15.886	13.562	0.400	156.856	1.9	1.25	240.8	Surcharged
S3-1.007	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	S3-7	S3-8	16.660	14.976	0.300	101.065	2.7	0.6	190.8	OK
S1-1.00	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP1	C1 - Attenuation Tank	19.346	17.655	0.300	110.991	3.1	2.82	207.5	Surcharged
S2-1.007	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP2	C2 - Attenuation Tank	17.036	15.660	0.300	98.132	2.7	2.5	183.3	Surcharged
S4-4.002	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP 4.2	C4 - Attenuation Tank	15.189	13.416	0.300	45.814	1.4	1.34	98.8	Surcharged
S4-1.007	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP 4.1	C4 - Attenuation Tank	15.181	13.445	0.300	113.400	2.9	2.76	203.1	Surcharged
S3-5.004	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP 3.2	C3 - Attenuation Tank	15.450	12.606	0.300	95.095	2.6	2.5	183.4	Surcharged
Pipe	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP 3.1	C3 - Attenuation Tank	15.095	13.209	0.300	165.245	3.6	4.52	252.6	Surcharged
S5-1.008	100 Yr: 100 years: +30 %: 15 mins: Winter	Pipe	BP 5	C5 - Attenuation Tank	14.829	12.131	0.400	99.402	2.1	1.7	177.2	Surcharged

Appendix D – Site Infiltration Tests

Infiltration Test Summary

Hole #	Infiltration Rate (m/hr) Test 1	Test 2	Test 3	Test 4
1	0.028974985			
2	0.255069234	0.289179124	0.302863767	
3	0.264415538	0.113982183	0.132116391	
4	0.095258986	0.062529459		

Average Site Infiltration Rate 0.171598852 m/hr
171.5988518 mm/hr

Hole #	Infiltration Rate (mm/hr) Test 1	Test 2	Test 3	Average
1	28.975			28.975
2	255.069	289.179	302.864	282.371
3	264.416	113.982	132.116	170.171
4	95.259	62.529		78.894
				171.599

m/hr	m/s
0.02897499	8.04861E-06
0.28237071	7.84363E-05
0.17017137	4.72698E-05
0.07889422	2.19151E-05
0.17159885	4.76663E-05

Hole No 1

Excavation time: 8:20

Width	Length	Depth
1300	1800	1000

Soil Profile (Trial Pit Log)
0.00–0.20 m: Topsoil – Dark brown, soft, organic.
0.20–0.90 m: Silty sand – Light brown, soft, occasional gravel.
0.90–1.00 m: Limestone – Grey, weathered bedrock.

1.Fill (1m)

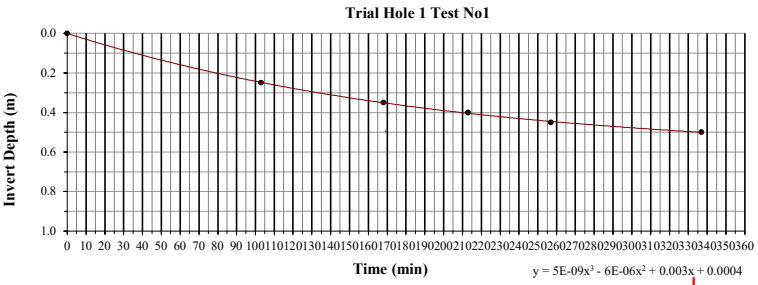
Depth Down	Time	T		Minutes
0	*09:11*	-		0
250	*10:54*	*01:43*		103
350	*11:59*	*01:05*		65
400	*12:44*	*00:45*		45
450	*13:28*	*00:44*		44
500	*14:48*	*01:20*		80
600				
750			Theoretical	

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.25	102.7872	0.25000023
25% =	0.75	**548.151**	0.74999955
50%	0.5	**378.198**	0.50000032

Ap50 5 m2

2.Fill N/A



Time (min)	Invert (m)
0	0.000
103	0.250
168	0.350
213	0.400
257	0.450
337	0.500

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where
$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.17 m^3
a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 5 m^2
$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 26721.83275 s

f **8.05E-06** m/s 0.0000080486 m/s

28.97498511 mm/hr
0.028974985 m/hr

Hole No 2

Excavation time: 8:30

Width	Length	Depth
1300	1600	1200

1.Fill (1m)

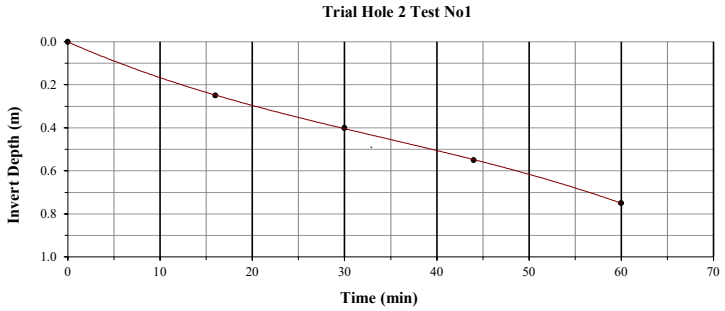
Depth Down	Time	T	Minutes
0	09:15	-	0
250	09:31	00:16	16
400	09:45	00:14	14
550	09:59	00:14	14
750	10:15	00:16	16

Soil Profile (Trial Pit Log)
0.00–0.20 m: Topsoil – Dark brown, soft, organic.
0.20–1.2 m: Silty sand – Light brown, soft, occasional gravel.
1.2- .. : Limestone – Grey, weathered bedrock.

solver used

	Y	X	Formula
	Invert Depth	Time at Depth	
75% =	0.3	21.69826	0.300000324
25% =	0.9	**70.8226**	0.900000627
50%	0.6	**52.5013**	0.600000252

Ap50 6 m2



y = 3E-06x³ - 0.0003x² + 0.0189x + 0.0005

Time (min)	Invert (m)
0	0.000
16	0.250
30	0.400
44	0.550
60	0.750

The soil infiltration rate (f) is determined from

$$f = V_{p75-25} / (a_{p50} \times t_{p75-25})$$

where
V_{p75-25} = The effective storage between 75% and 25% of the depth of water in the test — 1.248 m^3
a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 6 m^2
t_{p75-25} = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 2947.463395 s

f = **7.09E-05** m/s 0.0000708526 m/s

255.0692335 mm/hr
0.255069234 m/hr

Hole No 2

Excavation time: 8:30

Width	Length	Depth
1300	1600	1200

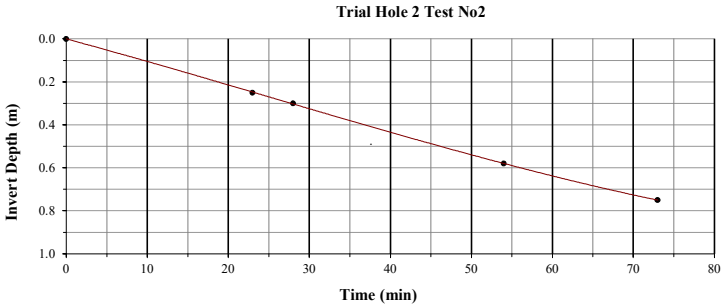
2.Fill (1m)

Depth Down	Time	T	Minutes
0	11:47	-	0
250	12:10	00:23	23
300	12:15	00:05	5
580	12:41	00:26	26
750	13:00	00:19	19

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.3	28.15473	0.299999958
25% =	0.7	**71.4847**	0.700000131
50%	0.4	**37.6431**	0.400000008

Ap50 6 m2



Time (min)	Invert (m)
0	0.000
23	0.250
28	0.300
54	0.580
73	0.750

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.248 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 6 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 2599.797728 s

f **8.03E-05** m/s 0.0000803275 m/s

289.1791238 mm/hr

0.289179124 m/hr

Hole No 2

Excavation time: 8:30

Width	Length	Depth
1300	1600	1200

3.Fill (1m)

Depth Down	Time	T
0	*13:19*	-
250	*13:45*	*00:26*
470	*14:07*	*00:22*
750	*14:40*	*00:33*

Minutes
0
26
22
33

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.3	30.76299	0.299999864
25% =	0.7	**72.1351**	0.700000256
50%	0.4	**40.5503**	0.39999996

Ap50 6 m2



Time (min)	Invert (m)
0	0.000
26	0.250
48	0.470
81	0.750

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.248 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 6 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 2482.328064 s

f = **8.41E-05** m/s 0.0000841288 m/s

302.8637672 mm/hr

0.302863767 m/hr

Hole No 3

Excavation time: 8:40

Width	Length	Depth
1200	1600	1150

1.Fill (1m)

Depth Down	Time	T
0	*09:17*	-
250	*09:38*	*00:21*
450	*10:00*	*00:22*
650	*10:26*	*00:26*
750	*10:45*	*00:19*

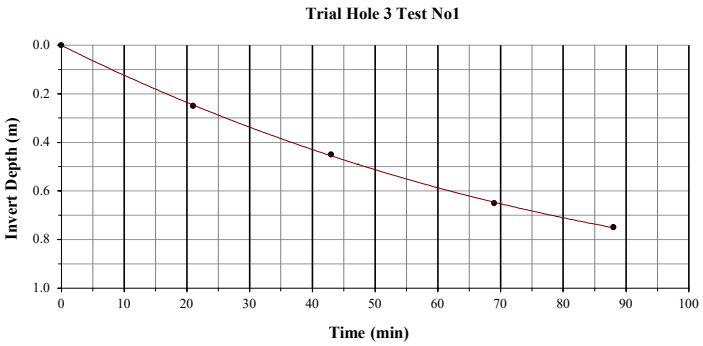
Minutes
0
21
22
26
19

Soil Profile (Trial Pit Log)
0.00–0.20 m: Topsoil – Dark brown, soft, organic.
0.20–1.1 m: Silty sand – Light brown, soft, occasional gravel.
1.1- .. : Limestone – Grey, weathered bedrock.

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.2875	24.67033	0.287500031
25% =	0.8625	**70.8226**	0.68170402
50%	0.575	**52.5013**	0.545427292

Ap50 5 m2



Time (min)	Invert (m)
0	0.000
21	0.250
43	0.450
69	0.650
88	0.750

$y = 7E\text{-}08x^3 - 5E\text{-}05x^2 + 0.0128x + 0.0011$

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.104 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 5 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 2769.139041 s

f _____ **7.34E-05** m/s 0.0000734488 m/s

264.4155381 mm/hr
0.264415538 m/hr

Hole No 3

Excavation time: 8:40

Width	Length	Depth
1200	1600	1150

2.Fill (1m)

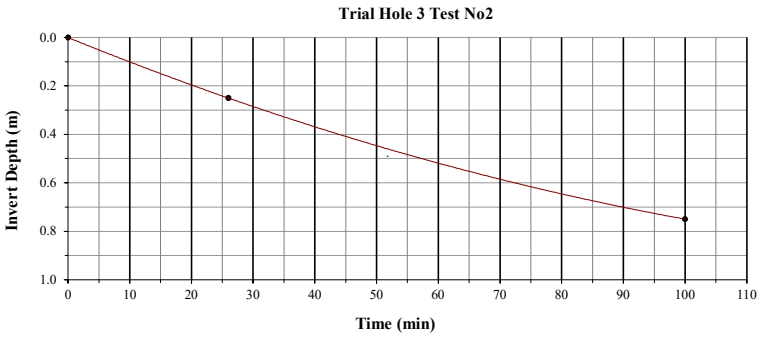
Depth Down	Time	T
0	11:51	-
250	12:17	00:26
750	13:31	01:14

Minutes
0
26
74

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.2875	30.291	0.287500036
25% =	0.8625	**137.355**	0.86250014
50%	0.575	**69.0368**	0.575000283

Ap50 5 m2



Time (min)	Invert (m)
0	0.000
26	0.250
100	0.750

$y = -3E\text{-}05x^2 + 0.0104x - 1E\text{-}15$

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.104 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 5 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 6423.840746 s

$$f = \frac{\quad}{\quad}$$

3.17E-05 m/s 0.0000316617 m/s

113.9821827 mm/hr

0.113982183 m/hr

Hole No 3

Excavation time: 8:40

Width	Length	Depth
1200	1600	1150

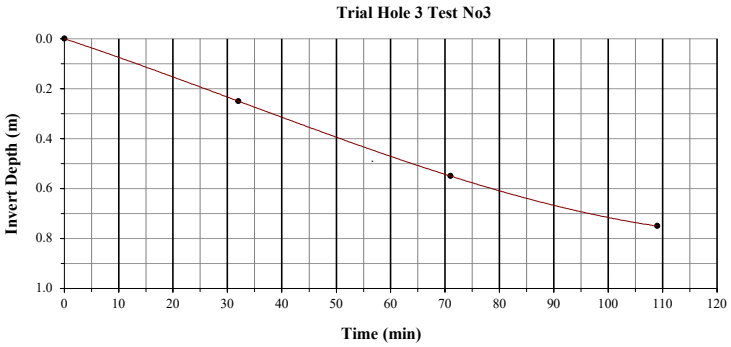
3.Fill (1m)

Depth Down	Time	T		Minutes
0	13:31	-		0
250	14:03	00:32		32
550	14:42	00:39		39
750	15:20	00:38	Theoretical	38

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.2875	36.417	0.287499463
25% =	0.8625	**128.785**	0.784027257
50%	0.575	**73.9237**	0.575000195

Ap50 5 m2



Time (min)	Invert (m)
0	0.000
32	0.250
71	0.550
109	0.750

$y = -3E\text{-}07x^3 + 3E\text{-}05x^2 + 0.0072x + 4E\text{-}15$

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.104 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 5 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 5542.108606 s

f = **3.67E-05** m/s 0.0000366990 m/s

132.1163914 mm/hr

0.132116391 m/hr

Hole No 4

Excavation time: 8:45

Width	Length	Depth
1200	*1700*	*1100*

2.Fill (1m)

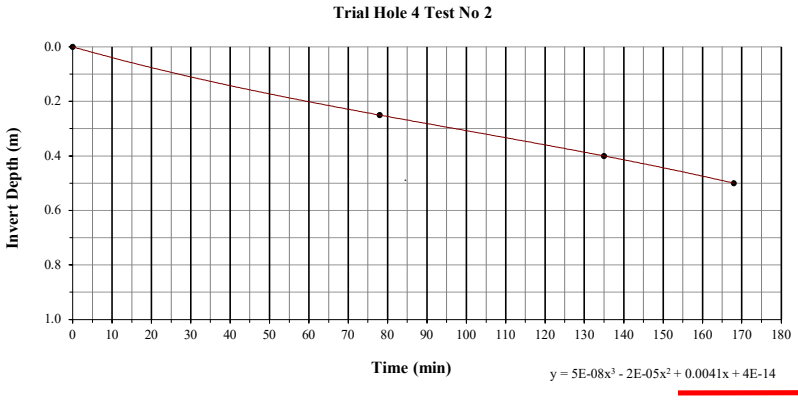
Depth Down	Time	T
0	*11:55*	-
250	*13:13*	*01:18*
400	*14:10*	*00:57*
500	*14:43*	*00:33*

Minutes
0
78
57
33

solver used

	Y Invert Depth	X Time at Depth	Formula
75% =	0.275	109.6373	0.275000012
25% =	0.825	**307.763**	0.824999897
50%	0.55	**248.185**	0.550000064

Ap50 5 m2



Time (min)	Invert (m)
0	0.000
78	0.250
135	0.400
168	0.500

The soil infiltration rate (f) is determined from

$$f = V_{p75\text{-}25} / (a_{p50} \times t_{p75\text{-}25})$$

where

$V_{p75\text{-}25}$ = The effective storage between 75% and 25% of the depth of water in the test — 1.122 m^3

a_{p50} = Internal surface area of the trial hole up to 50% of the depth of water in the test and including the base area — 5 m^2

$t_{p75\text{-}25}$ = Time taken for the water level to drop from 75% effective depth to 25% effective depth taken from the graph above — 11887.51437 s

f = **1.74E-05** m/s 0.0000173693 m/s

62.52945863 mm/hr

0.062529459 m/hr

N

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE TO MALIN HEAD DATUM.
3. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.
4. CONTRACTOR TO CHECK ALL DIMENSIONS ON SITE.
5. ALL COORDINATES ARE TO IRISH TRANSVERSE MERCATOR
6. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS.
7. COPYRIGHT OSL.

Car Park

Limerick East Educate Together National School

Sports Surface Multiple Use

1

X: 553215.383
Y: 653601.359

2

X: 553273.030
Y: 653520.919

3

X: 553347.250
Y: 653509.223

4

X: 553260.615
Y: 653436.699

19.00
18.00
17.00
16.00
15.00
14.00
13.00

FW Pump Station

<ita>An Dro
Dromdarrig

<ita>Cathair</ita>
<ita>Fhardorais</ita>
<ita></ita>Caheranardrish

<ita>an</ita>

0 1.00m 2.0m

REV	DATE	DESCRIPTION	BY	CHK'D	AUTH
P02	09.06.25	TEST LOCATIONS REVISED	BJM	DB	DB
P01	04.06.25	ISSUED FOR INFORMATION	BJM	DB	DB

OSL·BUTLER CONSULTING ENGINEERS
Civil, Structural & Project Engineering Services
Unit 38 Eastgate Drive, Little Island, Cork T45 YO49
Tel: +353 21 4297572

CLIENT

HOMELAND PROJECTS LTD.

PROJECT
BISHOPS QUARTER EXTENSION
MUNGRET
COUNTY LIMERICK

TITLE
PROPOSED SOAKAWAY TEST LOCATIONS

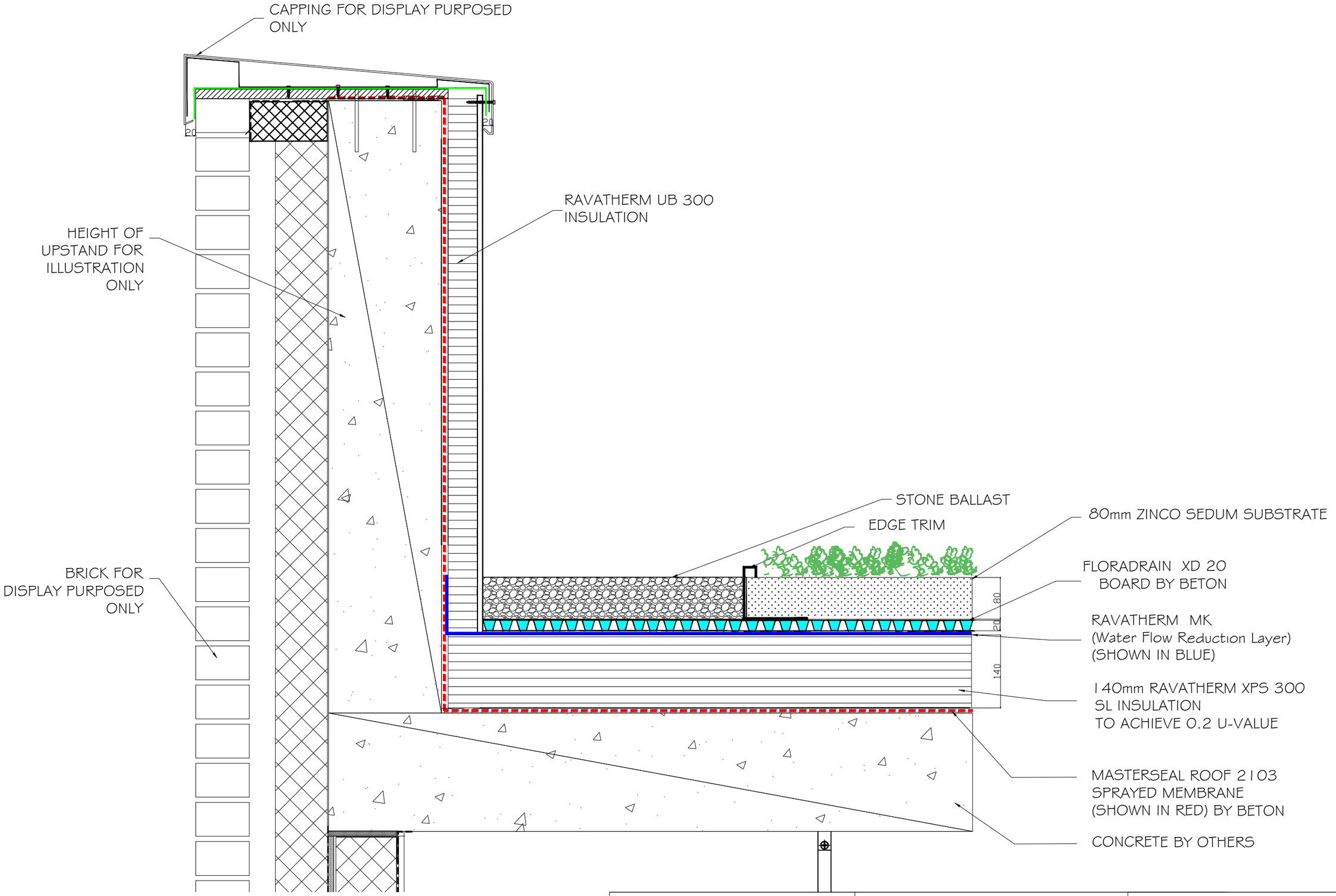
PURPOSE
FOR INFORMATION

ORIGINAL SCALE	ORIGINAL ISSUE DATE
A1 - 1:1000	04.06.2025

STATUS	DRAWING NO	REV
S2	24051-OSL-00-SK-C-0002	P02

ORDNANCE SURVEY IRELAND LICENSE No. CYAL50364947.
© TAILTE ÉIREANN - SURVEYING

Appendix E – Green Roof Details



BETON CONSTRUCTION SERVICES LTD

Cork
Beton Construction Services Ltd
Heron Court, Market Quay,
Bandon,
Co.Cork
Phone: +353 23 88 542 31

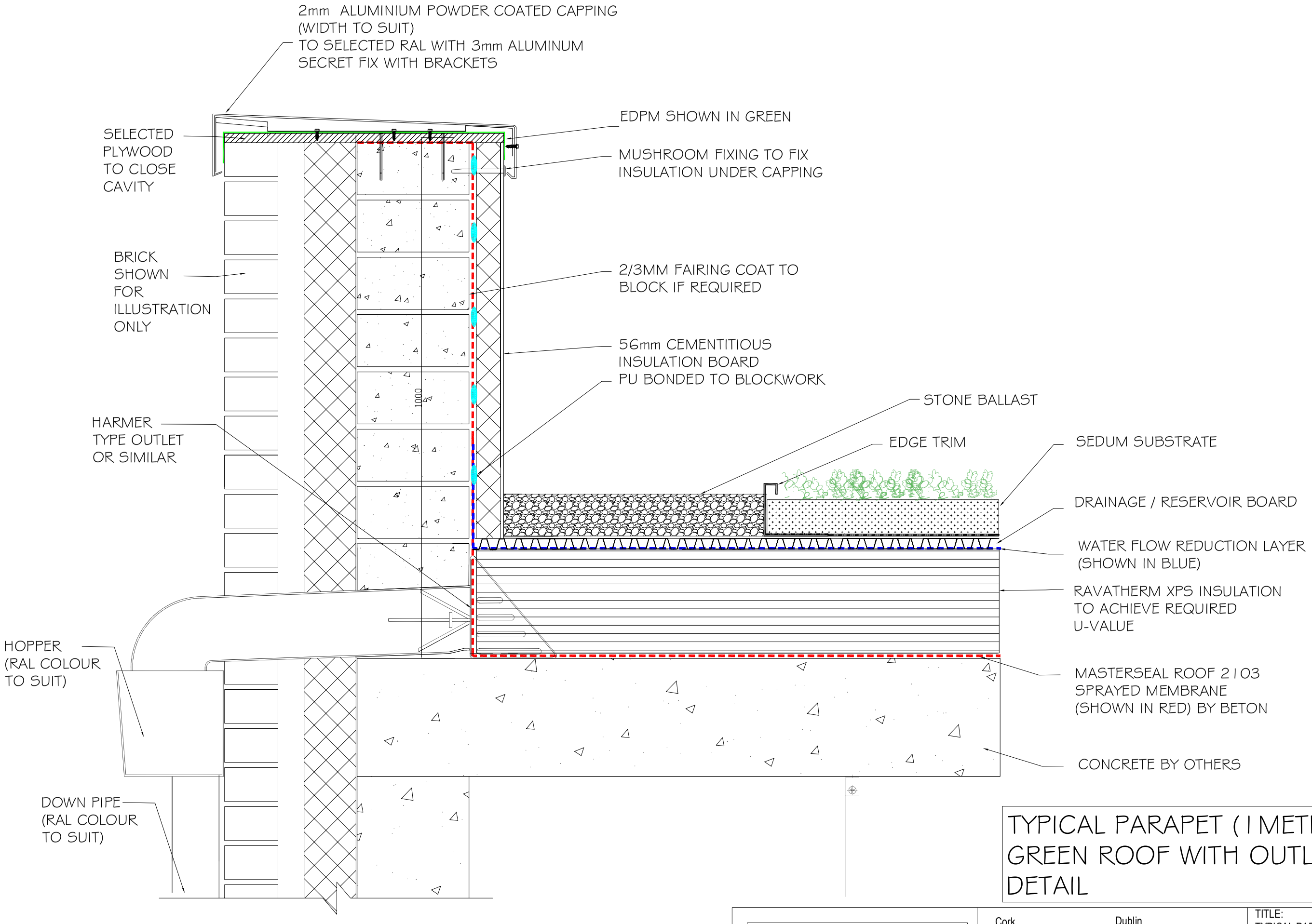
Dublin
Beton Construction Services Ltd
Unit B14, Aerodrome Business Park
Rathcoole
D24 NW93.
Phone: +353 1 401 6402

TITLE:
SECTION PARAPET GREEN ROOF DETAIL

Project : XX

Scale: NTS	Drawn No: CB-IGR-2022-04-03	
Drawn by: AM	Date: 05-03-2026	REV: 1

Note: This Drawing is for illustration purposed only and not considered a working drawing.



TYPICAL PARAPET GREEN ROOF DETAIL

TYPICAL PARAPET (1 METRE HIGH) GREEN ROOF WITH OUTLET & HOPPER DETAIL

Cork
Beton Construction Services Ltd
Heron Court, Market Quay,
Bandon,
Co.Cork
Phone: +353 23 88 542 31

Dublin
Beton Construction Services Ltd
Unit B14, Aerodrome Business Park
Rathcoole
D24 NW93.
Phone: +353 1 401 6402

TITLE: TYPICAL PARAPET GREEN ROOF WITH OUTLET & HOPPER DETAIL	
Project : ARD NA GLAISE	
Scale: NTS	Drawn No: ANG-2022-11-3
Drawn by: AM	Date: 18-11-2022
Note: This Drawing is for illustration purposed only and not considered a working drawing.	

Appendix F – Bypass Interceptor Details

Water Management Solutions

Klargester AquaOil Bypass MDPE and GRP / Full retention MDPE and GRP separator range



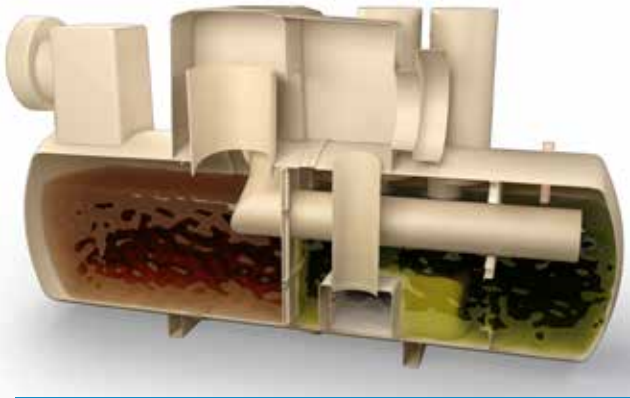
HVO ready**

170 – 69,444m²
Available to cover flow rates up to 285 litres per second

Why choose an AquaOil fuel and oil separator?

- Total peace of mind offered through SmartServ Pro remote monitoring system, for early fault detection and in line with Kingspan's Planet Passionate programme
- Total flexibility, with deep invert options available
- Range tested against full flow
- Easily utilised as part of SuDS Management Train
- Full range of bypass and full retention separators available

3 YR WARRANTY PERIOD*



Our range has been tested against full flow - why is this important?

Our units have been tested at their maximum flow rate (10l/s), unlike some products which have been tested based on bypass and therefore only 10% of the flow. This ensures total accuracy of our silt retention results, by replicating the full effect of the silt wash through.

As part of our Planet Passionate programme, Kingspan are dedicated to delivering innovative surface water management technologies, developed on the back of 70 years' experience.

*Terms and conditions apply. View online at https://www.kingspan.com/gb/en-gb/products/wastewater-management/warranty-terms

**Also suitable for Midel Oil

Kingspan

WE ARE PLANET PASSIONATE

Product Code	Flow (l/s)	Drainage Area (m^2)	Silt Capacity (ltrs)	Oil Capacity (ltrs)	Length (mm)	Diameter (mm)	Manhole Cover Dimensions (mm)	Base to Inlet Invert (mm)	Base to Inlet Invert (mm)	Min. Inlet Invert (mm)	Std Pipework Diameter (mm)
Polyethylene Chamber Construction											
NSFP003	3	170	300	30	1700	1350	600	1410	1335	550	160
NSFP006	6	335	600	60	1700	1350	600	1410	1335	550	160
GRP Chamber Construction											
NSFA010	10	555	1000	100	2610	1225	600	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	600	1050	1000	500	200
NSFA020	20	1115	2000	200	3230	2010	600	1810	1760	1000	315
NSFA030	30	1670	3000	300	3960	2010	600	1810	1760	1000	315
NSFA040	40	2225	4000	400	4750	2010	600	1810	1760	1000	315
NSFA050	50	2780	5000	500	5790	2010	600	1810	1760	1000	315
NSFA065	65	3610	6500	650	7360	2010	600	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	600	2500	2450	1000	315
NSFA100	100	5560	10000	1000	6200	2820	600	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	600	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	600	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	600	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	600	2550	2450	1000	600
NSFA210	210	11667	21000	2100	11994	2820	600	2550	2450	1000	600
NSFA225	225	12500	22500	2250	12766	2820	600	2550	2450	1000	600
NSFA240	240	13333	24000	2400	13528	2820	600	2550	2450	1000	600
NSFA255	255	14167	25500	2550	14300	2820	600	2550	2450	1000	600
NSFA270	270	15000	27000	2700	15071	2820	600	2550	2450	1000	600
NSFA285	285	15833	28500	2850	15833	2820	600	2550	2450	1000	600

Forecourt Separator Range Technical Specifications

Sepaator Class	Backfill Type	Total Capacity (Ltrs)	Darinage Area (m^2)	Peak Flow Rate (l/s)	Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)
1	Concrete	10000	720	15	3915	2020	600	2180	2130	50
1	Concrete	10000	115	20	3915	2020	600	2180	2130	50

Bypass Separator Range Technical Specifications

Model Reference	Flow (l/s)	Peak Flow Rate (l/s)	Drainage Area (m^2) Based on UK rainwater flow	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Access Shaft Diameter* (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)**
				Silt	Oil								
Polyethylene Chamber Construction													
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
GRP Chamber Construction													
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	5941	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

*Some units have more than one access shaft - diameter of largest shown | **Large pipework available on request.

For more information on any of our products: **T:** +44 (0)28 3026 6799
E: klargesterinfo@kingspan.com or visit **klargester.ie**

We take every care to ensure that the information in this document is accurate at the point of publication. Specification may vary (within a small parameter) due to manufacturing process variations or environmental conditions. All images are for illustration purposes only and should not be taken as binding. The actual product may vary, and specification/dimensions/colour/other attributes may differ. To ensure you are viewing the most recent and accurate product information, please scan the QR code to the right. ®Kingspan and the Lion Device are Registered Trademarks of the Kingspan Group plc in the UK, Ireland and other countries. All rights reserved. Registered in Country No.NI017631. Registered Office: 180 Gilford Road, Portadown, Co. Armagh, BT63 5LF. VAT GB412 5124 03

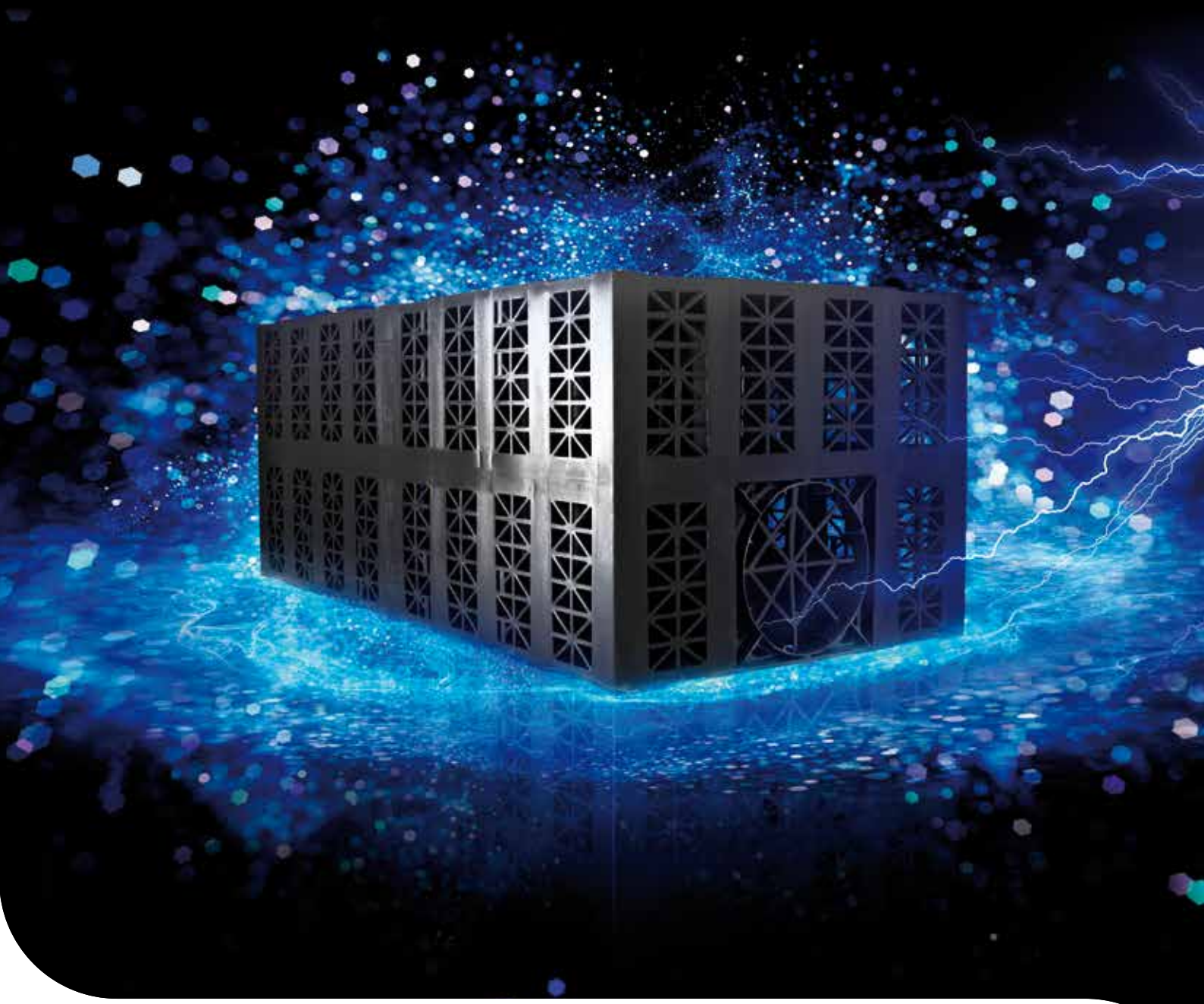
04/2025_v2_4360.01_ie

Appendix G – Attenuation Systems

WATER MANAGEMENT

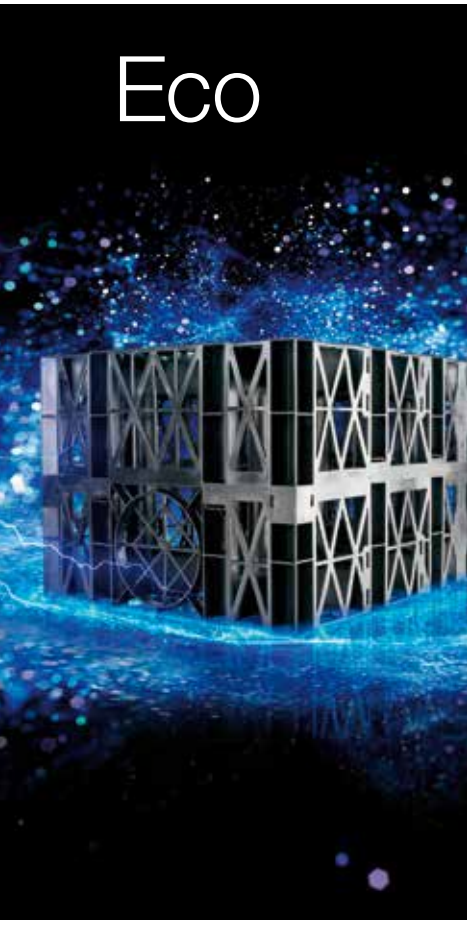
AquaCell systems

Product and installation manual



wavin

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Introduction to SuDS

Continuing urban development, a changing climate and the consequences of increased rainfall are all increasingly prominent issues on the political and environmental agenda and all drive the need to actively manage excessive rainfall across new and existing developments through the use of Sustainable Drainage Systems (SuDS).
Designed correctly drainage systems can assist in delivering sustainable development whilst improving the spaces where we live, work and play.
The SuDS approach to managing water takes account not just of how water quantity is managed but also considers how improvements to water quality can be delivered as well as the creation of habitats promoting biodiversity and amenity for the community.
Good SuDS aim to mimic nature and manage rainfall close to where it falls. They are designed to move and attenuate water within the development before it is released into water courses. Water is stored within the development where is allowed to infiltrate into the ground or is released at a controlled rate to prevent issues downstream.
The CIRIA SuDS Manual gives guidance on all areas of SuDS and focuses on the cost-effective planning, design, construction, operation and maintenance of SuDS.

Which SuDS components are best?

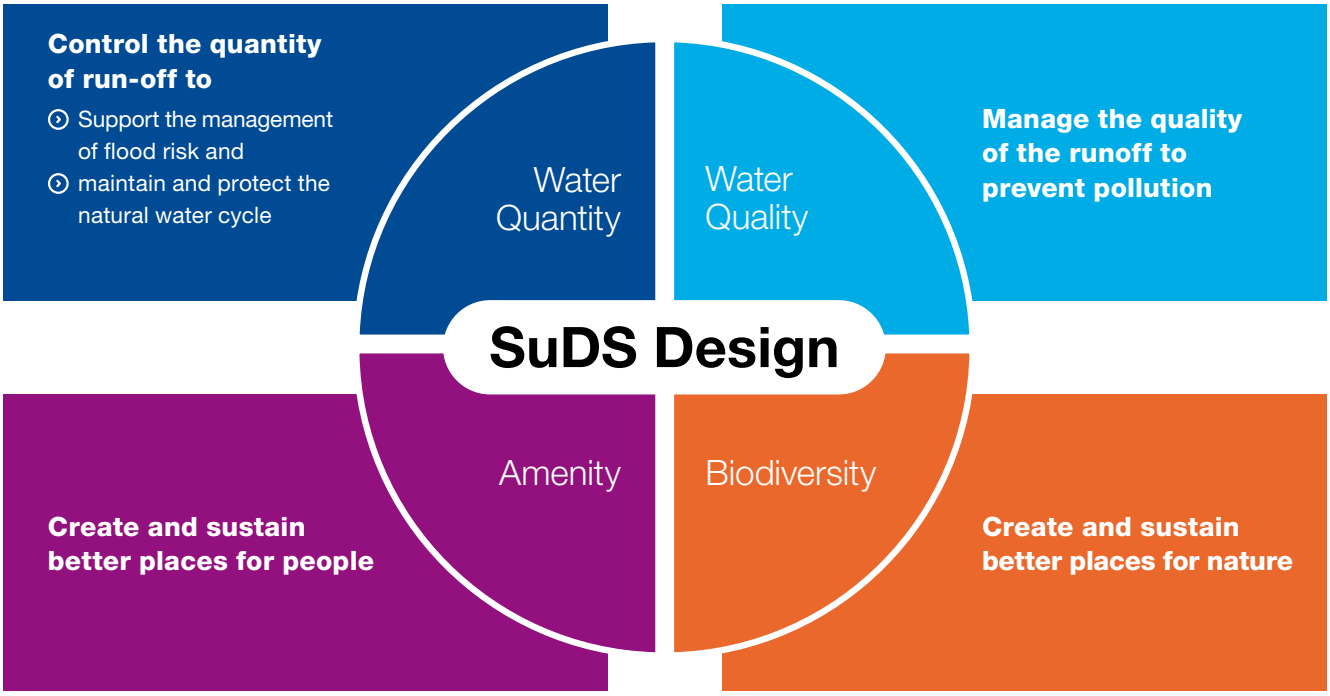
SuDS should help maximise amenity and biodiversity, whilst also delivering key objectives to manage flood risk and water quality For any given site, SuDS should be considered as sequence of components designed to efficiently drain surface water whilst minimising pollution.
Selection of which SuDS components is best for each development is dependent on the site specific requirements.

How can Wavin help with SuDS projects?

Wavin is well qualified to advise on how to comply with current and emerging regulation. We can aid specifiers, developers and contractors in responding to legislative demands as they pertain to flooding, sewage, urban drainage and sustainable resources use.
In particular, the proven qualities and performance of AquaCell systems not only support the achievement of SuDS, they can also help reinforce and enhance planning applications and enable development to proceed.

CIRIA SuDS Design

Source: The SuDS Manual (CIRIA)



Keeping you on top of legislation

Flood and Water Management Act 2010

The Flood and Water Management Act was designed to reduce the risk of flooding and its consequences by providing for better, more comprehensive and co-ordinated water management, embracing groundwater, surface water and coastal erosion risk. Schedule 3 of the act gives DEFRA responsibility for establishing national standards for sustainable drainage and empowers local authorities to manage local flood risk by adopting and maintaining sustainable drainage schemes. In January 2019 Schedule 3 was implemented by the Welsh Government. This legislation effectively makes the use of SuDS mandatory on new developments with the aim of reducing flood risk and improving water quality. The new standards for Wales support the 'four pillars' of SuDS.

Sewers for Adoption

In England the framework for the delivery of SuDS in the absence of Schedule 3 is through a revision to Sewers for Adoption to include some SuDS components as adoptable by the Water and Sewage Companies. The document, currently with Ofwat for approval, is expected to be introduced early 2020. When it comes into force it will be the only guide to the standards that sewers must meet if they are to be adoptable by WaSCs in England. The new document will, for the first time, offer guidance on SuDS components (although not all) that can be adopted by Water and Sewerage Companies with standards on the flood risk performance that is expected.

The Water Environment and Water Services (WEWS) (Scotland) Act 2003

In Scotland WEWS makes Scottish Water responsible for SuDS that deal with the run-off from roofs and any paved ground surface within the property boundary. In order to deliver this SuDS need to be designed to Scottish Water's specifications as set out in their manual, Sewers for Scotland v4.0. In addition, the law makes the use of SuDS obligatory when dealing with surface water drainage from all new developments.

The EU Water Framework Directive

Nearly half the EU population lives in 'water-stressed' countries, caused by high extraction from freshwater sources, and demand is growing all the time. The EU Water Framework Directive introduces a new legislative approach designed to better manage and protect water resources, based not on national orpolitical boundaries but on the natural catchment of river basins.

Building Regulation Part H (Drainage and Waste Disposal)

Building Regulation Part H embraces the guidelines for drainage and waste disposal that must be met in the UK. Although Part H extends to rainwater drainage and solid waste storage, waste drainage issues are to the fore. The Building Regulations are designed to ensure that all foul water is properly disposed of to maintain a decent level of sanitation, promoting both personal and environmental health. The regulations also highlight the importance of pollution prevention, working sewage infrastructure and sewage maintenance. With regards to stormwater, Building Regulations Approved Document H3 stipulates that adequate provision should be made for rainwater to be carried from the roof of a building to either a soakaway, water course or sewer.

National Planning Policy Framework

Section 14 of the National Planning Policy Framework sets out policy to ensure that flood risk is taken into account at all stages of the planning process and that inappropriate development in areas at risk of flooding is avoided. The policy directs development away from areas of highest risk and where new development is, exceptionally necessary in such areas, aims to make it safe without creating an increase in flood risk elsewhere and, where possible, reduce flood risk overall. It also states developments should only be allowed in an area of flood risk if it incorporates sustainable drainage systems, unless there is clear evidence that these would be inappropriate.






Overview

The AquaCell range of geocellular systems are a fully tried and tested, modular technique for managing excessive rainfall.

Applications

The AquaCell range can be used as either a temporary storage tank or as a soakaway, and is suitable for applications including:

- Landscaped areas
- Parks
- Domestic gardens
- Residential developments
- Car parks & roads
- Industrial/commercial areas








The AquaCell range

There are three types of AquaCell unit. Each can be used as a standalone system or different unit types can be mixed and matched together in layers to value engineer the most cost effective solution.

All AquaCell units have identical dimensions (1m x 0.5m x 0.4m), but they are manufactured to perform differently. The type of unit, or combination of units required will depend on factors such as the load application, overall installation depth and site conditions.

Features and benefits

The following are applicable to all AquaCell units:

- Modular, lightweight and versatile
- Easy to handle and quick to install
- Proven clip and peg connection system
- 95% void (each unit holds 190 litres of water)
- Can be brick-bonded for extra stability
- Units can be mixed and matched together for optimum performance
- Full range of ancillaries
- Can be used as integral part of a SuDS scheme

In addition, AquaCell Eco and AquaCell Core-R are fully BBA approved (Certificate No. 03/4018).

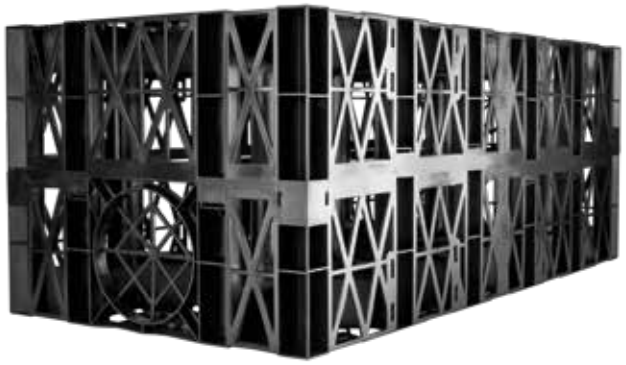
Environmental benefits

In addition, the AquaCell range can also offer the following environmental benefits:

- Reduced flooding risk
- Controlled release of stormwater into watercourses or, where permitted, existing sewer systems
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment

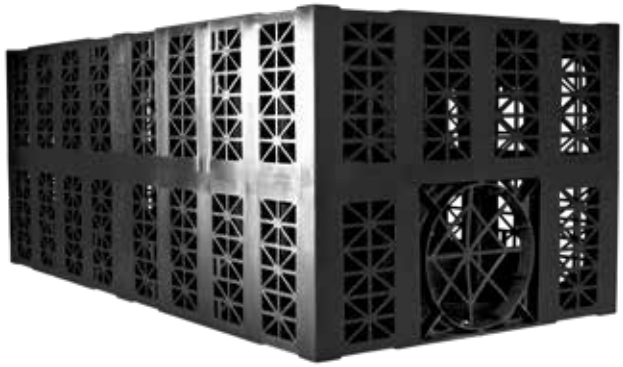


Eco



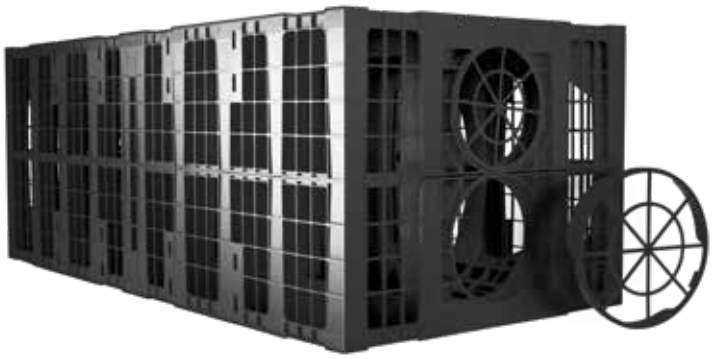
Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscape applications.

Core-R



Core-R has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's.

Plus-R



Plus-R has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas including HGV.

AquaCell Configurator Tool



Optimise tank and soakaway designs with the AquaCell Configurator Tool

The AquaCell Configurator tool aids and speeds the efficient design of stormwater tank or soakaway solutions. The tool guides users through a step-by-step specification process and, based on responses, will recommend the optimum design, based on the loadings, depths and site conditions of each project.

The tool generates a PDF of the design for easy download and can store the data online for future reference. To start using the tool or to learn more visit: **myportal.wavin.co.uk/tools**

AquaCell Eco

Application

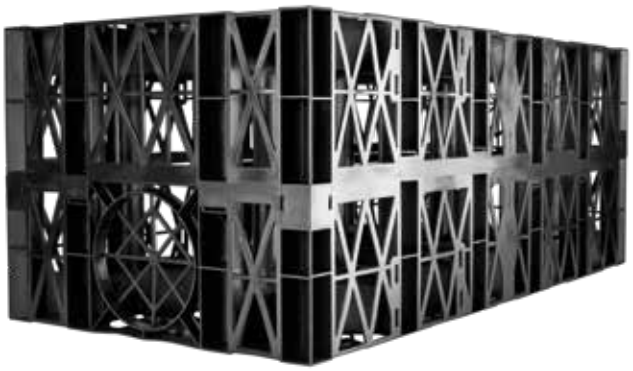
AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is **NOT** suitable for locations subject to high water tables.

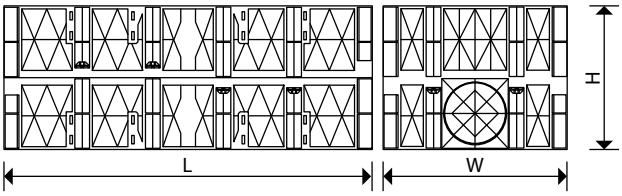
AquaCell Eco is typically suitable for installations to a maximum depth of 2.68 metres, to the base of the units from ground level, with a minimum cover depth of 0.3 metres, (CIRIA's recommendation, is to allow a cover depth of 0.5 metres in applications where a ride on mower may be used).

Any installation using AquaCell Eco must **NOT** be subjected to additional loading at any time. Trafficking by construction plant on site, including mechanical equipment, must be avoided.

If trafficking of the buried tank by construction plant or, other vehicles is unavoidable, the installation should be constructed using AquaCell Core-R units (see page 9).

The width of an AquaCell Eco installation should not exceed 12 metres to allow for mechanical backfilling without loading. There is no limit to the length of the installation.



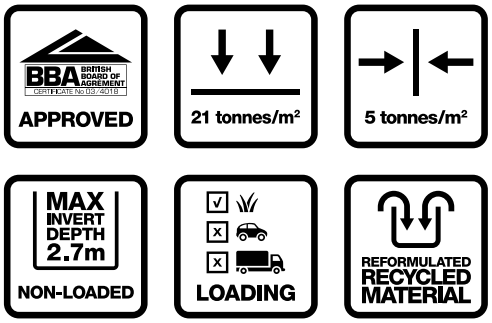


Material: Reformulated polypropylene

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB025	500	400	1000

Features and benefits

- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Proven vertical loading capacity of: 21.3 tonnes/m² (213kN/m²)
- Proven lateral loading capacity of: 5.2 tonnes/m² (52kN/m²)
- Integral "hand holds" for ease of carrying/handling
- BBA approved – Certificate No 03/4018



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2, 3]	Landscaped areas
Over-consolidated stiff clay	20	24	1.53
Silty sandy clay	19	26	1.68
Loose sand and gravel	18	30	2.08
Medium dense sand and gravel	19	34	2.35
Dense sand and gravel	20	38	2.68

(1) These values relate to installations where the groundwater is a minimum of one metre below the base of the excavation.
(2) AquaCell Eco units should not be used where groundwater is present.
(3) 0.5m cover is required where a ride-on mower may be used.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

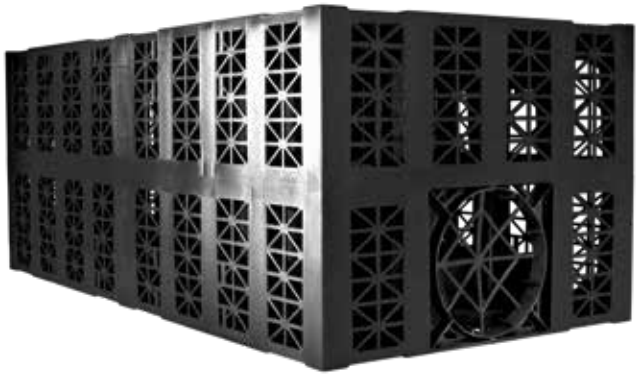
AquaCell Core-R

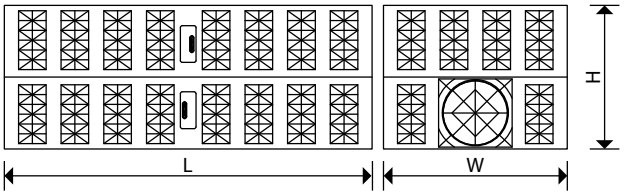
Application

AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used for deep soakaways and landscaped applications.

Typically for use down to depths of 6.24m in landscaped areas (5.99m trafficked by cars) to the base of the units from ground level, in best soil conditions.

Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 1.21 metres is in place.

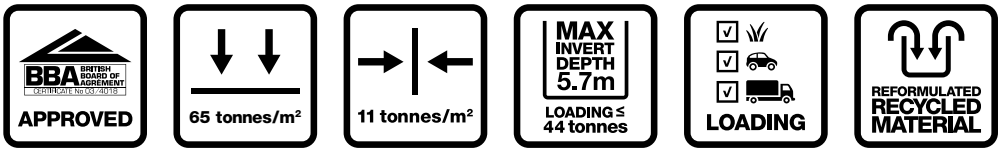




Features and benefits

- Suitable for regular and heavy traffic loadings
- Proven vertical loading capacity of: 65 tonnes/m² (650 kN/m²)
- Proven lateral loading capacity of: 11 tonnes/m² (110kN/m²)
- BBA approved – Certificate No 03/4018
- Ideal for all types of shallow and deep projects including major attenuation and infiltration schemes

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB150	500	400	1000



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2,3]	Landscaped areas	Vehicle mass <9 tonnes[4,5]	Vehicle mass <44 tonnes
Over-consolidated stiff clay	20	24	3.60	3.35	3.10
Silty sandy clay	19	26	4.07	3.81	3.54
Loose sand and gravel	18	30	4.99	4.71	4.43
Medium dense sand and gravel	19	34	5.55	5.28	5.02
Dense sand and gravel	20	38	6.24	5.99	5.74

(1) Without groundwater present below base of units – AquaCell Core-R may be used where groundwater is present, contact Wavin for technical advice.
(2) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
(3) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(4) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
(5) This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

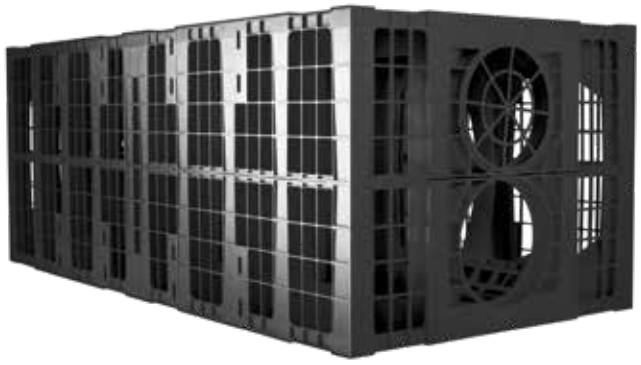
AquaCell Plus-R

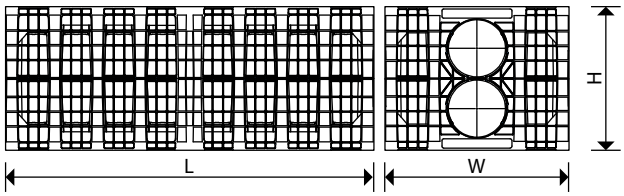
Application

AquaCell Plus-R has been designed primarily for use in applications where inspection is required. It is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes). The units can be used in combination with AquaCell Core-R (and Eco if there is at least one layer of Core-R in between the Plus-R and Eco layer).

Extra lateral loading capacity allows installation at greater depths. Integral inspection channels in each unit combine to create viewing channels for the full length of the installed structure.

Typically for use down to depths of 7.82m in landscaped areas (7.57m trafficked by cars and 7.3m trafficked by HGV's) to the base of the units from ground level, in best soil conditions. Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 1.30 metres is in place.



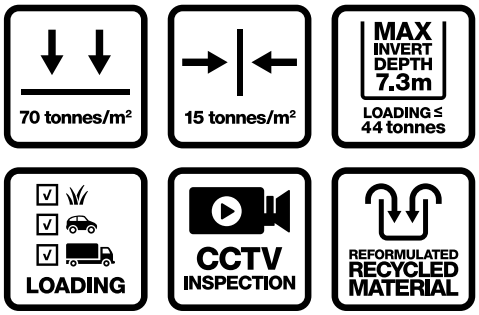


Material: Polypropylene

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB200	500	400	1000

Features and benefits

- Suitable for extra deep installations
- Inspectable (supplied with end cap for use when an inspection channel is not required)
- Proven vertical loading capacity of: 70.2 tonnes/m² (702 kN/m²)
- Proven lateral loading capacity of: 15.1 tonnes/m² (151 kN/m²)



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2,3]	Landscaped areas	Vehicle mass <9 tonnes[4,5]	Vehicle mass <44 tonnes
Over-consolidated stiff clay	20	24	4.67	4.42	4.17
Silty sandy clay	19	26	5.03	4.78	4.53
Loose sand and gravel	18	30	5.86	5.61	5.36
Medium dense sand and gravel	19	34	6.87	6.62	6.37
Dense sand and gravel	20	38	7.82	7.57	7.30

(1) Without groundwater present below base of units – AquaCell Plus-R may be used where groundwater is present, contact Wavin for technical advice.
(2) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
(3) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(4) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
(5) This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

AquaCell Plus-R: for inspectability

By aligning AquaCell Plus-R units end-to-end, full length viewing channels can be created – allowing for CCTV inspection if required. These are created in the bottom layer of an AquaCell tank installation.

The units can be used in combination with AquaCell Core-R (and with Eco if there is at least one layer of AquaCell Core-R in between the Plus-R and Eco layer).

NOTE: For any AquaCell Plus-R units on the perimeter of a structure that are NOT required for inspection access, the open ends of the integral inspection tunnels should be fitted with the end caps provided.

Inspection chambers

An inspection chamber should precede the inlet pipework for the AquaCell structure.

A silt trap or hydro-dynamic separator prior to the inspection chamber is also recommended.

For on-line installations the following Chambers are recommended:
- Down to 3m Wavin Non-Entry Inspection Chambers
- Down to 5m Wavin Range 600 Inspection Chambers, or a traditional manhole*

**where inlet pipework is replaced by AquaCell units acting as flow conduit.*

For off-line installations:
- Manhole with in-built flow control

Recommendation: If installing any Wavin Non-Entry Inspection Chamber, deeper than 1.2 metres, ensure that the cover and frame includes a 350mm restrictor to prevent man entry.

Inspection and maintenance

CCTV inspection at every inspection point is recommended:
- after every major storm
- at regular intervals according to the specific maintenance plan for the site

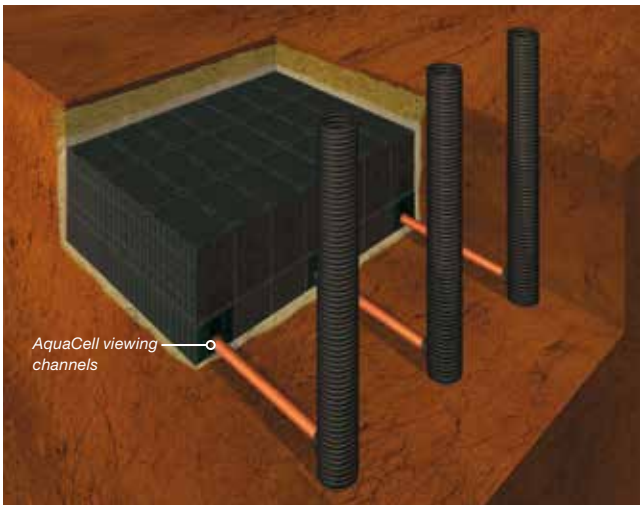
Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank.
It is important to prevent construction silt from entering the AquaCell structure.

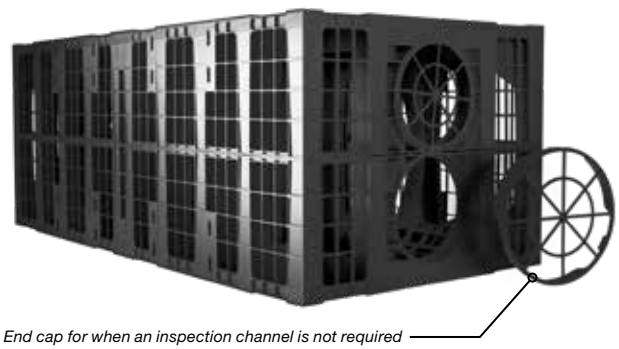
Inspectability scenarios

AquaCell Plus-R viewing channel



Trafficked tank installation with inspection chambers





End cap for when an inspection channel is not required

Design guidance

Infiltration or attenuation?

The AquaCell range can be used either as:

- A soakaway whereby the units will be installed in suitable pervious soils so the units can be wrapped in a geotextile to allow infiltration of the stormwater into the surrounding ground, or
- As an attenuation tank in impervious ground (e.g. clay) where infiltration is not possible, here the units are encapsulated in a geomembrane (which is in turn wrapped in a protective geotextile layer) so that the structure can hold the stormwater temporarily until local drainage flows can accept it for normal disposal at a permissible outflow rate.

Large scale AquaCell Core-R storage tank



Domestic AquaCell Core-R soakaway







Site assessment

Ground conditions may be established as part of a geotechnical assessment. This may include tests for infiltration and ground water level.

If there is no confirmation that such assessments have been conducted, or resulting conclusions are unavailable, a trial pit will be required in accordance with BRE 365.

For further information and guidance, please contact the Wavin Technical Design Team.

Infiltration (soakaways)

According to the principals of SuDS, wherever possible stormwater should be drained back into the ground via a soakaway as the first priority. A site must meet BOTH of the following criteria for infiltration to be possible:

- The underlying soil surrounding the proposed installation is sufficiently permeable
- The seasonally high water table is a minimum of 1 metre below the base of the proposed installation

If either of these criteria is not met, or cannot be confirmed for any reason, a soakaway system may not be suitable for the application, in which case a storage tank must be used.

Attenuation (storage tanks)

A storage tank may be designed to be online or offline (see pages 26-31 for typical details). However, if the site is subject to groundwater or a high water table, it is important to ensure that the tank is not vulnerable to flotation. Sufficient weight from soil, or other covering placed over the AquaCell units, must be sufficient to counter any buoyancy uplift force from the rising groundwater level.

Important design considerations for geocellular structures

Rising rainfall levels and increased focus on SuDS compliance, have led to an increase in the use of modular units to create underground structures for infiltration or the temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary to meet the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units provide assured performance, since all strength and hydraulic capabilities have been verified by independent testing and our ECO and CORE-R units are both BBA approved.

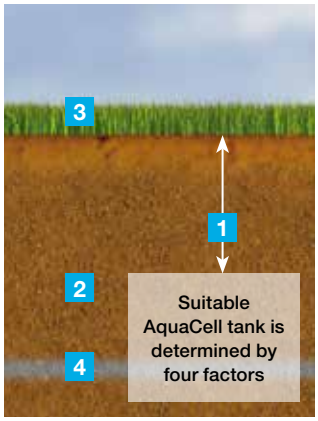
To guarantee the structural integrity of an engineered drainage system, any underground structure must be strong enough to support the loads to which it will be subjected without any unacceptable deflection.

The correct choice of geocellular unit must have appropriate proven top (vertical) and side (lateral) load bearing capacity and deflection characteristics to suit site conditions.

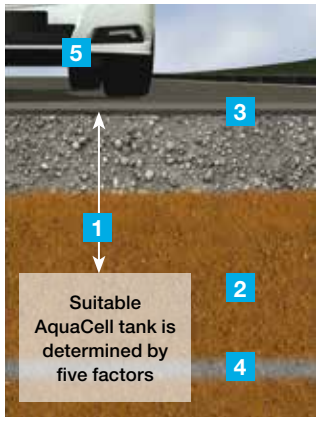
The five key site considerations to be noted when designing a geocellular structure are:

1. Depth of cover (See page 14)
2. Soil type
3. Surface finishing
4. Presence of groundwater
5. Type of traffic/loading

A: Non-trafficked



B: Trafficked



The combination of these 5 factors effectively means that the required characteristics of a geocellular structure to be installed under a trafficked location (for example) will be very different from that under a landscaped/low-loaded location.

Two typical examples are given below.

Example A: Landscaped/non-trafficked location and 0.3m cover depth. Typically requires minimum vertical strength of 17.5 tonnes/m²

Example B: Car park with occasional light delivery traffic and between 0.5 – 0.7m cover depth. Typically requires minimum vertical strength of 40 tonnes/m²

Design guidance

Hydraulic design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, have a nominal void ratio of 95% and each holds 190 litres of water. Hydraulic calculations are accordingly the same for AquaCell Eco, Core-R and Plus-R.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680 or CIRIA C737 for further guidance (we recommend using the BPF Guide Designing Geocellular Drainage Systems to CIRIA Report C737 alongside.)

Structural design – installation and cover depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 8-10) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration

The table shows a summary of typical cover depths and installation depths as a guide.

Typical minimum cover depths and maximum installation depths

Location type	Minimum cover depths (m)		
	AquaCell Eco	AquaCell Core-R	AquaCell Plus-R
Landscaped/non-trafficked areas[2]	0.30	0.30	0.30
Car parks, vehicle mass up to 9 tonnes[1]	n/a	0.64	0.69
HA/HGV loading up to 60 tonnes	n/a	1.21	1.30
	Maximum installation depths (m)[3]		
Maximum depth to base of unit (Landscaped)	2.68	6.24	7.82
Maximum depth to base of unit – vehicle mass up to 9 tonnes	n/a	5.99	7.57
Maximum depth to base of unit – vehicle mass up to 44 tonnes	n/a	5.74	7.30

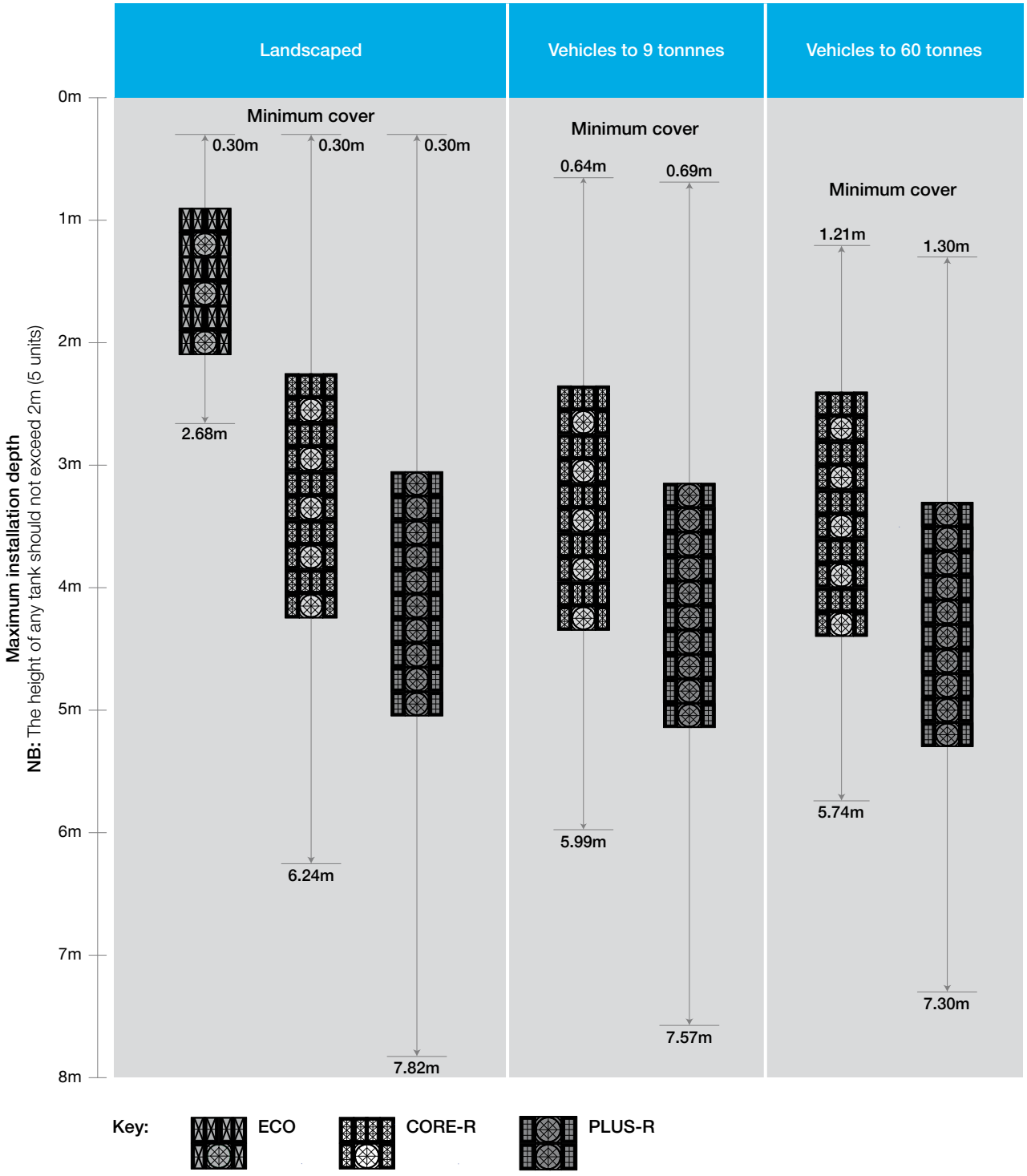
(1) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5165.
(2) 0.30m is minimum depth for AquaCell in landscaped applications. 0.5m cover is recommended in applications where ride-on mowers may be used. If construction plant is to be used on site, extra protection may be needed.
(3) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

In trafficked applications it is recommended that the height of any tank should not exceed 2m (5 units). If you require a tank that exceeds this, please contact Wavin Technical Design for guidance:

T: 0800 038 0088 E: technical.design@wavin.co.uk

Minimum cover and maximum installation depths to base of units from ground level, in best soil conditions

This chart shows how deep each unit can be used for different applications in best soil conditions.



Note: The AquaCell units can also be used in combination with each other, please contact Wavin Technical Design for guidance.

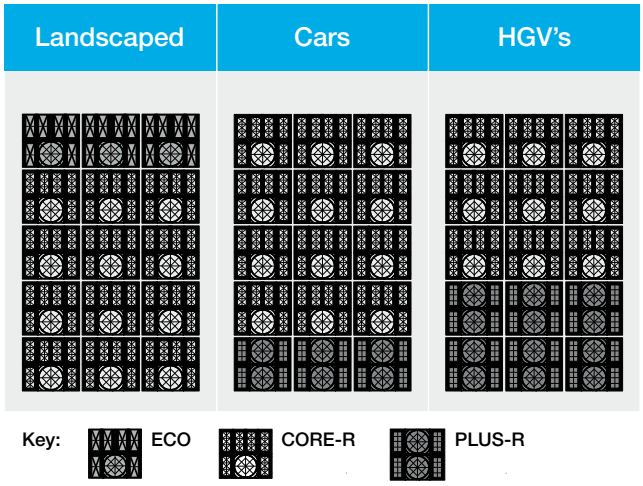
Design guidance

Mix and match

Although all AquaCell units have identical dimensions, and a high nominal void ratio of 95%, they are manufactured to perform at a range of depths, dependent on soil type, angle of shearing resistance, loading and ground water levels. For optimum performance the units can be mixed and matched (in layers) to value engineer the most effective design (in cost and performance terms) for each installation. For example, in a landscaped application if you needed to install a tank or soakaway that is deeper than 2.7m, you could install layers of AquaCell Core-R underneath the AquaCell Eco. See below illustrations showing examples of how the AquaCell units can be mix and matched together. For advice on how to optimise a tank or soakaway design using more than one type of AquaCell please contact Wavin Technical Design.

Note: AquaCell Eco cannot be used directly with AquaCell Plus-R therefore there must be a layer of AquaCell Core-R between them.

Typical examples of mix and match with AquaCell



Brick bonding – for extra stability

When assembling a geocellular structure that comprises two or more layers, it is recommended that AquaCell units are placed in a 'brick-bonded' configuration for extra stability.

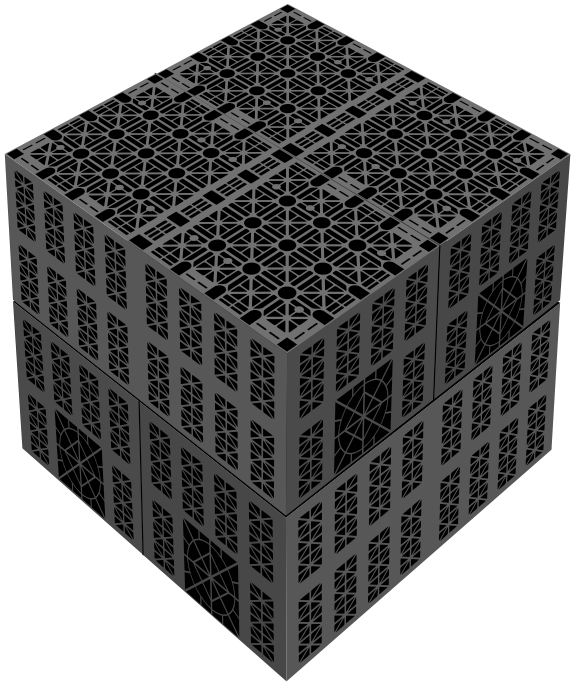
This helps minimise continuous vertical joints in the assembly, and gives the structure extra stability.

A significant advantage of AquaCell unit design is that brick bonding placement does not require extra connectors.

All three AquaCell units may be placed in this way, unless inspection channels and cleaning access are required using AquaCell Plus-R.

AquaCell Plus-R units incorporate integral inspection channels. These are designed for combined alignment to create viewing tunnels at the base of an assembled structure (see page 11).

Example of AquaCell being brick bonded



Installation guidance

AquaCell Core-R and Plus-R: Construction loads

Construction plant such as excavators can impose significant loads on any AquaCell unit. The following guidelines should be observed:

- Tracked excavators (not exceeding 21 tonnes weight) should be used to place fill over the AquaCell units when the geotextile or geomembrane wrapping has been completed
- At least 300mm of fill should be placed before the excavators or trucks delivering the backfill are allowed to traffic over the installed units
- Compaction plant used over the AquaCell units should not exceed 2300kg/metre width. This will allow the compaction of Type 1 sub-base in 150mm layers over the units in accordance with the Specification for Highways Works
- All other construction plant should be prevented from trafficking over the system once it is installed and surfacing completed, unless a site specific assessment demonstrates that it is acceptable
- In particular cranes should not be used over, or place their outriggers over the system

AquaCell Eco: Construction loads

As AquaCell Eco is designed for landscaped and non-loaded applications, certain precautions are recommended on site to prevent damage to the units through excess loading.

Manual assembly

Whilst assembling the tank, it may be necessary to walk on top of previously laid AquaCell units. Therefore care should be taken not to damage the edges of the units.

Backfilling

When backfilling AquaCell Eco installations:

- Machines placing the material must be located OFF the units
- Only light compaction should be applied to the material
- Backfill with suitable, stone-free, as-dug material
- First layer should be 300mm thick before using any compaction plant
- NO vibratory mechanism should be used for compacting this first layer
- Compaction plant must not exceed 2300kg per metre width

Construction traffic on site

Once backfilled, if construction plant (e.g. excavators or loaders) are likely to run over the installation, ensure that:

- MINIMUM protective cover should be 500mm well-compacted granular material
- Only tracked excavators can be used and MUST NOT weigh more than 14 tonnes.
- HGVs MUST NOT run over installed AquaCell Eco units

Manual assembly

All ancillaries and adaptors (see pages 34-37) can be used with either the AquaCell Eco, Core-R or Plus-R units, except the 225mm Flange Adaptor (6LB106) which must only be used with AquaCell Core-R or Plus-R.

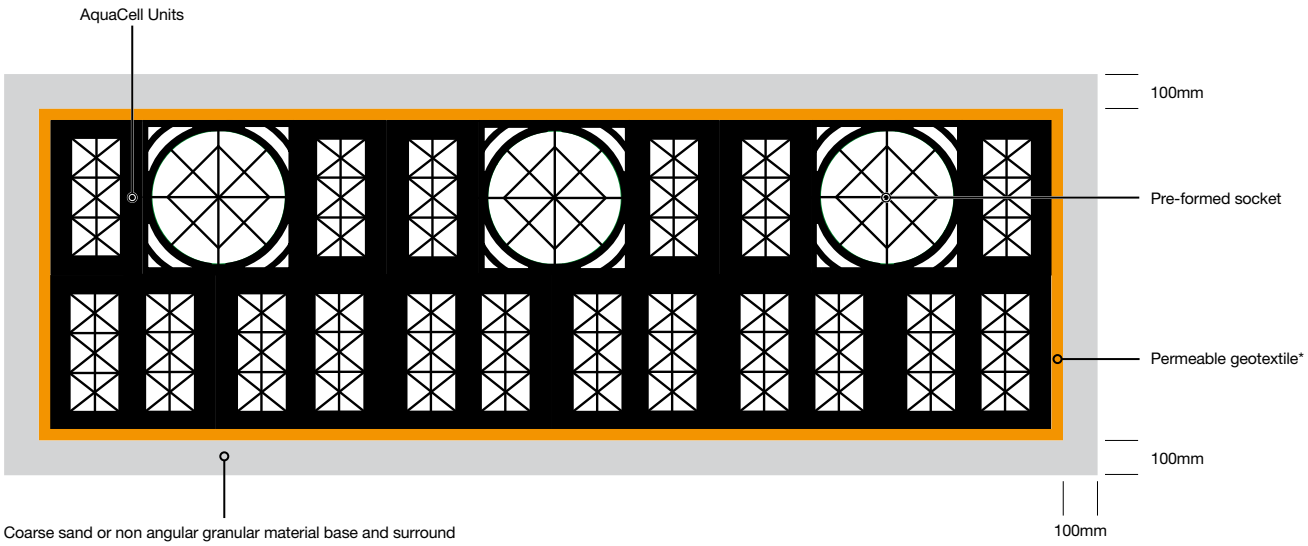
The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of an Eco unit.

Installation

Typical soakaway installation method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 16. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fix the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or one of the standard Silt Traps (6LB600, 6LB625, 6LB630) is installed prior to the inlet pipework – see page 24 for installation guidelines.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole and/or a petrol interceptor.



Example shows the use of AquaCell Eco. However, a soakaway can also be installed as shown using either of the other versions of AquaCell units (Core-R or Plus-R) as appropriate.

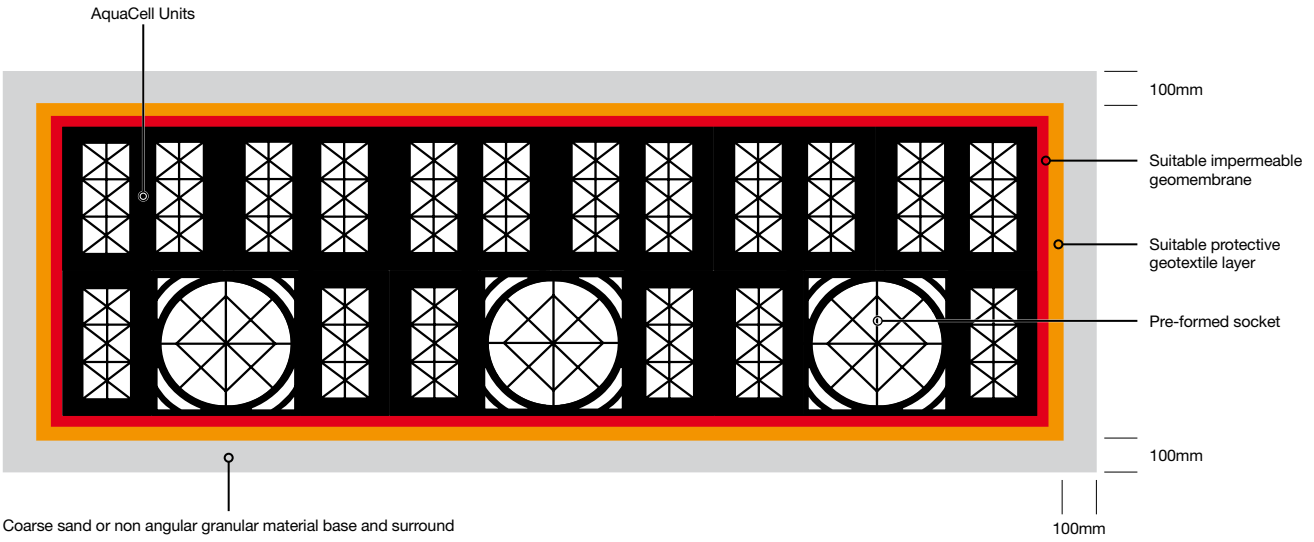
**The geotextile should be selected according to specific site conditions. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is a high risk of damage from ground contaminants.*

Typical storage tank installation method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non-angular granular material, level and compact.
3. Lay the geotextile[1] over the base and up the sides of the trench.
4. Lay the geomembrane[2] on top of the geotextile over the base and up the sides of the trench.
5. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 16. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
6. Wrap the geomembrane around the AquaCell structure and seal to manufacturers recommendations.*
7. If side connections into the AquaCell units is required, (other than the preformed socket), use the appropriate Flange Adaptor (6LB104 or 6LB106). Fix the flange adaptor to the unit using self-tapping screws. Drill a hole through the Flange Adaptor and connect the pipework. (6LB106 should not be used with AquaCell Eco).
8. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 20 for installation guidelines.
9. Wrap and overlap the geotextile covering the entire AquaCell structure, to protect the geomembrane.
10. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
11. Lay 100mm of coarse sand or non angular granular material over the geotextile/geomembrane and compact.
12. Backfill with suitable material.

NB: A storage tank must be vented, and it is recommended that one vent pipe, 110mm in diameter is provided per 7,500 square metres of impermeable catchment area on a site, see page 20 for design.



Example shows the use of AquaCell Core-R. However, a storage tank can also be installed as shown using any of the other versions of AquaCell units (Eco, Core-R or Plus-R) as appropriate.

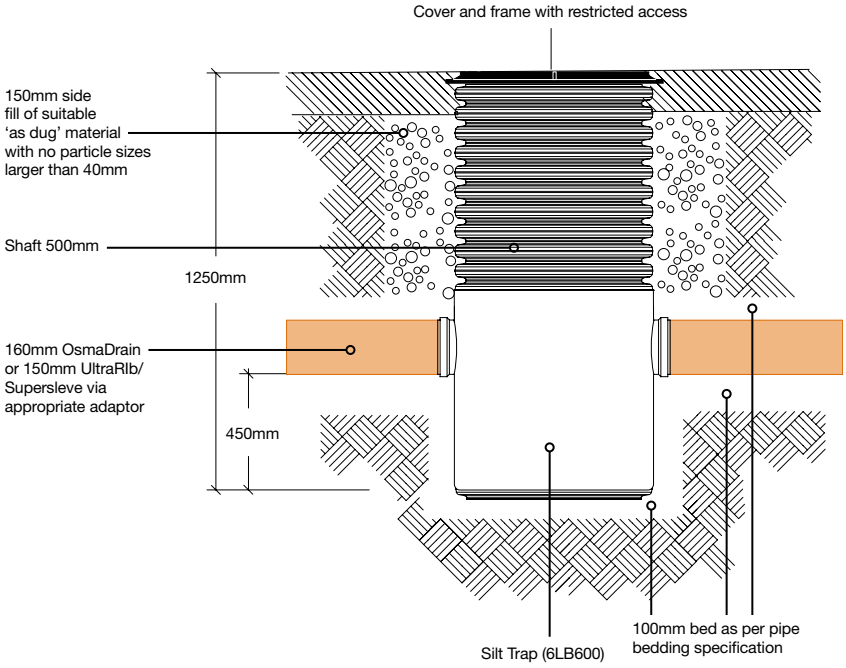
1. For protective geotextiles CIRIA C753 – The SuDS Manual recommends a geotextile of at least 2mm thick and 300gsm.

2. The geomembrane should be designed to survive the rigours of construction, this is typically at least 0.5mm thick. Joints should be sealed using proprietary welding techniques.

Installation

Silt Trap and Air Vent termination

Silt Trap

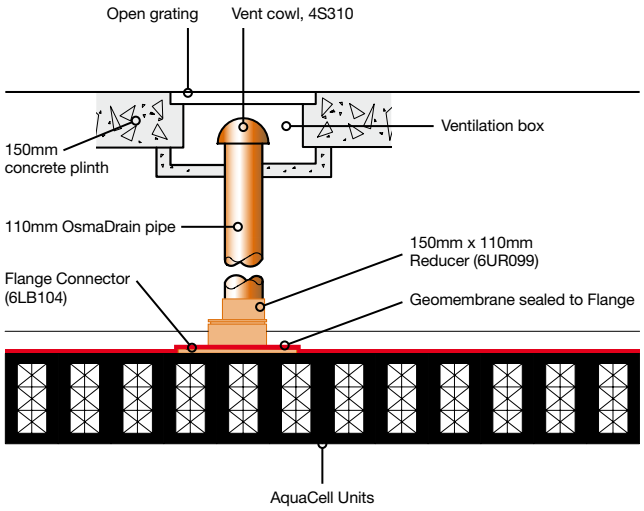


Typical installation procedure

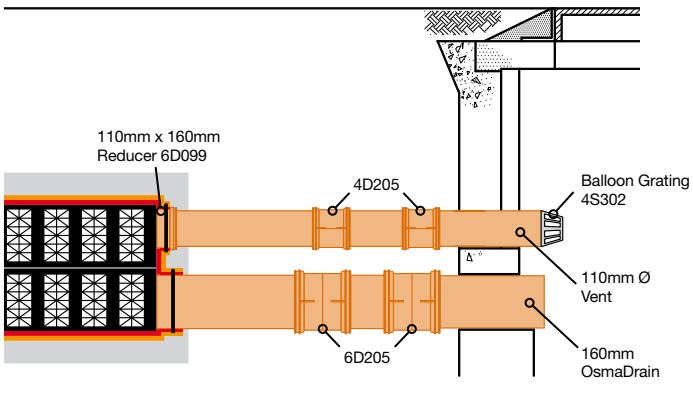
1. Place the Silt Trap (6LB600, 6LB625, 6LB630) on a minimum of 100mm bed as per pipe bedding specification. Ensure that the trap is as close to the AquaCell unit as possible and in a suitable position to allow pipework connection.
2. Connect the relevant pipework in accordance with standard pipe installation guidelines.
3. Surround the sides of the Silt Trap with 150mm of 'as dug' material, with no particle sizes larger than 40mm.
4. Fit relevant cover and frame.

NOTE: When surrounded by a concrete plinth (150mm x 150mm) the 4D920 Cover and Frame can be used in situations with a loading of up to 50kN (5 tonne).

Typical Air Vent design



Typical Air Vent through manhole



NOTE: It is recommended that all connections and air vent installations in storage applications (using geomembrane) are made using a Flange Adaptor.

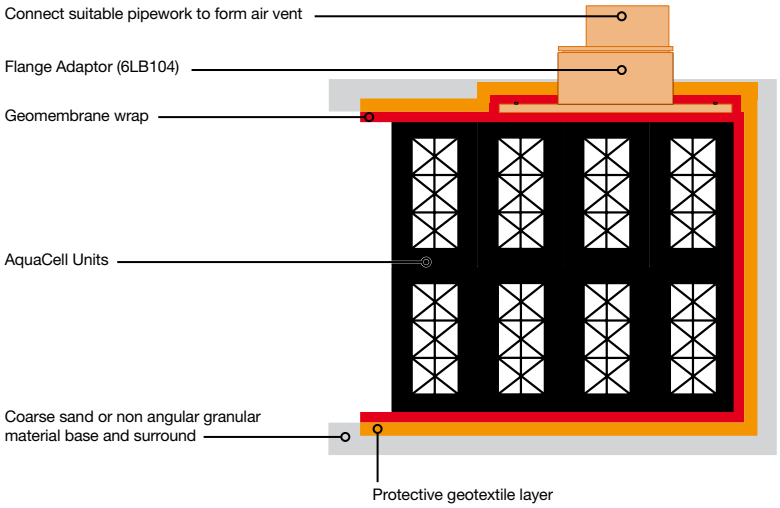
Adhesive or double sided tape should be used between the geomembrane and the flange plate to ensure a watertight seal.

NOTE: It is recommended that one vent pipe, 110mm in diameter, is provided per 7,500 square meters of impermeable catchment area on a site. Please contact Wavin Technical Design for further details.

Connections

Top connection for Air Vent

Connect into the top of the AquaCell unit, using Flange Adaptor.

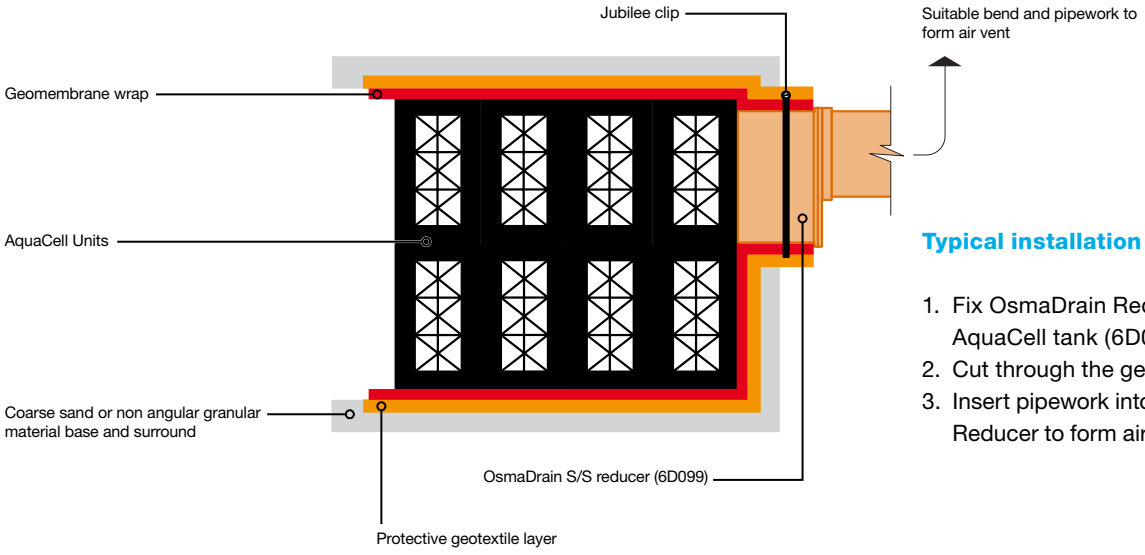


Typical installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor to form air vent.

Side connection for Air Vent

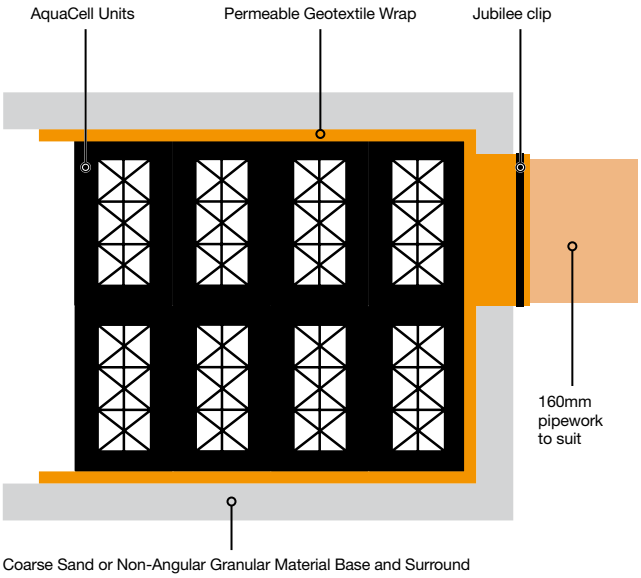
Connect into the side of the AquaCell tank unit using standard Reducer.



Typical installation procedure

1. Fix OsmaDrain Reducer to the AquaCell tank (6D099).
2. Cut through the geomembrane.
3. Insert pipework into OsmaDrain Reducer to form air vent.

Connections

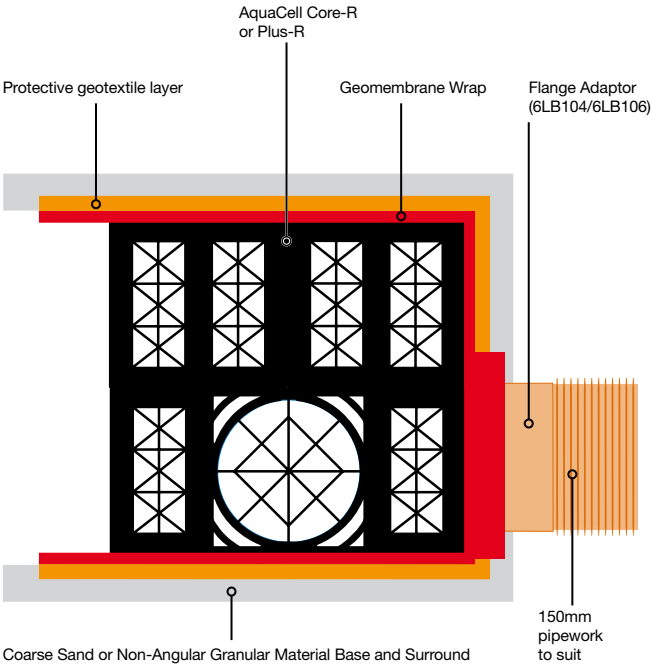


Connections to AquaCell units

Connection for soakaway application using either the pre-formed socket (as shown below) or standard adaptors into pre-formed socket*.

*NOTE: For pipework other than 160mm OsmaDrain, these adaptors can be used to connect to the following:

- 6TW141: TwinWall S/S Adaptor connects to 150mm TwinWall
- 6D099: OsmaDrain Adaptor connects to 110mm OsmaDrain
- 6UR141: UltraRib S/S Adaptor connects to 150mm UltraRib
- SA15/2: Double Spigot Adaptor connects 160mm OsmaDrain to 150mm Supersleve Clay



Connection for storage application using Flange Adaptor at points other than pre-formed socket, (for AquaCell Core-R or Plus-R).

Installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor.

*NOTE: When using the 6LB104: For pipework other than 150mm UltraRib these adaptors can be used to connect to the following:

- 6UR099: S/S Level Invert Reducer to 110mm OsmaDrain
- 6UR143: UltraRib 150mm Spigot Adaptor connects to 160mm OsmaDrain
- 6TW145: UltraRib 150mm Spigot Adaptor connects to 150mm Twinwall
- TA/2: UltraRib 150mm Spigot Adaptor connects to 150mm Supersleve Clay

When using the 6LB106: For pipework other than 225mm UltraRib these adaptors can be used to connect to the following:

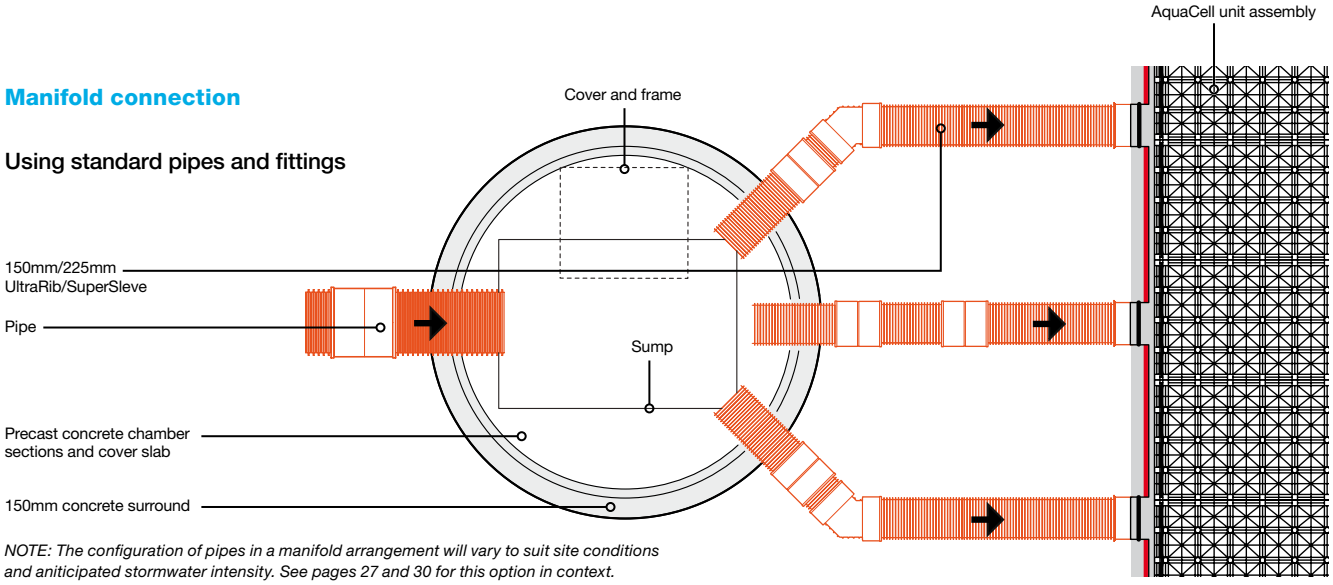
- 9TW145: UltraRib 225mm Spigot Adaptor connects to 225mm Twinwall
- TA/4: UltraRib 225mm Spigot Adaptor connects to 225mm Supersleve Clay

Connection configurations

The connections shown here in schematic form, are the typical options used to connect AquaCell units to control chambers. They provide a controlled feed into and out of the AquaCell units, and are used for either infiltration or attenuation schemes.

Manifold connection

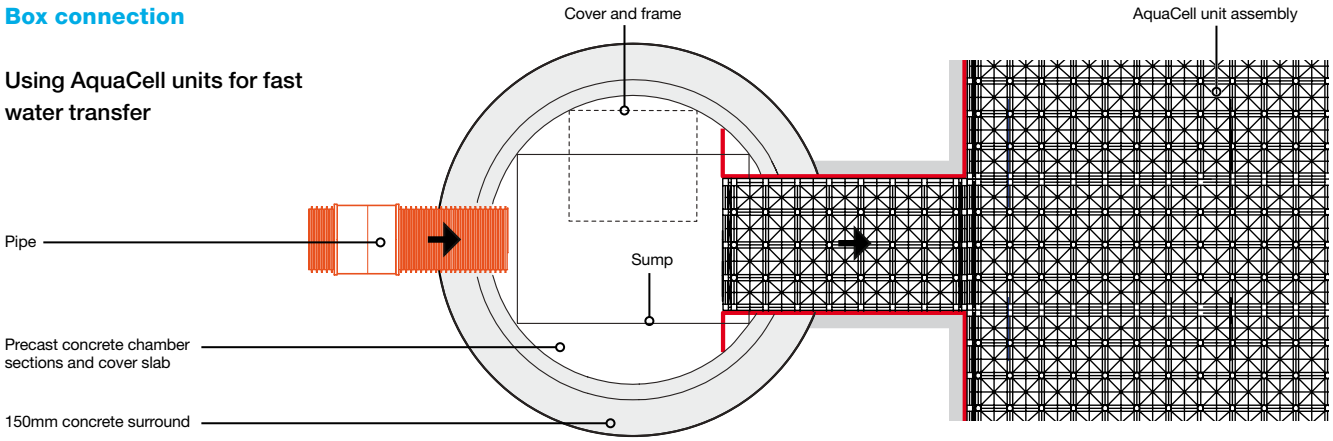
Using standard pipes and fittings



NOTE: The configuration of pipes in a manifold arrangement will vary to suit site conditions and aniticipated stormwater intensity. See pages 27 and 30 for this option in context.

Box connection

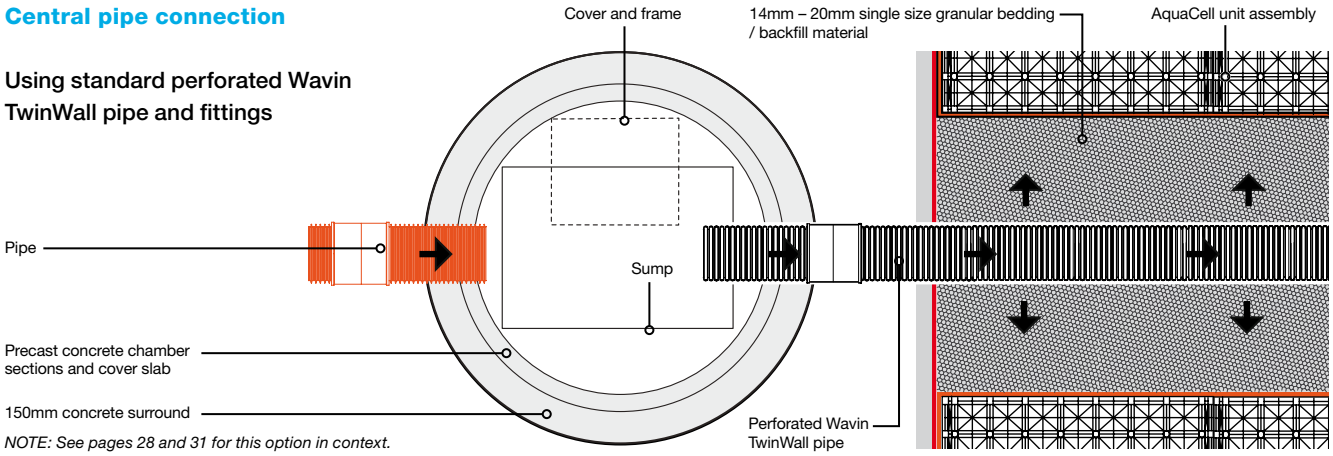
Using AquaCell units for fast water transfer



NOTE: See pages 26 and 29 for this option in context.

Central pipe connection

Using standard perforated Wavin TwinWall pipe and fittings

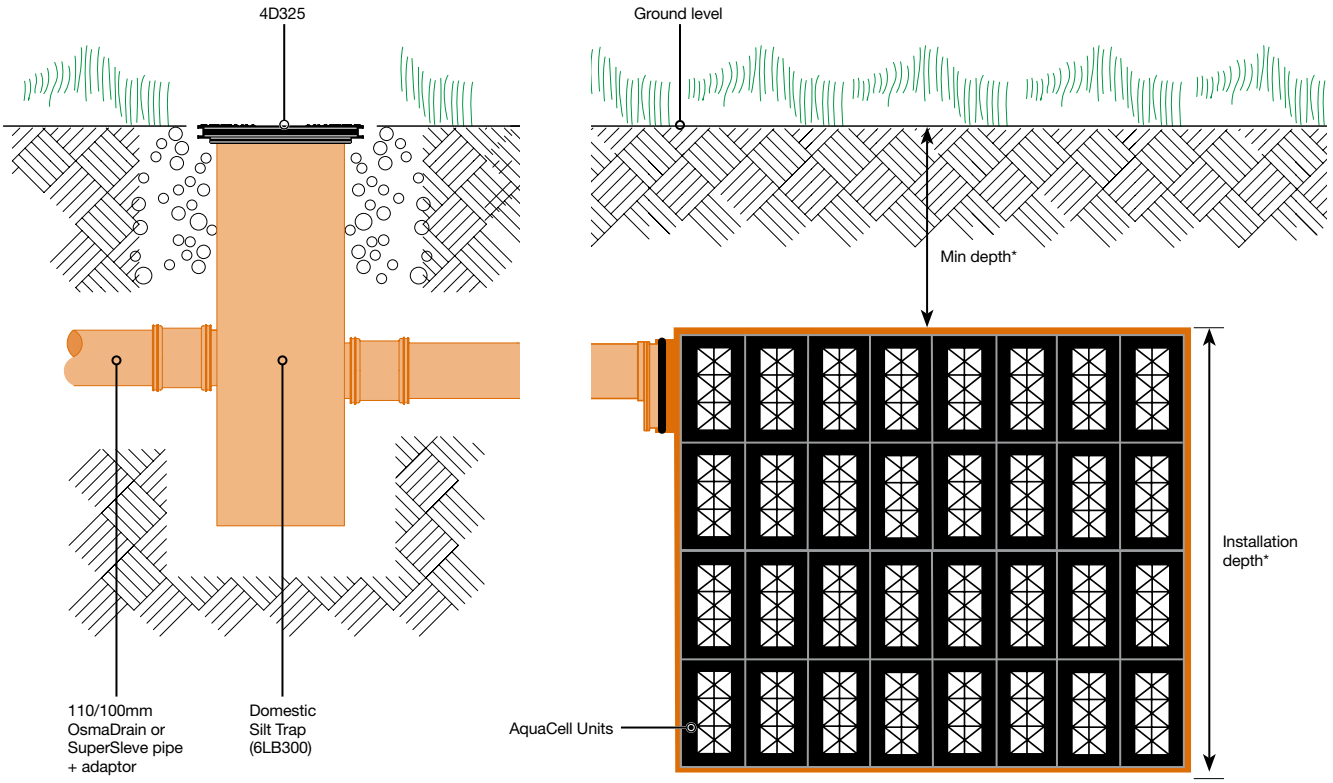


NOTE: See pages 28 and 31 for this option in context.

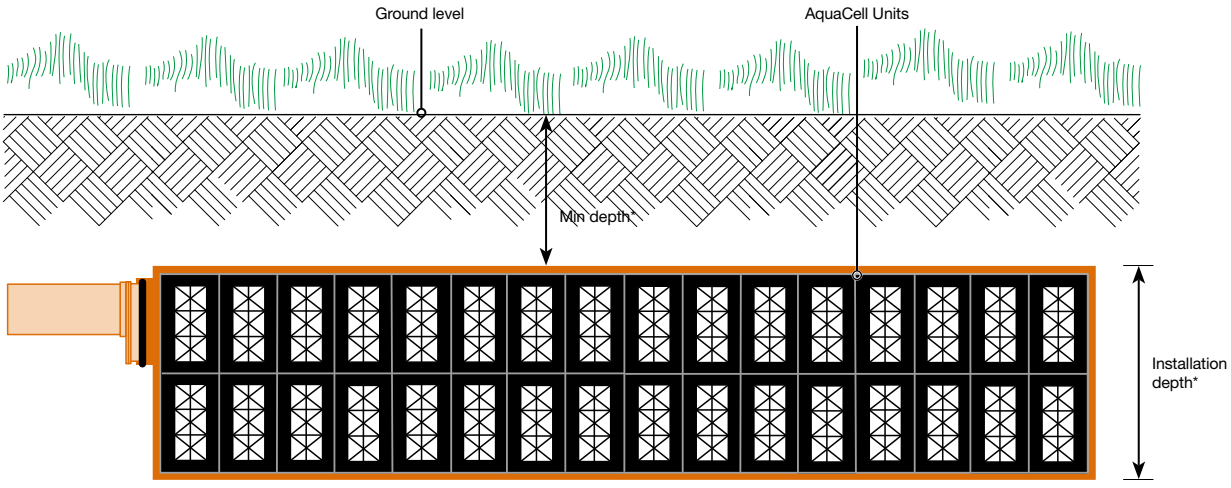
Soakaways

Soakaway – non-traffic loading

Soakaway

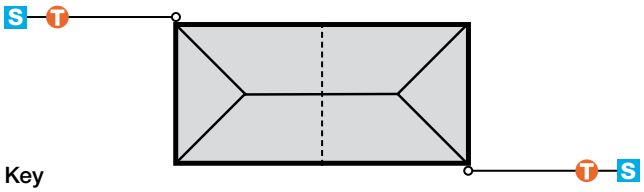


Trench soakaway



Notes

1. Soakaways should be sited at least 5m away from the building (Ref BS EN 752-4).
2. The exact size and shape of the soakaways are to be determined once all the necessary calculations have been produced.
   *For information regarding cover depths and installation depths, see page 15.

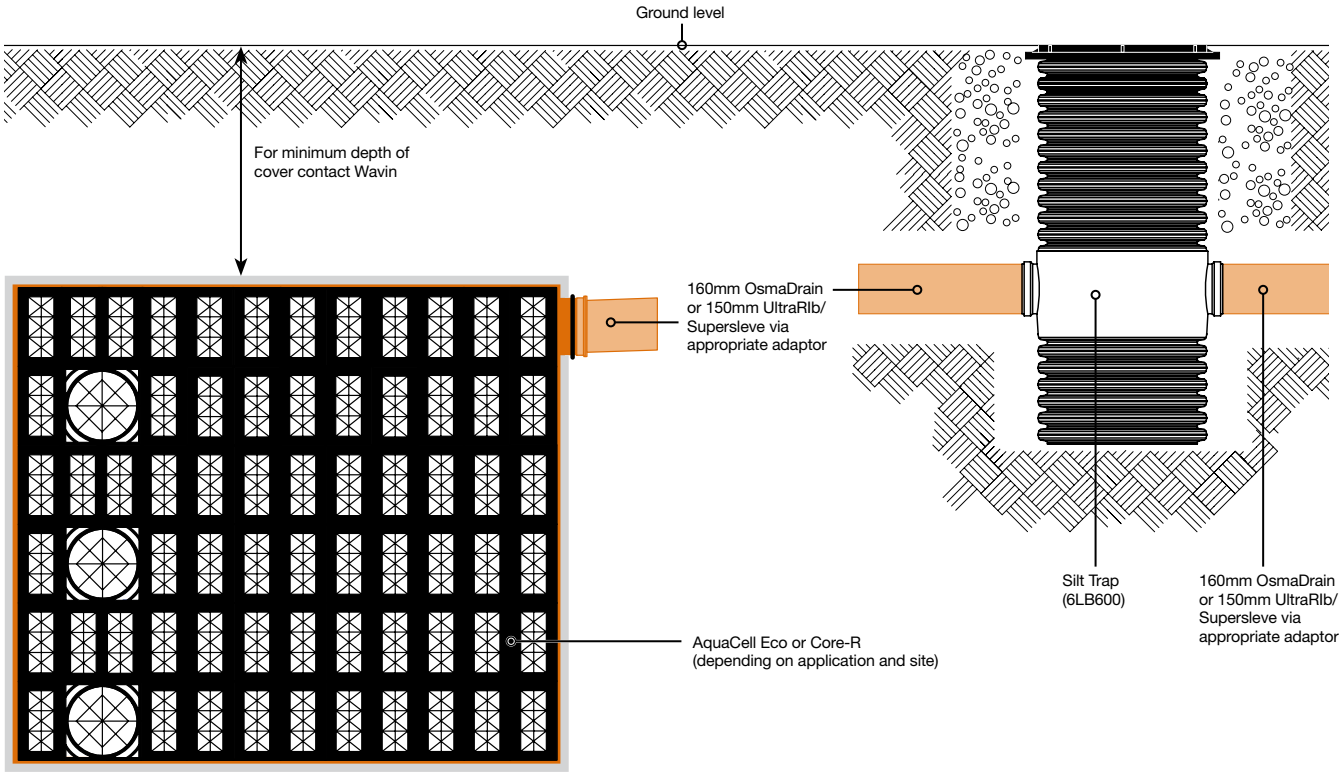


Key

S = AquaCell units soakaway (See note 2)
T = 250mm Dia Silt Trap

Soakaway – traffic loading

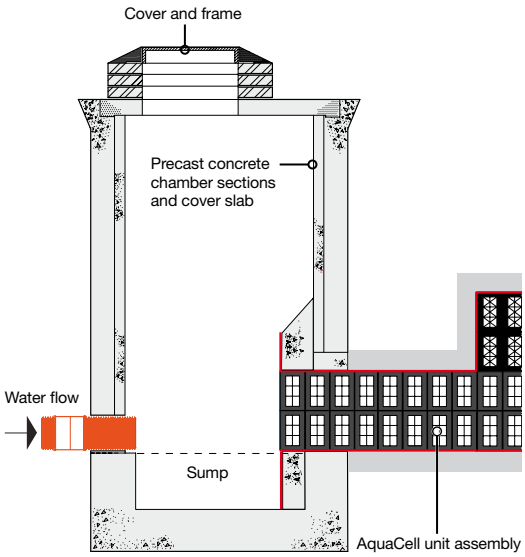
Soakaway



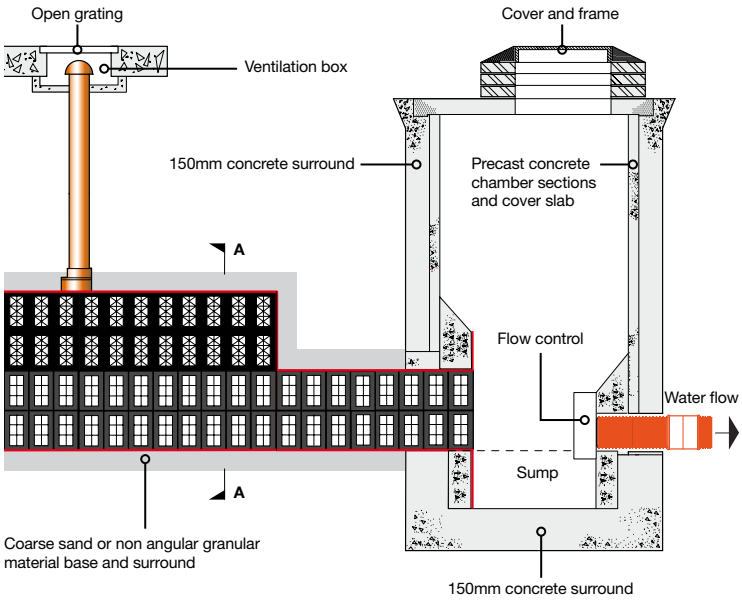
On-line storage

On-line storage – box feed

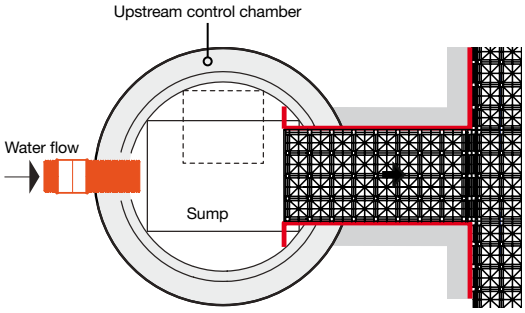
Long section

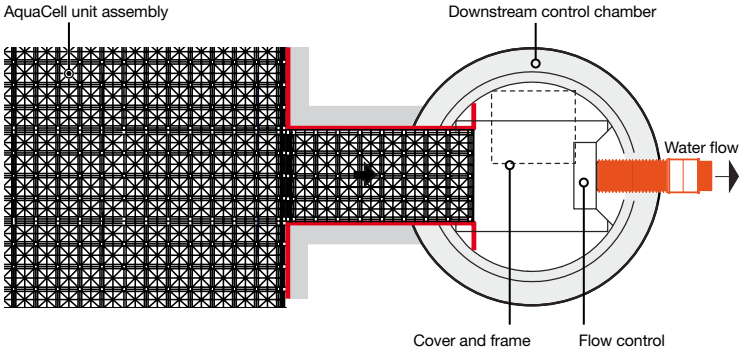


Typical vent detail

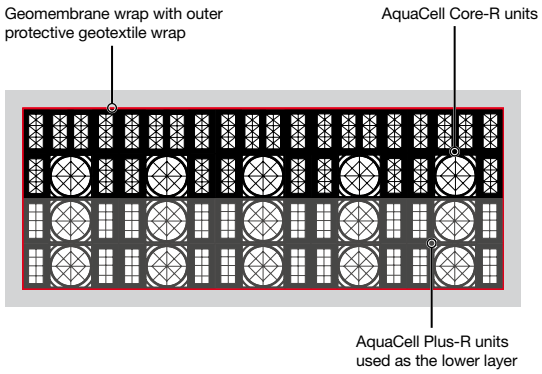


Plan





Cross section A-A

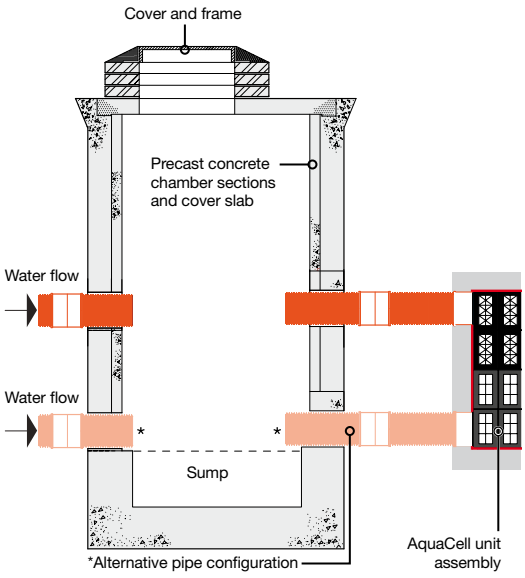


What happens to the water?

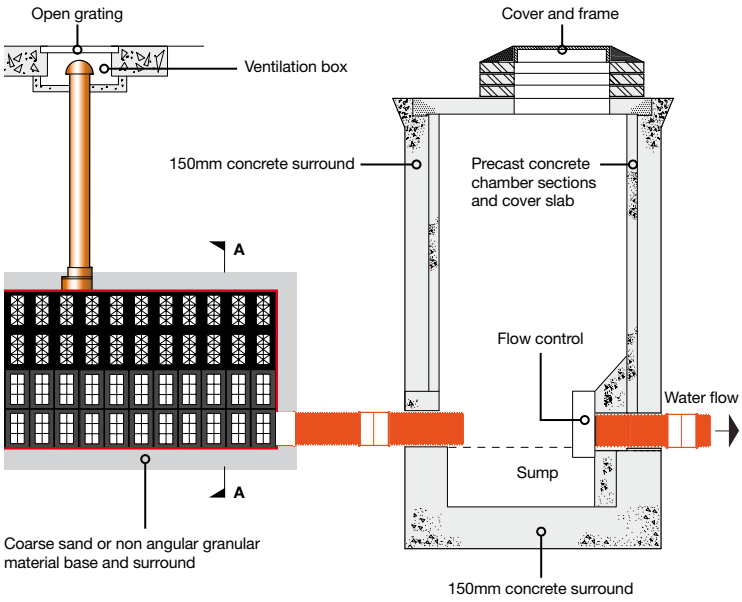
1. The water level in the upstream control chamber rises.
2. Then, during a storm event, the AquaCell storage assembly quickly fills with water via the AquaCell feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

On-line storage – manifold feed

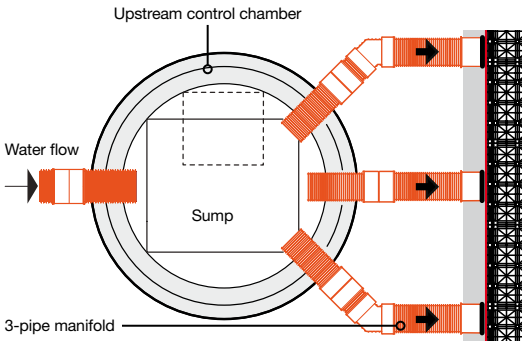
Long section

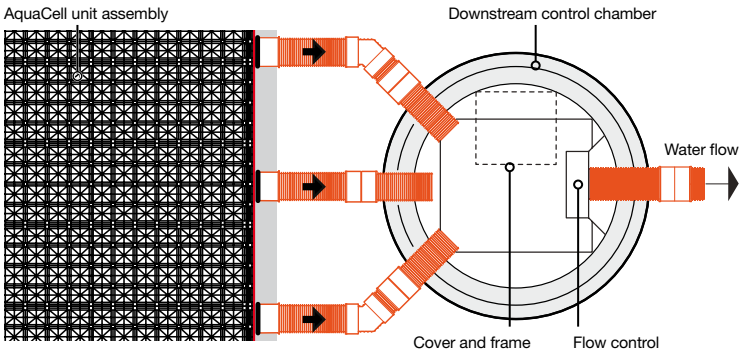


Typical vent detail

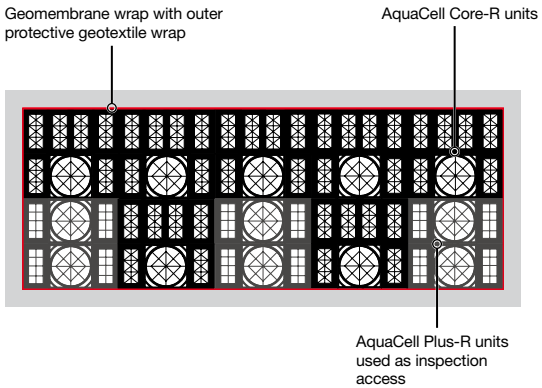


Plan





Cross section A-A



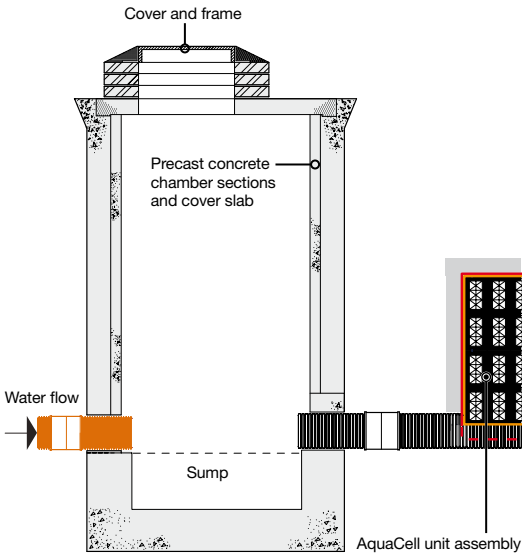
What happens to the water?

1. The water level in the upstream control chamber rises.
2. During a storm event, the AquaCell storage assembly fills with water via the manifold feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

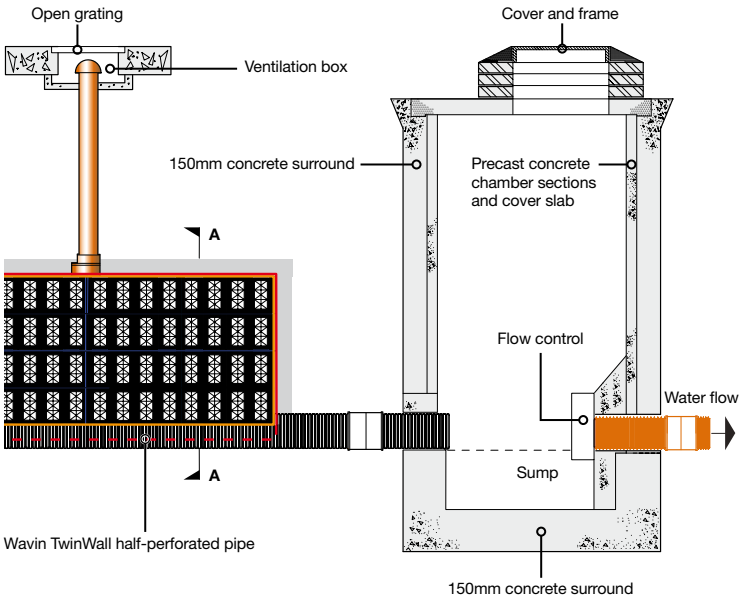
On-line storage

On-line storage – central pipe feed

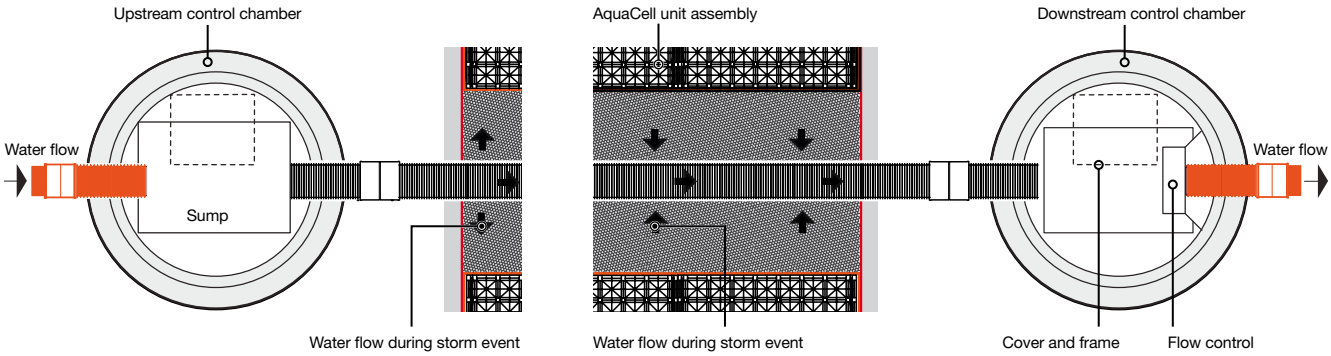
Long section



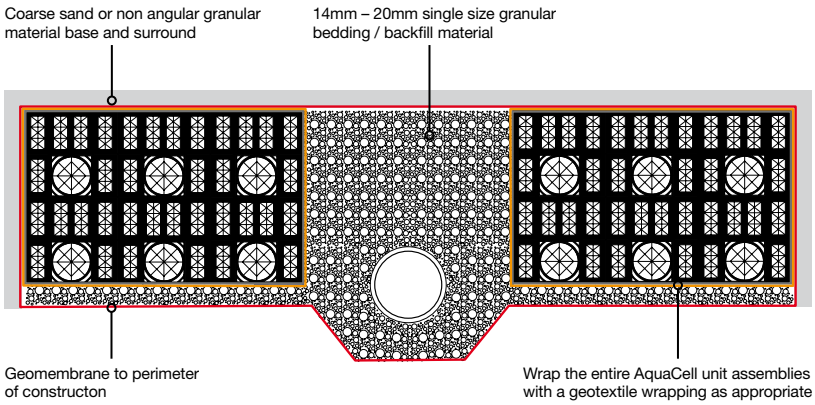
Typical vent detail



Plan



Cross section A-A



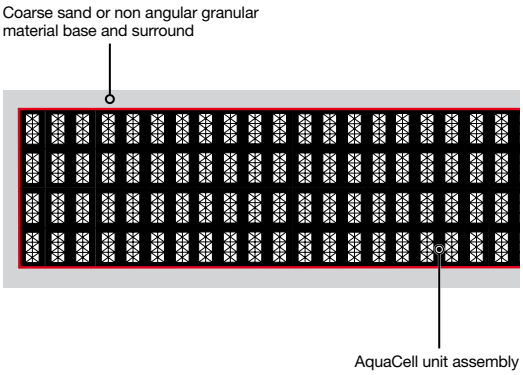
What happens to the water?

1. The water level in the upstream control chamber rises.
2. AquaCell storage assemblies fill with water via the central pipe connection and percolate's through the granular bedding material.
3. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

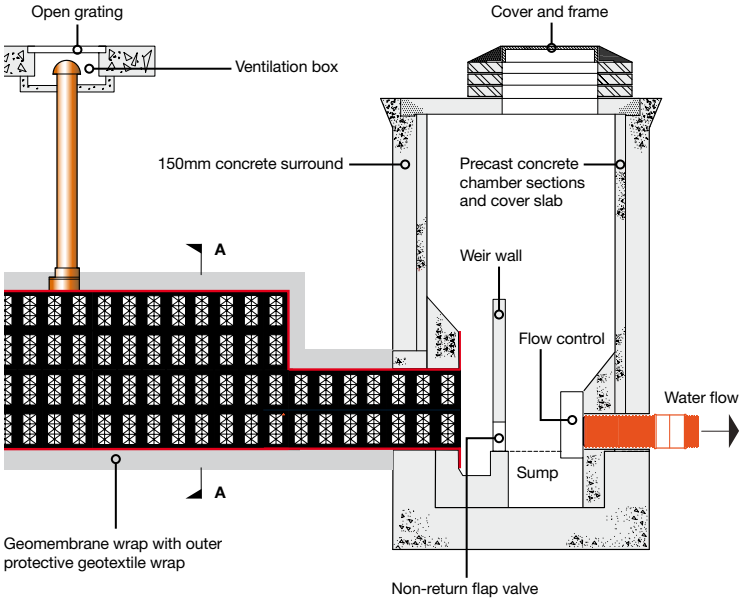
Off-line storage

Off-line storage – box feed

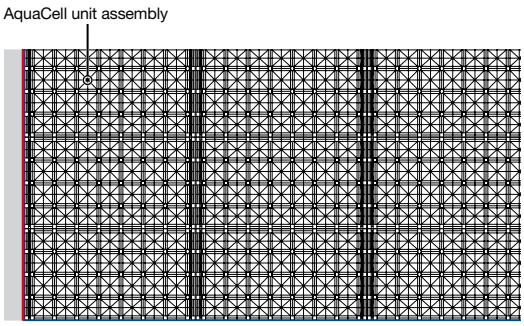
Long section

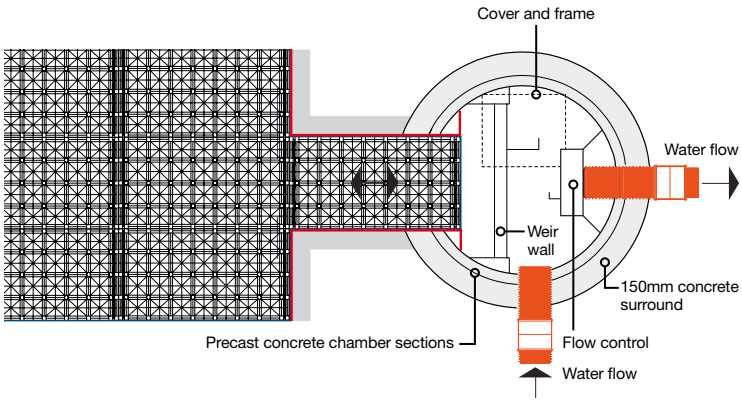


Typical vent detail

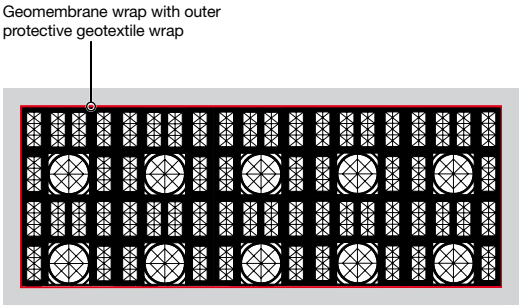


Plan





Cross section A-A



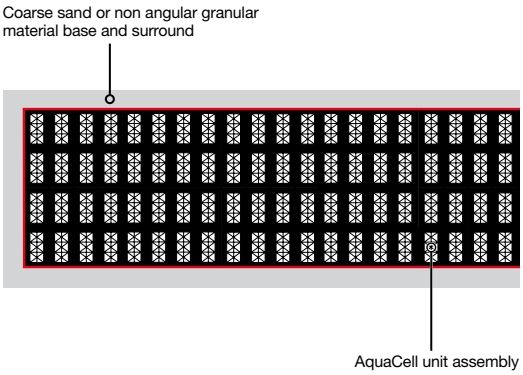
What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the AquaCell connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

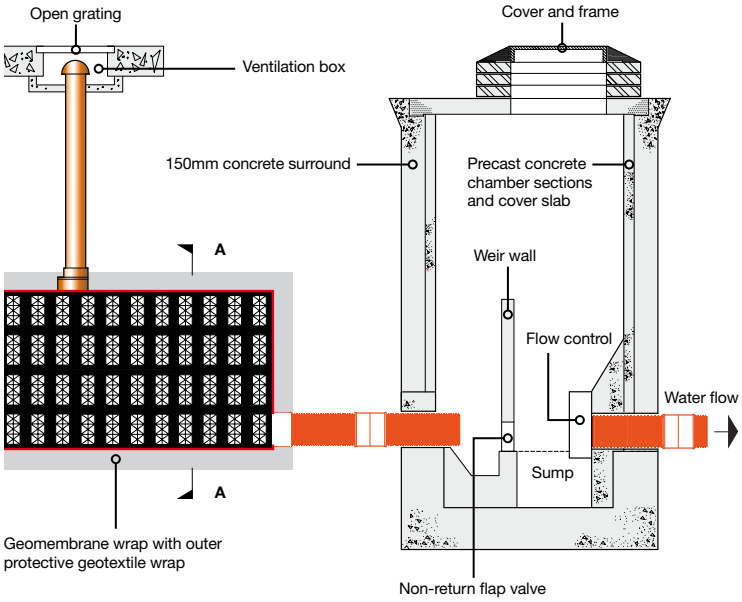
Off-line storage

Off-line storage – manifold feed

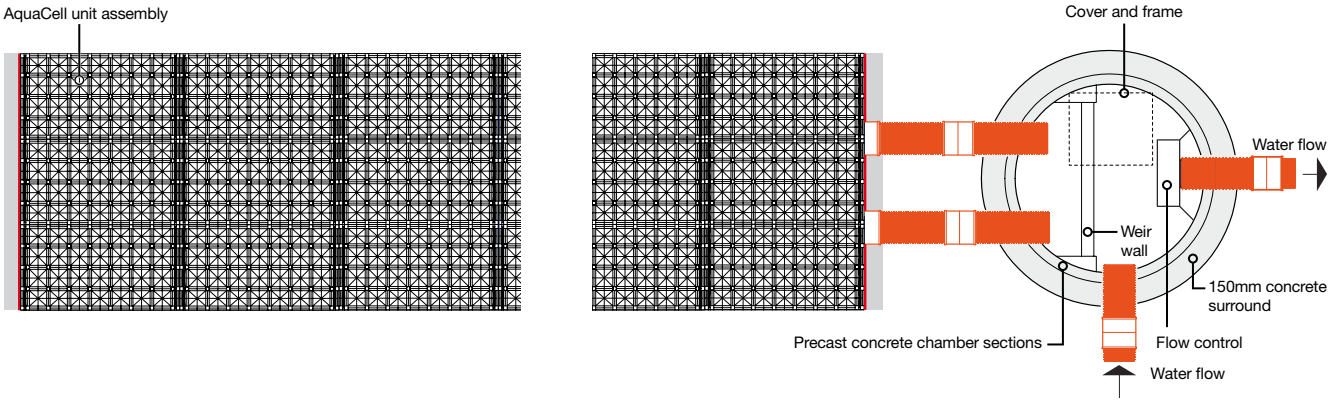
Long section



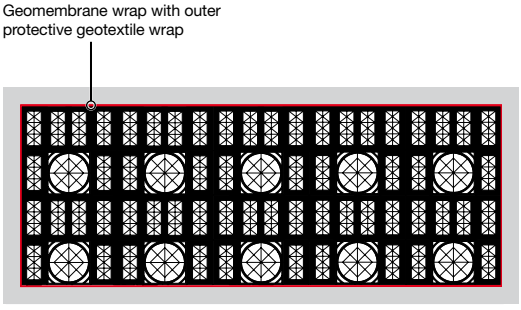
Typical vent detail



Plan



Cross section A-A

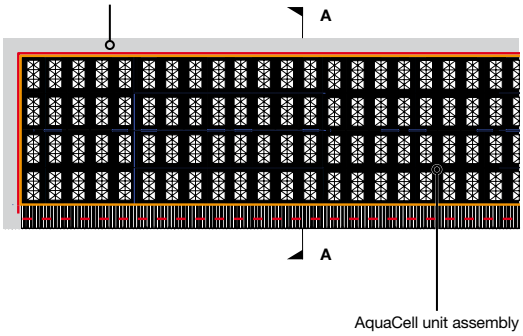


What happens to the water?

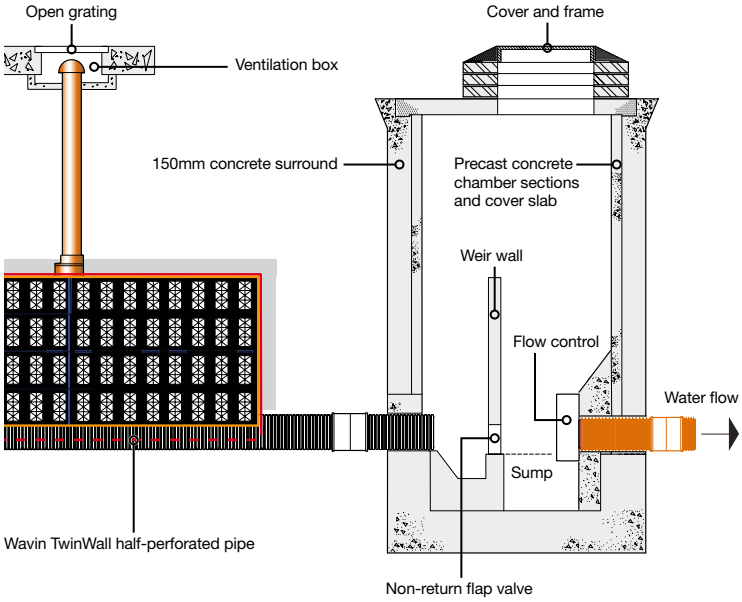
1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the manifold connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

Off-line storage – central pipe feed

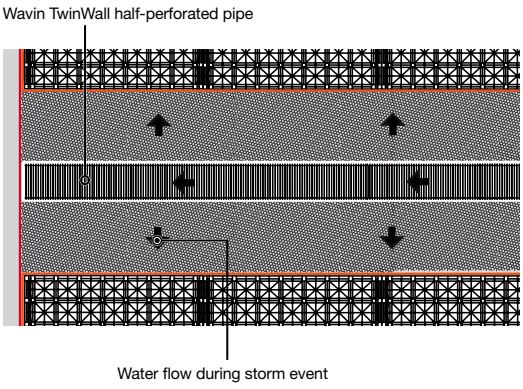
Long section

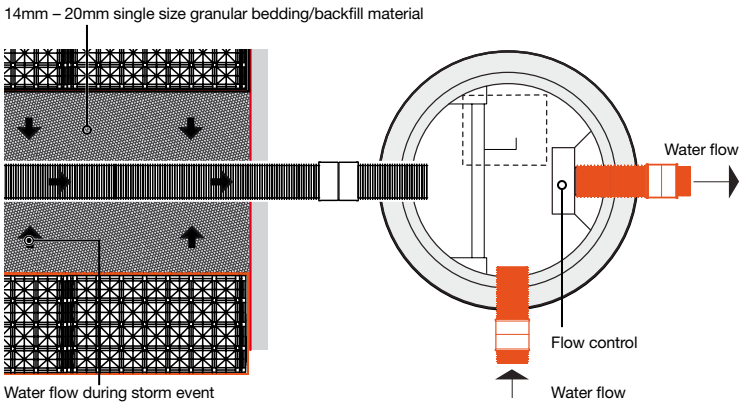


Typical vent detail

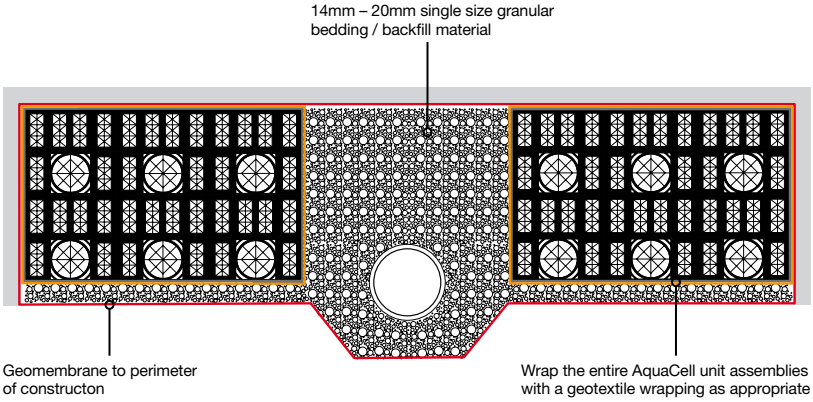


Plan





Cross section A-A

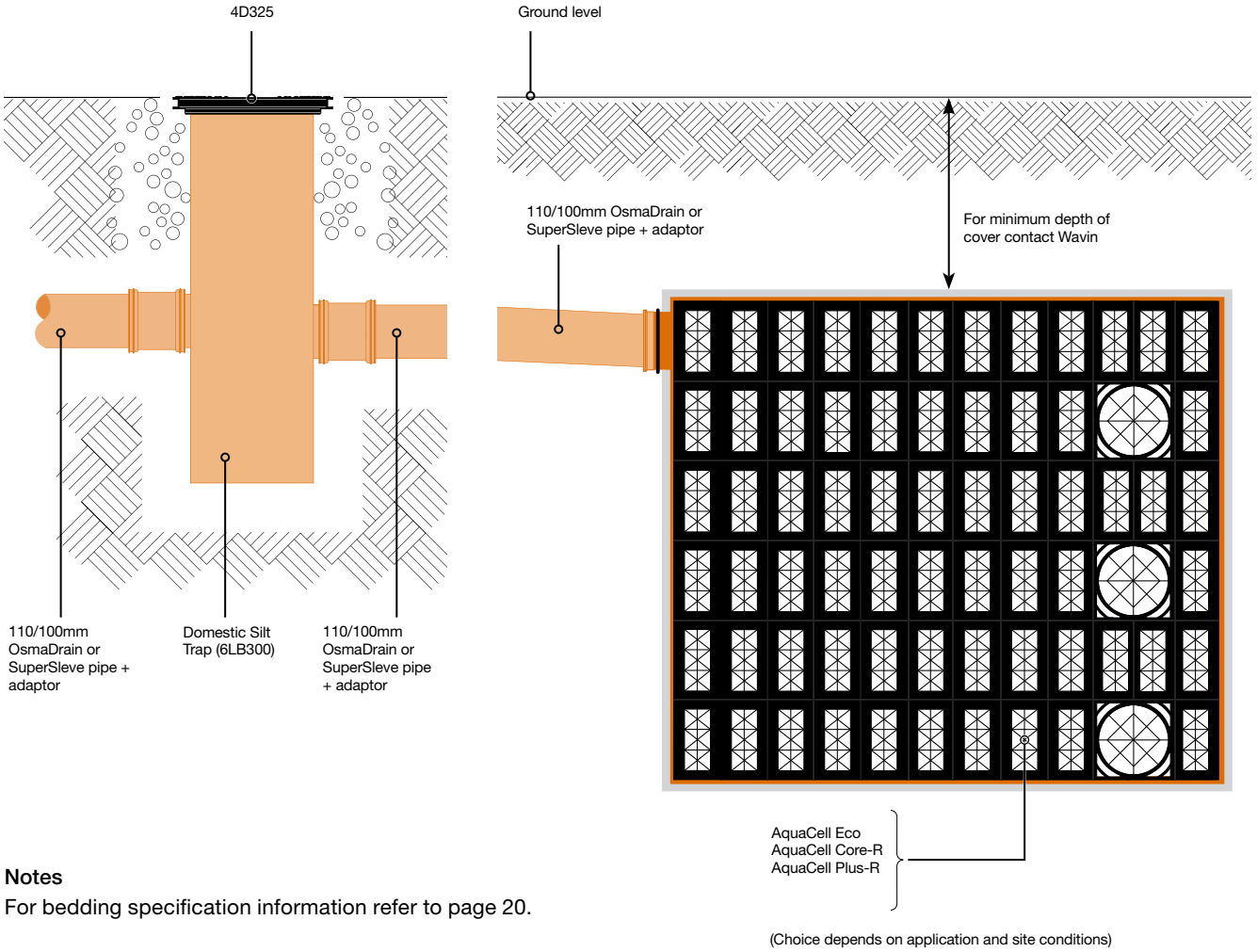


What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assemblies via the central pipe connection and percolate's through the granular bedding material.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve

Soakaway with Silt Trap

Soakaway or storage tank – with Silt Trap



Notes

For bedding specification information refer to page 20.

The silt trap can be used in conjunction with a soakaway (as shown) or a storage tank.

Wavin stormwater management

To achieve optimum stormwater management

The Wavin Stormwater Management System represents a combination of specialist expertise and technology from Wavin. This is specifically focused on achieving the optimum solution for each project requiring effective and sustainable management of stormwater.

Such a solution may be entirely based on a tailored combination of our engineered systems.

In other cases, Wavin Stormwater Systems can be integrated with 'soft' SuDS techniques, such as ponds and swales, to help achieve the optimal solution.

Other Wavin stormwater systems

Channel drainage

Environmentally-friendly polyester concrete systems to cover all EN 1433 load classes. With outstanding chemical resistance and low water absorption:

- Medium duty range for applications up to C250
- Heavy duty range for D400 / F900 application

Plastic pervious paving

High performance, plastic pervious paving system, for use in all types of Sustainable Drainage systems (SuDS).

- AquaGrid 50 – for use in landscape projects
- AquaGrid 75 – for use in car parking areas

Flow control valves

The Wavin+Mosbaek range of vortex flow control valves are manufactured from stainless steel and are custom-built to meet exact site requirements:

- Tornado, Hurricane and Typhoon stainless steel flow control valves with no moving parts of power needs

Q-Bic Plus

As part of an effective SuDS solution, no other attenuation tank ticks as many boxes as Q-Bic Plus.

Designed from the ground up to be compliant with Sewers for Adoption 8, it is easy to handle, fast and simple to install, and carries BBA approval. The high void design makes it the most accessible, inspectable and cleanable attenuation tank on the market, scoring with specifiers for its design flexibility whatever the soil type, available area or load.

Anti-flood valves

- Anti-Flood Valves that comply with EN 13546-1, and Part H1– Sections 2.8-2.12 of Building Regulations

Below ground water transportation

Wavin Stormwater installations can draw from an extensive choice of plastic and clay pipe systems, including:

- OsmaDrain solid wall PVC-U pipe system
- Structured wall plastic UltraRib and TwinWall pipe systems
- SuperSleve clay pipe systems

Other options include perforated pipe for land drainage: WavinCoil plastic and HepLine clay – and a full range of Wavin Non-Entry Inspection Chambers.

The Wavin stormwater service

Precision and performance

The Wavin Technical team are ready to contribute to any stormwater management project.

This may be at the very earliest stage – or when initial plans have already been developed. There are no pre-conditions with regards to you requesting Wavin to become involved.

We are ready to:

- Originate project design
- Comment on an existing design
- Help validate a specification – or, where we see an opportunity to do so, to suggest how it may be enhanced
- Check, clarify and confirm maximum cost-efficiency, performance capability and regulatory compliance

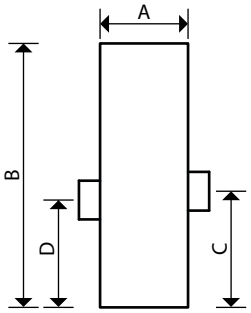
This involvement is a core part of the Wavin principle. It extends beyond the systems and components.

To discuss your stormwater management project, call 0800 038 0088 or email technical.design@wavin.co.uk.

Supplementary items

Silt Trap – domestic – for non loaded applications





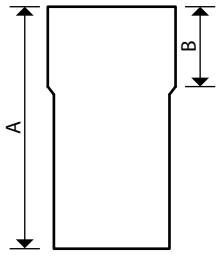
Domestic Silt Trap

- 250mm x 750mm depth
- With 110mm diameter inlet and outlet spigots
- For use with the 4D325 cover and frame

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
–	6LB300	250	750	330	305





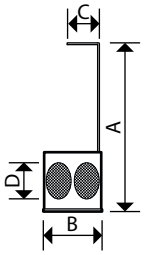
Extension Piece for 6LB300

- 250mm x 500mm depth (effective length = 335mm)

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B
–	6LB301	500	165





Silt Trap Bucket for 6LB300

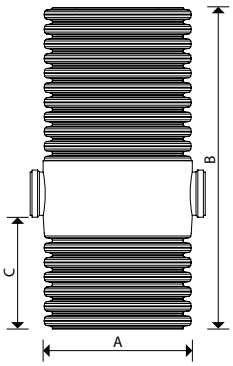
- 200mm x 210mm depth

Material: PVC-U/Polypropylene

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
–	6LB302	597	208	114	127.5

Silt Trap – trafficked





Silt Trap

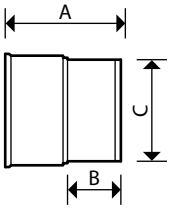
- 500mm diameter x 1.25m depth

Material: Polypropylene

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
160mm	6LB600	500	1250	450
225mm	6LB625	500	1250	450
300mm	6LB630	500	1250	450

Ancillaries





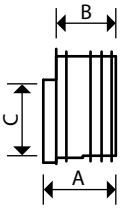
S/S Adaptor

- 6UR socket x 160mm BS EN 1401 spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150	6UR141	180	84	160





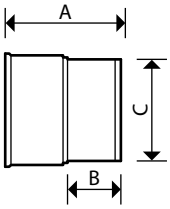
S/S Level Invert Reducer

- To 110mm OsmaDrain spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150 x 110	6UR099	115	95	111





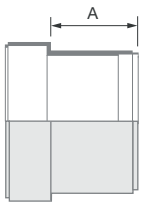
S/S Adaptor

- 6TW socket x 160mm BS EN 1401 spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150	6TW141	180	84	160





Double Ended Spigot Adaptor

- For connecting SuperSleve pipes to OsmaDrain pipes

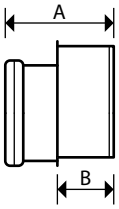
Material: Polyproylene

Nominal Size (mm)	Part Number	Dimensions (mm) A
100	SA15/1	65
150	SA15/2	80

Supplementary items

Ancillaries





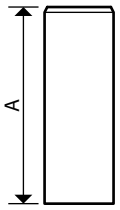
S/S Level Invert Reducer

- To 110 OsmaDrain

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B
160	6D099	127	70



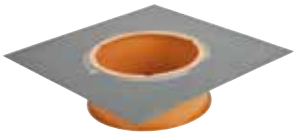


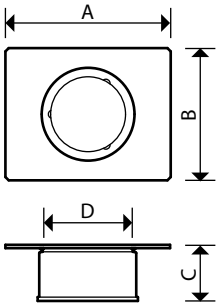
P/E Adaptor

- 160mm spigot connection

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A
160	4D916	325





Flange Adaptor

- 6UR socket for connection of UltraRib to infiltration unit at positions other than preformed opening
- 9UR socket for connection of UltraRib to infiltration unit (can only be used with AquaCell Core-R and Plus-R)

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
150	6LB104	300	300	100	160.3
225	6LB106	500	400	120	226.5

Spares



AquaCell Clip

- For jointing all AquaCell units horizontally

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB105



AquaCell Shear Connector

- For jointing all AquaCell units vertically

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB102



AquaCell Plus End Cap

- For blocking off unused inlets/outlets

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB202

Your notes

Discover our broad portfolio at
www.wavin.co.uk



Water management | Plumbing and heating | Waste water drainage
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Advancing life together

Wavin is part of Orbia, a community of companies working together to tackle some of the world's most complex challenges. We are bound by a common purpose: To Advance Life Around the World.

wavin

Wavin Limited
Registered Office | Edlington Lane | Doncaster | DN12 1BY
Tel. 0800 038 0088 | www.wavin.co.uk | info@wavin.co.uk

WM424 - January 2022

Appendix H – Flow Control Device Details

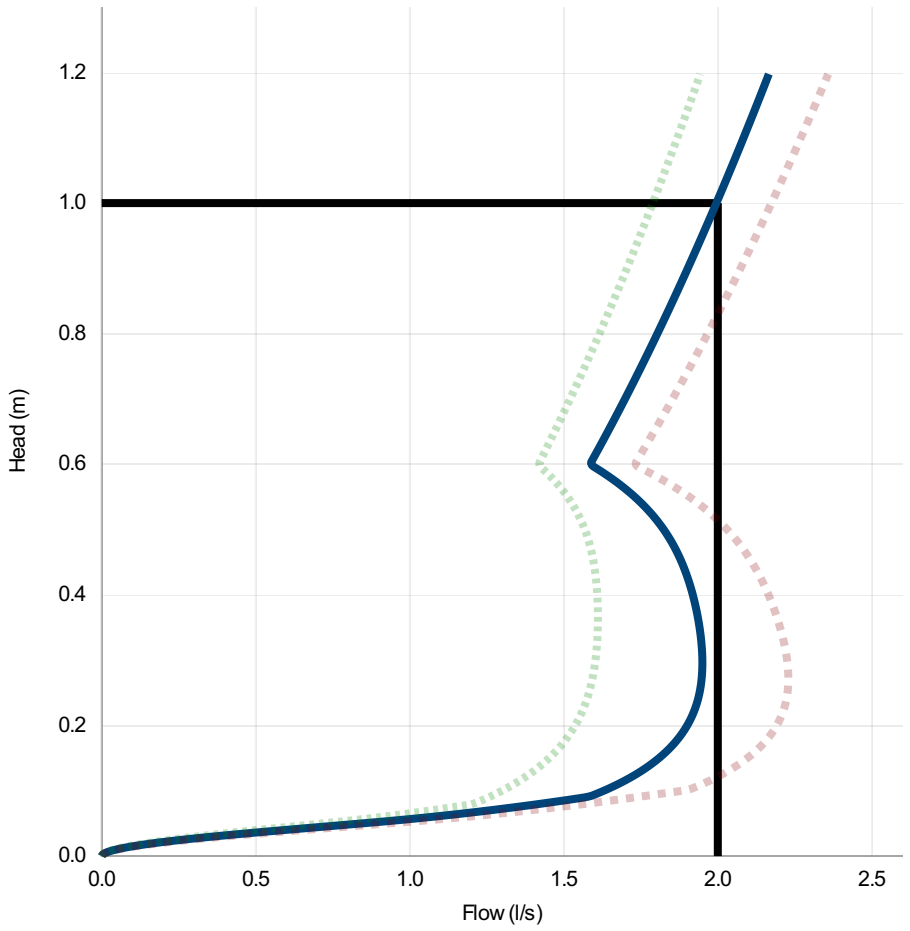
Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	1.000	2.000	1.000	1.789	1.000	2.174
Flush-Flo™	0.296	1.950	0.366	1.611	0.272	2.229
Kick-Flo®	0.599	1.584	0.598	1.416	0.598	1.728
Mean Flow		1.730		1.487		1.927

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

wrc approved™
PT/503/0422
Valid: 01/04/2022 - 31/03/2027

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Head (m)	Flow (l/s)
0.000	0.000
0.034	0.462
0.069	1.240
0.103	1.646
0.138	1.775
0.172	1.858
0.207	1.909
0.241	1.936
0.276	1.948
0.310	1.949
0.345	1.942
0.379	1.929
0.414	1.911
0.448	1.884
0.483	1.848
0.517	1.797
0.552	1.726
0.586	1.631
0.621	1.609
0.655	1.649
0.690	1.687
0.724	1.725
0.759	1.761
0.793	1.797
0.828	1.832
0.862	1.866
0.897	1.899
0.931	1.932
0.966	1.964
1.000	1.995

DESIGN ADVICE

The head/flow characteristics of this SHE-0067-2000-1000-2000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International
A CRH COMPANY

DATE	05/03/2026 12:28
Site	Caheranardrish LRD
DESIGNER	Ben Mong
Ref	24051 - HB1

SHE-0067-2000-1000-2000

Hydro-Brake® Optimum

© 2024 Hydro International, Rivermead Court, Kenn Business Park, Windmill Road, Kenn, Clevedon, BS21 6FT. Tel 01275 878371 Fax 01275 874979 Web www.hydro-int.com Email designtools@hydro-int.com

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	2.000
Flush-Flo™	0.296	1.950
Kick-Flo®	0.599	1.584
Mean Flow		1.730

This Hydro-Brake® Optimum includes:

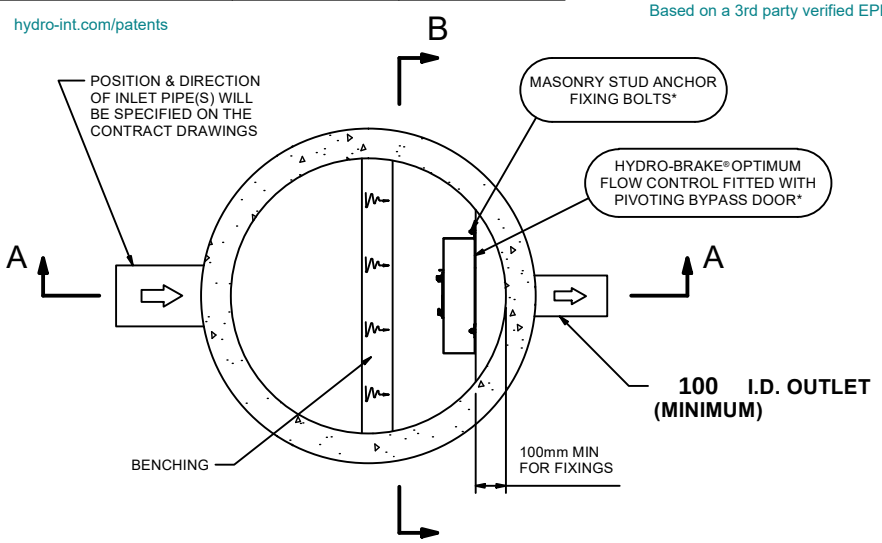
- •All in 3 mm Grade 304L stainless steel
- • Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- • Media blasted for corrosion resistance
- • Variable flow rate post installation via adjustable inlet (if necessary)
- • Indicative Weight: 10 kg
- • Product Carbon Footprint: 38.11 kgCO2e

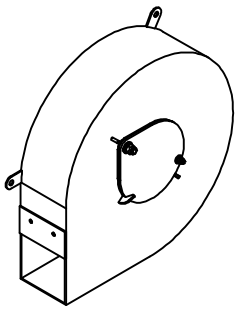
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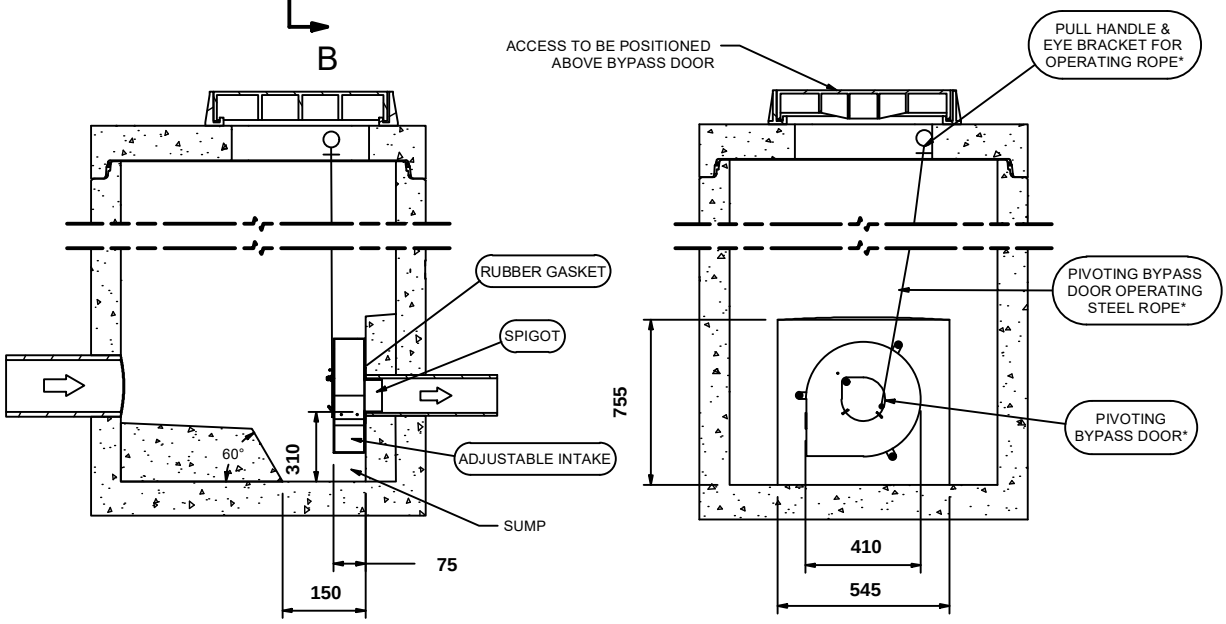
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SECTION A-A

SECTION B-B

IMPORTANT:
⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SHE-0067-2000-1000-2000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
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Hydro International A CRH COMPANY

DATE	05/03/2026 12:28
SITE	Caheranardrish LRD
DESIGNER	Ben Mong
REF	24051 - HB1

SHE-0067-2000-1000-2000
Hydro-Brake® Optimum

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bmong@oslbutler.ie

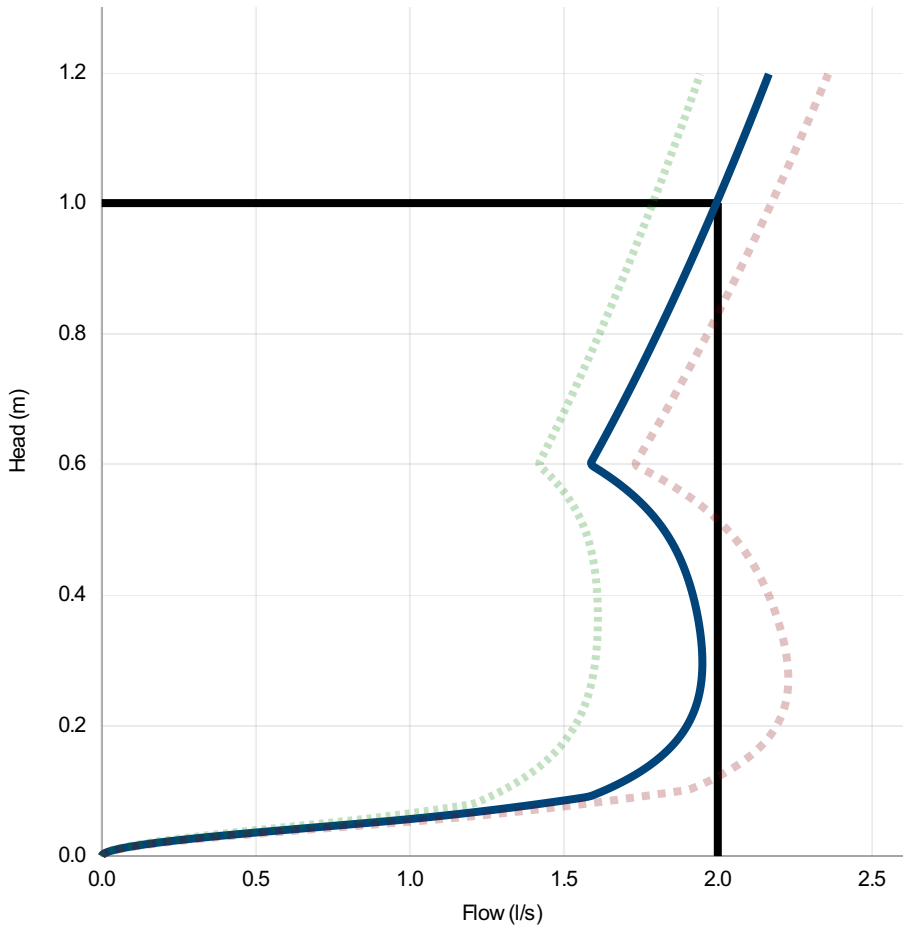
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0.862	1.866
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0.931	1.932
0.966	1.964
1.000	1.995

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Hydro International
A CRH COMPANY

DATE	05/03/2026 12:29
Site	Caheranardrish LRD
DESIGNER	Ben Mong
Ref	24051 - HB2

SHE-0067-2000-1000-2000

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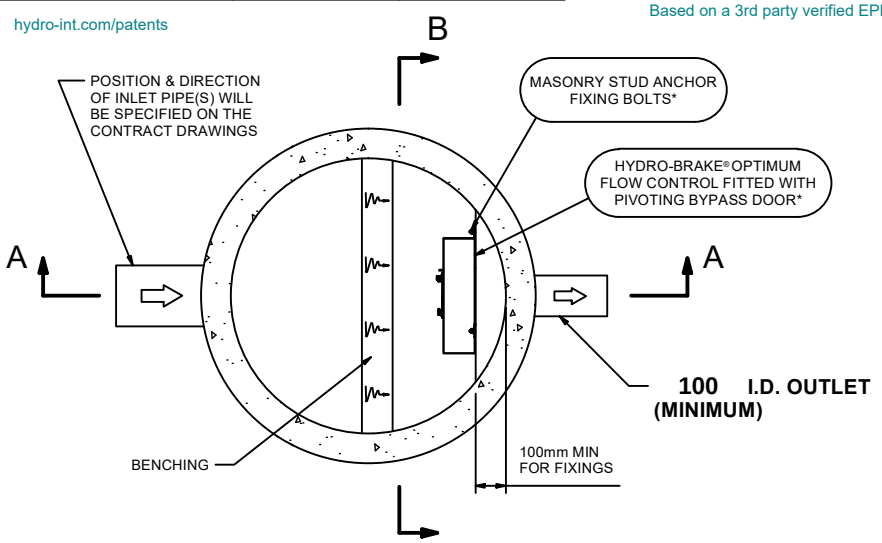
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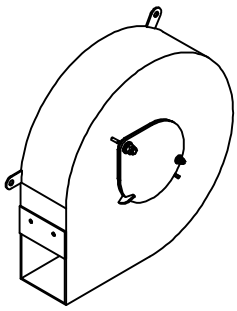
Based on a 3rd party verified EPD: hydro-int.com/epd

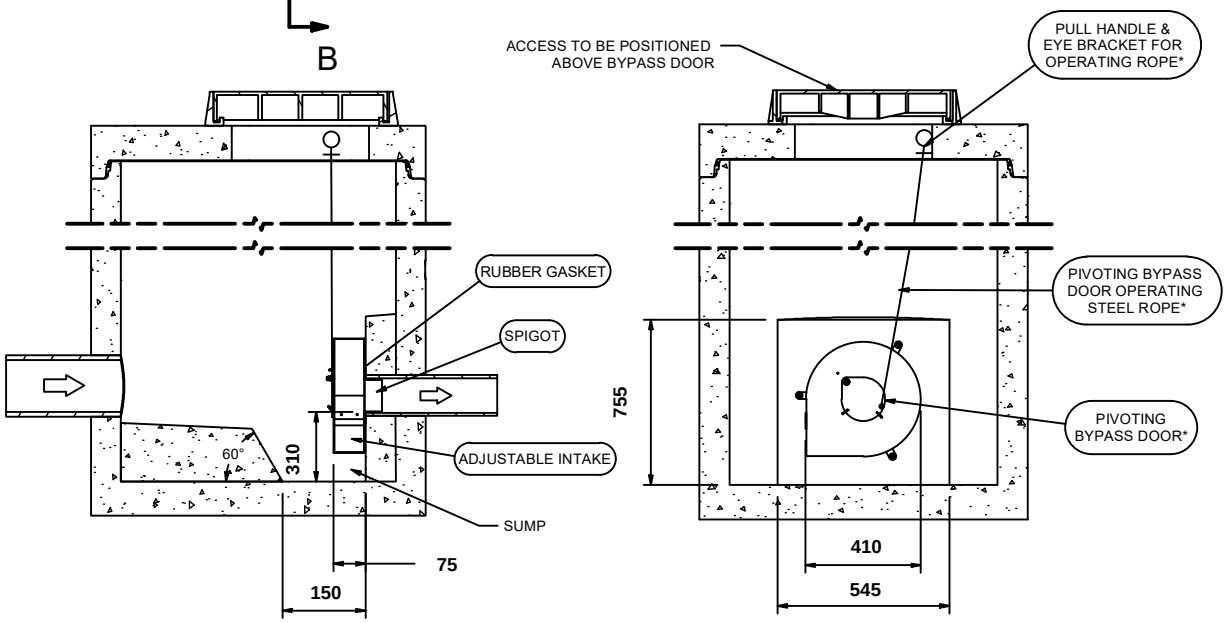
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SECTION A-A

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SITE	Caheranardrish LRD
DESIGNER	Ben Mong
REF	24051 - HB2

SHE-0067-2000-1000-2000
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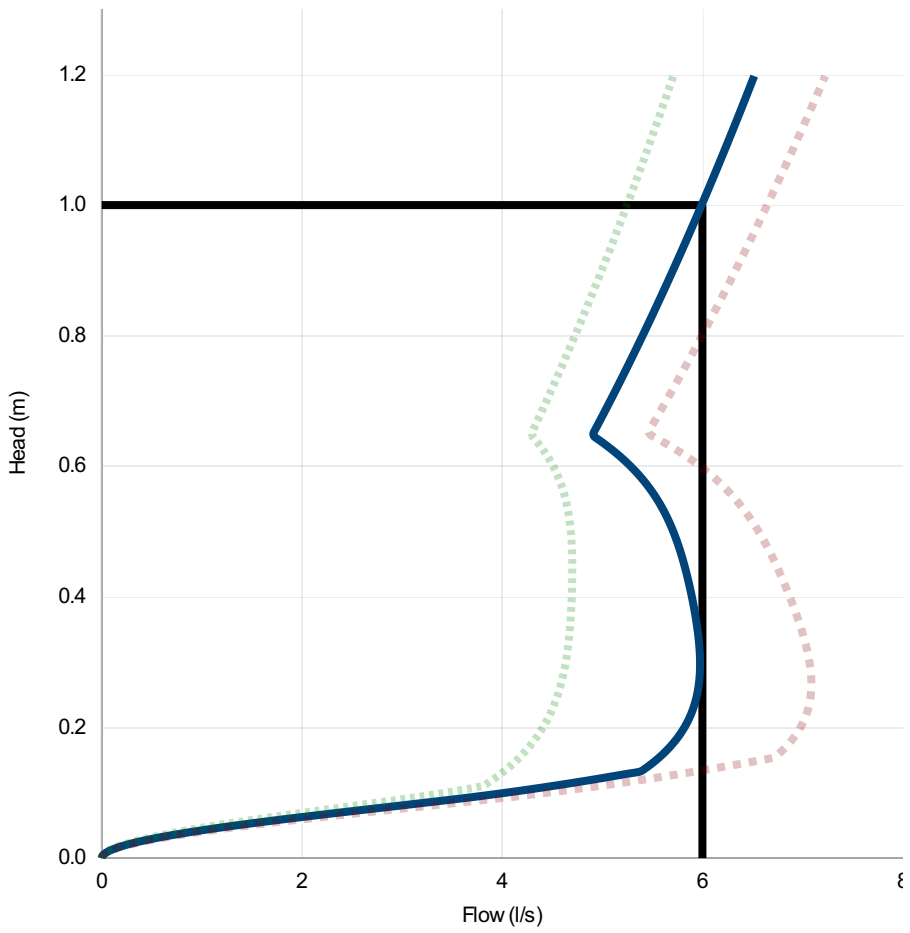
Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	1.000	6.000	1.000	5.246	1.000	6.647
Flush-Flo™	0.298	5.977	0.443	4.701	0.267	7.089
Kick-Flo®	0.647	4.896	0.647	4.284	0.650	5.448
Mean Flow		5.188		4.298		5.922

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Head (m)	Flow (l/s)
0.000	0.000
0.034	0.675
0.069	2.334
0.103	4.192
0.138	5.435
0.172	5.688
0.207	5.845
0.241	5.933
0.276	5.971
0.310	5.975
0.345	5.955
0.379	5.921
0.414	5.876
0.448	5.820
0.483	5.751
0.517	5.661
0.552	5.538
0.586	5.368
0.621	5.135
0.655	4.926
0.690	5.044
0.724	5.159
0.759	5.271
0.793	5.381
0.828	5.488
0.862	5.593
0.897	5.695
0.931	5.796
0.966	5.895
1.000	5.992

DESIGN ADVICE

The head/flow characteristics of this SHE-0115-6000-1000-6000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

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DATE	05/03/2026 12:30
Site	Caheranardrish LRD
DESIGNER	Ben Mong
Ref	24051 - HB3

SHE-0115-6000-1000-6000

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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	6.000
Flush-Flo™	0.298	5.977
Kick-Flo®	0.647	4.896
Mean Flow		5.188

This Hydro-Brake® Optimum includes:

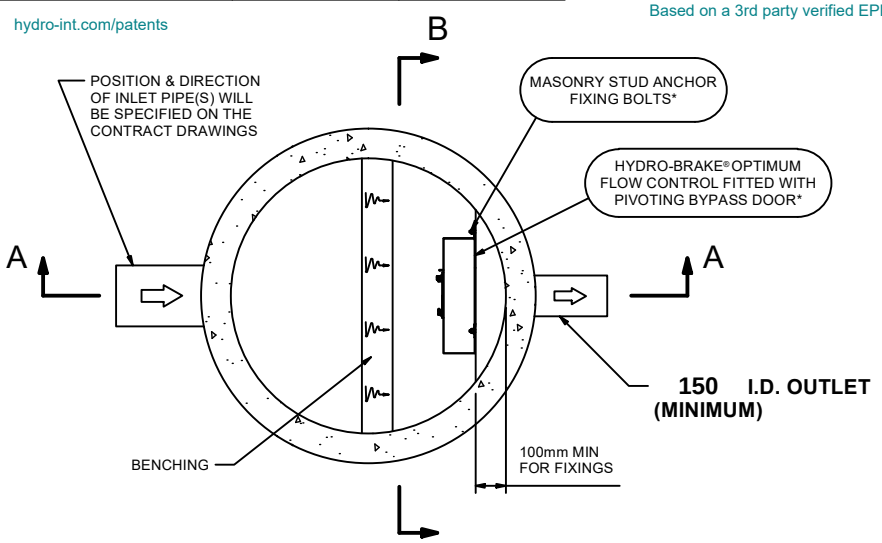
- •All in 3 mm Grade 304L stainless steel
- • Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- • Media blasted for corrosion resistance
- • Variable flow rate post installation via adjustable inlet (if necessary)
- • Indicative Weight: 20 kg
- • Product Carbon Footprint: 68.14 kgCO2e

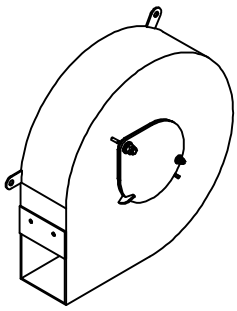
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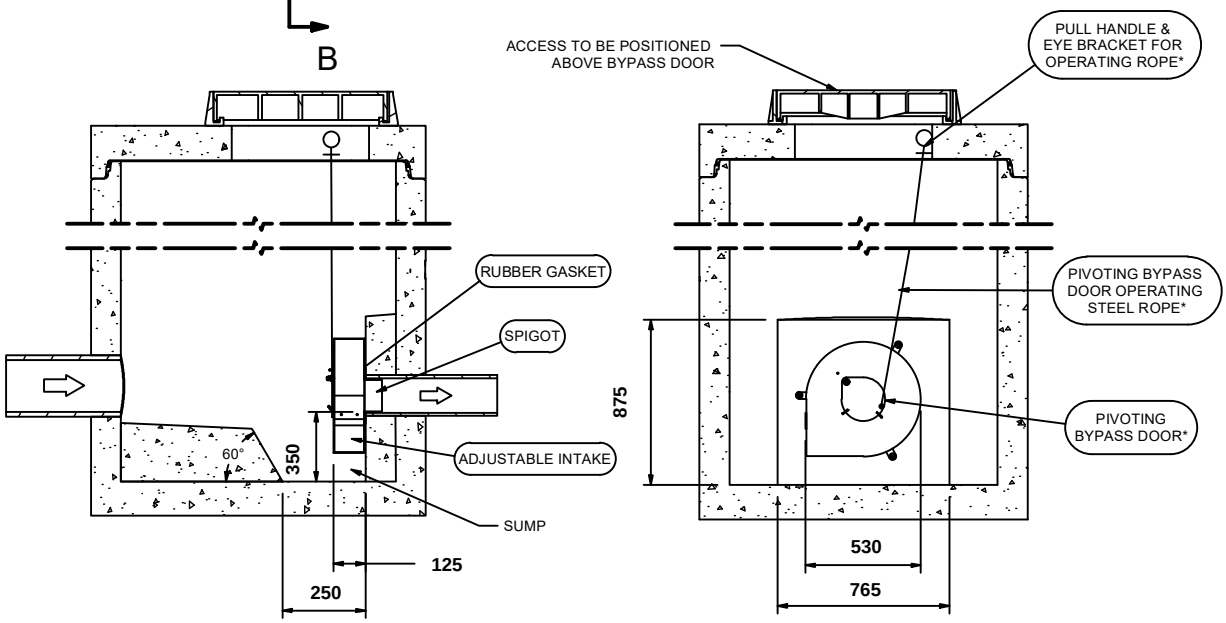
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SECTION A-A SECTION B-B

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SHE-0115-6000-1000-6000
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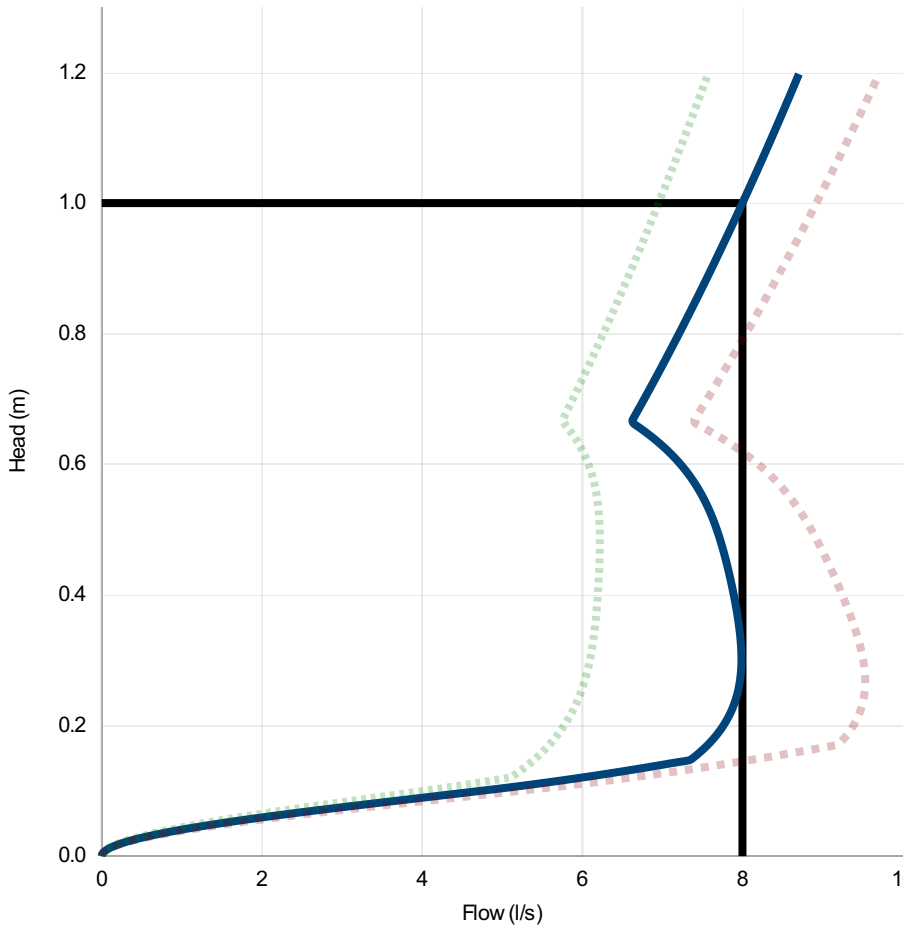
Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	1.000	8.000	1.000	6.954	1.000	8.923
Flush-Flo™	0.302	7.987	0.482	6.219	0.267	9.532
Kick-Flo®	0.664	6.608	0.665	5.744	0.664	7.376
Mean Flow		6.898		5.658		7.901

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Head (m)	Flow (l/s)
0.000	0.000
0.034	0.735
0.069	2.610
0.103	4.971
0.138	6.906
0.172	7.583
0.207	7.797
0.241	7.920
0.276	7.976
0.310	7.986
0.345	7.965
0.379	7.923
0.414	7.868
0.448	7.803
0.483	7.725
0.517	7.628
0.552	7.498
0.586	7.318
0.621	7.067
0.655	6.725
0.690	6.727
0.724	6.881
0.759	7.032
0.793	7.179
0.828	7.323
0.862	7.463
0.897	7.601
0.931	7.737
0.966	7.869
1.000	7.999

DESIGN ADVICE

The head/flow characteristics of this SHE-0132-8000-1000-8000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

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DATE	05/03/2026 12:31
Site	Caheranardrish LRD
DESIGNER	Ben Mong
Ref	24051 - HB4

SHE-0132-8000-1000-8000

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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	8.000
Flush-Flo™	0.302	7.987
Kick-Flo®	0.664	6.608
Mean Flow		6.898

This Hydro-Brake® Optimum includes:

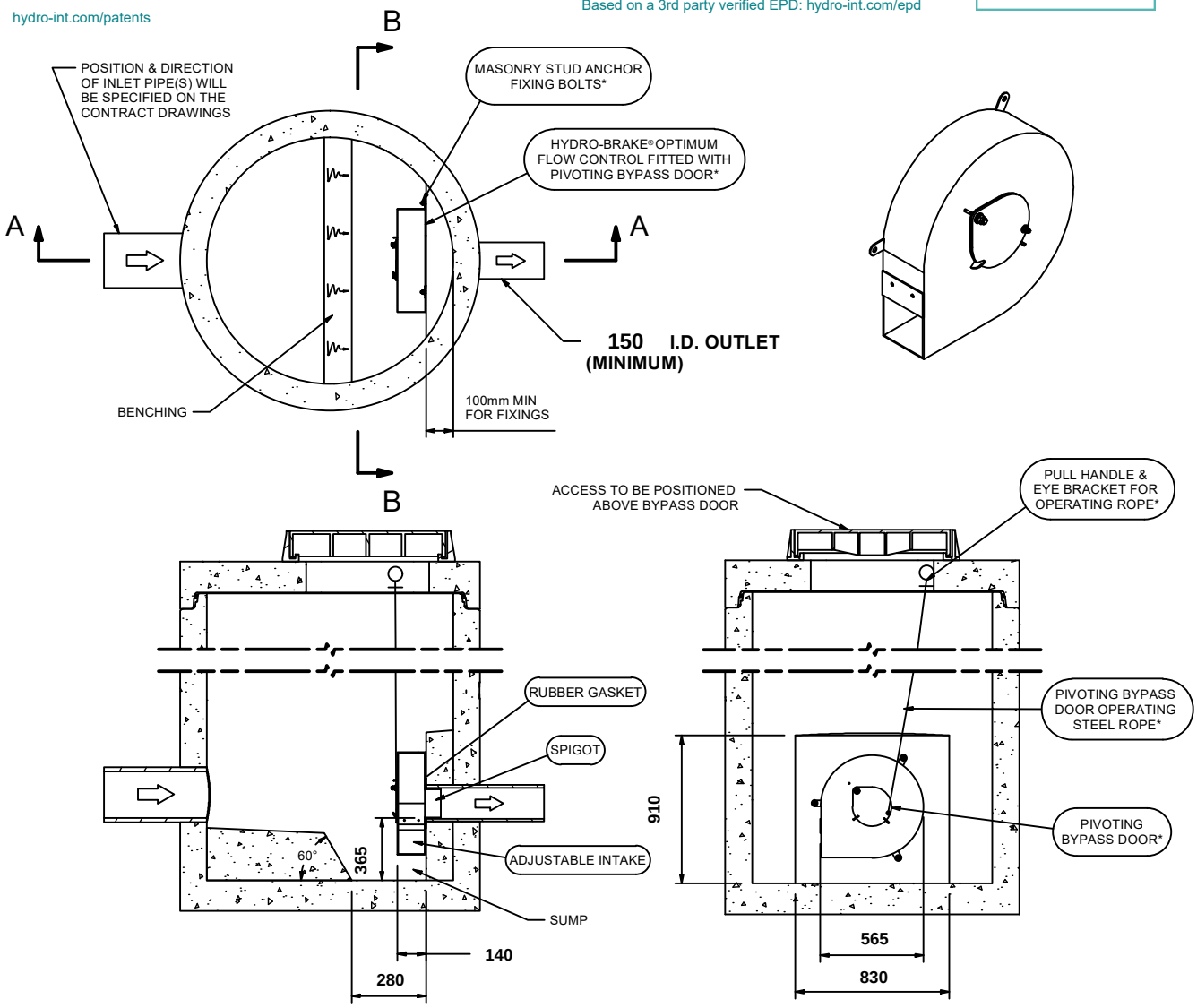
- •All in 3 mm Grade 304L stainless steel
- • Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- • Media blasted for corrosion resistance
- • Variable flow rate post installation via adjustable inlet (if necessary)
- • Indicative Weight: 20 kg
- • Product Carbon Footprint: 79.2 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd

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SECTION A-A

SECTION B-B

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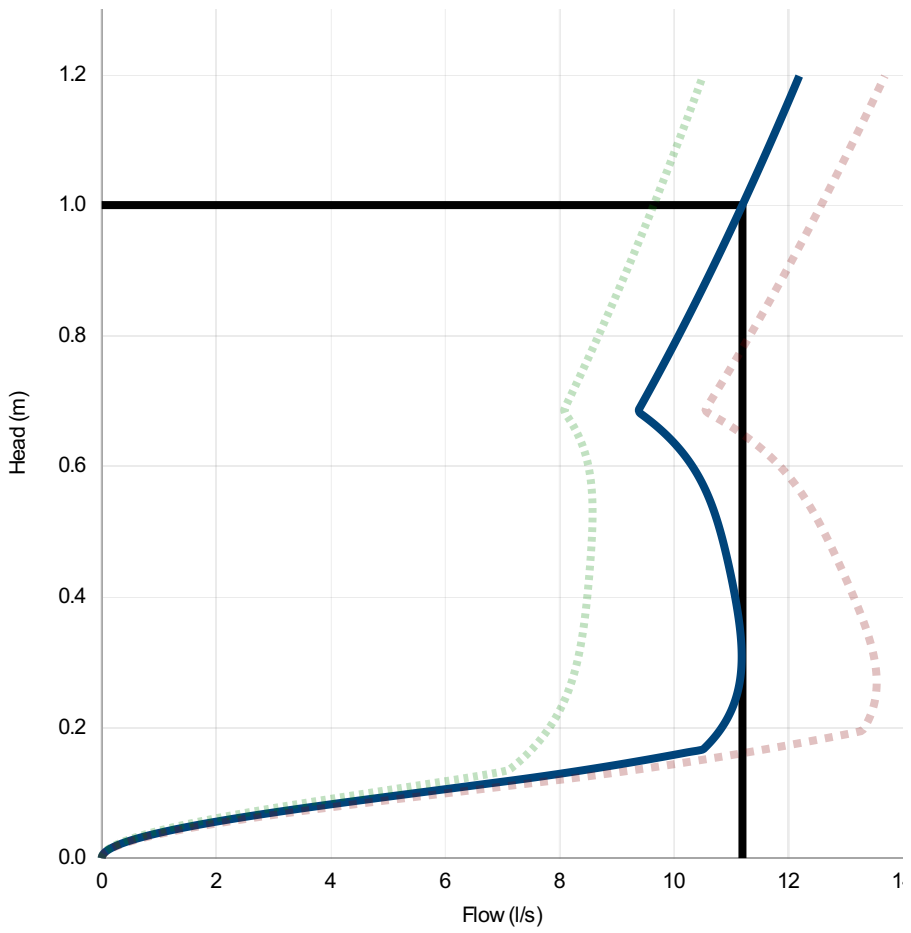
Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	1.000	11.200	1.000	9.648	1.000	12.576
Flush-Flo™	0.308	11.187	0.530	8.580	0.270	13.546
Kick-Flo®	0.683	9.363	0.684	8.064	0.684	10.528
Mean Flow		9.585		7.747		11.069

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Head (m)	Flow (l/s)
0.000	0.000
0.034	0.807
0.069	2.934
0.103	5.822
0.138	8.658
0.172	10.582
0.207	10.890
0.241	11.072
0.276	11.163
0.310	11.187
0.345	11.164
0.379	11.112
0.414	11.042
0.448	10.960
0.483	10.866
0.517	10.755
0.552	10.614
0.586	10.422
0.621	10.154
0.655	9.781
0.690	9.406
0.724	9.623
0.759	9.835
0.793	10.043
0.828	10.245
0.862	10.444
0.897	10.638
0.931	10.828
0.966	11.015
1.000	11.199

DESIGN ADVICE

The head/flow characteristics of this SHE-0154-1120-1000-1120 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

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DATE	05/03/2026 12:32
Site	Caheranardrish LRD
DESIGNER	Ben Mong
Ref	24051 - HB5

SHE-0154-1120-1000-1120

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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	11.200
Flush-Flo™	0.308	11.187
Kick-Flo®	0.683	9.363
Mean Flow		9.585

This Hydro-Brake® Optimum includes:

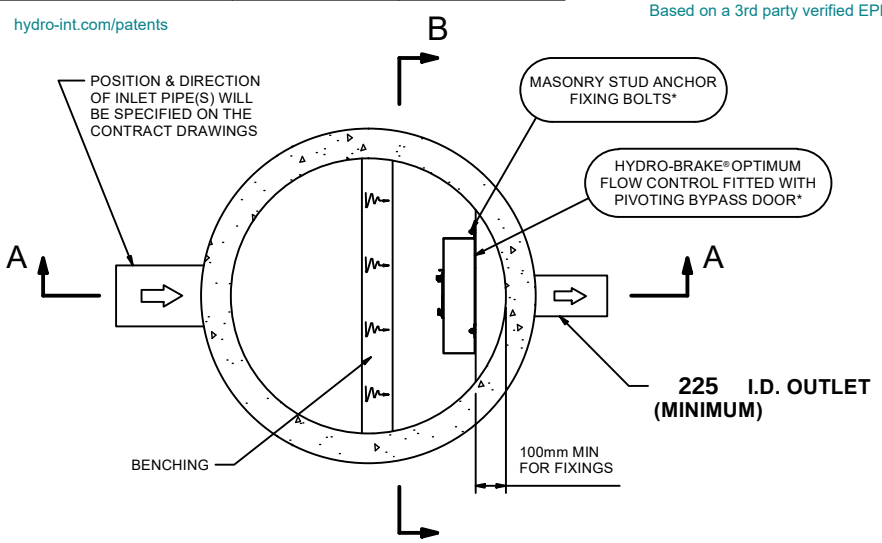
- •All in 3 mm Grade 304L stainless steel
- • Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- • Media blasted for corrosion resistance
- • Variable flow rate post installation via adjustable inlet (if necessary)
- • Indicative Weight: 25 kg
- • Product Carbon Footprint: 94.31 kgCO2e

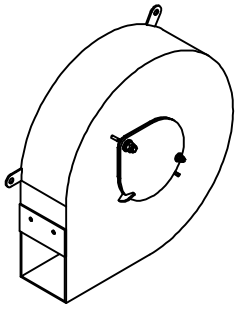
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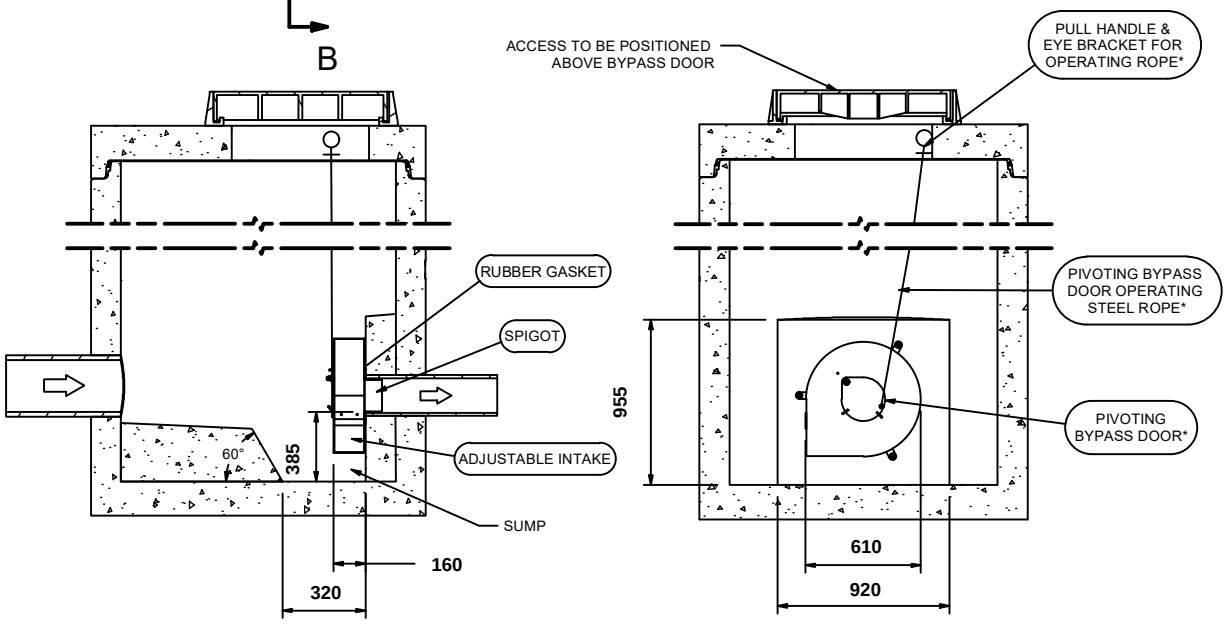
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SECTION A-A SECTION B-B

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The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

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DATE	05/03/2026 12:32
SITE	Caheranardrish LRD
DESIGNER	Ben Mong
REF	24051 - HB5

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Appendix I – Permissible Site Discharge Calculations

PROJECT			JOB REF.
Proposed Development at Caheranardrish, Limerick, Co. Limerick			24051
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Permissible Site Discharge			1
Drawing ref.	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

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PERMISSIBLE SURFACE WATER DISCHARGE CALCULATIONS

Site Area

What is the overall site area? **5.671** Hectares (ha) Site is Less than 50 Hectares

Pre-Development Catchment Soil Characteristics

Are there different soil types present on the pre-developed site? No

Catchment (This refers to the entire site area)	1	
Area	5.67	Hectares (ha)
Drainage Group	1	Class
Depth to Impermeable Layers	2	Class
Permeability Group above Impermeable Layers	2	Class
Slope (°)	2	Class
SOIL Type	2	From FSR Table
[1]SOIL Index	0.30	

SOIL	SOIL Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.40	0.37
4	0.45	0.47
5	0.50	0.53

Site SOIL Index Value **0.30**

Site SPR Value **0.30**

Post-Development Catchment Characteristics

Is the development divided into sub-catchments? No

What is the actual drainage area for catchment? 5.579 Hectares (ha)

Overall Catchment	Area (m^2)	Runoff Coeff.	Effective Area (m^2)
Roads, Roofs, Hardstanding, Footpaths	27,325.53	1.00	27,325.53
Green Areas/ Landscaping	28,464.19	0.20	5,692.84

Effective Catchment Area **33018.4** m^2

Effective Catchment Runoff Coefficient **0.59**

Long-Term Storage

Is long-term Storage provided? No

Permissible Site Discharge

Refer to UkSuds Calc

What is the Standard Average Annual Rainfall (SAAR)? 990.1 mm

Met Éireann Extreme Rainfall\SAAR 1991 – 2020

Is the overall site area less than 50 hectares? Yes

Co-ordinates (Irish Grid) Easting: 153316, Northing: 153488 (ITM X 553270, Y 653519)

[5]$QBAR_{Rural}$ calculated for 50 ha and linearly interpolated for area of site 15.3 Litres/sec

[r]Site Discharge = **11.2** Litres/sec

LCCC Surface Water/SuDs Specification 2022 requirement for 2l/s/ha or QBAR which ever is the greater restrictor

Notes and Formulae

1. SOIL index value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).
2. SPR value calculated from GDSDS - Table 6.7.
3. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change.
4. Long-term storage Vol_{ss} (m^3) = Rainfall.Area.10.[(PIMP/100)(0.8.α)+(1-PIMP/100)(β.SPR)-SPR]. (GDSDS Section 6.7.3).
   Where long-term storage cannot be provided on-site due to ground conditions, Total Permissible Outflow is to be kept to $QBAR_{(Rural)}$.
5. Total Permissible Outflow - $QBAR_{(Rural)}$ calculated in accordance with GDSDS - Regional Drainage Policies
   (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$ - For catchments greater than 50 hectares in area. Flow rates are linearly interpolated for areas samller than 50hectares.
6. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0 l/s or closest value possible.
7. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year and 2.6 for 100 year return period events, from GDSDS Figure C2 or 2l/s/ha whichever is the greater restriction as per LCCC Surface Water/SuDs Specification 2022

PROJECT			JOB REF.
Proposed Development at Caheranardrish, Limerick, Co. Limerick			24051
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Soil Characteristics from FSR			2
Drawing ref.	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	DV	DB	04.03.2026

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Estimation of flood peaks from catchment characteristics

Property		Classes
A	Drainage group	1 Rarely waterlogged within 60 cm at any time (well and moderately well drained) 2 Commonly waterlogged within 60 cm during winter (imperfect and poor) 3 Commonly waterlogged within 60 cm during winter and summer (very poorly drained)
B	Depth to 'impermeable' layers	1 >80 cm 2 80–40 cm 3 <40 cm
C	Permeability group (above 'impermeable' layers or to 80 cm)	1 Rapid 2 Medium 3 Slow
D	Slope	1 0–2° 2 2–8° 3 >8°

Table 4.4 Classification of soil factors.

Having decided all four parameters, Table 4.5 was used to reach the index of 'winter rain acceptance'.

Table 4.5 The classification of soils by winter rain acceptance rate from soil survey data.

Drainage class Group	Depth to impermeable layer (cm)	Slope classes								
		0 - 2°			2 - 8°			>8°		
		Permeability rates above impermeable layers								
		Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)
1	>80	1			1			1	2	3
	40 - 80							3		4
	<40	—	—	—	—	—	—	—	—	—
2	>80	2		3		4		—		
	40 - 80									
	<40	3								
3	>80	5						—		
	40 - 80							—		
	<40									

Winter rain acceptance indices: 1, very high; 2, high; 3, moderate; 4, low; 5, very low. Upland peat and peaty soils are in Class 5. Urban areas are unclassified.

1. Soil index (SPR) value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).

Appendix J – SuDS Calculations and Summary

TITLE	Job Reference		
Large Scale Residential Development at Caheranardish, Limerick, Co. Limerick	24051		
SUBJECT	**Calc. Sheet No.**		
Interception/Treatment Volume Summary	1		
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

INPUT DATA

Interception Volume Required	132.07	m^3
Treatment Volume Required	396.22	m^3

Catchment	**Interception Volumes**		**Treatment Volumes**	
Swales	136.3	m^3	158.2	m^3
Bio-Retention - Tree Pits	30.0	m^3	8.1	m^3
Bio-retention - Raingardens	73.1	m^3	66.1	m^3
Private Permeable Paving (Tanked).	0.0	m^3	438.1	m^3
Public Permeable Paving (Untanked)	608.3	m^3	52.0	m^3
Green Roof	0	m^3	34.5	m^3
Total Volumes Provided	847.7	m^3	757.0	m^3
Check Provided Volumes are greater than Required Volumes	PASS		PASS	

TITLE		Job Reference
Proposed Development at Caheranardish, Limerick, Co. Limerick		24051
SUBJECT	**Raingarden**	**Calc. Sheet No.**
Raised Planters - Bioretention Design	1	1
DRAWING NUMBER	**Calculations by**	**Checked by** / **Date**
24051-OSL-11-DR-C-1120	RSP	BJM / 04.03.26

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BIORETENTION AREA

Surface Area of Bioretention Area (A_f)	180.0	m^2

TREATMENT VOLUME

[1]**Treatment Volume (V_T)**	**66.1**	m^3

CATCHMENT AREA

Effective Impermeable Area Covered for Treatment (A)	**5400.0**	m^2

INPUT DATA

[2]Filter Bed Depth (L)	0.800	m
Coefficient of Permeability of Filter Medium (k)	0.000002	m/s
[3]Average Height of Water above Filter Bed (h)	0.050	m
[4]Time Required for Percolation (t)	48.0	hr

INFILTRATION VOLUME

Subgrade Infiltration Rate per hour	20.00	mm/hr
Subgrade Infiltration Rate (*f*)	0.006	mm/s
[5]**Subgrade Infiltration Volume**	**73.1**	m^3

Notes:

1 Treatment Volume Vt (m^3) = Impermeable Area (ha) x 15mm x 10 x 80% (GDSDS Section 6.3.1.2.1).

2 Filter Bed depth typically between 0.9 and 1.5m

3 h = Half maximum height, where hmax <=2m

4 Typically between 24 and 48 hours

5 Volume calculated using 6 hour storm event.

Area of Bioretention Filter Bed = $\frac{V_T \cdot L}{k(h+L)t}$

Table: 1 Coefficient of Permeability of Filter Medium

Soil Type/Texture	Infiltration Rate (m/s)
Source: SUDS Manual Table 25-1	
Gravel	0.0003 - 0.03
Sand	0.00001 - 0.00005
Loamy Sand	0.0001 - 0.00003
Sandy Loam	0.0000001 - 0.00001
Loam	0.0000001 - 0.00005
Silt Loam	0.0000001 - 0.00001
Chalk	0.00000003 - 0.000003
Sandy Clay Loam	0.0000000003 - 0.0000003
Silty Clay Loam	0.0000001 - 0.000001
Clay	< 0.00000003
Till	0.000000003 - 0.000003

TITLE		Job Reference	
Proposed Development at Caheranardish, Limerick, Co. Limerick		24051	
SUBJECT		**Calc. Sheet No.**	
GREEN ROOF DESIGN		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

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INPUT DATA

Green Roof Area (A)	460.0	m^2
[1]Filter Layer Depth (d)	0.250	m
[1]Filter Layer Voids Ratio (η)	30.0	%

TREATMENT VOLUME

[2]Treatment Volume (V_T)	**34.5**	m^3

EVAPOTRANSPIRATION VOLUME

[3]Evapotranspiration Rate per Day	5.00	mm/day
Evapotranspiration Volume	**2.300**	m^3

Notes:

1 Filter Bed depth typically between 0.25 and 0.35m

2 Treatment Volume Vt (m^3) = Green Roof Area (m^2) x d x η

3 Assumed 2mm evaporation and 3mm transpiration.

TITLE			Job Reference
Proposed Development at Caheranardish, Limerick, Co. Limerick			24051
SUBJECT		**Calc. Sheet No.**	
Public Permeable Paving Design (Partial Infiltration/not sealed)		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

FLAT SITES

INPUT DATA

Pavement Area (A)	385.00	m^2
Pavement Perimeter (P)	462.00	m
Sub-base Depth (d)	0.450	m
[1]Sub-base Voids Ratio (η)	0.30	
Sub-base Infiltration Rate per hour	3600	mm/hr
Sub-base Infiltration Rate (k)	1.000	mm/s
Subgrade Infiltration Rate per hour	171.00	mm/hr
Subgrade Infiltration Rate (f)	0.048	mm/s

VOLUME (STORAGE AND TREATMENT)

Permeable Paving Storage Volume per m^2	0.135	m^3/m^2
Total Permeable Paving Storage Volume	**52.0**	m^3

INFILTRATION

Approx. Permeable Paving Infiltration per m^2	0.073	$l/s/m^2$
[2]Total Permeable Paving Infiltration Rate	**28.163**	l/s
[3]Total Permeable Paving Infiltration Volume	608.3	m^3

FLOW

Average Distance between Outlet Drains	5.0	m
Flow Velocity through Permeable Paving	**0.000183**	m/s
Trench Retention Time	**7.6**	hr

TITLE		Job Reference
Proposed Development at Caheranardish, Limerick, Co. Limerick		24051
SUBJECT	**Calc. Sheet No.**	
Public Permeable Paving Design (Partial Infiltration/not sealed)	1	

DRAWING NUMBER	Calculations by	Checked by	Date
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

Notes:

1 Sub-base material has a void ratio of approximately 30%, source 'BRE Digest 365'.

2 Wetted perimeter assuming 50% of trench depth, source 'BRE Digest 365'.

3 Volume calculated using 6 hour storm event.

4 For Paving on slopes includes infiltration, provide 500mmx500mm trenches at 10m centres along slope with 1000mmx500mm at base of slope. source 'Formpave - Aquaflow Permeable Paving System'.

Table: 1

Material	void Ratio, η
Clean stone	0.40 - 0.50
Uniform gravel	0.30 - 0.40
Graded sand or gravel	0.20 - 0.30
Source: The SUDS manual, Published by CIRIA.	

Table: 2

Pavement Type	Effective Depth (m)
Car-Parking	0.40
Footpath	0.20
Effective Depths are provided from source 'Formpave - Aquaflow Permeable Paving System' and may subject to change as per site requirement.	

Total Permeable Paving Outflow:

$= A \cdot k \cdot i$

where:

A = Cross Sectional Area of Subbase
k = Subbase Infiltration Rate
i = Hydraulic Gradient

Hydraulic gradient has been assumed as the pavement gradient with an additional 250mm fall per 100m length.

Table: 3

Material	Infiltration Rate (mm/hr)
Gravel	10 - 1000
Sand	0.1 - 100
Loamy sand	0.01 - 1
Sandy loam	0.05 - 0.5
Loam	0.001 - 0.1
Silt loam	0.0005 - 0.005
Chalk	0.001 - 100
Sandy clay loam	0.001 - 0.01
Silty clay loam	0.00005 - 0.005
Clay	< 0.0001
Till	0.00001 - 0.01
Rock	0.00001 - 1
Cutoff point for most infiltration drainage systems = 0.001 mm/hr Source: Microdrainage	

Total Trench Infiltration:

$= 1/2 \cdot D \cdot L \cdot f$

where:

L = Length
D = Depth to Invert
f = Subgrade infiltration rate

TITLE			Job Reference
Proposed Development at Caheranardish, Limerick, Co. Limerick			24051
SUBJECT		**Calc. Sheet No.**	
Private Permeable Paving Design (Tanked/Sealed)		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

FLAT SITES

INPUT DATA

Pavement Area (A)	3,245.00	m^2
Pavement Perimeter (P)	3,894.00	m
Sub-base Depth (d)	0.450	m
[1]Sub-base Voids Ratio (η)	0.30	
Sub-base Infiltration Rate per hour	3600	mm/hr
Sub-base Infiltration Rate (k)	1.000	mm/s
Subgrade Infiltration Rate per hour	0.00	mm/hr
Subgrade Infiltration Rate (f)	0.000	mm/s

VOLUME (STORAGE AND TREATMENT)

Permeable Paving Storage Volume per m^2	0.135	m^3/m^2
Total Permeable Paving Storage Volume	**438.1**	m^3

INFILTRATION

Approx. Permeable Paving Infiltration per m^2	0.000	$l/s/m^2$
[2]Total Permeable Paving Infiltration Rate	**0.000**	l/s
[3]Total Permeable Paving Infiltration Volume	0.0	m^3

FLOW

Average Distance between Outlet Drains	5.0	m
Flow Velocity through Permeable Paving	**0.000183**	m/s
Trench Retention Time	**7.6**	hr

TITLE		Job Reference
Proposed Development at Caheranardish, Limerick, Co. Limerick		24051
SUBJECT	**Calc. Sheet No.**	
Private Permeable Paving Design (Tanked/Sealed)	1	
DRAWING NUMBER	**Calculations by** / **Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP / BJM	04.03.2026

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Notes:

1 Sub-base material has a void ratio of approximately 30%, source 'BRE Digest 365'.

2 Wetted perimeter assuming 50% of trench depth, source 'BRE Digest 365'.

3 Volume calculated using 6 hour storm event.

4 For Paving on slopes includes infiltration, provide 500mmx500mm trenches at 10m centres along slope with 1000mmx500mm at base of slope. source 'Formpave - Aquaflow Permeable Paving System'.

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Hydraulic gradient has been assumed as the pavement gradient with an additional 250mm fall per 100m length.

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Material	Infiltration Rate (mm/hr)
Gravel	10 - 1000
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Loam	0.001 - 0.1
Silt loam	0.0005 - 0.005
Chalk	0.001 - 100
Sandy clay loam	0.001 - 0.01
Silty clay loam	0.00005 - 0.005
Clay	< 0.0001
Till	0.00001 - 0.01
Rock	0.00001 - 1
Cutoff point for most infiltration drainage systems = 0.001 mm/hr Source: Microdrainage	

Total Trench Infiltration:

$= 1/2 \cdot D \cdot L \cdot f$

where:

L = Length
D = Depth to Invert
f = Subgrade infiltration rate

TITLE		**Job Reference**	
Proposed Development at Caheranardish, Limerick, Co. Limerick		24051	
SUBJECT		**Calc. Sheet No.**	
Tree Pits		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	RSP	BJM	04.03.2026

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BIORETENTION AREA

Surface Area of Bioretention Area (A_f)	22.5	m^2

TREATMENT VOLUME

[1]**Treatment Volume (V_T)**	**8.1**	m^3

CATCHMENT AREA

Effective Impermeable Area Covered for Treatment (A)	**675.0**	m^2

INPUT DATA

[2]Filter Bed Depth (L)	1.200	m
Coefficient of Permeability of Filter Medium (k)	0.000002	m/s
[3]Average Height of Water above Filter Bed (h)	0.050	m
[4]Time Required for Percolation (t)	48.0	hr

INFILTRATION VOLUME

Subgrade Infiltration Rate per hour	20.0	mm/hr
Subgrade Infiltration Rate (*f*)	0.006	mm/s
[5]**Subgrade Infiltration Volume**	**30.0**	m^3

Notes:

1 Treatment Volume Vt (m^3) = Impermeable Area (ha) x 15mm x 10 x 80% (GDSDS Section 6.3.1.2.1).

2 Filter Bed depth typically between 0.9 and 1.5m

3 h = Half maximum height, where hmax <=2m

4 Typically between 24 and 48 hours

5 Volume calculated using 6 hour storm event.

$$\text{Area of Bioretention Filter Bed} = \frac{V_T \cdot L}{k(h+L)t}$$

Table: 1 Coefficient of Permeability of Filter Medium

Soil Type/Texture	Infiltration Rate (m/s)
Source: SUDS Manual Table 25-1	
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Sand	0.00001 - 0.00005
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Sandy Clay Loam	0.0000000003 - 0.0000003
Silty Clay Loam	0.0000001 - 0.000001
Clay	< 0.00000003
Till	0.000000003 - 0.000003

Appendix K – Interception and Treatment Calculations

PROJECT			JOB REF.
Proposed Development at Caheranardrish, Limerick, Co. Limerick			24051
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Treatment Volume			1
Drawing ref.	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	DV	DB	04.03.2026

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SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	5.67	Hectares (ha)

Treatment Volume (Post-Development)

Impermeable Area =	3.302	Hectares (ha)
Rainfall Depth =	15	mm
[1]Treatment Volume (Vt) =	396.2204	m^3

Notes

1. Treatment Volume Vt (m^3) = Impermeable Area (ha) x 15mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.

PROJECT			JOB REF.
Proposed Development at Caheranardrish, Limerick, Co. Limerick			24051
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Interception Volume			2
Drawing ref.	**Calculations by**	**Checked by**	**Date**
24051-OSL-11-DR-C-1120	DV	DB	04.03.2026

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SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	5.67	Hectares (ha)

Interception Volume (Post-Development)

Impermeable Area =	3.302	Hectares (ha)
Rainfall Depth =	5	mm
[1]Interception Volume =	132.07346	m^3

Notes

1. Interception Volume (m^3) = Impermeable Area (ha) x 5mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.