Surface Water Management Plan

Cherry Orchard Point – Phase 2 of Proposed Development at Sites 4 and 5, Park West Avenue, Dublin 10

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This document has been prepared and checked in accordance with
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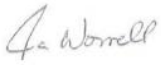
1	30 January 2025	P Ingle	I Worrell	

Comments

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1. Introduction

This report has been prepared by Waterman Moylan as part of the planning documentation for the proposed Phase 2 development of the Cherry Orchard Point masterplan development at Sites 4 and 5, Park West Avenue, Dublin 10.

The report sets out to demonstrate how pollution of watercourses both during the construction stage and after the construction period, during the operational stage will be prevented and/or mitigated. This is in accordance with Chapter 9, Policy SI25 of the DCC Development Plan 2022-28, which requires "*the preparation of a Surface Water management Plan as part of all new developments in accordance with the requirements of Appendix 13 – The Council's Surface Water Management Guidance."* This is required for 2 or more residential units or commercial space of 100m^2 or greater. As the proposed Phase 2 development consists of 137-no. residential units, this requirement is applicable to this application.

2. Masterplan Lands

2.1 Cherry Orchard Point Site Location and Description

The subject masterplan development is comprised of 2 no. sites. Site 4 & Site 5 are bisected by Park West Avenue and lie to the west and east of this roadway respectively, as per the blue boundary lines indicated on Figure 2-1: Site Location Map (Source: Google Earth). The proposed Phase 2 Subject Site is located within Site 4 of the masterplan development.

The 2022 and 2024 Site Investigation Report undertaken by Ground Investigations Ireland (GII), included as an appendix to the Preliminary Construction Environmental Management Plan submitted under a separate cover, has determined that Site 4 is combination of Greenfield and Brownfield, with evidence of fill material in the area of the site previously used as a construction compound. Site 5 is predominantly a brownfield site, with fill material found for the same reason.

Site 4 is bound to the west by the M50, to the south by the Dublin-Kildare rail line and the Park West & Cherry Orchard station, and to the east and north by Park West Avenue. Site 5 is bound to the west by Park West Avenue, the northwest by Cedar Brook Way, the northeast and east by Barnville Park, and to the south by the Dublin-Kildare rail line and the residential unit of 62 Barnville Park.

Site 4 is currently accessed via a secured gate from Park West Avenue. Site 5 is accessed via a similar arrangement from Cedar Brook Way.

The masterplan development is a 4-Phase development with Phase 1, 2, and 4 located on Site 4, and Phase 3 located on Site 5. The subject site for this assessment, Phase 2 of the multi-phase masterplan development is indicated by the red boundary line, also shown on Figure 2-1: Site Location Map (Source: Google Earth).

The overall masterplan development area as per the blue line boundaries is c. 13.02ha, with Site 4 being c. 11.41 ha and Site 5 being c. 1.61ha. The area of the subject application indicated by the redline boundary, including for works in the public domain, is 3.185ha (31,850m^2).

For Site 4, the topographic survey of the area indicates that the low point of the site has a level of 55.70m OD. This is located on the eastern site boundary approximately 140m north of the junction of Park West Avenue and Cedar Brook Way. The remainder of the site generally slopes to this location owing to the embankments and subsequent site grading from the Dublin-Kildare Rail line to the south, M50 to the west, and approach road to the overpass on the M50 to the north. A local high point of the site has a level of 62.65m OD located at the northeast of Site 4.

Site 5 has a central high point with a level of 58.05m OD, and slopes outwards to all boundaries. The boundaries of Site 5 typically have levels between 54.80m and 56.00m, with the higher of these levels being located to the south of the site, adjacent to the retaining wall of the Park West Avenue Bridge over the rail lines.

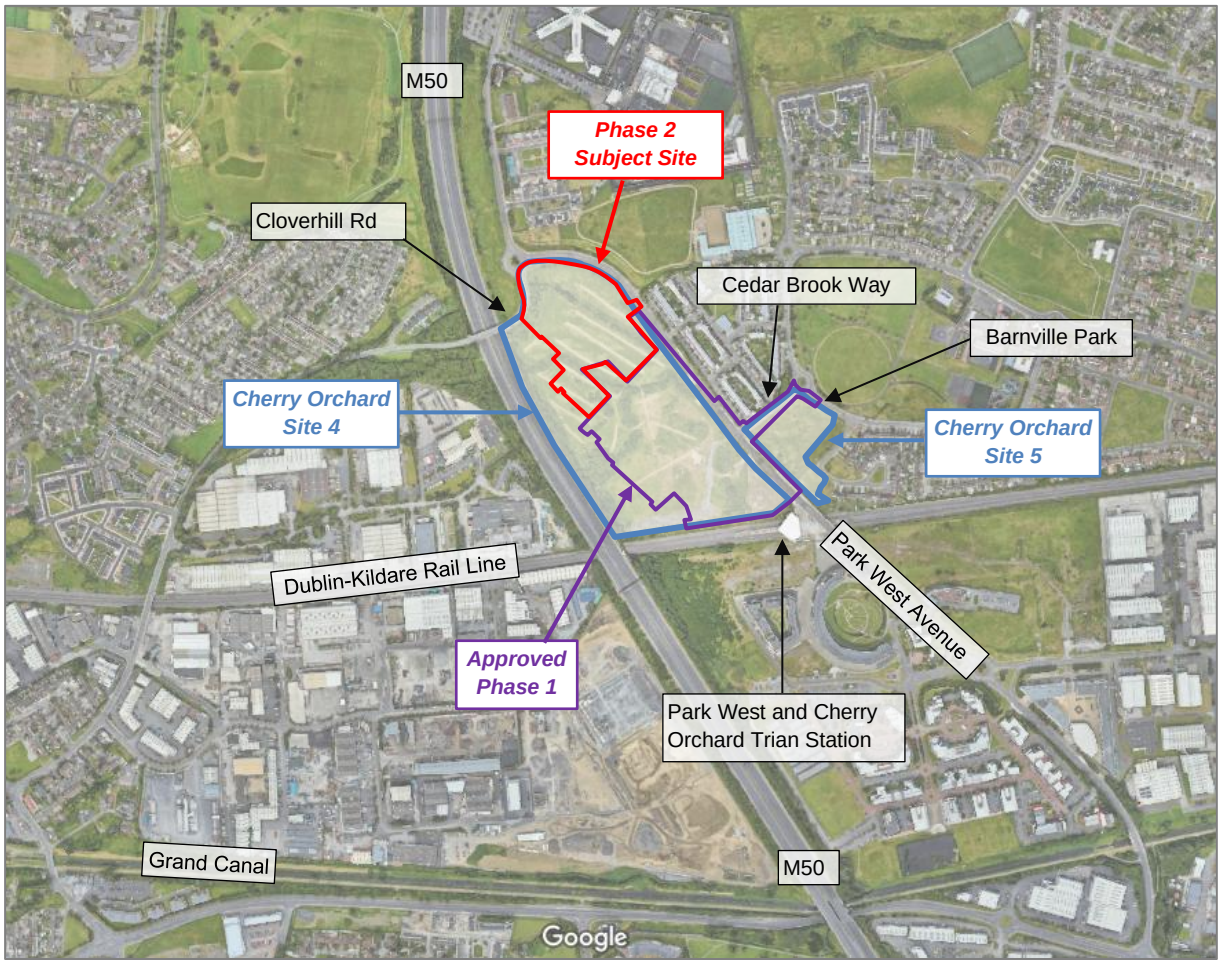

Figure 2-1: Site Location Map (Source: Google Earth)

Ordnance survey and topographic survey mapping indicates that Site 4 contains static ditches with no outfall. These ditches previously had hydrological connectivity and flow, which has been cut-off by the construction of the M50 to the east and the Cedar Brook housing development to the west. These ditches normally remain dry except in heavy rainfall events where water that is not percolated via the site's naturally grassed landscaping, would collect locally in these static ditches for infiltration to the groundwater table. Site 5 does not have any form of surface drainage network and conveys rainfall directly to the soils via its grassed landscape. There is potential during heavy rainfall events, that the ground may become saturated and unable to further infiltrate rainfall, which would then run from the surface, over the boundary and to the adjacent road networks to outfall to the storm drainage networks serving these roads. The sites are located in the catchment of the Blackditch stream, a tributary of the Camac River which has an ultimate outfall to the River Liffey at Heuston Station.

The project archaeologist, Archer Heritage Planning Ltd., have identified the ploughed out remains of a Fulacht Fia located centrally on site 4, adjacent to the convergence of 2 no. static ditches on their southern side. The archaeologist has recommended that the remains of the Fulacht Fia be preserved by record prior to further works being undertaken on site. Further detail is provided in the Archaeology Chapter of the EIAR submitted as part of this planning application.

2.2 Topographical Details

An updated Site Investigation Report undertaken by Ground Investigations Ireland (GII) in July of 2024 has determined that Site 4 is combination of Greenfield and Brownfield, with evidence of fill material in the area of the site previously used as a construction compound. Site 5 is predominantly a brownfield site, with fill material found for the same reason.

For Site 4, the topographic survey of the area indicates that the low point of the site has a level of 55.70m OD. This is located on the eastern site boundary approximately 140m north of the junction of Park West Avenue and Cedar Brook Way. The remainder of the site generally slopes to this location owing to the embankments and subsequent site grading from the Dublin-Kildare Rail line to the south, M50 to the west, and approach road to the overpass on the M50 to the north. A local high point of the site has a level of 62.65m OD located at the northeast of Site 4.

Site 5 has a central high point with a level of 58.05m OD, and slopes outwards to all boundaries. The boundaries of Site 5 typically have levels between 54.80m and 56.00m, with the higher of these levels being located to the south of the site, adjacent to the retaining wall of the Park West Avenue Bridge over the rail lines.

Refer to Figure 2-2: Existing Site Topography of Masterplan Lands for an extract of the topographical survey of the development showing spot elevations throughout Sites 4 and 5.

It is noted that the existing low points of Site 4 are generally located along Park West Avenue on the east and southeast of the site, a secondary isolated low area within the Site 4 boundary is located centrally within the northern portion of the Phase 1 site (55.54m OD).

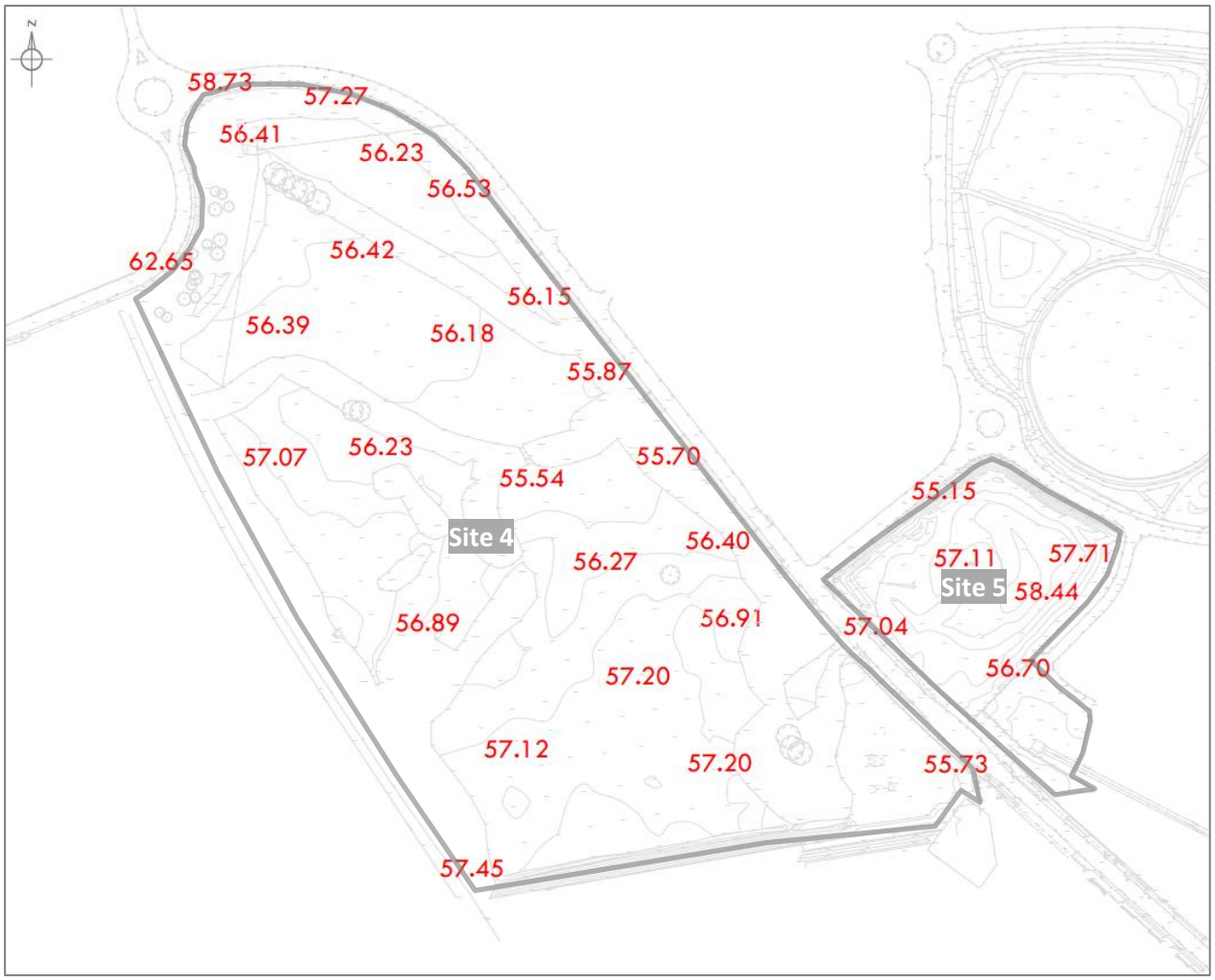

Figure 2-2: Existing Site Topography of Masterplan Lands

2.3 Site Investigation Details and Infiltration Rates

Site investigations for both sites were undertaken in 2022 by Ground Investigations Ireland (GII), the technical Ground Investigation report was completed in November 2022, and the Waste Analysis Classification report was completed in October 2022. An updated site investigation report was undertaken by GII in July 2024 with an updated Waste Analysis Classification Report completed in August 2024. The current 2024 reports will be referenced here within and are submitted as part of this application as an appendix to the Preliminary Construction Environmental Management Plan.

The scope of the works undertaken in the 2024 Site Investigation Report included the following:

- 118 no. Trial Pits undertaken to a maximum depth of 3.6m BGL
- 5 no. Soakaways undertaken to determine a soil infiltration value to BRE digest 365
- 6 no. Slit trenches undertaken to determine existing services.
- 5 no. Window Sample Boreholes undertaken to recover soil samples

- 33 no. Cable Percussion boreholes undertaken to a maximum depth of 4.0m BGL
- 14 no. Rotary Core Boreholes undertaken to a maximum depth of 10.1m BGL
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

Trial Pits

The trial pits were excavated using a 8T, 13T tracked or JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1 of the Site Investigation Report. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of the Site Investigation Report.

Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1 of the Site Investigation Report. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 4 of the Site Investigation Report.

Slit Trenches

The slit trenches were excavated using 3T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1 of the Site Investigation Report. The slit trenches were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the slit trench records which are provided in Appendix 3 of the Site Investigation Report.

Window Sampling

The window sampling was carried out at the locations shown in the location plan in Appendix 1 of the Site Investigation Report using a Tecopsa SPT Tec 10 percussion drilling rig. The window sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 50kg weight falling a height of 500mm. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. The window sample records are provided in Appendix 5 of the Site Investigation Report.

Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing. The standard method of boring in soil for site investigation is known as the Cable Percussion method. Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records of the Site Investigation Report. The cable percussion borehole logs are provided in Appendix 6 of the Site Investigation Report.

Rotary Coring

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1 of the Site Investigation Report. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring. The rotary borehole logs are provided in Appendix 7 of the Site Investigation Report.

Refer to Figure 2-3: Site Investigation Locations in the Subject Development - Phase 2 which shows the 2024 GII Site Investigation test locations in and around the subject site, Phase 2 of the Masterplan Lands.

Figure 2-3: Site Investigation Locations in the Subject Development - Phase 2

Soakaway Design

The 2024 GII Site Investigation Report stated the following:

"*At the locations of SA A, SA B, SA C, SA D, and SA E the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.*"

It is noted that the above referenced soakaway test locations refer to all 5 no. tests undertaken within the Masterplan Lands, 2 no. of which are located within the Phase 2 subject site, SA A and SA B.

Furthermore, the GII Site Investigation Report undertaken in 2022 contained similar findings regarding the infiltration rates of the Cherry Orchard Point Masterplan Lands, stating the following:

"Infiltration rates of f = 7.303 x 10^{-6} m/s, 6.95 x 10^{-6} m/s and 7.262 x 10^{-6} m/s respectively were calculated for the soakaway locations ST06, ST10, and ST11. At the locations of ST01, ST02, ST03, ST04, ST05, ST07, ST08, & ST09, the water level dropped too slowly to allow calculation of "f", the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction."

2.4 Proposed Masterplan Development

The proposed masterplan development is a 4-Phase development to be built on Site 4 and Site 5. Each Phase is subject to its own planning permission application. Refer to Figure 2-4: Masterplan Development Phasing Layout for an illustration of the masterplan development layout.

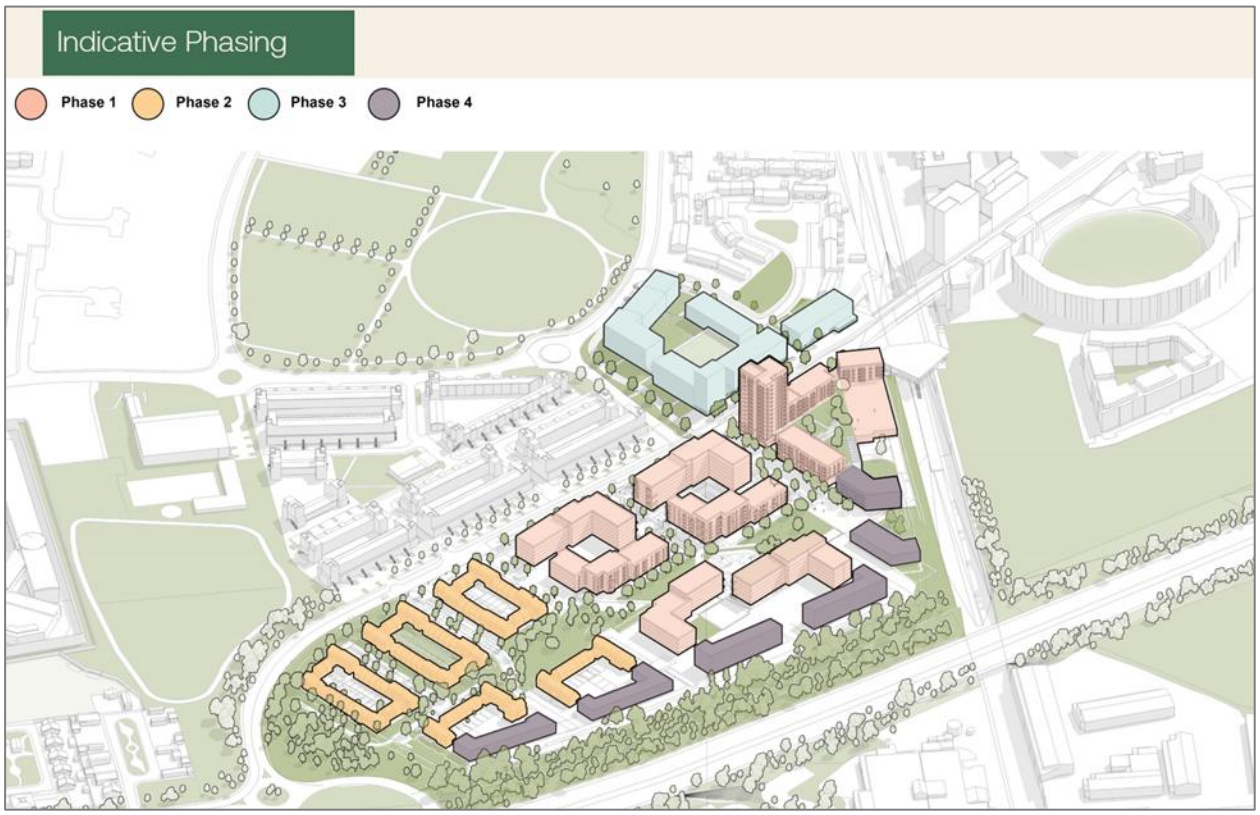

Figure 2-4: Masterplan Development Phasing Layout

A description of each of the 4-Phases is included below:

Approved Phase 1

Is a medium and high-density area located on Site 4 which will provide a total of 708 no. residential units ranging in size from studio to 3-bed apartments, a 2,523m² supermarket, a combined area of 373m² for retail over 7 units, a 672m² creche and 1,222m² of community spaces over 13 buildings. It is noted that the trunk foul and surface water drainage, including attenuation storage, to serve phases 2, 3, & 4 are part-provided under the planning application submission for Phase 1.

Phase 1 of Cherry Orchard Point was approved in July 2024 under ABP Ref. ABP-318607-23.

Phase 2 (Subject Site)

The subject development, Cherry Orchard Point - Phase 2, is a low-density housing area located to the north of Site 4 and is proposed to contain 137 no. residential units comprising a mix of apartment/duplex units and houses.

The subject development, Cherry Orchard Point – Phase 2 will be referred to as the “Phase 2” development or subject site within this report.

Phase 3

Is located on Site 5, and comprises 254 residential units, 1,200m² of retail space, with community facilities to be confirmed.

Phase 4

Is located on Site 4 and will consist of the construction of commercial office space over 6 blocks with a total area of c. 16,310m².

3. Proposed Development

3.1 Subject Development Description & Location

The proposed Phase 2 development located on lands at Cherry Orchard, Dublin 10 (known as Development Site 4 in the Park West Cherry Orchard Local Area Plan 2019) is on a site of c. 3.185 hectares.

The Phase 2 Subject Site is bound by Cloverhill Road to the north, Cedar Brook Avenue and Park West Avenue to the east, the consented Phase 1 development (Bord. Ref: ABP-318607-23) to the south, and the M50 motorway to the west. The development will consist of the construction of a residential scheme containing 137no. residential dwellings (comprising 31no. 2-bedroom units, and 106no. 3-bedroom units) through a mixture of houses, duplex units and own-door apartments. The proposed development will include a new access road connecting to the entrance point at Park West Avenue as permitted under the Phase 1 scheme, new internal streets, landscaped public and communal open space, a new pedestrian connection to Cloverhill Road and all associated site and development works. The proposed development represents Phase 2 of the overall planned development for Development Sites 4 and 5 of the LAP lands. Phase 1 of the overall planned development was granted permission in July 2024 (Bord. Ref: ABP-318607-23). The proposed development (GFA of c. 13,280sqm) involves the construction of 137no. dwellings in a mix of houses, duplexes and own-door apartments ranging in height from 2 to 3 storeys comprising 31no. two-bed units (9no. two-bed three-person and 22no. two-bed four-person) and 106no. three-bed units (13,015 sqm total residential floor area), and all ancillary accommodation including bike and bin stores and ESB substation (265sqm total GFA). The proposed development also includes the provision of 2,133sqm landscaped public open space, in addition to 2,050sq.m of public open space as consented under the Phase 1 permission (Bord. Ref: ABP-318607-23).

The total public open space provided for Phase 2 totals 4,183 sqm (12.34% of the net site/development area (3,390ha) of Phase 2 lands). Communal open space for the duplex and apartment units is provided across three dedicated communal amenity areas (602sq.m in total area) with private open space to serve the proposed units to be delivered through a mixture of rear gardens and terraces.

The proposed development will also involve the provision of 141no. car parking spaces at curtilage and street level throughout the development, of which 7no. are accessible spaces and 71no. EV charging points (representing 50% of the total parking spaces). A total of 306no. bicycle parking spaces, of which 18no. are visitor spaces accommodated through a mixture of bike stores and external cycle parking stands. A total of 7no. motorbike parking spaces are also provided. Vehicular, pedestrian and cycle access routes to serve the proposed development are provided via the consented Phase 1 entrance to the east of the site along Park West Avenue with further connections provided to the north and to the south to the permitted Phase 1 scheme. Provision is also made for the installation of a signalised access junction with associated traffic lights and below ground infrastructure and the relocation of bus stop and shelter along Park West Avenue. The need to provide a signalised junction requires minor alterations to the entrance to the development including adjustment to the paving as previously permitted under the Phase 1 scheme (no further amendments to that permission are proposed under this application.) The proposed development also includes the provision of off-street cycle lanes along Park West Avenue that will provide direct connectivity to the Rail Station to the southeast and Cherry Orchard Park to the east.

The development will also provide for all associated ancillary site development works including site clearance, boundary treatment, associated public lighting, internal roads and pathways, bin and bike stores, ESB substation, hard and soft landscaping, play equipment, and all associated works and infrastructure to facilitate the development including connection to foul and surface water drainage and water supply.

Refer to Figure 3-1: Subject Site Location within Masterplan development for the location of the subject development.

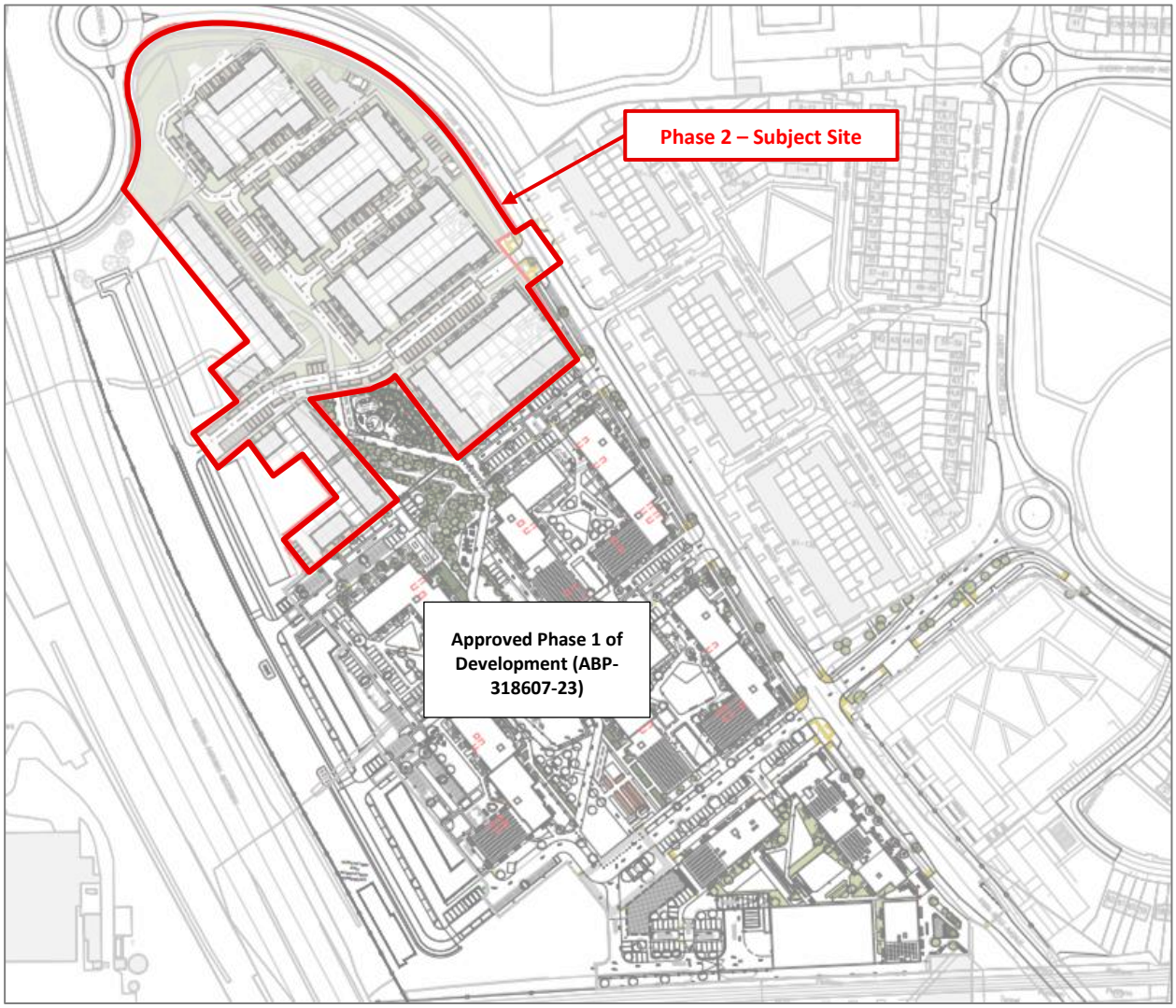

Figure 3-1: Subject Site Location within Masterplan development

A breakdown of the schedule of accommodation for the subject application is provided below.

Table 3-1: Phase 2 Schedule of Accommodation

Unit Type		Area sqm	No. of Units	Total Floor Area
2 Bed/ 4 Person House	HT A	81	13	1053
3 Bed/ 5 Person House - 2 storey	HT B	96	56	5376
3 Bed/ 5 Person House - 2 storey (end terrace)	HT B1	96	19	1824
3 Bed/ 5 Person House - 2 storey	HT C	106	13	1378
2 Bed/ 4P Own-Door Apt - mid terrace	Duplex A	73	6	438
2 Bed/ 3P Own-Door Apt (UD) - mid terrace	Duplex A (UD)	73	4	292
2 Bed/ 4P Own-Door Apt - end terrace/ corner	Duplex A1	73	3	219
2 Bed/ 3P Own-Door Apt (UD) - end terrace/ corner	Duplex A1 (UD)	73	5	365
3 Bed/5P Own-Door Duplex - end terrace/ corner	Duplex A2	115	8	920
3 Bed/5P Own-Door Duplex - mid terrace	Duplex A3	115	10	1150
Total			**137**	**13015**

The development includes all associated site works, undergrounding of overhead lines, boundary treatments, drainage, and service connections.

3.2 Surface Water Impacts

Surface water run-off from surface construction activities has the potential to become contaminated. The main contaminants arising from construction activities include:

- Suspended solids: arising from ground disturbance and excavation;
- Hydrocarbons: accidental spillage from construction plant and storage depots;
- Faecal coliforms: contamination from coliforms can arise if there is inadequate containment and treatment of onsite toilet and washing facilities; and
- Concrete/cementitious products: arising from construction materials.

These pollutants pose a temporary risk to surface water quality for the duration of the project if not properly contained and managed.

3.3 Proposed Construction Works

The Approved Phase 1 development is earmarked for completion by Q2 of 2028. Construction of the subject proposed development, Phase 2, will commence thereafter.

Working hours for the Phase 2 Subject Site will be set out in the conditions of planning approval and would typically be 08.00 to 19.00 from Monday to Friday and 08.00 to 14.00 on Saturday. No Sunday or Bank Holiday work will generally be permitted. The above working hours are typical; however, special construction operations may need to be carried out outside these hours in order to minimise disruption to the surrounding area.

The proposed works will consist of the following:

- Site preparation;
- Erection of security fencing/perimeter fencing;
- Setting up a secure site compound including wash down area;
- Site clearance including topsoil stripping;
- Construction of infrastructure including roads, drainage, and services;
- Provision of road upgrades and pedestrian links;

- Construction of residential and commercial units.
- Reinstatement landscaping.

4. Mitigation Measures

The masterplan lands, including the subject development, have no direct hydrological connectivity to natural watercourses or surface water networks. There may be an indirect link from surface water runoff which may have the potential to run off the site boundary to the surface water gullies on the adjacent road networks. These networks outfall to the Blackditch Stream.

The following Mitigation Measures are to address potential impacts to water quality and are required to protect the Blackditch Stream, and the Camac River which has an ultimate outfall to the River Liffey at Heuston. All works will be undertaken with reference to the following guidelines:

- CIRIA C532: Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al., 2001);
- CIRIA C692: Environmental Good Practice on Site, (Audus et al., 2010)
- BPGCS005: Oil Storage Guidelines;
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Technical Guidance (Murnane et al., 2006a)
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al., 2006a)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016)
- Guidelines for Planning Authorities – Architectural Heritage Protection – Guidance on Part IV of the Planning and Development Act 2000. (Part 2, Chapter 7) and ICOMOS Principles.

The schedule of mitigation presented within the following table summarises measures that will be undertaken for the Phase 2 Subject Site in order to reduce impacts on ecological receptors within the zone of influence which would include surrounding soils, the public water supply network, groundwater aquifers, and the public surface water network.

Table 4-1: Schedule of Surface Water Mitigation Measures

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
1	Hydrocarbons from carparking area entering the drainage network.	Water quality impacts.	Petrol interceptor to be installed on drainage network prior to outfall to public surface water network.	Prevents hydrocarbons from entering the public surface water network.
2	Pollutants from site compound areas entering the drainage network or contaminating soils.	Water quality impacts. Soil quality impacts. Groundwater impacts.	Materials to be stored appropriately in designated areas (discussed below). Temporary foul water connection to be obtained from Uisce Eireann to serve site compound welfare facilities.	Prevents contamination of public surface water network, soil, and groundwater.

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
3	Pollutants from material storage areas entering the watercourse or contaminating soils.	Water quality impacts. Soil quality impacts. Groundwater impacts.	Fuels, oils, greases, and other potentially polluting chemicals will be stored in roofed and bunded compounds at the Contractor's compound. Storage area to be located over 50m away to ensure no direct pathway to the surface water network. Bunds are to be provided with 110% capacity of storage container. Spill kits will be kept on site at all times and all staff trained in their appropriate use. Method statements for dealing with accidental spillages will be provided the Contractor for review by the Employer's Representative.	Prevents contamination of public surface water network, soil, and groundwater.
4	Concrete/ cementitious materials entering the drainage network.	Water quality impacts	A designated wash down area within the Contractor's compound will be used for cleaning of any equipment or plant, with the safe disposal of any contaminated water.	Prevents contamination of public surface water network. Ensures invasive species material is not transported off site as muck.
5	Leaching of contaminated soil into groundwater.	Groundwater quality impacts	Spill kits will contain 10 hr terrestrial oil booms (80mm diameter x 1000mm) and a plastic sheet, upon which contaminated soil can be placed to prevent leaching to ground water.	Prevents contamination of groundwater.
6	Pollutants from equipment storage/ refuelling area entering the drainage network.	Water quality impacts	Any refuelling and maintenance of equipment will be done at designated bunded areas with full attendance of plant operative(s) within contained areas. Discharge licence (where required) pollutant limits to be monitored and adhered to. The site is located at least 50m from any direct pathway to the surface water drainage network.	Prevents contamination of public surface water network.
7	Runoff from exposed work areas and excavated material storage areas entering the drainage network.	Water quality impacts due to silt entering the network.	Provision of silt entrapment facilities such as; straw bales, silt fencing, silt barriers, diversion drains, settlement tank(s), & settlement pond(s), as appropriate and as outlined below.	Prevents contamination of public surface water network.

5. Construction Stage

The proposed potential pollution mitigation measures outlined below will be implemented in accordance with 'CIRIA C532 – Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors' – CIRIA-2001.

5.1 Roles and Responsibilities

5.1.1 Main Contractor

The Main Contractor will have overall responsibility for the implementation of the project Construction Surface Water Management Plan (CSWMP) during the construction phase. The appointed person from the Main Contractors team will be appropriately trained and assigned the authority to instruct all site personnel to comply with the specific provisions of the CSWMP. At the operational level, a designated person from each sub-contractor on the site shall be assigned the direct responsibility to ensure that the operations stated in the CSWMP are performed on an on-going basis.

Copies of the Construction Surface Water Management Plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the CSWMP and informed of the responsibilities which fall upon them because of its provisions.

The responsibilities of the appointed person will be as follows;

- Updating the CSWMP as necessary to reflect activities on site.
- Advise site management (including, but not limited to, the site Construction Manager) on environmental matters.
- Ensure pre-construction checks for protected species, if any, are undertaken.
- Review method statement of the sub-contractors to ensure that it incorporates all aspects of CSWMP.
- Provide toolbox talks and other training, and ensure understanding by all involved of all mitigation measures.
- Assess effectiveness of mitigation, check weather forecast and site conditions where trigger levels are required.
- Ensure adherence to the specific measures listed in the Planning Conditions.
- Advise upon the production of written method statements and site environmental rules and on the arrangements to bring these to the attention of the workforce.
- Investigate incidents of significant, potential, or actual environmental damage, ensure corrective actions are carried out and recommend means to prevent recurrence; and,
- Be responsible for maintaining all environmental related documentation.
- Ensure plant suggested is environmentally suited to the task in hand.
- Co-ordinate environmental planning of the construction activities to comply with environmental authorities' requirements and with minimal risk to the environment. Give contractors precise instructions as to their responsibility to ensure correct working methods where risk of environmental damage exists.

5.2 Pre-Construction Plan

5.2.1 Designated Storage Area & Site Compound

A site compound(s) including offices and welfare facilities will be set up by the main contractor in locations to be decided within the subject site.

The main contractor will be required to schedule delivery of materials daily. The main contractor will be required to provide a site compound on the site for the secure storage of materials.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and surrounding watercourses from oil and petrol leakages and significant siltation. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to provide protection from accidental spills. Spill kits will be provided by the Contractor to cater for any other spills.

5.3 Construction Plan

5.3.1 Vehicle Washdown

Where possible, and subject to licence, the permanent connection to the public foul sewer will be used temporarily for construction phase. Vehicle wash down water will discharge directly, via suitable pollution control and attenuation, to the foul sewer system. If this connection is not permitted, then wastewater generated will be required to be stored for collection and treatment off-site at a suitable waste disposal facility.

5.3.2 Surface Water Run-off

On-site treatment measures will be installed to treat surface water run-off from the site prior to discharge to the receiving surface water sewer on Park West Avenue. This treatment will be achieved by the construction of settlement tanks/ponds, in conjunction with the installation of proprietary surface water treatment systems including class 1 full retention petrol interceptors, and spill protection control measures. Settlement tanks/ponds will be sized to deal with surface run-off and any groundwater encountered.

A sampling chamber with shut down valve will be installed downstream of the settlement pond/tank and water quality monitoring will be carried out here prior to discharge to the surface water sewer.

It is likely that the surface water run-off from the site will be discharged to the existing public surface water network, post treatment. This will need to be confirmed between the Contractor and Local Authority, as well as any further conditions such as the permitted levels of contamination as well as frequency for testing, as part of the Contractor's application for a discharge licence.

5.3.3 Surface Water Monitoring Parameters

In addition to daily visual inspections, a surface water monitoring programme, as outlined in Table 5-1 must be followed during construction in order to ensure maintenance of water quality protection. This is in line with Transport Infrastructure Ireland (TII)'s 'Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan'. It is considered that the parameter limit values (Guide/Mandatory) defined in the Fresh Water Quality Regulations (EU Directive 2006/44/EEC) should act as a trigger value for the monitoring of Surface Water.

Table 5-1: Monitoring Guidelines (Fresh Water Quality Regulations)

Parameter	Limit		Frequency and Manner of Samplings
	Limit Value	Guide/Mandatory	
Temperature	1.5°C	Mandatory Limit	Weekly, and at appropriate intervals where the works activities associated with the scheme have the potential to alter the temperature of the waters.
Dissolved oxygen	50% of Samples ≥ 9 (mg/l O2) 100% of Samples ≥ 7 (mg/l O2)	Guide Limit	Weekly, minimum one sample representative of flow oxygen conditions of the day of sampling
pH	6 to 9	Mandatory Limit	Weekly
Nitrites	≤0.01 (mg/l N02)	Guide Limit	Monthly
Suspended Solids	≤25 (mg/l)	Guide Limit	Monthly
BOD5	≤3 (mg/l)	Guide Limit	Monthly
Phenolic Compounds	-	-	Monthly where the presence of phenolic compounds is presumed (An examination by test)
Petroleum Hydrocarbons	5 (mg/l)	Guide Limit	Monthly (visual)
Non-Ionized Ammonia	≤ 0.005 (mg/l NH3)	Guide Limit	Monthly
Total Ammonium	≤ 0.004 (mg/l NH4)	Guide Limit	Monthly
Total Residual Chlorine	≤ 0.005 (mg/l HOCl)	Mandatory Limit	At appropriate intervals where works activities associated with the scheme have the potential to alter the Total residual Chlorine of the waters
Electrical Conductivity	-	-	Weekly

6. Operational Stage

The design of the surface water network is discussed in full in the Waterman Moylan Engineering Assessment Report, submitted under a separate cover. This report, however, discusses the surface water management plan as a whole, with an emphasis on describing the rational for the selection of proposed SuDS, and calculations for attenuation volumes, discharged water quality enhancement, and the further enhancement of amenity and biodiversity values. The following sections may be considered as the *"SuDS Design statement"* as required under Section 9.11 of the Council's SuDS Design & Evaluation Guide.

6.1 Sustainable Urban Drainage Systems (SuDS)

The Council's SuDS Design & Evaluation Guide advises that: *"Sustainable Drainage or SuDS is a way of managing rainfall that minimises the negative impacts on the quantity and quality or runoff while maximising the benefits of amenity and biodiversity for people and the environments."*. These Sustainable Drainage Systems (SuDS) are considered a collection of water management practices that aim to align modern drainage systems with natural water processes.

Sustainable Drainage Systems (SuDS) are a collection of water management practices that aim to align modern drainage systems with natural water processes.

SuDS facilities are designed to prevent pollution of streams and rivers and to slow down runoff from sites, therefore helping to prevent downstream flooding and improve water quality. This closely mimics natural catchment behaviour where rainfall either infiltrates through the soil or runs off slowly over the ground surface to the nearest watercourse. This is known as the "treatment train" approach. SuDS devices should be placed at source, site, and regional levels. SuDS can also provide amenity benefits to local communities and benefits for biodiversity simultaneously.

Dublin City Council's Development Plan (2022-2028) has identified SuDS as the preferred method of managing rainfall from new developments. In the sections to follow of this report, it will be outlined in detail how SuDS devices have been utilised and incorporated as an integral part of the overall plan for the proposed development, and how their inclusion will mitigate the risk of localised and downstream flooding, while also promoting residential amenity and biodiversity.

The proposed SuDS measures have been assessed for suitability, designed, and incorporated in accordance with CIRIA Report C753 The SuDS Manual, and Dublin City Council's SuDS Design and Evaluation Guide, Dublin City Council's SuDS Property Level Guide (2021), and Green & Blue Roof Guide, in order to develop a nature-based approach to surface water management for the proposed development.

6.1.1 Subject Development's Proposed SUDS

As part of the Approved Phase 1 planning compliance process, a Surface Water Management Plan was submitted by Waterman Moylan outlining the proposed SUDS features within Site 4 (including within the proposed Phase 2 development). Since the submission of the compliance document, the extent of proposed SUDS features within Phase 2 has been increased, as per DCC guidance from discussions had between DCC and Waterman Moylan in November 2024, to enhance the amenity and biodiversity of the subject site as far as practically possible. The details of the Phase 2 SUDS proposals are included here within.

The following SUDS features are proposed for the Phase 2 Subject Site:

- Permeable paving below all parking spaces;

- Public rain gardens throughout the development;
- Bio-retention tree-pits throughout the development;
- 1m wide private rain gardens in all rear gardens;
- Varying width roadside swales throughout the development.

Additionally, as per the DCC's SuDS Property Level Guide (2021), the following SuDS features are proposed to be incorporated into the drainage design to enhance the provision of SuDS in private areas:

- Water butts on rear garden downpipes, where feasible;
- Rain garden provision at the duplex privacy screening planting, where feasible;
- Green sedum roof or alternative suds measures such as rain garden / filter drain at downpipe location on selected bin/bike stores.

Details of the rain gardens within duplex privacy screening planting areas and typical water butt arrangement details can be found on the landscape architects drawings submitted as part of this planning application.

It is proposed that surface water runoff from the residential building roofs is collected in the rear garden within private rain gardens and within the permeable paving proposed at all car parking spaces to the front of the buildings. Where possible, the rear garden private rain gardens will connect into surface water networks routed below the permeable paving of the proposed car park spaces to add an additional layer of treatment before connecting into the mainline surface water networks within the internal roads network.

Surface water runoff from the proposed internal roads and footpath network will be conveyed into roadside swales, bio-retention tree pits and public rain gardens positioned throughout the development. Dropped kerb details adjacent to roadside swales will ensure surface water runoff from the roads infiltrates these proposed SUDS features.

The indicative layout of the proposed SUDS for the Phase 2 development can be seen in Figure 6-1: Indicative Layout of the Proposed SUDS Features in Phase 2.

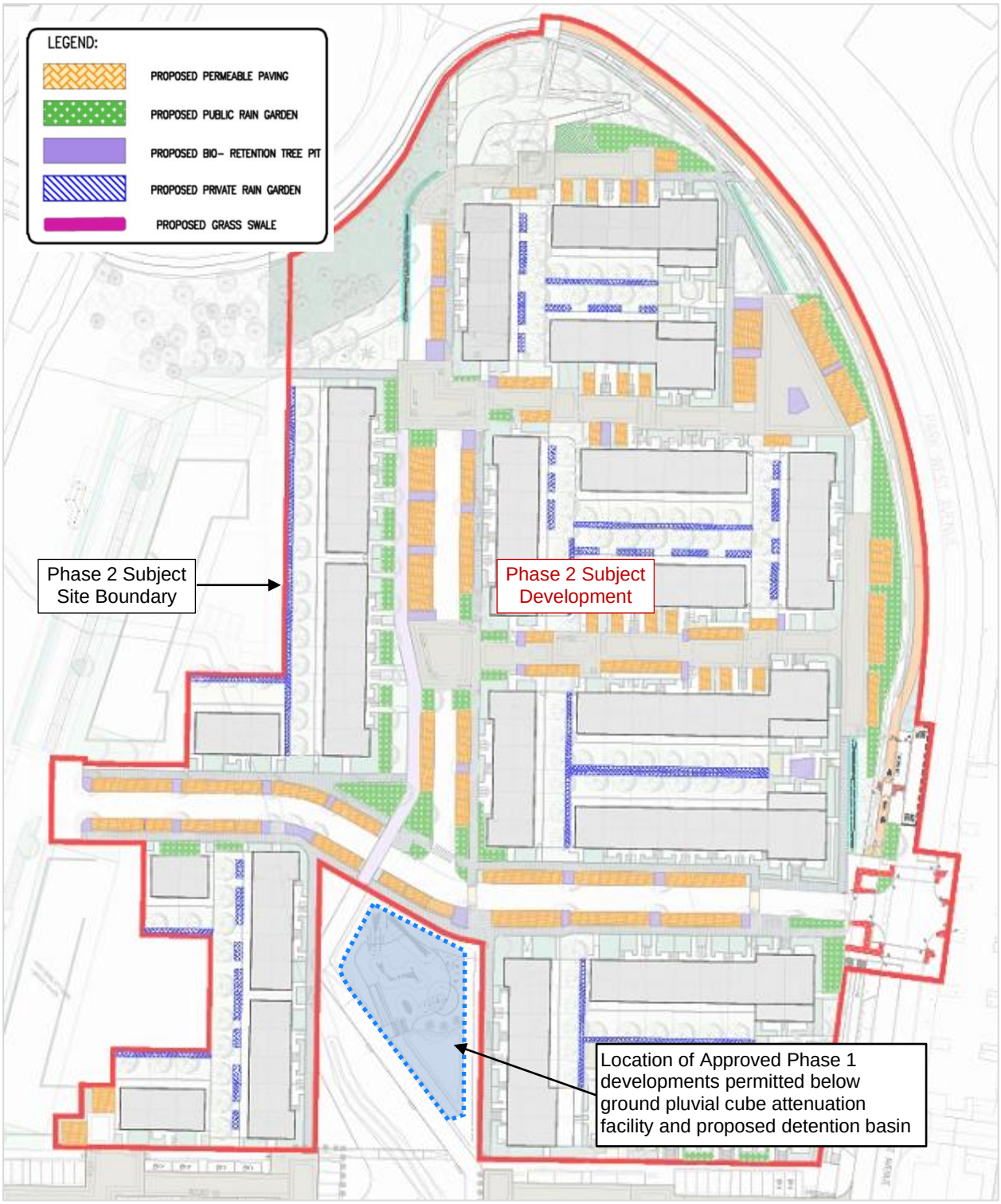

Figure 6-1: Indicative Layout of the Proposed SUDS Features in Phase 2

The total storage volume offered by the various SUDS features proposed within the Phase 2 development is included in the below table.

Table 6-1: Storage Volume of Proposed SUDS in Phase 2

SUDS Feature	Area (m^2)	Depth	Void Ratio	Storage Volume Provided (m3)
Permeable Paving	1870	0.35	0.4	262 m^3
Bio-retention Tree Pits	380	1.00	0.4	152 m^3
Swales	106	1.00	0.4	64 m^3
Private Rain Gardens	631	0.50	0.4	126 m^3
Public Rain Gardens	1172	0.65	0.4	305 m^3
Total				**909 m^3**

It is proposed to incorporate a Storm Water Management Plan through the use of various SUDS techniques to treat and minimise surface water runoff from the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS), Dublin City Council's SUDS Design and Evaluation Guide, and in the CIRIA Report C753 The SUDS Manual. Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the CIRIA Report C SUDS train concept have been implemented in the design, providing SUDS devices for each of the following:

- Source Control
- Site Control
- Regional Control

6.1.2 Source Control

Permeable Paving:

It is proposed to introduce permeable paving at all private driveways and parking areas throughout the development. Downpipes from the front of the houses, duplexes, and apartments will drain to filter drains beneath the permeable paving to facilitate maximum infiltration of surface water from driveways and roof areas.

The goal of permeable paving is to control stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

Refer to Figure 6-2: Illustration of Permeable Paving Buildup for an extract of a permeable paving detail taken from the SUDS Design & Evaluation Guide.

A total area of 1870m^2 below parking spaces is proposed to be used for permeable paving throughout the Phase 2 site.

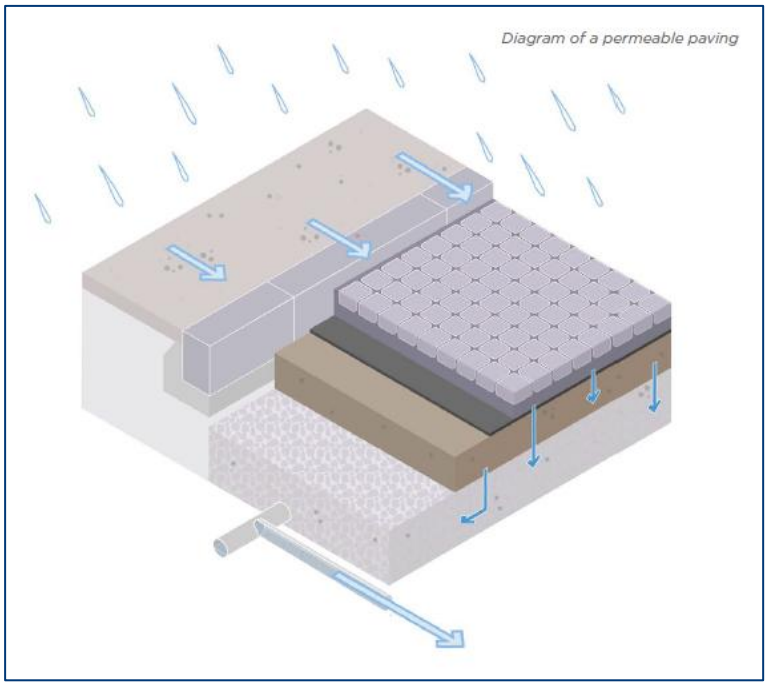

Figure 6-2: Illustration of Permeable Paving Buildup

6.1.3 Site Control

Roadside Bio-retention Tree Pits:

It is proposed to provide roadside trees throughout the development. Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Trees help to attenuate flows, trap silts and pollutants, promote infiltration, and prevent erosion. Incorporating tree planting offers multiple benefits, including attractive planting features, improved air quality and increased biodiversity whilst helping to ensure adaptation to climate change.

Refer to Figure 6-3: Illustration of SUDS Tree Pit for an extract of a tree pit detail taken from the SUDS Design & Evaluation Guide.

A total area of 380m^2 is proposed to be used for roadside bio-retention tree pits throughout the Phase 2 site.

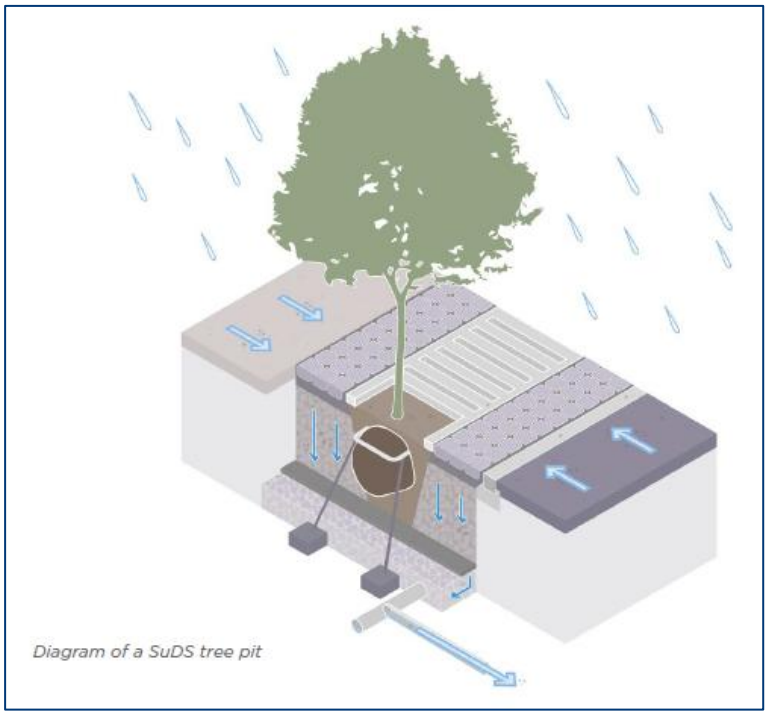

Figure 6-3: Illustration of SUDS Tree Pit

Swales:

Swales are grassed channels proposed to run parallel and adjacent to selected roads throughout the site. Rainfall from the road surface will be directed to gaps in the road kerbing and will flow to the swales. The swales will be linked back to the drainage network to prevent flooding in extreme weather events, where the volume of rainfall exceeds the percolation capacity of the swales. An image extracted from the SUDS Design & Evaluation Guide showing a swale with potential for storing rainfall runoff, constructed in Pelletstown, is shown in Figure 6-4: Illustration of Swale, below.

Figure 6-4: Illustration of Swale

Grassed swales enhance surface water runoff quality as they slow down water flow, allowing suspended particles to filter and settle out of suspension.

106 linear metres of swales are proposed as part of the Phase 2 site development.

Bio-retention Raingarden Systems:

Bio-retention planted areas will be provided within the private domain in rear gardens for all dwellings, with public rain gardens proposed adjacent to the internal roads network. Planted boxes rain gardens in strategy placed locations will also intercept down pipes from the apartment blocks.

Refer to Figure 6-5: Illustration of Rain Garden for an extract of a rain garden detail taken from the SUDS Design & Evaluation Guide.

It is proposed that a total area of 631m^2 within rear gardens will be used for proposed rain gardens. The private rain gardens will be 1m in width and 650mm in depth. Furthermore, it is proposed that a total area of 1172m^2 within green spaces areas adjacent to the internal roads network will be used for public rain gardens. The public rain gardens vary in width and length and have a depth of 800mm.

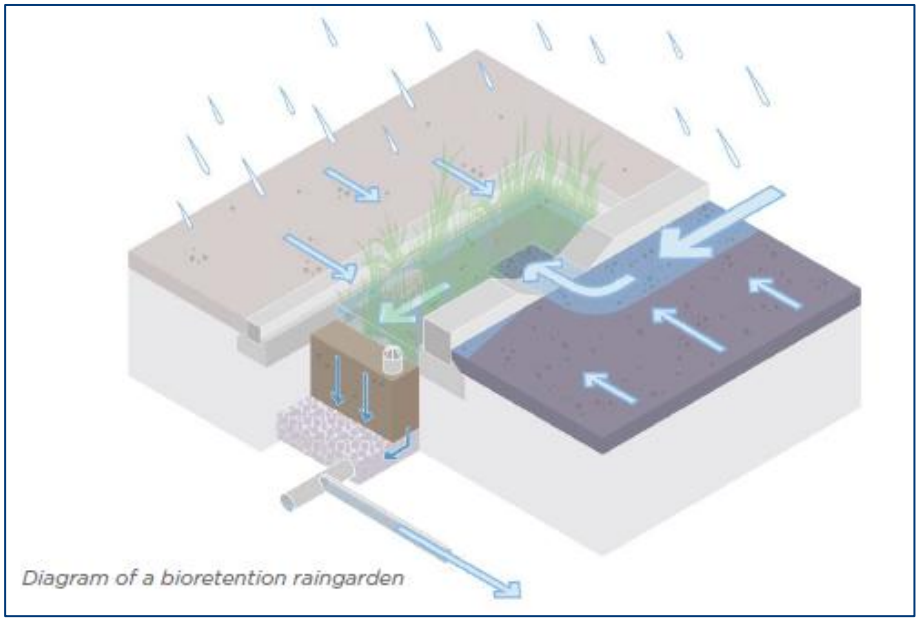

Figure 6-5: Illustration of Rain Garden

6.1.4 Regional Control

Regional Control for the Phase 2 subject developments surface water runoff is facilitated under the Approved Phase 1 development via an above ground detention basin.

Detention Basin and Pluvial Cube Attenuation Facility (Approved under Phase 1 development)

As part of the Planning Compliance submission for the Approved Phase 1 development, an above ground detention basin is to be utilised for attenuation of surface water within the permitted park area of the Approved Phase 1 development. This basin can be utilised during regular weather conditions for other purposes and will only fill with water during heavier rainfall events. Detention basins are engineered depressions in the ground and are typically seeded with grass and may also be suitable for planting. Detention basins may be further utilised as recreational/play areas, an option which has been utilised in the proposals for this Phase 1 project. A prime example of this incorporated to the project is the above ground detention basin located within the park area, on the border of the Approved Phase 1 development and the

proposed Phase 2 development, which performs the role of a “multi-functional SUDS component” which will act as a playground and open green space area during dry weather and an attenuation area during heavier rainfall events, as per the figure included on Page 15 of the Council’s SUDS Design & Evaluation guide (and for which is included below).

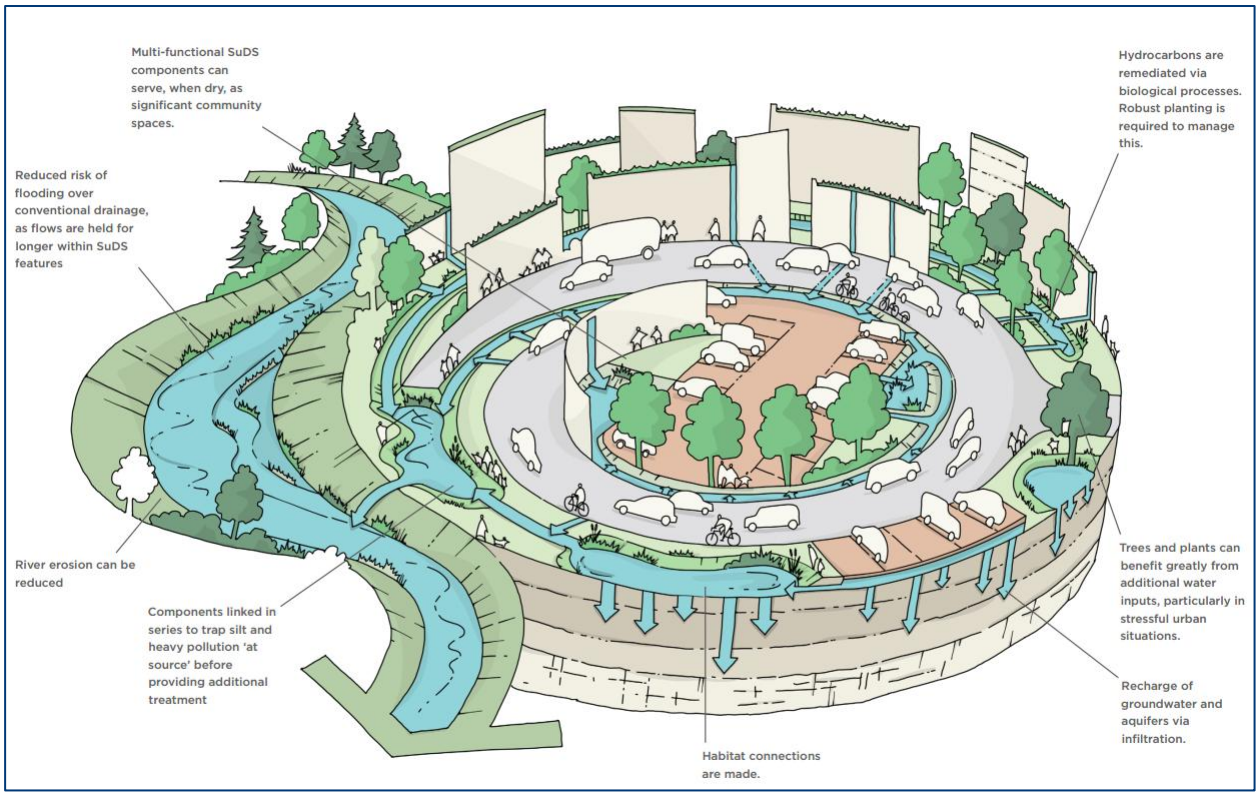

Figure 6-6: Multi-Functional SUDS Components Extract

This detention basin is designed to cater solely for surface water runoff from Catchment 1A. The majority of the Phase 2 subject development (95% of total area) lies within Catchment 1A, with the remainder of the development falling within Catchment 1B. The detention basin is designed above a below ground pluvial cube system. The surface water catchments are discussed in detail under Section 7.3 of this report.

Refer to Figure 6-1: Indicative Layout of the Proposed SUDS Features in Phase 2 for the location of the detention basin.

The detention basin can be seen in an extract of Waterman Moylan Drawing No. COP-WMC-PH1-00-DR-P-0205 - Attenuation Storage Tank 1 Details (submitted as part of Planning Compliance for the Approved Phase 1 development) included in Figure 6-7 and for which shows a cross-section view through the below ground pluvial tank system and the above ground detention basin proposed directly south of the Phase 2 development within the Approved Phase 1 development.

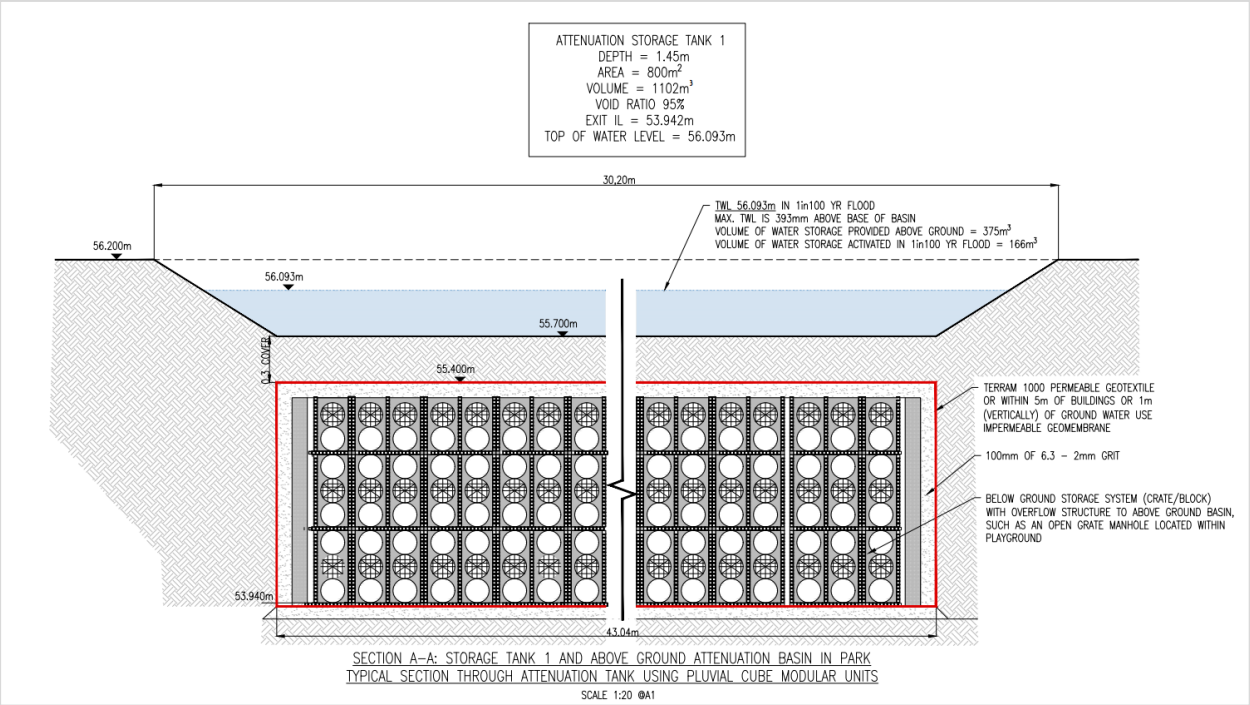

Figure 6-7: Extract of Waterman Moylan Drawing: Attenuation Storage Tank 1 Details

The top of water level (T.W.L) in the critical 1-in-100-year storm event within the detention basin, 56.093m, has been designed 500 mm below the lowest adjacent finished floor level (FFL). The lowest adjacent FFL within the relevant catchment (Catchment 1A) is set at 56.700m OD Malin (located in the Phase 2 development) and is 607 mm above the critical storm event T.W.L level.

The detention basin offers a total above ground storage volume of 375 m^3. The volume of water activated during the critical 1-in-100-year storm event is 166 m^3.

The above ground detention basin is not activated during the critical 1-in-5-year and 1-in-30-year storm events and is only activated during the critical 1-in-100-year storm event. A summary of these volumes and water levels are shown in the table below.

Table 6-2: Detention Basin Volume and Water Levels during Storm Events

Detention Basin (Volume 375 m^3)	1-in-5-year storm event	1-in-30-year storm event	1-in-100-year storm event
Storage Volume Activated	0 m^3	0 m^3	166 m^3
Top of Water Level in Basin	0 m	0 m	56.093 m
Depth of Water in Basin	0 mm	0 mm	393 mm
Volume of Basin Activated	0 %	0 %	44 %

As per the Planning Compliance submission to be submitted for the Approved Phase 1 development, the already permitted below ground pluvial cube tank, located below the above ground detention basin, is proposed to be reduced in volume from 1437 m^3 to 1102 m^3. The below ground pluvial cube tank is activated during the critical 1-in-5-year, 1-in-30-year storm, and 1-in-100-year storm events. A summary of these volumes and water levels are shown in the table below.

Table 6-3: Pluvial Cube Attenuation Facility Volume and Water Levels during Storm Events

Pluvial Cube Attenuation Tank	1-in-5-year storm event	1-in-30-year storm event	1-in-100-year storm event
Storage Volume Activated	769 m^3	1062 m^3	1102 m^3
Top of Water Level in Tank	55.01 m	55.40 m	55.40 m
Depth of Water in Tank	0 mm	0 mm	393 mm
Volume of Basin Activated	0 %	0 %	44 %

Flow Control:

A flow control device (Hydrobrake or similar approved) is proposed at each sub-catchment attenuation feature, which will limit exiting flows to a maximum rate of 2l/s/ha as permitted by DCC. A hydro-brake downstream of the detention basin will limit the surface water outflow for Catchment 1A to 8.60 l/s.

Petrol interceptor:

Class 1 petrol interceptors will be provided before the surface water outfalls to the local surface water network in Cedar Brook Way.

6.1.5 SuDS Maintenance Regime

Surface SUDS features can typically be maintained as part of the regular maintenance of the landscape, incorporating litter picking, grass cutting, and inspections. Figure 6-8: Regular Maintenance Requirements for SuDS, is an extract taken from Section 12.3 of the SUDS Design & Evaluation Guide and generally describes the regular maintenance aspect for the SuDS.

Type	Activity	Normal site care (Site) or SuDS-specific maintenance (SuDS)	Suggested frequency
Regular Maintenance			
Litter	Pick up all litter in SUDS Landscape areas along with remainder of the site – remove from site	Site	1 visit monthly
Grass	Mow all grass verges, paths and amenity grass at 35-50mm with 75mm max. Leaving cuttings in situ	Site	As required or 1 visit monthly
Grass	Mow all dry swales, dry SUDS basins and margins to low flow channels and other SUDS features at 100mm with 150mm max. Cut wet swales or basins annually as wildflower areas – 1st and last cuts to be collected	Site	4-8 visits per year or as required
Grass	Wildflower areas strimmed to 100mm in Sept or at end of school holidays – all cuttings removed Or Wildflower areas strimmed to 100mm on 3 year rotation – 30% each year – all cuttings removed	Site	1 visit annually 1 visit annually
Inlets & outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	SuDS	1 visit monthly
Permeable paving	Sweep all paving regularly to keep surface tidy	Site	1 visit annually or as required

Figure 6-8: Regular Maintenance Requirements for SuDS

There will still be a remaining requirement for more intensive maintenance tasks to be undertaken however, the severity of these tasks can be reduced by regular inspections and proactive responses being incorporated as a part of the regular maintenance regime discussed above. A table showing the typical requirements for the occasional maintenance tasks and remedial works is extracted from the SUDS Design & Evaluation Guide to Figure 6-9: Further Maintenance Requirements for SuDS.

Occasional Tasks			
Permeable paving	Sweep and suction brush permeable paving when ponding occurs	SuDS	As required - estimate 10-15 year intervals
Flow controls	Annual inspection of control chambers - remove silt and check free flow	SuDS	1 visit annually
Wetland & pond	Wetland vegetation to be cut at 100mm on 3 – 5 year rotation or 30% each year. All cuttings to be removed to wildlife piles or from site.	Site	As required
Silt	Inspect swales, ponds, wetlands annually for silt accumulation	Site & SuDS	1 visit annually
Silt	Excavate silt, stack and dry within 10m of the SUDS feature, but outside the design profile where water flows. Spread, rake and overseed.	Site & SuDS	As required
Native planting	Remove lower branches where necessary to ensure good ground cover to protect soil profile from erosion.	SuDS	1 visit annually
Remedial Work			
General SuDS	Inspect SuDS system to check for damage or failure when carrying out other tasks. Undertake remedial work as required.	SuDS	Monthly As required

Figure 6-9: Further Maintenance Requirements for SuDS

Further to the above extracts on SUDS maintenance requirements, maintenance schedules for the particular SUDS features proposed within the Phase 2 site – swales, raingardens and bio-retention tree pits, and permeable paving have been sourced from The SUDS Manual (CIRIA C753) and summarised in the tables to follow.

Table 6-4: Phase 2 - Swale Maintenance Schedule

	Maintenance Period	Maintenance Task	Frequency
Swales	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required
		Manage other vegetation and remove nuisance plants.	Monthly at 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 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 filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Table 6-5: Phase 2 - Bio-Retention Tree Pit & Rain Gardens Maintenance Schedule

	Maintenance Period	Maintenance Task	Frequency
Bio-Retention Tree Pit & Rain Gardens	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required
		Manage other vegetation and remove nuisance plants.	Monthly at 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 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 filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Table 6-6: Phase 2 - Permeable Paving Maintenance Schedule

	Maintenance Period	Maintenance Task	Frequency
Permeable Paving	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 actions	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. Monitor inspection chambers.	Annually

7. Surface Water Network

7.1 Dublin City Council Consultation

Meetings were held with the Surface Water Department of Dublin City Council in 2022 & 2023 in order to agree the principles of the surface water and SuDS strategy of the masterplan lands. These meetings outlined the preliminary surface water strategy, SuDS strategy, and connection points. The overall preliminary proposal was deemed acceptable and suitable for further detailed design progression. It was agreed that the outflow rate be set at a maximum of 2 l/s/ha as per Dublin City Council requirements. This is in accordance with Dublin City Council's "SuDS Design and Evaluation Guide", which instructs in their Flow Control Discharge Limits Table (page 43), that the 1-in-100-year maximum outflow rate shall be limited to 2 l/s/ha.

Discussions were held with the Surface Water Department of Dublin City Council on the preliminary design strategy of the Proposed Cherry Orchard Point - Phase 2 development on 4 November 2024. DCC confirmed that the surface drainage strategy presented, which includes the connection of the Proposed Cherry Orchard Point - Phase 2 site to the Approved Phase 1 developments surface water network that ultimately discharges into the existing network in Cedar Brook Way, was acceptable. They further confirmed that the internal drainage strategy was acceptable in principle and expressed a desire for maximum SuDS features within the subject site. It was also noted that the outflow rate is limited to 2 l/s/ha as per Dublin City Council policy, which is lower than the current greenfield runoff rate for the site, thus when the Proposed Cherry Orchard Point - Phase 2 development becomes developed, the runoff rate for the site will actually be reduced from its current rate.

7.2 Site Conditions and Existing Surface Water Network

The 2022 Site Investigation Report by GII, that undertook infiltration rate testing within Site 4, including the Phase 2 Subject Site, advises for ground conditions that:

"Infiltration rates of f = 7.303 x 10^{-6} *m/s, 6.95 x* 10^{-6} *m/s and 7.262 x* 10^{-6} *m/s respectively were calculated for the soakaway locations ST06, ST10, and ST11. At the locations of ST01, ST02, ST03, ST04, ST05, ST07, ST08, & ST09, the water level dropped too slowly to allow calculation of "f", the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction."*

This is generally in line with the reports finding of predominantly clay-based subsoils.

Of the 14 no. Trial Pits undertaken with a maximum depth of 3.2m, Trial Pit (TP) 04 showed signed of slow seepage from groundwater at 2.6m BGL (Below Ground level).

Of the 11 no. Soakaway Tests undertaken, Soakaway Test (ST) 06 encountered groundwater at 1.8m BGL, which rose to a level of 1.6m BGL within 5 minutes.

Similarly, the 2024 Site Investigation Report by GII, that undertook infiltration testing within Site 4, including the Phase 2 Subject Site, advises for ground conditions that:

"*At the locations of SA A, SA B, SA C, SA D, and SA E the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction."*

It is noted that the above referenced soakaway test locations refer to all 5 no. tests undertaken within the Masterplan Lands, 2 no. of which are located within the Phase 2 subject site, SA A and SA B.

7.3 Surface Water Catchments

7.3.1 Masterplan Development

For storm water management purposes, the Masterplan Lands (Site 4 and Site 5) have been divided into 4-no. separate catchments, as shown in Figure 7-1: Indicative Layout of Surface Water Catchments. As noted, Catchment 1 is further divided into 2-no. sub-catchments, Catchment 1A and 1B. The Site 4 surface water network has been designed according to the surface water catchments identified above, the Phases of Site 4 (Approved Phase 1, proposed Phase 2, and future proposed Phase 4) may fall within more than 1-no. surface water catchment.

Based on the details presented by the 2022 and 2024 Site Investigation Reports, the sites have properties equivalent of a Type 5 soil, which has a runoff rate of 8.66 l/s/ha. However, in line with DCC requirements the attenuation calculations undertaken, have limited the outflow rate to a maximum of 2.0 l/s/ha, by using a soil type 2 for progression of the calculations. This is in accordance with Dublin City Council's "SuDS Design and Evaluation Guide", which instructs in their Flow Control Discharge Limits Table (page 43), that the 1-in-100-year maximum outflow rate shall be limited to 2 l/s/ha.

The calculated greenfield runoff rate for each surface water catchment is shown in the below table.

Table 7-1: Greenfield Runoff Rates for Surface Water Catchments

Catchment	Location / Phases Included	Area (Ha)	Greenfield Runoff Rate
Catchment 1A	North – Phase 2 Subject Site, Phase 4, small portion of Approved Phase 1	4.58 ha	8.60 l/s
Catchment 1B	Central East – Approved Phase 1, small portion of Phase 2 Subject Site	1.36 ha	3.20 l/s
Catchment 2	West – Phase 4 and Approved Phase 1	3.79 ha	7.55 l/s
Catchment 3	South – Approved Phase 1	1.67 ha	3.33 l/s
Catchment 4	Southwest – Phase 3 / Site 5	1.61 ha	3.21 l/s

Storm water from each catchment will be attenuated and discharge at a controlled rate, limited to a maximum of 2 l/s/ha (as per Dublin City Council requirements), to ultimately outfall to the existing surface water networks at Cedar Brook Way and Barnville Walk.

7.3.2 Subject Development

The Phase 2 subject site lies within Catchments 1A and 1B. The majority of Phase 2 (95% of site area) falls within Catchment 1A with the remainder (5% of site area) falling within Catchment 1B. Catchment 1A is shown by orange shading and Catchment 1B is shown by blue shading in Figure 7-1.

It is proposed to construct a stormwater drainage network that will service and attenuate the Site 4 development internally before discharging at the allowable greenfield rates to the local surface water network. This surface water network will facilitate connections from the Approved Phase 1 development to the Phase 2 subject development and future Phase 4 development. It is proposed that Site 4 will connect to the existing 1,050mm Ø network in Cedar Brook Way. The proposed development has been designed to incorporate best drainage practice in line with the Dublin City Development Plan (2022-2028), Greater Dublin Strategic Drainage Study (GDSDS), CIRIA SuDS Manual 2015 C753 – The SuDS Manual, and the Greater Dublin Regional Code of Practice (V6.0).

The Greenfield Runoff Rate of a development refers to the pre-development rainfall runoff rate. According to the Greater Dublin Regional Code of Practice, a range of formulae exist for predicting greenfield runoff. The simplest and the one considered most appropriate for applying to this criterion was developed by the Institute of Hydrology in their report 124 “Flood estimation for small catchments”, 1994. An online tool available from the UK SUDS website uses this criterion to calculate the required Greenfield Runoff Rate.

Refer to Appendix C of the Engineering Assessment Report submitted as part of this application for a copy of the Greenfield Runoff Rates retrieved from the UK SUDS website confirming the above outfall rate for Catchment 1, for which, the Phase 2 subject site development is located within.

Refer to Figure 7-1: Indicative Layout of Surface Water Catchments for which shows the location and extent of the 4-no. surface water catchments and the Phase 2 subject development boundary within the Masterplan Lands.

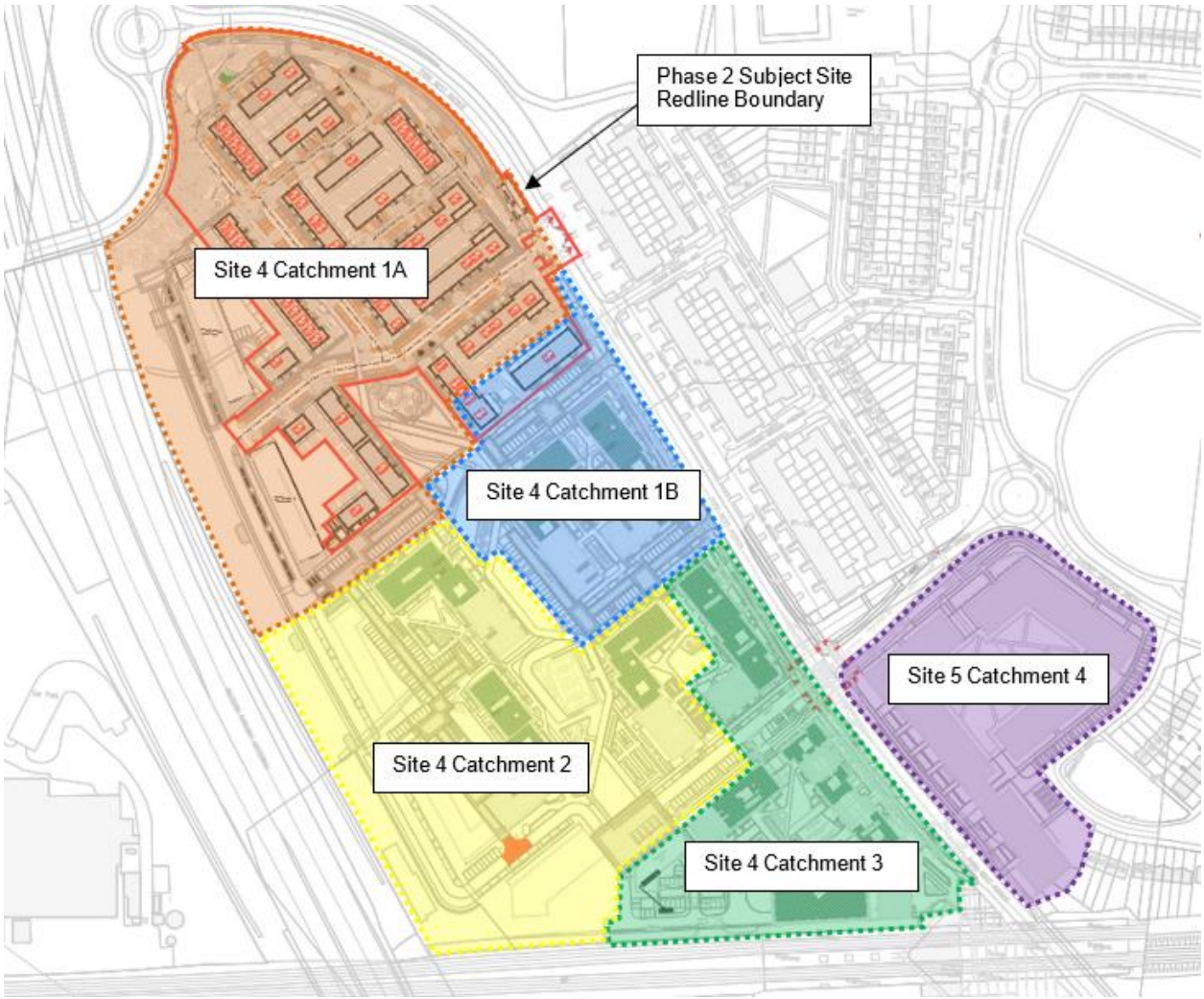

Figure 7-1: Indicative Layout of Surface Water Catchments on Site 4 and Site 5

7.4 Proposed Surface Water Network Design

The Phase 2 subject site will be served by a surface water network with pipes ranging in size from 150mm to 450mm and will outfall to the permitted below ground pluvial tank system to be constructed under the Approved Phase 1 development (referred to as Tank 1). The permitted below ground pluvial tank system is positioned below an above ground detention basin (which is proposed as part of the Planning Compliance submission for the Approved Phase 1 development). The location of the permitted pluvial tank and proposed detention basin is directly south of the Phase 2 boundary, within the Approved Phase 1 development.

Calculations for pipe sizes and gradients are based on surface water runoff from hardstanding areas such as the dwelling roofs, the parking areas, and footpaths, using the Rational Method for surface water design (Bilhams Formula).

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid in such a manner as to minimise the risk of inadvertent connection of waste pipes to the surface water system.

All SUDS and surface water drainage networks proposed in the public domain will be constructed to the standards required for Taking in Charge of the local authority, DCC. As is standard, the proposed Surface Water network, including SUDS devices will be constructed in accordance with the requirements of the Greater Dublin Regional Code of Practice (V6.0) such as in respect to separation distance between utilities etc.

For storm water management purposes, Site 4 of the Masterplan Lands has been divided into 3-no. separate catchments; Catchment 1, 2, and 3 (with Catchment 1 further divided in Catchments 1A and 1B). The details of these catchments are discussed in the preceding chapter.

As noted, the Phase 2 subject development surface water network connection is proposed at the permitted pluvial tank system located at the south of the subject site, to be built under the Approved Phase 1 development. A 450mm Ø outfall pipe is proposed to connect into the pluvial cube system at an invert level of 54.10m. The outlet invert level of the pluvial tank is designed as 54.00m with a proposed hydro-brake installed downstream of the tank set to the allowable greenfield runoff rate for Catchment 1A.

Figure 7-2: Subject Development's Proposed Surface Water Connection Point shows the Phase 2 subject development’s proposed connection point into the Approved Phase 1 development’s surface water network. The Approved Phase 1 surface water network on Site 4 will connect into the existing 1,050mm Ø network in Cedar Brook Way as shown in the below sketch. The surface water connection point has been designed as a crown-to-crown connection.

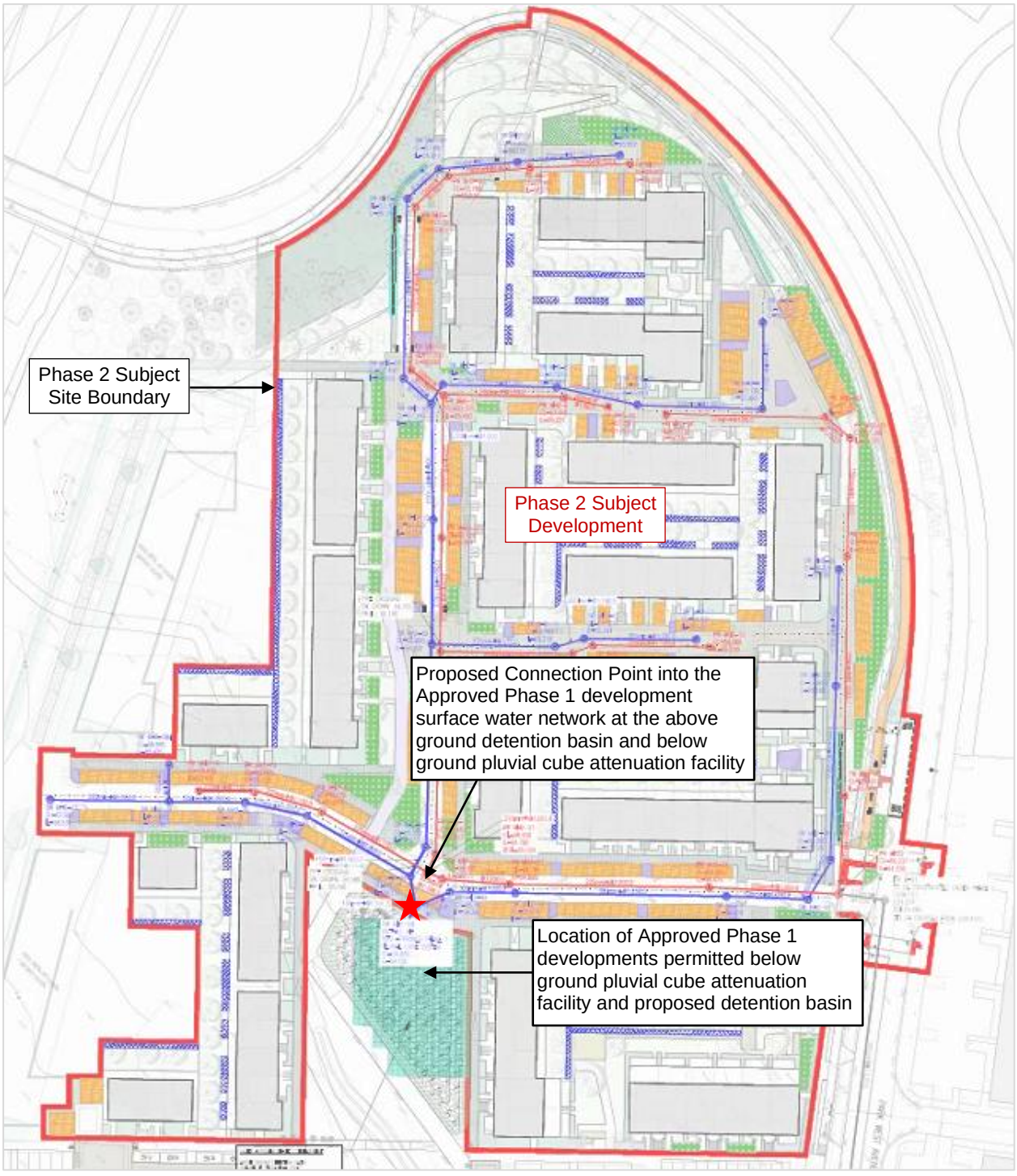

Figure 7-2: Subject Development's Proposed Surface Water Connection Point

7.5 Proposed Surface Water Attenuation Storage

7.5.1 Introduction

Focus will be placed on Site 4 within this chapter, for which contains the Phase 2 Subject Site. The infrastructure to be built under the Approved Phase 1 (ABP-318607-23) development; the permitted attenuation pluvial cube system located in the park area, will provide the required attenuation storage volumes for the proposed Phase 2 Subject Site. Similarly, the Approved Phase 1 development will provide the required attenuation storage volumes for the future Phase 4 development of the Masterplan Lands.

Due to the topography of the existing lands, Site 4 generally slopes toward the eastern boundary, along Park West Avenue. Localised low areas are also located centrally within the Approved Phase 1 development and to the southeast of Site 4.

The maximisation of above ground attenuation storage in the form of detention basins, wetland areas, or similar above ground storage systems is possible on sites that offer open green spaces at the low points of the site. Following this rationale, if the Site 4 layout (containing Phases 1, 2, and 4) where to be designed with above ground attenuation storage potential as the primary design criteria, the green open space area of Site 4 would be proposed along the western edge of Park West Avenue.

The agreed upon Masterplan layout based on the Cherry Orchard Local Area Plan and consultation between the Design Team, the LDA, and Dublin City Council, includes open green space areas located in the following locations:

- The permitted park and open green space area on northern edge of the Approved Phase 1 development.
- The permitted communal garden and MUGA pitch area centrally located within the Approved Phase 1 development.
- The permitted open green space located at the northwest of the proposed Phase 2 development.

Of the above permitted open green space areas, only the permitted park located on the northern edge of the Approved Phase 1 development (also located along the southern edge of the proposed Phase 2 Subject Site) is located at a localised low point. The remaining 2-no. open green space areas are not located at low areas of Site 4 (within the Approved Phase 1 development). Due to the topography of the permitted park area, an above ground detention basin is possible at this location.

7.5.2 Above Ground vs. Below Ground Storage

As discussed, it must be noted that the permitted open green space areas within Site 4 are located to the north and centrally of the Approved Phase 1 development, and to north of the proposed Phased 2 development. A sizeable above ground detention basin is proposed within the northern open green space area of the Approved Phase 1 development (as part of the Planning Compliance submission for the Approved Phase 1 development), additionally, the MUGA pitch in the centrally located green space area in the Approved Phase 1 development is to be used as an above ground attenuation area during extreme rainfall events. Where possible, above ground storage has been proposed as far as practically possible within Site 4. The open green space area within Phase 2 is located to the north, at the high point of the site and thus cannot be utilised for attenuation storage purposes.

A summary of the below storage for Site 4 as per the Approved Phase 1 development (planning submission design) is included in the below table. The majority of the Phase 2 Subject Site (95% of site area) lies within Catchment 1A of Site 4.

Table 7-2: Approved Phase 1 Below Ground Attenuation Storage Volumes

Catchment	Description	Name/Reference	Storage Volume Provided
1A	Below ground pluvial cube system below permitted park area	Tank 1	1437 m^3
1B	Below ground stone storage areas south of Tank 1	Stone Storage Areas (1), (2), & (3)	48.40 m3 + 126 m^3 + 85 m^3 =211 m^3
2	Below ground pluvial cube system south of MUGA Pitch	Tank 3	410 m^3
3	Below basement parking concrete attenuation tank (in Blocks 1,2 & 3)	Tank 4	1122 m^3
Total			**3228.40 m^3**

The total permitted below ground attenuation storage under the Approved Phase 1 development is 3228.40m^3.

As part of Planning Compliance for the Approved Phase 1 development, and in response to feedback received from the Drainage Department of DCC on 4 November 2024, the below ground storage provided throughout the Approved Phase 1 development has been proposed to be reduced where possible. Planning Compliance is to be submitted in conjunction with the proposed Phase 2 development, as such, the proposed reduction in below ground storage is deemed necessary for inclusion within this application. The approval of the below proposal is subject to agreement/approval from DCC by the Planning Compliance process. The proposed reduction in below ground attenuation storage within the Approved Phase 1 development is shown in the below table.

Table 7-3: Planning Compliance Submission - Reduced Below Ground Attenuation Storage Volumes

Catchment	Description	Name/Reference	Updated Proposed Storage Volume Provided
1A	Below ground pluvial cube system below permitted park area	Tank 1	1102 m^3
1B	Below ground pluvial cube system below permitted park area	Tank 2	200 m^3
2	Below ground pluvial cube system south of MUGA Pitch	Tank 3	66.50 m^3
3	Below basement parking concrete attenuation tank (in Blocks 1,2 &3)	Tank 4	721 m^3
Total			**2089.50 m^3**

The total proposed below ground attenuation storage to be submitted as part of Planning Compliance for the Approved Phase 1 development is 2089.50m^3.

Similarly, the above ground attenuation storage volumes permitted under the Approved Phase 1 development have been increased as part of Planning Compliance in response to feedback received from the Drainage Department of DCC on 4 November 2024.

The permitted above ground attenuation storage volume as per the Approved Phase 1 development is a total of 459 m^3. The updated design proposal to be submitted as part Planning Compliance is 508 m^3 achieved through the use of the following SuDS features:

- An above ground detention basin (above Tank 1) in Catchment 1A – 375 m^3;
- An existing historic ditch in Catchment 1B – 79 m^3;
- A MUGA Pitch (also used as a detention basin) in Catchment 2 – 220 m^3.

The increase in above ground attenuation storage offers an additional 49 m^3 of storage.

Additionally, all green roofs permitted under the Approved Phase 1 development have been redesigned as blue green roof systems to hold higher volumes of rainfall runoff at roof level. Although no green nor green blue roofs are proposed on the residential unit's roofs in the Phase 2 development, mention of this SuDS feature within the Approved Phase 1 development is necessary as this contributes to the attenuation storage volume offered on Site 4 (for which includes the Phase 2 subject site). The total attenuation storage volume offered by the proposed blue green roof systems to be submitted as part of Planning Compliance for the Approved Phase 1 development is included per Catchment, below:

Table 7-4: Green vs. Green Blue Roof Attenuation Volumes

Catchment	Total Area of Green / Green Blue Roofs	Provided Storage Volume in Green Roofs (submitted as part of Planning)	Provided Storage Volume in Green Blue Roofs (to be submitted as part of Planning Compliance)	Increase in Storage Volume Provided
1A	-	-	-	-
1B	1841 m^2	147 m^3	250 m^3	103 m^3
2	2850 m^2	228 m^3	388 m^3	160 m^3
3	3628 m^2	290 m^3	493 m^3	203 m^3
Totals	8319 m^2	665 m^3	1131 m^3	**466 m^3**

The total roof level attenuation for the Approved Phase 1 development as proposed as part of Planning Compliance is 1131 m^3.

7.5.3 Required Attenuation Volumes

A breakdown of the required and provided attenuation storage volumes for each surface water catchment within Site 4 is included in the table below. Required attenuation storage for each catchment is calculated using the industry standard software, FLOW (Causeway). The majority of the Phase 2 Subject Site (95% of site area) lies within Catchment 1A, with the remainder (5% of site area) located within Catchment 1B.

Table 7-5: Required and Provided Attenuation Storage per Catchment

Catchment	Area (Ha)	Attenuation Storage Volume		
		Required (m^3)	Provided (m^3)	Above Requirement
Catchment 1A	4.58 ha	1,733	2,589	49 %
Catchment 1B	1.36 ha	530	641	21 %
Catchment 2	3.79 ha	1,305	1,480	13 %
Catchment 3	1.67 ha	994	1,352	36 %
Total		**4,562**	**6,062**	**33 %**

As can be seen from the above table, each sub-catchment within Site 4 has been designed to provide above the attenuation storage requirement. A total of 4562 m^3 of surface water storage is required for the overall Site 4, a total of 6,062 m^3 has been provided through the use of various nature-based sustainable urban drainage systems, 33% above the requirement. The provided attenuation storage for Site 4 is thus considered acceptable as it meets the required volume of storage.

7.5.4 Allowable Outflow Rates – Chain System

As noted, Site 4 has been divided into 3-no. catchments (a total of 4-no. sub-catchments), namely, Catchment 1A, 1B, 2, and 3, with Site 5 its own catchment. However, 3-no. of the sub-catchments for Site 4, catchments 1A, 1B and 2, will run in a chain-like system to outfall to the public surface water network. The result of the chain system includes Catchment 1 flowing through Catchment 2 before discharging to the public surface water network in Cedar Brook Way. Subsequently, the hydrobrake limit for Catchment 2 will be the sum of the permitted outflow rate for Catchments 1 (1A & 1B) & 2.

The required attenuation storage volume for each sub-catchment within Site 4 and the corresponding allowable discharge rate accounting for the chain system is shown in the table below.

Table 7-6: Attenuation Storage Volume and Discharge Rate in Chain System

Catchment	**Area**	**Allowable Discharge Rate (Per Catchment)**	**Allowable Discharge Rate (accounting for Chain System)**	**Required Attenuation Volume**
	Ha	*l/s*	*l/s*	*m^3*
Catchment 1 A: Site 4 North	4.58 ha	8.60 l/s	8.60 l/s	1733
Catchment 1 B: Site 4 North	1.36 ha	3.20 l/s	11.80 l/s	530
Catchment 2: Site 4 Central	3.79 ha	7.55 l/s	19.35 l/s	1305
Catchment 3: Site 4 South	1.67 ha	3.33 l/s	3.33 l/s	994
Total	**11,40**	**22.68**	**-**	**4562**

7.6 Interception of Treatment Storage and Attenuation Storage

As noted above, the methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS). DCC's SUDS Design and Evaluation Guide 2021, and in the CIRIA Report C753 The SUDS Manual. Appendix E

of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long-term storage at a development site. These calculations are summarised below.

7.6.1 Criterion 1: River Water Quality Protection

Water Quality Standard 1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall for the **Phase 2 subject site** yields the following:

Table 7-7: Interception Calculation

Paved surfaces connected to drainage system	*31850m² x 0,58 x 1 =* 18 473,00m²	*31 850m² site area* *58% of the site is paved* *100% of the paved area*
Volume of Interception Storage	*18473m² x 5mm x 0,8 =* **73,89m³**	*Paved area directly drained* *5mm rainfall depth* *80% paved runoff factor*

This is further in line with Section 4.2.2 of the CIRIA Report C753 The SUDS Manual, which identifies Water Quality Criterion 1 as required to "*Support the management of water quality in receiving waters and groundwaters*". The section further lists methods whereby this can be achieved: Pollution Prevention, Interception, Treatment, & Maintenance and remedial work. Section 4.3.1 of the same document discusses the requirements for provided sufficient interception methods via the introduction of Pervious Surfaces, & Vegetated SuDS.

It has been calculated that the interception volume as noted above will be provided through the introduction of nature-based SUDS to the Phase 2 design as follows:

Permeable paving is proposed under all parking spaces with the Phase 2 subject development and accounts for a total cumulative area of c. 1,870m^2. Assuming a subbase depth of 0.35m with 40% voids, this yields a treatment volume of 262m^3. The permeable paving locations can be seen in Figure 6-1: Indicative Layout of the Proposed SUDS Features in Phase 2.

The permeable paving SUDS feature alone provides ample treatment volume to meet the volumetric interception requirements.

Water Quality Standard 1: Treatment

For events larger than 5mm, and in situations where interception storage cannot be provided, surface water runoff treatment is provided in accordance with the CIRIA design manual C521. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 15mm of rainfall yields the following:

Table 7-8: Treatment Volume Calculation

Paved surfaces draining to public drainage network	*31850m² x 0,58 x 1 =* 18 473,00m²	*31 850m² site area* *58% of the site is paved* *100% of the paved area*

Volume of Treatment Storage	*18473m² x 15mm x 0,8 =* **221,68m³**	*Paved area directly drained* *15mm rainfall depth* *80% runoff from paved surfaces*

The required treatment volume is achieved through the use of various SuDS devices.

As set out above, bio-retention planted areas will be provided as public rain gardens proposed adjacent to the internal roads network. Planted boxes rain gardens in strategy placed locations will also intercept down pipes from the apartment blocks.

It is proposed that a total area of 1172m^2 within green spaces areas adjacent to the internal roads network will be used for public rain gardens. The public rain gardens vary in width and length and have a depth of 800mm. Assuming a voids ratio of 40%, this SuDS feature offers a total of 305m^3 of treatment volume throughout the Phase 2 subject site.

7.6.2 Criterion 2: River Regime Protection

Attenuation storage is provided to limit the discharge rate from Site 4 into receiving waters. As per the GDSDS, the required attenuation volume is calculated assuming 80% runoff from paved areas has been calculated for **Site 4** for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each – using the industry standard FLOW (Causeway Software).

Please note: the attenuation storage requirement for the Phase 2 subject development, is as mentioned, provided for under the Approved Phase 1 development that has accounted for the full Site 4's attenuation requirements within the surface water network design of Phase 1.

Based on the FLOW model the required attenuation storage volume for each Site 4 sub-catchment is set out in the below table, as well as the permitted outflow rate per catchment, and the actual outflow rate of the catchments running in the chain system.

Table 7-9: Attenuation Volume for Each Site 4 Sub-Catchment

Catchment	**Area**	**Allowable Discharge Rate (Per Catchment)**	**Allowable Discharge Rate (accounting for Chain System)**	**Required Attenuation Volume**
	Ha	*l/s*	*l/s*	*m³*
Catchment 1 A: Site 4 North	4.58 ha	8.60 l/s	8.60 l/s	1,733
Catchment 1 B: Site 4 North	1.36 ha	3.20 l/s	11.80 l/s	530
Catchment 2: Site 4 Central	3.79 ha	7.55 l/s	19.35 l/s	1,305
Catchment 3: Site 4 South	1.67 ha	3.33 l/s	3.33 l/s	994
Total	**11,40**	**22.68**	**-**	**4,562**

In order to cater for the full attenuation requirement, detention basins, below ground pluvial system tanks, and a concrete attenuation tank have been incorporated into the Approved Phase 1 design. The subject development's attenuation storage is catered for within the Approved Phase 1 developments above ground detention basin and below ground pluvial cube attenuation tank (also referred to as Tank 1).

The attenuation areas have been designed to ensure the required attenuation volume is catered for and that there will be no surcharging of the tanks or basins for up to the 1-in-100-year storm incorporating an additional 20% for climate change.

The attenuation volumes provided in the various attenuation storage structures and SUDS features throughout the Approved Phase 1 development to cater for the required attenuation storage volumes in each Site 4 surface water catchment are re-recorded to the below table.

Table 7-10: Attenuation Volume Provision per Site 4 Sub-Catchment

Location	**Attenuation Volume Required**	**Attenuation Volume Provided**
	m^3	m^3
Catchment 1A	1,733	2,589
Catchment 1B	530	641
Catchment 2	1,305	1,480
Catchment 3	994	1,352
Total	**4,562 m^3**	**6,062 m^3**

As per the above table the required attenuation volume for Site 4 is 4,562 m^3, with a total of 6,062 m^3 of attenuation volume provided through the use of SUDS features such as a detention basin, below ground pluvial systems, a concrete attenuation tank, swales, rain gardens, and green roofs.

Please note that given the masterplan development for Site 4 in mainly comprised of apartment, duplex, and commercial blocks with their associated private green spaces to be controlled by a management company, there is limited to no scope for urban creep, and as such these have not been factors to the attenuation calculations previously discussed.

7.6.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).

Criterion 3.2: No internal flooding (100-year high intensity rainfall event).

Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).

Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed for the Approved Phase 1 development in the Flood Risk Assessment report which accompanied the planning application submission for the Phase 1 development. Similarly, a detailed Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management,* published in November 2009, for the Phase 2 subject development.

Site 4 (and Site 5) lie within Flood Zone C and are separated from sites identified as being in Flood zone A & B both topographically and with sufficient separation distance. The Phase 2 subject site (located within Site 4) is thus a suitable location for the proposed development. Thus, justification tests are not required to

be undertaken. There are currently no floodplains identified on-site nor are any proposed as part of the subject development design.

The assessment for the Phase 2 subject site has identified, in detail, the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding to be assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events will be low.

7.6.4 Criterion 4: River Flood Protection

The long-term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

The Criteria 4.3 approach is for all runoff to be limited to either Q_{BAR} or to 2 l/s/Ha, whichever is the greater. However, DCC policy instructs that a max outflow rate of 2 l/s/ha is permitted. The proposed drainage system includes flow control devices at the outfall for each catchment to ensure that the discharge rate is limited to the permitted outflow rate, and ample attenuation is provided for the 1-in-100-year critical storm event, accounting for a 20% increase due to climate change.

8. Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the Phase 2 subject development and is submitted as part of this planning application under a separate cover. The site is located in an area designated as Flood Zone C, which is suitable for the proposed development.

There have been no flood plains identified on site, nor are any proposed as part of the subject development design. Overland flood routing has been incorporated into the design of Site 4. Should fluvial flooding occur, surface water can flow overland towards the attenuation areas and/or external roads network.

The Flood Risk Assessment discusses in detail the various sources, pathways, receptors, likelihood, consequence, and risk of flooding. The identified risks are mitigated and the residual risk assessed.

UK and Ireland Office Locations