Engineering Assessment Report

Proposed LRD at Ballycullen, Dublin 16

April 2025

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Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
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Comments

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Content

1. Introduction

Waterman Moylan has been appointed by Lagan Homes Ballycullen Ltd. to provide Engineering services on the development of their lands at Ballycullen, Co. Dublin.
Lagan Homes Ballycullen Limited intend to make a planning application for planning permission for a Large Scale Residential Development (LRD) in the townland of Woodtown, Ballycullen, Dublin 16. The lands are located to the east of Abbots Grove Park, south-east of Abbots Grove Avenue, south of Stocking Avenue and Stocking Wood estate, and west of White Pines Park.

The development will comprise a Large-Scale Residential Development (LRD) on a site at Ballycullen of 502 No. residential units comprising 197 no. houses and 305 No. apartment units and a crèche.

This report sets out the intended approach to deal with water/drainage services and road access/parking that would be required to facilitate a residential development on the subject site. It details the options available for the disposal of stormwater, disposal of foul water, water supply and road access for the developed site.

2. Site Description

2.1 Site Location

The site is located to the south of Stocking Avenue and west of the M50 motorway. There are existing residential developments to the North/Northeast (Stocking Wood and White Pines) and the Northwest/West (Abbots Grove). Agricultural lands are located to the south. The site location is shown in Figure 2-1 below.

Figure 2-1 Site Location

2.2 Site Description

The overall site area is approximately 10.38 ha. The site is currently greenfield as shown in Figure 2-1. The site topography falls steeply from south to north. It is divided by a hedgerow and watercourse which run south/north through the middle of the site.

The contours on the west side of the site fall from a high point of 119.5m to 115.5m. The east side of the site is steeper with the contours falling from a high point of 125.5m to 108m. There are also existing overhead cables crossing the site. See Figure 2-2 illustrating the existing ground contours.

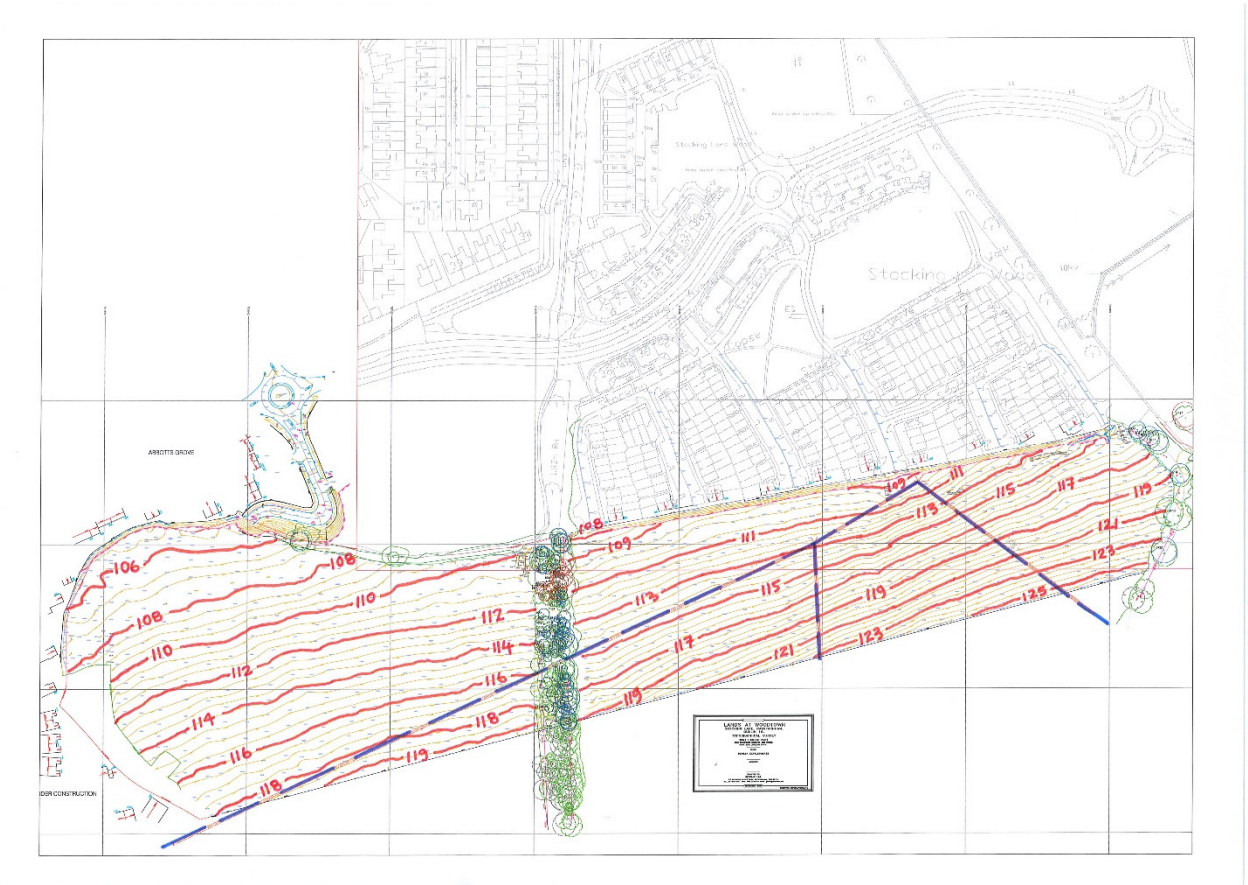


Figure 2-2 Existing Ground Contours

2.3 Proposed Development

Lagan Homes Ballycullen Limited intend to make a planning application for planning permission for a Large Scale Residential Development (LRD) in the townland of Woodtown, Ballycullen, Dublin 16. The lands are located to the east of Abbots Grove Park, south-east of Abbots Grove Avenue, south of Stocking Avenue and Stocking Wood estate, and west of White Pines Park.

The proposed development will consist of 502 no. residential units (108no. 1-bed, 170no. 2-bed, 162 no. 3-bed; 62 no. 4-bed) comprising 197no. 2 storey houses (terraced/semi-detached/detached) (19no. 2-bed, 116no. 3-bed; 62no. 4-bed) and 28no. 3 and 4 storey simplex/duplex apartment blocks providing 305no. apartments (108no. 1-bed apartments, 151no. 2-bed apartments, 46no. 3-bed apartments). The proposed development also includes a crèche (c.475sq.m), public open space, car parking (surface/undercroft), bicycle parking, bicycle storage structures and lockers, bin stores, and 8no. ESB substations. Vehicular access to be provided from the existing spur road connection to Stocking Avenue to the west of the site, and via Stocking Wood Drive to the east of the site (with relocation of existing ESB substation and associated works to the existing hammerhead). Additional pedestrian only routes will be provided into Abbot's Grove Park and Stocking Wood Copse with future connections provided for into Stocking Wood Manor, White Pines Park and the future school site to the north of the application site. The proposed development includes all associated site development works (including site reprofiling, retaining structures and downing of ESB overhead lines), landscaping, boundary treatments and services provision.

3. Foul Water Drainage

3.1 Receiving Environment

There is an existing 225mm diameter foul sewer constructed in the spur road adjacent to Abbot Grove development on the west side of the site. This 225mm sewer connects to an existing 450mm diameter sewer north of Stocking Avenue. There are existing foul sewers within the Stocking Wood development which are not shown on the Uisce Eireann records (assumed to be not taking in charge). These sewers have been CCTV surveyed by the applicant who has rights to connect into them.

3.2 Proposed Foul Water Drainage

It is proposed to provide a gravity system which will discharge to the existing foul water infrastructure north of the subject site at 2 No. locations for the west and east parts of the site respectively. Refer to drawing BYCN-WM-ZZ-DR-C-P1200 and P1201 for exact details of the proposed foul network.

A Pre-Connection Enquiry form was submitted to Uisce Éireann on 26/01/2024 for 400 units which outlined the proposals for the drainage of wastewater from the development. Uisce Éireann responded with the Confirmation of Feasibility (COF) on 12/02/2024, with reference no. CDS24000704. Refer to Appendix A, in report 24-007r.007, for the Uisce Éireann Confirmation of Feasibility. In summary, the letter states that the foul connection is feasible without infrastructure upgrades.

A revised Pre-Connection Enquiry form was submitted to Uisce Éireann on 06/12/2024 for 505 No. houses and 1 No. creche and a COF with reference number CDS24010539 was received from Uisce Éireann on 05/03/2025 which further confirmed that the foul connection is feasible without infrastructure upgrades. Refer to Appendix B, in report 24-007r.007, for the revised Uisce Éireann Confirmation of Feasibility.

3.3 Foul Water Calculations

The design of the foul water drainage has been based on the "*Code of Practice for Wastewater Infrastructure*", (July 2020) published by Uisce Éireann. The peak foul flow is based on Uisce Éireann recommended peak demand/ flow factors. Pipe capacities and velocities have been calculated using Colebrook-White formula with a roughness coefficient (Ks) of 1.5 mm.

The proposed development will consist of 502 no. Residential units and a creche. Based on the Uisce Éireann's Code of Practice, the peak foul flow from the proposed development will be as follows:

Table 3-1 Calculation of proposed Foul Water Flow

	Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge (l/d)
West site	Residential Units	272	150	2.7	1.1	121,176
	Creche	1	50	120	1.1	6,600
					Totals	***127,776 l/d***

	Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge (l/d)
East site	Residential Units	230	150	2.7	1.1	102,465
					Total	***102,456 l/d***

	Calculation of Proposed Peak Foul Flow		
West Site	Total Daily Discharge *(from Table 1.)*	***127,776***	l/d
	Residential Dry Weather Flow (RDWF)		1.4025 l/s
	Commercial Dry Weather Flow (CDWF)		0.0764l/s
	Residential Foul Peak Flow (=6 x RDWF)		***8.415 l/s***
	Commercial Foul Peak Flow (=4.5 x CDWF)		***0.3438 l/s***

	Calculation of Proposed Peak Foul Flow		
East Site	Total Daily Discharge *(from Table 1.)*	102,465	l/d
	Residential Dry Weather Flow (RDWF)		1.19 l/s
	Residential Foul Peak Flow (=6 x RDWF)		***7.14 l/s***

The total proposed peak outflow from the west and east site is 8.7588 l/s and 7.14 l/s, respectively. The 2 no. proposed foul water outfalls from the site are 225 mm-diameter pipes laid at a minimum gradient of 1:100 for the west site and 1:150 for the east site, each giving a minimum capacity of 45.6l/s and 37.2l/s respectively for the west and east part of the site. Therefore, the proposed outfall has adequate capacity to cater for the flows from the development.

3.4 Network Design

Drains generally will consist of uPVC pipes (to IS 123) or concrete socket and spigot pipes (to IS 6). Pipes will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H. Foul water sewers will consist of concrete pipes (to IS 6) or uPVC capable of resisting jetting pressure of 2,600psi and laid strictly in accordance with Uisce Éireann requirements for taking in charge.

In accordance with the Uisce Éireann *"Code of Practice for Wastewater Supply*", 150mm nominal internal diameter sewers have been proposed for carrying wastewater from 20 properties or less; whilst 225mm nominal internal diameter carrying Wastewater from more than 20 properties. Furthermore, where there are at least ten dwelling units connected, the 150mm diameter pipes are laid at a minimum gradient of 1:150 and will be laid at 1:60 for up to nine connected dwelling units.

A Statement of Design Acceptance (SODA) has been received from to Uisce Éireann (UE) which confirms that the proposed design is in compliance with the UE standards. The SODA is included in Appendix F of report 24-007r.007 included with this application under a separate cover.

4. Surface Water Drainage

4.1 Introduction

The proposed surface water drainage network complies with the GDSDS Regional Drainage Policies Volume 2, for New Developments. The following documents have also been considered in preparing the surface water drainage strategy for the development:

- South Dublin County Council (SDCC) 2022-2028 Development Plan
- Sustainable Drainage Explanatory Design and Evaluation Guide 2022
- CIRIA SuDS Manual (C753)

4.2 Site Characteristics

The following parameters have been used in greenfield run-off rate and attenuation calculations.

Table 4-1 Surface Water Catchment Details

	Catchment
Site Area (Catchment) – Ha	10.38 ha
SAAR – mm	997
SOIL Index	4*
Climate Change	20 %

* The site investigation indicates that the site comprises clay overlying rock and it is also steeply sloping so the existing greenfield runoff would be considered to be high.

The attenuation calculations have therefore used a Soil Type 4 in the determination of the greenfield runoff as agreed with Brian Harkin from the SDCC Drainage Department through both the Section 247 process and the Stage 2 submission to SDCC.

Site Investigations Summary

Site Investigation 2006

A site investigation was conducted by Ground Investigations Ireland on the proposed site in September 2006. The survey identified rock at shallow levels in the trial pits excavated in the eastern section of the site. No rock was identified by Ground Investigation Ireland on the western side of the site. The material encountered in Trial pit 1 to 10 was similar and in general, consisted of topsoil underlain by firm to stiff brown sandy gravelly clay which was underlain by rock which extends to the final level. The material encountered in Trial pits 11 to 20 was also similar and in general, consisted of topsoil underlain by firm to stiff brown sandy gravelly clay which was in turn underlain by stiff black gravelly clay which extends to final level. Groundwater was not encountered in the trial pits. Please refer to Appendix E, in report 24-007r.007 for a copy of the Site Investigation Report.

Percolation tests 2020

4 no. soakaways in accordance with BRE Digest365 were carried out in 2020 to assess the infiltration capacity of the soil.

2 no. of the tests were located in the southern boundary while the remaining 2 no. were located near the north end of the site.

Results show that each test produced a different result. However, the observations suggest there is a high level of variation due to differences in the depth of the overburden and the presence of what is most likely a perched water table as observed at location 3. In general, there is little scope for the design of soakaways. Even at location 4 where the soakage is at its best there is limited permeability. Please refer to Appendix E, in report 24-007r.007 for a copy of the Percolation Tests.

Rock Excavation Trial 2024

8 no. additional trial pits were excavated in the eastern section of the site on 16th February 2024. The purpose of the excavations was to ascertain whether rock could be removed by a mechanical excavator or whether a rock breaker would be required.

The trial pit results indicate that the rock depth ranges from 1.2 to 2.7 meters in the southern area of the site and from 1.0 meters to over 4.4 meters along the northern boundary. A preliminary assessment of potential building levels suggests that excavation may reach depths of approximately 5.0 meters in some areas of the site. The results confirmed that a rock breaker will be required for rock excavation on site for part of the excavation.

4.3 Greenfield run-off rates

The Local Authority and National guidelines require post-development run-off rates to be limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, using the UK SUDS Website. The Greenfield run-off rates for the east and west catchments are indicated in Table 4-2 below. Refer to Appendix C in report 24-007r.007, for the greenfield runoff rates calculations.

Table 4-2 Greenfield Runoff rates

Catchment	Q_{BAR} (l/s)
East	**35.10**
West	**37.40**

4.4 SUDS Assessment

As per South Dublin County Council guidelines, surface water should be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 2, for New Developments and CIRIA documents. These documents specify that surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the buildings prioritised.

Sustainable Urban Drainage Systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban stormwater drainage practices that typically consist of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as SUDS. They are typically made up of one or more structures, built to manage surface water run-off. The use of SUDS to control run-off also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

A stormwater management or treatment train approach assures that run-off quantity and quality are improved. The following objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in stormwater run-off flows that occur as land is urbanised and to help mitigate the impacts of stormwater quality on receiving systems:

1) **Source control:** conveyance and infiltration of run-off; and
2) **Site Control:** reduction in volume and rate of surface run-off, with some additional treatment provided.

It is proposed that the surface water runoff for the development will be intercepted, collected, slowed, and attenuated through the use nature-based rainwater management and sustainable urban drainage systems (SuDS). The SuDS for this subject site are summarised below:

- Permeable paving below parking spaces
- Rain gardens and bio-retention tree pits within strategically located landscaped areas
- Above-ground detention basins located in open green space areas
- Green roof systems on duplex/apartment blocks
- Roadside swales and a filter drain
- Hydrobrakes fitted downstream of the attenuation area basins
- Petrol Interceptors fitted downstream of the catchment areas

The proposed SUDS interventions have been implemented to ensure runoff is treated to the standards outlined in the Greater Dublin Strategic Drainage Study and to add value to the biodiversity potential of the development. The below images illustrate robust and aesthetically pleasing nature-based solutions in the form of a well-established swales, tree pits, and permeable paving.

Refer to Figure 4-1 for an illustration of a Suds tree pit designed to collect runoff from the surrounding environs. Kerb inlets have been designed adjacent to the system to allow surface water runoff into the tree pit before being released into the public network (image sourced from the Green Blue Urban website).

Refer to Figure 4-2 for illustration of a swale with the potential for storing rainfall runoff constructed at Tandy's Lane Park in Adamstown (image sourced from the SDCC Suds Explanatory, Design and Evaluation Guide).

Figure 4-1: Suds Tree Pit with Kerb Inlets

Figure 4-2: Image of a Swale

Refer to Figure 4-3 for an image showing the buildup of typical permeable paving installations (image sourced from the SDCC Suds Explanatory, Design and Evaluation Guide) and to Figure 4-4 for an image of constructed permeable paving (image sourced from The Suds Manual (CIRIA).

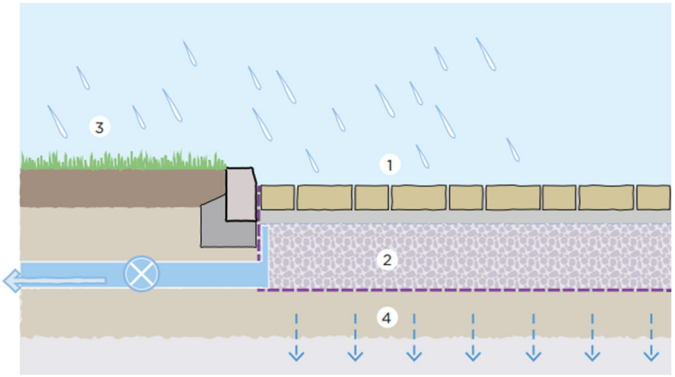


Figure 4-3: Cross-section of Permeable Paving

Figure 4-4: Image of Permeable Paving

A cross-section view of a typical green roof system sourced from the SDCC Suds Explanatory, Design and Evaluation Guide is shown in Figure 4-5 below.

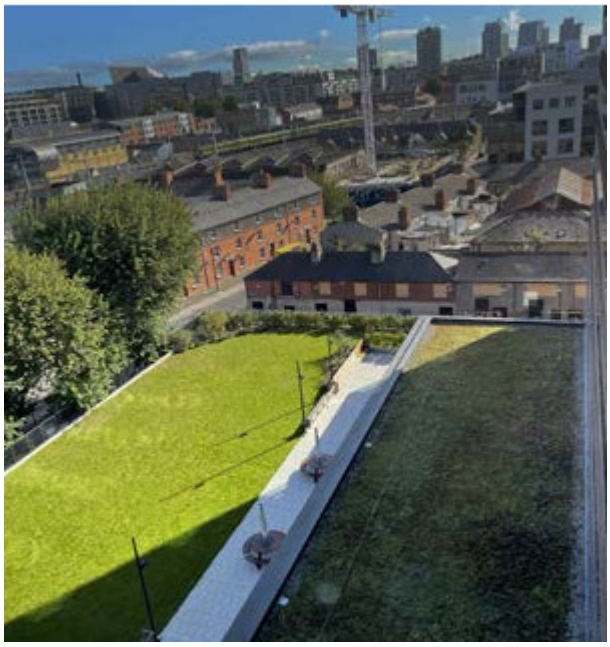
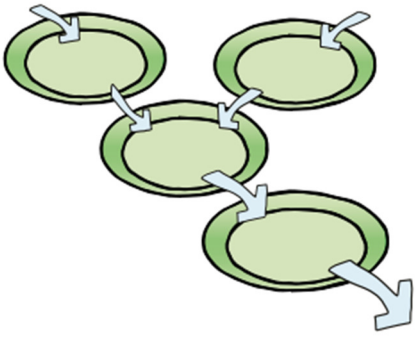


Figure 4-5: Cross-section of Blue Green Roof Build-up

Refer to Figure 4-6 for an image showing an example of a detention basin (image sourced from the SDCC Suds Explanatory, Design and Evaluation Guide)

Figure 4-6 An image of a Detention Basin

The above proposed SuDS measures have been proposed to provide a treatment train strategy using a range of SuDS features - permeable paving, raingardens, bio-retention tree pits, swales, green roofs and detention basins,—to manage runoff at both source and site level to manage both the quantity and quality of runoff. This ensures that surface water is intercepted, conveyed, treated, and attenuated before reaching receiving systems. This complies with Section 8.5 of SDCC's SuDS Explanatory, design and Evaluation Guide as shown in Figure 4-7.



Distributing storage volumes into discreet storage components such as raingardens, swales, basins and permeable pavement unlocks the potential for different rainfall depths being stored at each location.

Figure 4-7 Distributed Storage Volumes (source: SDCC SuDS Explnatory, Design and Evaluation Guide)

Refer to drawing BYCN- WM-ZZ-XX-DR-C-P1202 & 1203 showing the proposed SUDS Measures on site.

4.5 Storm Water Calculations

The total catchment area of the site including roads, footpaths, car-parking and roofs, SUDS components and soft landscaping draining to the sitewide drainage network is 10.38Ha. The peak outflow will be limited to 72.5 l/s for the 1 in 100-year event. It is proposed that the 1 in 100-year critical design storm, plus an additional 20% to account for climate change, be used for the stormwater attenuation calculations. The proposed surface water drainage network can be seen on Waterman Moylan drawings BYCN- WM-ZZ-XX-DR-C-P1200 and P1201.

The subject site will be split into 2 no. catchments for the purpose of surface water attenuation. These catchments are indicated on Surface Water Catchment Drawing no. BYCN- WM-ZZ-XX-DR-C-P1205 and in Figure 4-8 below.

The calculations for the surface water design are included in Appendix D of report 24-007r.007.

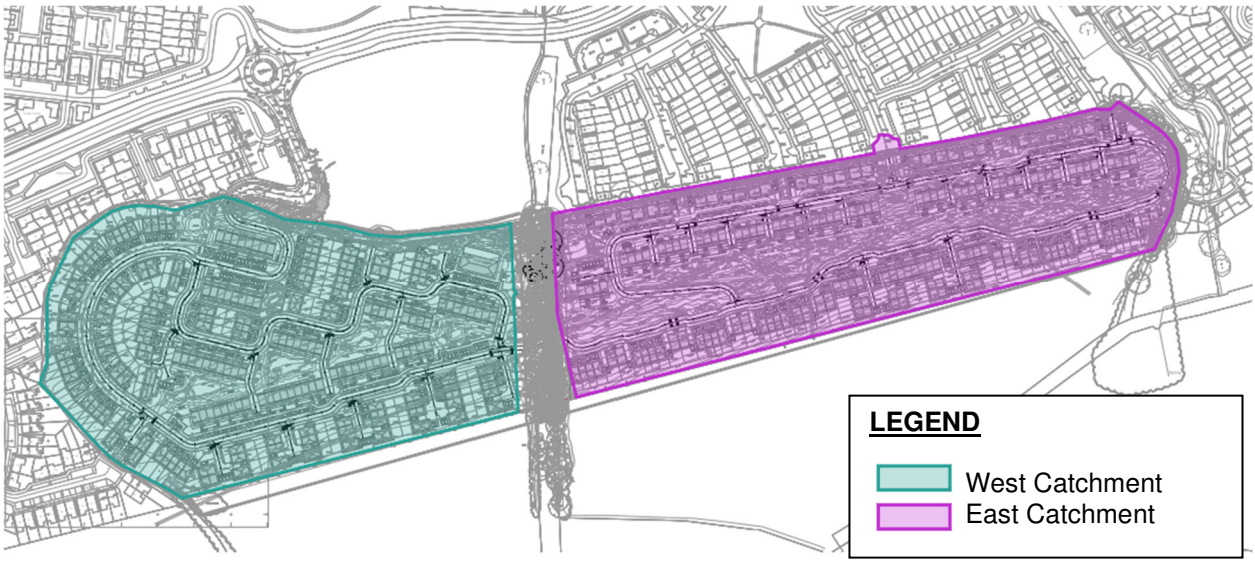


Figure 4-8 Surface Water Catchments

The following runoff coefficients have been applied to each of the surface finishes within the catchment for the design of the surface water drainage network:

- Duplex Roofs – CV: 100%
- House roofs (plus 4% urban creep) – CV: 104%
- Roads and footpaths – CV: 90%
- Permeable Paving – CV: 100%
- Landscape Areas, Back Gardens - CV: 47%

Section 8.4.7 of South Dublin County Council's SuDS Explanatory, Design and Evaluation Guide stipulates that an additional 4% be considered for houses to cater for urban creep in residential developments with a density of 45 - 50 dwellings per hectare. As the proposed development has a density of 48.5 units per hectare, an additional urban creep factor of 4% has been added to the house roofs.

Additionally, as the soil type has been assumed to be soil type 4 in line with the findings of the site investigation and the natural topography of the site, a CV of 47% has been considered for the soft landscaped areas.

Table 4.4 shows the total factored areas for each of the catchments.

Table 4-3: Total Factored Areas

WEST CATCHMENT					
Site area	**51223.8919**	**m^2**			
	Area (m^2)	**Area (ha)**	**cv values**	**cv x Area (m^2)**	**cv x Area (ha)**
Duplex Roofs	4271.2097	0.4271	1	4271.2097	0.4271
House roofs (+4 % urban creep)	7426.3091	0.7426	1.04	7723.361464	0.7723
Permeable paving	3238.8027	0.3239	1	3238.8027	0.3239
Roads/ Footpaths	12129.2982	1.2129	0.9	10916.36838	1.0916

Backgardens/ Open spaces	23865.5356	2.3866	0.47	11216.80173	1.1217
Total area	50931.1553	5.0931		37366.54398	3.7367

EAST CATCHMENT					
Site area	**48124.097**	**m^2**			
	Area (m^2)	**Area (ha)**	**cv values**	**cv x Area (m^2)**	**cv x Area (ha)**
Duplex Roofs	3956.4226	0.3956	1	3956.4226	0.3956
House roofs (+4 % urban creep)	5311.6874	0.5312	1.04	5524.154896	0.5524
Permeable paving	2119.7347	0.2120	1	2119.7347	0.2120
Roads/ Footpaths	10773.4758	1.0773	0.9	9696.12822	0.9696
Backgardens/ Open spaces	25899.614	2.5900	0.47	12172.81858	1.2173
Total area	48060.9345	4.8061		33469.259	3.3469

WEST + EAST CATCHMENT					
Site area	**99347.9889**	**m^2**			
	Area (m^2)	**Area (ha)**	**cv values**	**cv x Area (m^2)**	**cv x Area (ha)**
Duplex Roofs	8227.6323	0.8228	1	8227.6323	0.8228
House roofs (+4 % urban creep)	12737.9965	1.2738	1.04	13247.51636	1.3248
Permeable paving	5358.5374	0.5359	1	5358.5374	0.5359
Roads/ Footpaths	22902.774	2.2903	0.9	20612.4966	2.0612
Backgardens/ Open spaces	49765.1496	4.9765	0.47	23389.62031	2.3390
Total area	98992.0898	9.8992		70835.80297	7.0836

a. West Catchment

This catchment comprises the western part of the proposed development as shown in Waterman Moylan Drawing No. BYCN- WM-ZZ-XX-DR-C-P1205. The overall catchment area is c. 5.12 ha. The peak outflow from this catchment will be restricted to 37.40 l/s which is the greenfield runoff rate for the west catchment.

It is proposed to manage surface water in the west catchment in 2 no. surface water subcatchments as indicated in Figure 4-9.

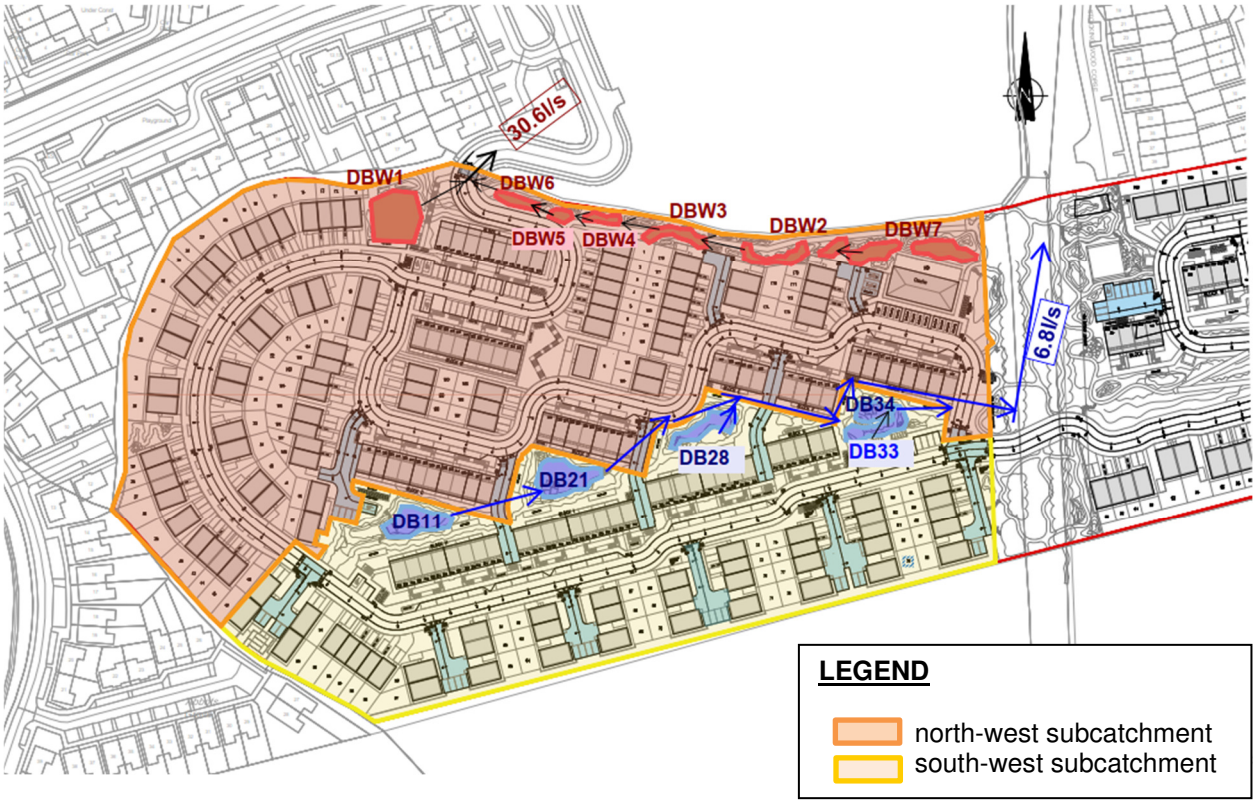


Figure 4-9 Surface Water West Catchment

The following attenuation strategy has been proposed for the western catchment, limiting the overall run-off to 37.4l/s:

- North-western subcatchment

  As shown in Figure 4-9 above, surface water from this subcatchment will be attenuated in 7 no. detention basins (DBW1, DBW2, DBW3, DBW4, DBW5, DBW6 and DBW7) before being discharged into the public surface water sewer located in the spur road from Stocking Avenue, adjacent to the site entrance, to the north-west of the site. Surface water will discharge into this public sewer at the restricted rate of 30.6 l/s. Refer to Figure 4-9 for the locations of the proposed detention basins and the proposed surface water outfall sewer for the north-west subcatchment.

- South-western subcatchment

  Surface water in this subcatchment will be attenuated in 5 no. detention basins (DB11, DB21, DB28, DB33 and DB34) before being discharged into the stream that runs through the centre of the proposed development at a controlled rate of 6.8 l/s. Refer to Figure 4-9 for the locations of the proposed detention basins and proposed outfall in this subcatchment.

It is noted that the south-west subcatchment has more available open space for attenuation, allowing a greater proportion of surface water in the western catchment to be attenuated within this area and discharged at a lower rate of 6.8 l/s. In contrast, the north-west subcatchment has less available open space for attenuation, hence less surface water is attenuated in this subcatchment before being discharged at a higher rate of 30.6 l/s.

Despite these variations in discharge rates, the overall discharge rate for the western catchment has been restricted to 37.4 l/s, which is the greenfield runoff rate for the western catchment.

A diagrammatic flow chart illustrating the flow path of the surface water through the cascading detention basin design and the final outflow from each of the proposed sub-catchments is provided in Figure 4-10 below.

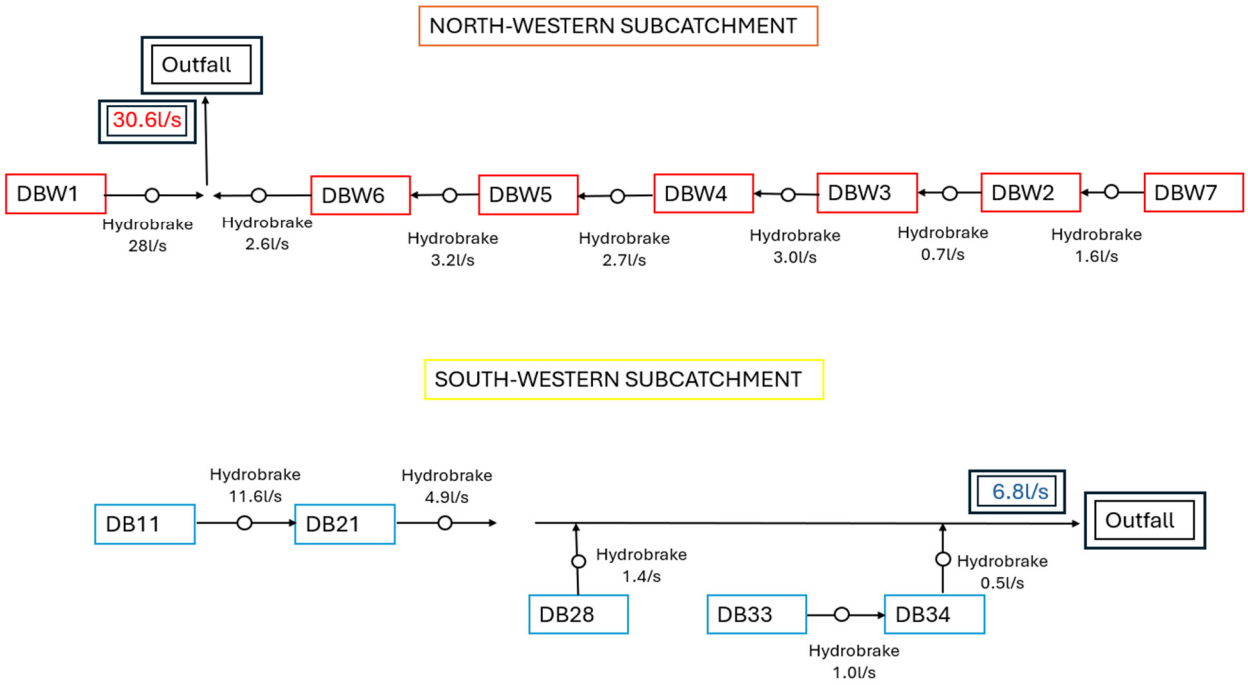


Figure 4-10 Attenuation Sketch- West Catchment

A summary of the attenuation for the west catchment is shown in Table 4-4

Table 4-4 West Catchment Attenuation Summary

	Tank	Critical Storm	Volume Required (m^3)	Volume Provided (m^3)	Outflow Rate (l/s)
North-west subcatchment	DBW1	600-minute summer	790	790	28

	DBW2	10,080-minute summer	259.80	292.70	0.7
	DBW3	2,880-minute summer	157.55	158.00	3.0
	DBW4	4,320-minute summer	72.60	72.00	2.7
	DBW5	2,880-minute summer	60.11	60.00	3.2
	DBW6	7,200-minute summer	83.11	83.11	2.6
	DBW7	10,080-minute winter	652.70	652.00	1.6
South-west subcatchment	DB11	2,160-minute summer	426.00	426.00	11.6
	DB21	2,880-minute winter	510.43	510.00	4.9
	DB28	2,880-minute summer	300.52	303.00	1.4
	DB33	5,760-minute summer	219.90	220.00	1.0
	DB34	10,080-minute winter	140.51	140.00	0.5

It is noted that hydrobrakes with outflow rates below 2l/s have been proposed to manage surface water from some of the subcatchments and accordingly, a mesh basket filled with aggregate has been used to protect the respective pipe openings in accordance with section 8.4.11.1 of South Dublin County Council's SuDS Explanatory, Design and Evaluation Guide. Refer to the details provided in the attenuation sections included as part of the engineering submission, for details of the detention basins.

Please refer to Appendix D, in report 24-007r.007, for the stormwater calculations for the west catchment.

Additionally, green roofs have also been considered on the flat duplex units and permeable paving has been considered under the car parking spaces to provide additional attenuation in the western catchment.

Refer to Waterman Moylan drawings BYCN- WM-ZZ-XX-DR-C-P1202-1203 - Proposed SUDS Layout for the location of the proposed SUDS.

The proposed surface water drainage network can be seen on Waterman Moylan drawings BYCN- WM-ZZ-XX-DR-C-P1200-1201 - Proposed Drainage Layout.

b. East Catchment

This catchment comprises the eastern part of the subject site as shown in Waterman Moylan Drawing No. BYCN- WM-ZZ-XX-DR-C-P1205. The overall catchment area is c. 4.81 ha. The peak outflow of surface water from this catchment will be restricted to greenfield runoff rate which is 35.1 l/s for the east catchment.

It is proposed to manage the surface water runoff in the east catchment in 3 no. surface water subcatchments as indicated in Figure 4-11 below.

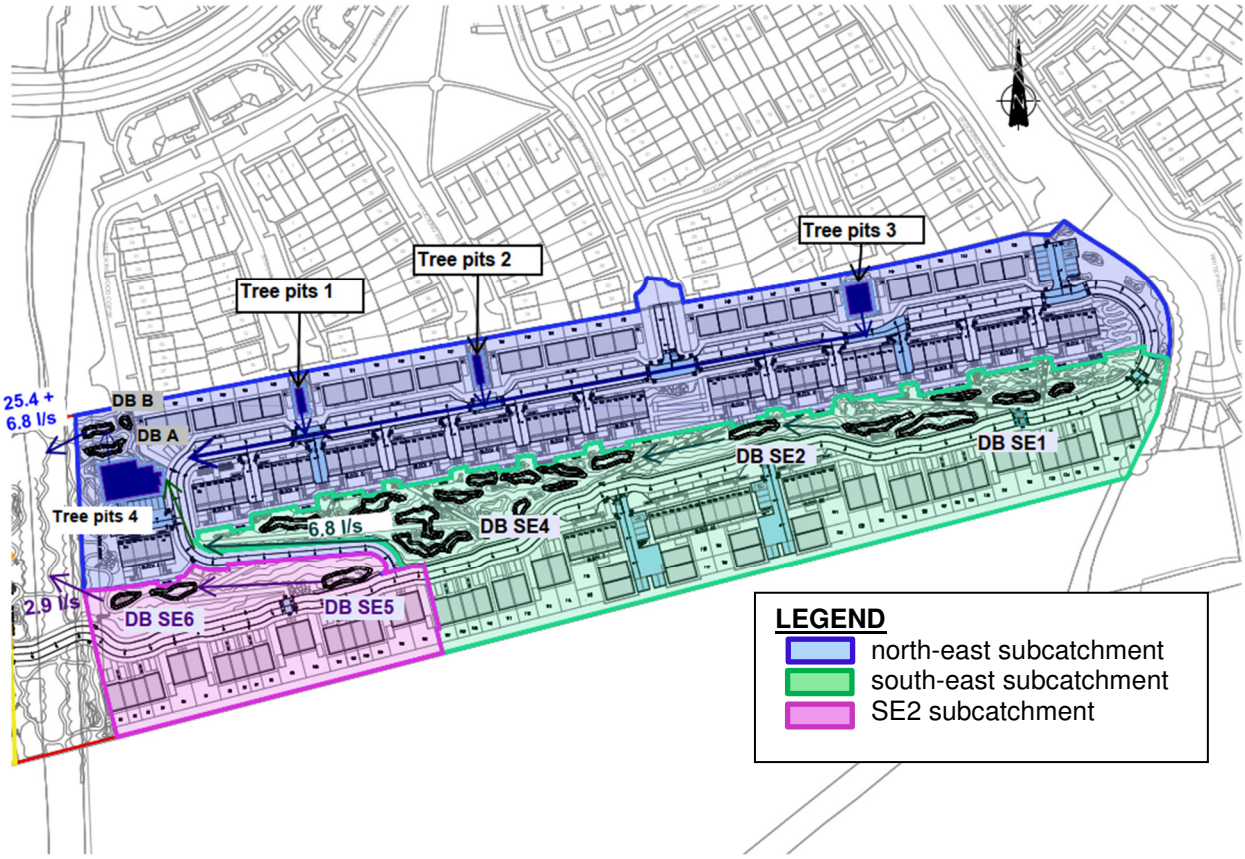


Figure 4-11 Surface Water East Catchment

The greenfield runoff rate for the western catchment is 35.1 l/s. Refer to appendix C of report 24.007.r007 for the greenfield runoff rate calculations. The following attenuation strategy has been proposed for each of the subcatchments:

- North-east subcatchment

  Surface water from this subcatchment will be attenuated in 4 no. underground modular tree pit storage (Tree Pits 1, Tree Pits 2 and Tree Pits 3, Tree Pits 4) and 2 no. detention basin (DB A and DB B) before being discharged into the central stream on the site at a restricted rate of 25.4 l/s.

- South-east subcatchment

  Surface water from the south-east subcatchment will be attenuated in 3 no. detention basins (DBSE1, DBSE2, and DBSE3) before being discharged into the surface water drainage network in the north-east subcatchment at a restricted rate of 6.8 l/s.

- SE2

  Surface water from the SE2 subcatchment will be attenuated in 2 no. detention basins (DBSE5 and DBSE6) before being discharged into the central stream at a controlled rate of 2.9 l/s.

As with the west catchment, despite the varying discharge rates in each of the subcatchments in the east catchment, the overall discharge rate has been restricted to the overall greenfield runoff rate for the east catchment which is 35.1l/s, in accordance with the relevant guidelines.

A diagrammatic flow chart illustrating the outflow from each of the proposed detention basins in each of the proposed sub-catchments is provided in Figure 4-12 below.

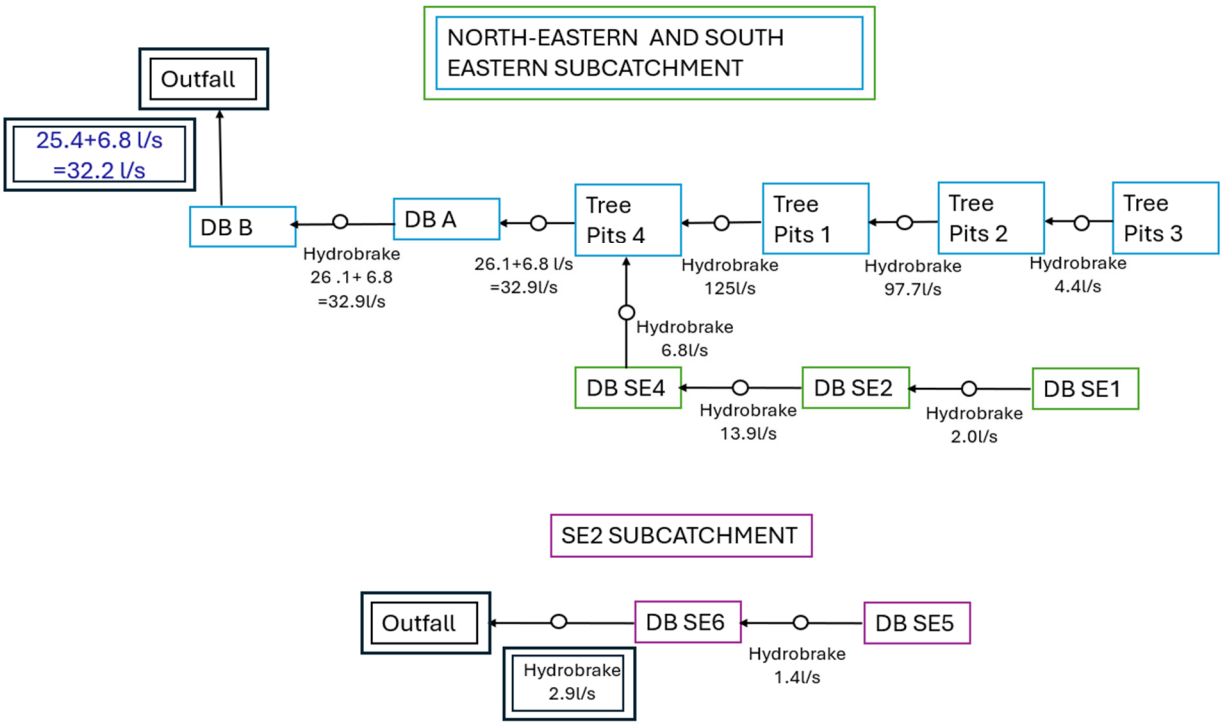


Figure 4-12 Attenuation Sketch East Catchment

A summary of the attenuation for the east catchment is shown in Table 4-5 .

Table 4-5 East Catchment Attenuation Summary

	Tank	Critical Storm	Volume Required (m^3)	Volume Provided (m^3)	Outflow Rate (l/s)

North-east subcatchment	Tree pits 1	720-minute summer	32.60	32.30	125.0
	Tree pits 2	60-minute summer	55.98	60.00	97.7
	Tree pits 3	1440-minute summer	270.27	276.50	4.4
	Tree pits 4	720-minute summer	564.00	1236.00	26.1 + 6.8
	DB A	720-minute summer	60.32	100.00	26.1+ 6.8
	DB B	960-minute winter	39.31	40.00	25.4 + 6.8
South-east subcatchment	DBSE1	2,880 minute summer	358.41	370.00	2.0
	DBSE2	180-minute summer	74.66	75.00	13.9
	DBSE4	2,880-minute summer	884.14	915.00	6.8
SE2 subcatchment	DBSE5	2,160-minute summer	100.23	117.00	1.4
	DBSE6	2,160-minute summer	305.10	305.00	2.9

As in the west catchment, hydrobrakes with outflow rates below 2l/s have been proposed to manage surface water from some of the subcatchments and accordingly, a mesh basket filled with aggregate has been used to protect the respective pipe openings in accordance with section 8.4.11.1 of South Dublin County Council's SuDS Explanatory, Design and Evaluation Guide.

Additional attenuation of surface water has been provided in permeable paving located under the car parking spaces. Green roofs have also been considered on the flat duplex units to provide treatment of rainwater.

Refer to Waterman Moylan drawings BYCN- WM-ZZ-XX-DR-C-P1202-1203 - Proposed SUDS Layout for the location of the proposed SUDS.

The proposed surface water drainage network can be seen on Waterman Moylan drawings BYCN- WM-ZZ-XX-DR-C-P1200-1201 - Proposed Drainage Layout.

4.6 Network Design

As described above, the proposed surface water drainage system for this development has been designed as a SUDS system and uses permeable paving, swales, green roofs, detention basins and tree pits together

with flow control devices and petrol interceptors to treat run-off and remove pollutants to improve quality, restrict outflow and control quantity.

Strict separation of surface water and wastewater will be implemented within the development. Surface water local drains will be a minimum of 225mm dia. and generally will consist of PVC (to IS123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H and will be laid strictly in accordance with the requirements of South Dublin County Council.

4.7 Biodiversity Support

This site presents a unique combination of opportunities and challenges. While the site itself boasts significant ecological advantages, its distinctive landscape also introduces complexities in runoff management.

A notable feature is the existing Woodstown stream, which flows from Woodtown Manor in the south, traversing an area of improved agricultural grassland (GA), some of which is undergoing natural restoration. The stream continues northward, passing through the Woodstown Village Boundary Wildflower Meadow before extending to the Knocklyon Wilderness and Wetlands Park.

According to *A Guide to Habitats in Ireland* by Julie A. Fossitt (2000), the site supports five valuable habitat types:

- Scrub (WS1)
- Hedgerow (WL1)

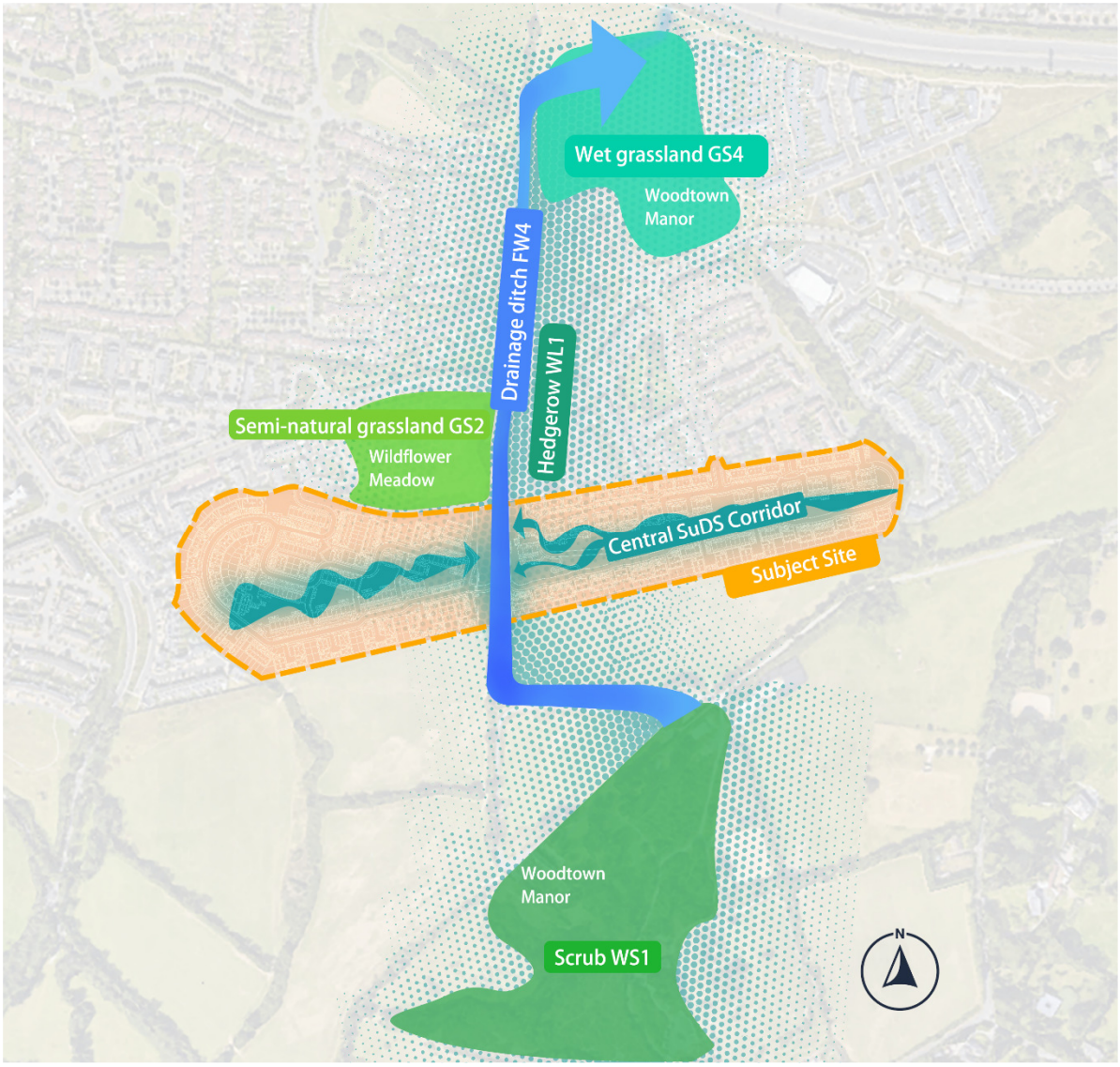
- Semi-natural grassland (GS2)
- Wet grassland (GS4)
- Drainage ditch (FW4)

This diverse habitat profile highlights the site's likely importance as a biological corridor, utilising Sustainable Urban Drainage to connect the surface water runoff back into the central watercourse will help to mitigate the impacts of urban fragmentation within this area.

The site's steep topography poses a challenge for runoff management. However, this very characteristic presents an opportunity to incorporate cascaded Sustainable Drainage Systems (SuDS), which deliver multiple ecosystem services.

In addition to managing water quantity, SuDS elements will provide passive purification, improving runoff water quality by filtering contaminants such as metals, nutrients, petrochemicals, and organic pollutants. This will help protect aquatic life and improve overall environmental health.

The proposed Central SuDS Green Corridor will provide a natural space for biodiversity restoration, benefiting from its lower accessibility compared to the primary amenity area. By utilising cascaded SuDS



units, runoff can be effectively treated prior to being discharged into the stream. These SuDS components are designed to reduce peak flows during storm events and enhance base flows during dry periods.

Areas of proposed detention basins will include over 600mm of refilled topsoil containing a native seed bank, allowing indigenous plant species to recolonise the wet soil naturally. This restoration effort will support a range of wildlife, including invertebrates, small mammals, birds, and pollinators.

5. SUDS Maintenance

For the SUDS strategy to work as designed, the entire drainage system must be well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, and manholes (including catch pits) will ensure adequate performance. After a heavy rainfall, all attenuation/ surface water drainage components should be checked for debris/ blockages to prevent future blockages and flooding. The recommended program is outlined in the tables below.

Table 5-1 Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year, after autumn leaf fall, or as required, based on site-specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

Table 5-2 Swale/ Bioretention Areas Maintenance Schedule

Swale/ Bioretention areas/ Filter Drains	Maintenance period	Maintenance Task	Frequency
	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during the growing season), or as required
		Manage other vegetation and remove nuisance plants.	Monthly at the start, then as required
		Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half-yearly
		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half-yearly
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if the soil is exposed over 10% or more of the swale treatment area
	Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	As required

		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of the filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Table 5-3 Green Roof Maintenance Schedule

	Maintenance		
Green Roof *	Maintenance Issues	Vegetation becoming either overgrown or dying	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.	Annually and after severe storms
		Inspect the underside of the roof for evidence of leakage.	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.	Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	Six monthly or as required
	Remedial Work	If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

*Note: Please refer to architects plans/documents for access strategy for green roofs.

Table 5-4 Detention Basin Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency
Detention Basin	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during the growing season), or as required
		Manage other vegetation and remove nuisance plants.	Monthly at the start, then as required
		Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half-yearly
		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half-yearly
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if the soil is exposed over 10% or more of the swale treatment area
	Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	As required
		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of the filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Table 5-5 Tree Pit Tanks Maintenance Schedule

	Maintenance		
Attenuation Tanks	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe Storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

Table 5-6: Petrol Interceptor Maintenance Schedule

	Maintenance		
Petrol Interceptor	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe Storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

6. Water Supply

6.1 Water Supply – General

There is an existing 200mm diameter watermain laid within the spur road at Abbots Grove which has been extended up to the boundary of the subject site and is intended to serve the subject site.

A Pre-Connection Enquiry form was submitted to Uisce Éireann for 400 no. units which outlined the proposals for the supply of water to the development. Uisce Éireann responded with the Confirmation of Feasibility (COF) on 12/02/2024, with reference no. CDS 24000704. Refer to Appendix A, in report 24-007r.007, for the Uisce Éireann Confirmation of Feasibility. In summary, the letter confirmed that the water connection is feasible without infrastructure upgrades.

A revised Pre-Connection Enquiry form was submitted to Uisce Éireann on 06/12/2024 for 505 No. houses and 1 No. creche and a COF with reference number CDS24010539 was received from Uisce Éireann on 05/03/2025 which further confirmed that the water connection is feasible without any necessary infrastructure upgrades. Refer to Appendix B, in report 24-007r.007, for the revised Uisce Éireann Confirmation of Feasibility.

In addition, a Statement of Design Acceptance (SODA) has been received from to Uisce Éireann (UE) which confirms that the proposed design is in compliance with the UE standards. The SODA is included in Appendix F of report 24-007r.007 included with this application under a separate cover.

Table 6-1 Total Water Demand

Description	No. of Units/People	Flow l/h/day	Population per Unit	Total Discharge (l/d)
Residential Units	502	150	2.7	203,310
Creche	1	50	120	6,000
Total				***214,535 l/d***

The total water requirement from the public supply, for the development, is estimated at 215 m^3/day. The proposed watermain network can be seen on Waterman Moylan drawing BYCN- WM-ZZ-XX-DR-C-P1300 and P1301.

7. Transport

7.1 General

There is an existing spur road constructed from the Roundabout in Stocking Avenue to the site boundary. This existing spur road is intended to provide road access to the subject site. A secondary road access is to be provided from Stocking Wood drive to the east. The proposed internal road layout incorporates a number of shared surfaces. Where straight section of road are proposed deflections in the horizontal alignment have been incorporated to reduce traffic speeds together with raised tables.

A detailed Traffic and Transportation assessment (TTA) has been undertaken for the proposed development, and this is included under separate cover.

7.2 Car Parking

Based on the current guidelines/policies, which are outlined in the accompanying TTA, it is considered that the *Sustainable Residential Development and Compact Settlements Guidelines for Planning Authorities (2024)* standards are the most restrictive for the subject development and is the reference for determining the proposed the car parking. Table 7.1 below shows the breakdown of proposed car parking spaces.

Table 7-1 Proposed Car Parking

Type	No. of units	Car Parking Spaces Proposed	
		Resident / Visitor Ratio	Resident / Visitor Car Parking Spaces
1-bed apartments	108	0.50	54
2-bed apartments	151	1.00	151
3-bed apartments	46	1.30	60
2-bed houses	19	1.00	19
3-bed houses	116	1.50	174
4-bed houses	62	1.45	90
Crèche	6 classrooms	2.5 per classroom	15
Total car parking spaces			**563**

The proposal for parking spaces, indicated in the table above, reflects that 563 No. spaces are proposed, including 548 no. spaces for residential units and 15 no. spaces are proposed for the creche. The overall car carping spaces include a total of 2 no. accessible car parking spaces in the creche area and 9 no. accessible car parking spaces for the apartment units.

In addition, the proposed development includes EV car parking spaces in the ratio of 20% of the total on-street car parking spaces.

7.3 Cycle Parking

Based on the guidelines/policies indicated in the accompanying TTA, it is considered that the *South Dublin County Development Plan 2022-2028 Standards* are the most relevant standard for the subject development and is the reference for determining the quantity of proposed cycle parking. House units without access to their rear gardens will be provided with bicycle storage in the front garden, in line with the *Sustainable Residential Development and Compact Settlements Guidelines for Planning Authorities (2024)*. The proposed Cycle Parking is shown in Table 7-2 below;

Table 7-2 Proposed Cycle Parking

Type	No. of units	Ratio		Cycle Parking Spaces Required	
		Resident long stay	Visitor short stay	Resident long stay	Visitor short stay
1-bed apartments	108	1	0.5	108	54
2-bed apartments	151	2	0.5	302	76
3-bed apartments	46	3	0.5	138	23
2-bed houses	19	2	-	38	-
3-bed houses	30 No. terrace units	3	-	90	-
	86 No. with access to their rear garden	3	-	258	-
4-bed houses	62	4	-	248	-
Crèche	6 classrooms 109 No. pupils 20 No. Staff	1 per 5 staff	1 per 10 children	4	12
Total cycle parking spaces				**1186**	**165**

For the subject site, a total of 1351 no. cycle spaces are proposed. Of this total, 634 no. spaces are for house units, 701 no. spaces are for apartment units, including 153 no. spaces for visitors, and 16 no. spaces are for the crèche24-007, including 4 no. spaces for staff and 12 no. spaces for visitors.

Cycle parking for terraced housing units is provided in the storage locker. For non-terraced housing units, the cycle parking is provided in the back gardens. The apartments cycle parking is provided in the communal storage. Visitor cycle parking is provided in the public space. Apartments have been provided with visitor bicycle parking spaces. For the housing units, it is assumed that there may be unoccupied spaces available for visitors.

UK and Ireland Office Locations