

Chapter 8:

Water

## 8.0 WATER

### 8.1 INTRODUCTION

This section of the Environmental Impact Assessment Report (EIAR) document has been prepared by DBFL Consulting Engineers and addresses all natural water bodies including surface freshwater (streams, bogs, ponds, rivers and lakes), groundwater (shallow and deep) and, where applicable, estuarine waters and marine waters which may be affected by the proposed development. This chapter also addresses the issues of hydrogeology and the interaction between water bodies and the surface water drainage, foul water drainage, and water supply. This chapter was prepared by Nick Fenner MEng (Hons) CEng MIEI, Associate (Civils), DBFL Consulting Engineers.

The application site is located adjacent to Glenamuck Road and the M50 motorway Junction 15 exit slipway. The proposed development seeks to provide for the construction of 482 no. residential units, a childcare facility, a gym, local shop, residential amenity spaces, open space and all associated site and infrastructural works on a site of c. 2.56 hectares.

The associated site and infrastructural works include foul and surface water drainage, internal accesses and footpaths, car parking spaces and bicycle spaces, public open space, landscaping, street lighting, walls and fences. The proposal includes for access to the Glenamuck Road from the development via a pedestrian and cycle bridge across the Golf Stream.

A Site-Specific Flood Risk Assessment (SSFRA) has been completed by DBFL Consulting Engineers and is included as a standalone report. Included within the SSFRA is a hydraulic analysis of the streams. This report has contributed to the contents of the EIAR, and the assessment below. A Hydrological and Hydrogeological Qualitative Risk Assessment Report has also been prepared by AWN Consulting.

### 8.2 STUDY METHODOLOGY

The assessment of the potential impact of the proposed development on the water bodies was carried out according to the methodology specified by the EPA and the specific criteria set out in the Guidelines on Information to be Contained in an Environmental Impact Statement (EPA 2002 and 2017 Draft), EIA Directive 2014/EU/52, Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA 2003), Environmental Impact Assessment (EIA), Guidance for Consent Authorities Regarding Sub-Threshold Development (DoEHLG 2003), Development Management Guidelines (DoEHLG, 2007) and Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessments (DoECLG, August 2018).

Information on the surrounding surface water and hydrogeological environments was assembled from the following sources:

- Environmental Protection Agency (EPA) interactive mapping and water quality data;
- Ordnance survey Ireland (OSI) mapping;
- Geological Survey of Ireland (GSI) online mapping service;
- Topographical survey;
- Site inspection / walkover;
- A SSFRA (Site Specific Flood Risk assessment) prepared by DBFL Consulting Engineers
- Calculation sheets for foul, surface water and watermains by DBFL Consulting Engineers
- Hydrological and Hydrogeological Risk Assessment Report prepared by AWN Consulting
- ECFRAMS Flood Mapping from OPW
- Local Authority Record Drawings
- Office of Public Works (OPW) National Flood Hazard Mapping & CFRAM Studies
- Flood Risk and Management Studies);
- Dun Laoghaire-Rathdown County Council record drawings;
- Site Investigations data (refer to Appendix 7.1 of this EIAR for site investigation reports);
- Ballyogan and Environs Local Area Plan 2019-2025;
- Dun Laoghaire-Rathdown County Development Plan May 2016-2022.

- Hydrological and Hydrogeological Qualitative Risk Assessment for Lands at Golf Lane, Glenamuck Road, Carrickmines – Proposed Mixed Development prepared by AWN Consulting.

All drainage (surface and foul) and water supply will be provided in accordance with the requirements of Dun Laoghaire-Rathdown County Council and in particular with the following:

- Greater Dublin Regional Code of Practice for Drainage Works
- Greater Dublin Strategic Drainage Study (GDSDS)
- Planning System and Flood Risk Management Guidelines
- Building Regulations (Part H)
- Irish Water Standard Details and Codes of Practice for Water and Wastewater Infrastructure
- CIRIA SUDS manual C753 (2015).

This chapter also encompasses knowledge obtained from site visits, drainage and water services record information received from Irish Water and the Local Authority. Additionally, information from the EPA and GSI websites has been utilised. DBFL met with the Dun Laoghaire-Rathdown County Council and Drainage personnel for pre-planning meetings and all comments have been incorporated into the proposed design. Where relevant, certain content of the An Bord Pleanála Opinion has also been considered in the preparation of this chapter of the EIAR.

### **8.3 THE EXISTING RECEIVING ENVIRONMENT**

The subject site is located in Carrickmines and is bordered to the north by the existing M50 motorway, to the west by Glenamuck Road, and to the east Golf Lane.

There are two EPA designated watercourses in the vicinity of the site include the Carrickmines River which enters and exits at the north west corner of the site and the Glenamuck / Golf Stream runs within the site parallel to the Glenamuck Road. The two watercourses converge in the north west corner of the site.

The subject site's topography generally falls from south-east to north-west towards the river valley, ranging from approximately 80m AOD in the south to 75m AOD at the top of the river embankment and 70m AOD at the lowest river level.

#### **8.3.1 Hydrology**

The EPA online mapping indicates that the main surface water bodies in the vicinity of the subject site comprise the following:

- The Golf Stream (IE\_EA\_10C040350, EPA code: 10G19) traversing the site which runs along the subject site's boundary from the south western side to the northern side;
- The Ballyogan Stream (IE\_EA\_10C040350, EPA code: 10B99) approximately 50m north of the subject site; and
- The Carrickmines River (IE\_EA\_10C040350, EPA code: 10C66) receiving the Golf Stream and Ballyogan Stream approximately 150m downstream from the subject site.



**Figure 8.1: Overview of Watercourses in the vicinity of the site (source: <https://gis.epa.ie/EPAMaps/Water>)**

The subject site falls within the Ovoca-Vartry Catchment 10 which is within the Eastern River Basin District (ERBD); and the Dargle sub catchment (10\_5) which is managed by the Wicklow County Council (WCC). The site lies within the Carrickmines Stream river sub catchment (EU code: IE\_EA\_10C040350). The lands are currently green open space and drains overland towards the Golf Stream which passes through the subject site before joining the Carrickmines River.

The surface water network surrounding the subject site includes a 225mm diameter UPVC sewer to the north, running parallel to a newly installed foul sewer under Golf Lane due to a recent development in the vicinity. There is also a surface water network in Golf Lane which runs north towards the M50 where it meets the SW sewer from the subject site and discharges into the Carrickmines River culvert between the slipway and motorway. Further to this, an extensive surface water network is present on Glenamuck Road, although it is believed that the surrounding area's surface water discharges into the Carrickmines River or tributaries.

The topography of the site generally falls from south-east to north-west towards the Golf Stream, ranging from approximately 80m AOD in the south to 75m AOD at the top of the river embankment and 70m AOD at the lowest stream level.

### 8.3.2 Water Quality

The Environmental Protection Agency on-line mapping presents the available water quality status information for water bodies in Ireland. The "Ballyogan and Environs Local Area Plan – 2019-2025" (LAP) describes the 'overall surface water status' as the general expression of the status of a body of surface water, determined by the poorer of its ecological status and its chemical status (in line with the EU Water Framework Directive). Therefore, to achieve 'good surface water status' both the ecological status and the chemical status of a surface water body need to be at least 'good'.

The current ecological and overall status of the Carrickmines is 'moderate'. Stretches of the Racecourse, the Ballyogan and the Golf Streams (which join to form the Carrickmines River in the eastern parts of the Plan area) are also identified by the EPA as being of 'moderate' status.

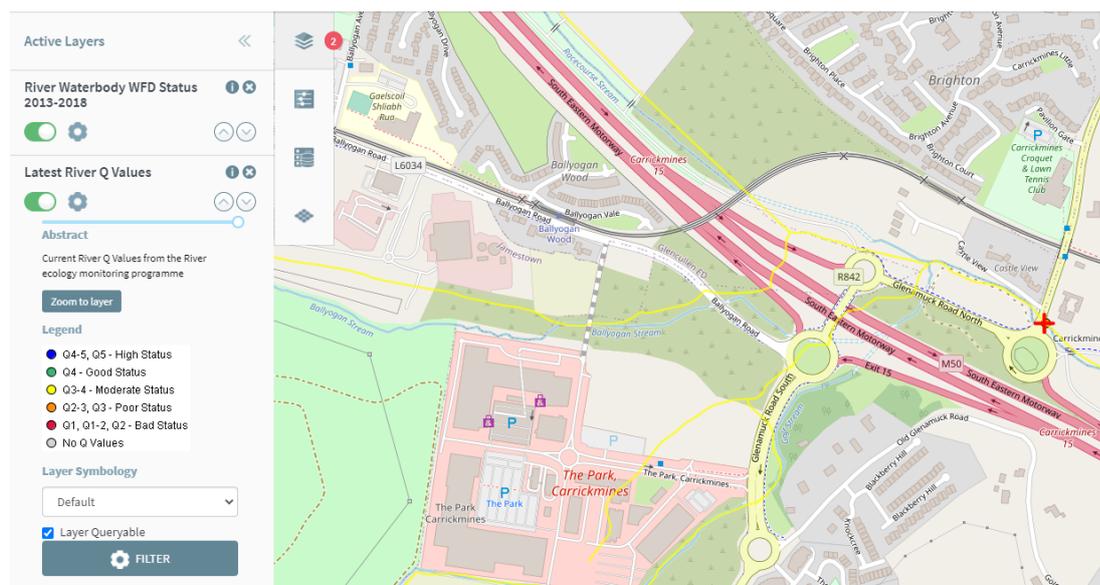


Figure 8.2: EPA River Quality Map (source: <https://gis.epa.ie/EPAMaps/Water>)

### 8.3.3 Hydrogeology

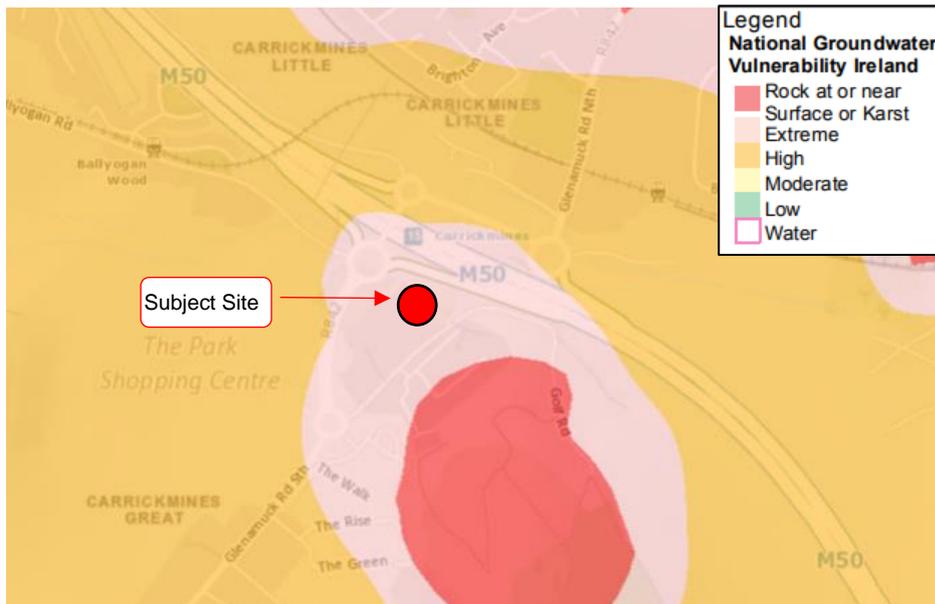
Aquifer or groundwater vulnerability is a relative measure of the ease with which the groundwater could be contaminated by human activity and depends on the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability of any overlying deposits. For example, bedrock with a thick, low permeability, clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, gravelly overburden.

Groundwater vulnerability categories are defined by the GSI as – Extreme rock at or near surface or karst (X), Extreme (E), High (H), Moderate (M) and Low (L) for mapping purposes and in the assessment of risk to ground waters. The classifications are based on the thickness and permeability of the sub-soils overlying the aquifer. The GSI has classified the aquifer vulnerability underlying the site as E (extreme) which infers groundwater or bedrock is present within 1 to 3m of the surface). Flow paths are generally not connected and limited to within the upper weathered zones identified. As such any potential for off-site migration through the underlying granite is considered low.

The “Ballyogan and Environs Local Area Plan – 2019-2025” (LAP) describes the WFD status (2010-2015) of all groundwater underlying the Ballyogan and Environs Plan area as being of ‘good’ status, meeting the objectives of the WFD. The Geological Survey of Ireland (GSI) have classified the groundwater vulnerability around the subject site as being of ‘extreme’ vulnerability with rock near the surface.

#### Local groundwater usage and source protection area

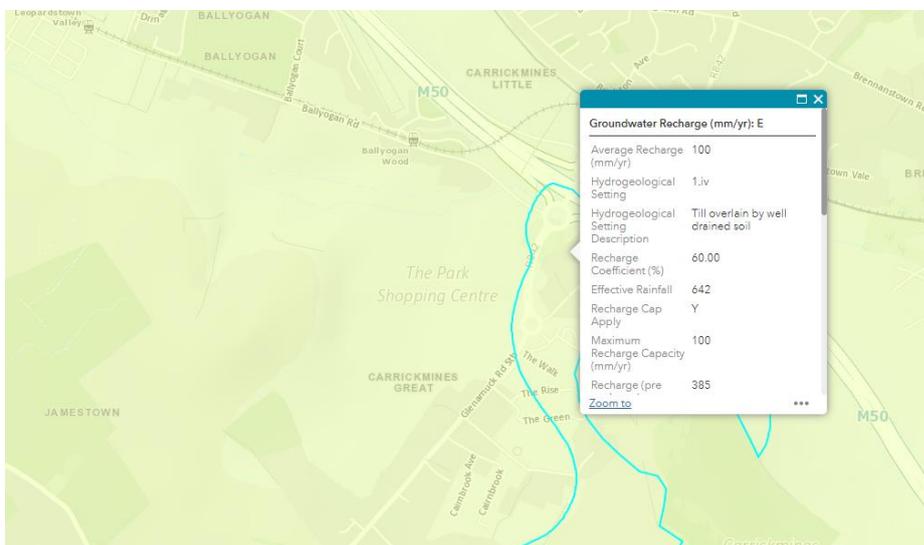
The GSI online map does not identify any significant or notable abstraction wells within the vicinity of the proposed development. No groundwater protection zones are marked in proximity to the site.



**Figure 8.3: Ground Water Vulnerability Map (source: GSI Online Mapping)**

### Recharge

Effective rainfall is the amount of rainfall available as either recharge to ground or run-off to surface water after evaporation or taken up by plants and is 100mm/yr. The recharge coefficient, which is the proportion of effective rainfall to recharge groundwater, varies from 60% for the site. Recharge is the amount of rainfall that replenishes the aquifer, it is a function of the effective rainfall, the permeability and thickness of the subsoil and the aquifer characteristics. According to GSI the maximum recharge capacity to the bedrock is 100 mm/yr across the site.



**Figure 8.4: Groundwater Recharge Map (source: GSI Online Mapping)**

GSI online mapping indicates the site is underlain by a Bedrock Aquifer which is classified as a Poor Aquifer which is generally unproductive except for Local Zones.

Groundwater monitoring was undertaken at two rotary boreholes which were converted to wells by the installation of standpipes. A copy of the Site Investigations reports by Ground Investigations Irelands is included in Appendix 7.1 to the previous chapter of this EIAR.

### 8.3.4 Flood Risk

In accordance with the 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' (2009), a site specific flood risk assessment (SSFRA) has been carried out by DBFL Consulting Engineers for the subject site and is included as a standalone report.

The primary flood information source for the site is the Eastern CFRAM maps which predicts a 10%, 1% and 0.1% AEP storm as causing flooding to a small area of the subject site with the 1% and 0.1 % AEP events causing an overland flow onto the M50 Motorway. The flooding is related to backwatering effects of the downstream culvert on the Carrickmines River causing the river level to rise and spill out of bank, initiating an over-land flow along the north boundary of the site.

The Strategic Flood Risk Assessment, that was undertaken as part of the Ballyogan and Environs Local Area Plan – 2019-2025, uses flood zone maps developed for the DLRCoCo County Development Plan 2016-2022 and flood maps from the Eastern CFRAM flood extents. The Golf Stream was not included as part of these assessments and it was deemed that the flood extents were required to fully assess the flood risk to the development.

A 1-D hydraulic model was created using multiple cross-sections along the streams length. Flows equivalent to the 1% and 0.1% AEP return events were calculated and were also increased as part of a sensitivity analysis undertaken at the request of the Local Authority. This allowed the flood extents to be developed along the Golf Stream extents and allow the development proposals to be fully assessed against this source. It should be noted the flood zone mapsshow. The SSFRA concludes that in the existing scenario the majority of the subject site is in Flood Zone C with areas that the proposed development is appropriate for the site's flood zone categories and that the proposed development is considered to have the required level of flood protection

## 8.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

### 8.4.1 Overview

The proposed development comprises a residential development of 482 no. units (all apartments) in 7no. blocks ranging from 4 to 22 storeys, along with ancillary residential amenities, and provision of a childcare facility, gym, and local shop. Two basement levels are proposed, providing car parking spaces (299 no.), bin stores, plant rooms, bicycle parking (1,000 no. spaces), and circulation areas. A further 240 no. bicycle parking spaces are provided at ground level. The proposed development includes landscaping, boundary treatments, public, private and communal open space (including roof terraces), two cycle / pedestrian crossings over the stream at the western side of the site, along with a new pedestrian and cycle crossing of Glenamuck Road South at the west of the site, cycle and pedestrian facilities, play facilities, and lighting. The proposed buildings include the provision of private open space in the form of balconies and winter gardens to all elevations of the proposed buildings. The development also includes vehicular, pedestrian, and cycle accesses, drop off areas, boundary treatments, services, and all associated ancillary and site development works.

Refer to Chapter 2.0 (Description of Development and alternatives) for a detailed site and development description. For further information regarding the infrastructure demands of the proposed development refer to DBFL "Infrastructure Design Report", document no. 170063-REP-003.

### 8.4.2 Hydrology

The proposed development has been designed so as to limit surface water runoff from the site to greenfield runoff rates. Surface water runoff will be managed using a variety of SuDs features as recommended in the GSDS and in accordance with Dun Laoghaire Rathdown County Council's development strategy. These SuDs features will include, filter drains, rain gardens, bioretention, green roofs and attenuation systems.

For storms exceeding a 100-year event, the development has been designed to accommodate overland flow paths, with water directed away from buildings and towards the green areas.

The total allowable surface water runoff for the subject site has been calculated as 3.9l/s and the storage volume required to accommodate runoff from a 1% AEP (Annual Event Probability) is calculated using Microdrainage software as approximately 773m<sup>3</sup>. Refer to DBFL report number 170063-REP-003,

“Infrastructure Design Report”, for detailed calculations of the allowable outflow from the site and the storage requirements.

The surface water drainage network, attenuation storage and site levels are designed to accommodate a 100- year storm event (including an allowance for climate change comprising a 20% increase in rainfall figures, as required by Dun Laoghaire Rathdown County Council). Proposed finished floor levels of all buildings are set a minimum of 500mm above the estimated 1 in 100-year return period storage level, as required in the GSDS.

Several SUDS features are incorporated into the surface water design providing a facility to intercept and filter pollutants in conjunction with providing attenuation and limiting surface water runoff flows.

### **8.4.3 Hydrogeology**

The integration of SUDS features with traditional drainage methods, is a strategy of both the LAP and the County Development Plan. SUDS features encourage groundwater recharge and replicate natural drainage systems. SUDS features proposed for the subject site include filter drains, rain gardens and bioretention areas.

### **8.4.4 Flood Risk**

The SSFRA carried out by DBFL Consulting Engineers, document no. 170063-REP-002, assesses the proposed development in the context of the ‘Planning System and Flood Risk Management Guidelines’ This report is included as a standalone report.

Following the Site Specific Flood Risk Assessment, it has been determined that most of the subject site is in Flood Zone C with portions along the south western and north eastern boundaries in Flood Zone A.

As set out in section 8.3.4, the flood extents of the site have been determined using the ECFRAMS maps and where information on the OGI Stream isn’t available, the flood extents have been determined by the creation of a 1-D hydraulic model. By assessing the development proposals against these flood extents, it can be summarised that :

- The residential development is located outside the 0.1% AEP Flood Zone B extents i.e. within low risk Flood zone C.
- All residential dwellings FFLs are located above the 0.1% AEP flood level with minimum freeboards of 500mm.

As part of the development, associated amenity space to the fringes of the proposed development, which are not ancillary to the development, located in Flood Zone A is classified as water compatible and therefore deemed appropriate under the guidelines and a justification test is not required proposals as part of this SSFRA, several mitigation measures are proposed in relation to the development’s drainage network and its general surface water management.

It is concluded that the proposed development is appropriate for the site’s flood zone categories and is considered to have the required level of flood protection.

## **8.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT**

### **8.5.1 Overview**

This section provides an assessment of the potential impact on the water environment of the proposed development without mitigation measures being incorporated into the detailed design and construction phase. The mitigation measures and predicted impact of the proposed development are set out below in Section 8.8 and 8.9.

### 8.5.2 Construction Phase

Potential impacts that may arise during the construction phase are:

- As per the AWN Consulting Hydrological and Hydrogeological Qualitative Risk Assessment, due to the low chemical loading during construction and operation and distance to the Natura sites there is no potential for impact on water quality at these sites.
- Excavation of soil and sub-soil layers for a large area of the proposed development, the removal of the overburden and the replacement with a large impermeable basement and other hard standing areas will reduce the ability of the lands to recharge groundwater. Most of surface water runoff will therefore be collected and positively discharged from the development to the Golf Stream. It is likely that this activity will have a slight, adverse, permanent, residual, impact on groundwater.
- Surface water runoff from the construction phase may also contain increased silt levels or result in pollution from the construction processes. The discharge of these contaminants, such as concrete and cement, which are alkaline and corrosive, to the Golf Stream and or Carrickmines River has the potential to cause pollution. Accidental oil or fuel spillages or leaks from construction activities also have the potential to find their way into the adjacent water courses. Both increased silt and contaminant levels have the risk of reducing water quality in the adjoining water courses.
- Heavy rainfall or a high level of ground water could produce ponding in open trenches. Discharge of this rainwater pumped from excavations to existing streams could compromise the capacity of the stream and as such cause flooding. This impact may be characterised as a likely, moderate, temporary, adverse impact. The consequence of this will increase the flow within the existing stream and hence potentially cause flooding.
- Discharge of wash water from concrete trucks and discharge of vehicle wheel wash water will contaminate the groundwater. This impact may be characterised as a temporary, regionally short-term moderate impact. It is likely that this activity would have a temporary, adverse, slight impact on groundwater and local watercourses within the area.
- Construction of the development may result in increasing silt levels in the water body and impacting on fisheries and riparian ecology which would be a short-term negative impact. The Environmental Report of the Dún Laoghaire-Rathdown County Development Plan 2016-2022 SEA states that "The Carrickmines (Glenamuck) / Shanganagh system is a regionally important salmonid system. The Carrickmines system supports a resident population of Brown Trout and a migratory population of Sea trout." Therefore, as set out in Section 8.8 below and in the Biodiversity chapter of the EIAR, adequate mitigation measures will be required to protect the stream from pollution during the construction phase.

The potential impact from the construction phase on surface water is likely to be short term and moderate without mitigation measures in place.

A Construction and Environmental Management Plan which details mitigation measures for the above issues has been prepared by DBFL and is included under a separate cover. These measures are summarised in the sections below.

### 8.5.3 Operational Phase

Potential operational phase impacts are:

- Increased impermeable surface area will reduce local groundwater recharge and potentially increase surface water runoff and flooding downstream. It is likely that this activity would have a slight, permanent, adverse impact on groundwater and the local watercourses in the absence of mitigation.
- Accidental hydrocarbon leaks and subsequent discharge into the piped surface water drainage network (e.g. along roads and in driveway areas). The likely impact may be characterised as imperceptible, temporary and adverse in the absence of mitigation.
- Contamination risks arising from development use / leaking pipes / contaminated surface water runoff. The likely adverse impact arising from this activity may be characterised as imperceptible and temporary.
- Restoration of the overland flow path from the Golf Stream to the M50 will alleviate any flooding of the Golf Stream upstream of the culvert passing underneath the M50. It is likely that this will therefore have a positive, significant, permanent, residual impact of the Golf Stream.

### 8.6 POTENTIAL CUMULATIVE IMPACTS

Given the scale of the proposed residential development, and the capacity of the surrounding environment to accommodate a development of this nature, it is not likely to give rise to any significant effects cumulatively or, in combination with the Park Quadrant 3 development, Glenamuck District Distributor Road Project or other developments in the area.

### 8.7 DO NOTHING IMPACT

To provide a qualitative and equitable assessment of the proposed development, this section considers the proposed development in the context of the likely impacts upon the receiving environment should the proposed development not take place.

If the proposed development does not proceed there would be no additional impact on the local water systems. The current rate of surface water run-off would continue to operate in its natural state.

Fluvial flooding events would continue as they have historically in this area with the existing floodplains. Groundwater status would also remain unchanged if the existing agricultural land use continued.

### 8.8 REMEDIAL AND MITIGATION MEASURES

#### 8.8.1 Construction Phase

To minimise the impact of the construction phase on the water environment, the mitigation measures set out in the site-specific Construction and Environmental Management Plan [CEMP] and Construction Waste Management plan (CWMP) will be implemented.

#### **WAT CONST 1: General Site Works**

- Implement best practice construction methods and practices complying with relevant legislation to avoid or reduce the risk of contamination of watercourses or groundwater.
- A Site Specific Construction and Environment Management Plan will be developed and will be implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction and Environment Management Plan.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate.
- Weather conditions and seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations, with an objective of minimising soil erosion.
- The extent of sub-soil and topsoil stripping will be minimised to reduce the rate and volume of the run-off during construction until the topsoil and vegetation are replaced.

- Precast concrete units fabricated off site will be specified for and bridging structures with cast on-site requirements minimised.
- Instream works will be in accordance with the requirements of the Office of Public Works (OPW) and Inland Fisheries Ireland (IFI).
- Concrete batching will take place off site.
- Concrete wash down and wash out of concrete trucks will take place off site or in an appropriate facility.
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds.
- Oil and fuel stored on site for construction will be stored in designated areas. These areas shall be bunded and will be located away from surface water drainage and features.
- Refuelling of construction machinery shall be undertaken in designated areas away from surface water drainage to minimise potential contamination of the water environment. Spill kits shall be kept in these areas in the event of spillages.
- Hazardous construction materials shall be stored appropriately to prevent contamination of watercourses or groundwater.
- Spill kits shall be kept in designated areas for re-fuelling of construction machinery.
- Dewatering measures will only be employed where necessary.
- Exclusion zone created along watercourse by erection of 1m high barrier with relevant signage to notify site users no construction activity or discharge of any kind is permitted in this exclusion zone.

#### **WAT CONST 2: Bridge Works**

The bridge design avoids works within the watercourse. The Inland Fisheries Ireland's guidelines to achieve best practice will be observed during the construction phase and the following mitigation measures will be implemented:

- Best site management practice for the control of silt and solids discharge into the watercourse.
- Excavation must be properly monitored; all topsoil is to be stored at a safe distance from the excavation.
- Earthworks to allow construction of abutments will be carried out to reduce existing ground levels to formation/foundation levels. Soil heap locations to be detailed in the appointed contractor's detailed construction management plan.
- Crane Setup for installation of main spans. Temporary access routes for craneage to be agreed prior to construction and be detailed in the contractor's detailed construction management plan. Construction of hard standing including foundations for crane outriggers need to be included.
- Prefabricated beams transportation. Delivery of precast elements to site. Storage area of prefabricated elements to be defined in contractor's construction management plan within reach of crane to minimise further disruption/construction traffic at river edge.
- Placement of prefabricated bridge beams. Crane position to be designed to minimise movements near river edge.
- Demobilisation of crane.

### **8.8.2 Operational Phase**

#### **WAT OPER 1:**

The completed development will result in a permanent change to the existing natural surface water processes on the current greenfield site. However, as a large proportion of runoff is routed through SuDS features these will have an attenuating effect which would reduce the rate of stormwater runoff for every rainfall event. Also, SuDS features would reduce the runoff volume through evaporation, transpiration, infiltration and depression storage of the water within each system.

Surface water run-off discharge rates from the development site may be increased because of increase in impermeable surfaces, shorter flow paths through pipes and reduced roughness co-efficient, however the implementation of SuDs features would aim to maintain runoff rates at or below existing greenfield runoff rates.

Greater run-off volumes generated by the impermeable surfaces will require stormwater storage within the site to provide protection against pluvial flooding events. Surface water attenuation storage will need to be incorporated into the design to safeguard against storms and associated flooding throughout the

lifetime of the development. Refer to the 'Site Specific Flood Risk Assessment', (SSFRA) prepared by DBFL.

The rate of discharge from the proposed development will not be greater than existing "Greenfield" runoff levels. Therefore, the development itself should pose no increased risk of pluvial flooding in the area. Best Management Practices will be incorporated into all surface water infrastructure / SuDS design within the proposed development site. The inclusion of a well-designed SuDS solution for the proposed development site will further negate the risk of any pollution from normal activities within the development itself.

Proposed levels within the development site are set to ensure overland flooding is directed towards open spaces or the Golf stream during storm events exceeding 1%AEP.

There is no perceived impact on the Golf stream or Carrickmines River caused by the proposed development as all discharge from the site will be controlled to greenfield runoff rates, as is the current situation on the undeveloped site. Furthermore, through the introduction of Sustainable Drainage Systems throughout the site, the quality of surface water runoff to the stream will be maintained at or as close to greenfield standards as possible.

For a further detailed information on the surface water strategy and management, refer to DBFL report 170063-REP-001 Infrastructure Design Report.

The potential impact from the operational phase on surface water is likely to be long term and low. The potential impact on water quality does not arise during the operation phase.

## **8.9 PREDICTED RESIDUAL IMPACTS OF THE PROPOSED DEVELOPMENT**

Implementation of the measures including the site specific Construction and Environmental Management Plan outlined in Section 8.8 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment will be negligible during the construction phase.

Since the surface water drainage design has been carried out in accordance with the GSDSDS, and SUDS methodologies are being implemented as part of a treatment train approach, there are no predicted impacts on the water and hydrogeological environment arising from the operational phase. Implementation of the measures outlined in Section 8.8 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment do not occur during the operational phase.

The only anticipated impact of the proposed development is the alleviation of fluvial flooding of the subject site and Golf Stream due to the reinstatement of the overland flow path between the Golf Stream and the M50.

## **8.10 MONITORING**

All surface water drainage works will be approved by Dun Laoghaire Rathdown County Council, Municipal Services Department, and will be carried out in accordance with the GDR COP (Greater Dublin Regional Code of Practice for Drainage Works).

Proposed monitoring during the operational phase in relation to the water and hydrogeological environment are as follows:

- The appointment of a management company will ensure the surface water network is regularly inspected and maintained.
- The performance of all SUDS features will be monitored by the relevant authorities during the life of the development.
- Monitoring of the installed Hydrobrake and gullies will be implemented to prevent contamination and increased runoff from the site.
- Although no specific monitoring will be required as part of the proposed development, it is envisaged that EPA Monitoring of the surrounding watercourses will continue in the area through the life of the development.

### **8.11 REINSTATEMENTS**

No specific reinstatement measures are required.

### **8.12 INTERACTIONS**

There is an interaction between the provision of surface water for the proposed development drainage and the flood potential of the Golf Stream. Mitigation measures identified in the Site Specific Flood Risk Assessment (SSFRA) by DBFL Consulting Engineers will ensure there is no adverse effect from the proposed works. It should be noted that the SSFRA has been submitted to the Board as part of the planning application documentation.

The design team have liaised regularly during the iteration of the proposed development in order to minimise environmental impacts and to ensure a sustainable and integrated approach to the design of the proposed development

### **8.13 DIFFICULTIES ENCOUNTERED IN COMPILING**

No difficulties were encountered in compiling this chapter or the EIAR.

### **8.14 REFERENCES**

- Environmental Protection Agency (2017). The Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Wexford. Available from: epa.ie [accessed: 03 August 2020].
- Environmental Report of The Dún Laoghaire-Rathdown County Development Plan 2016-2022 SEA
- EPA Website
- GSI Website
- Met Eireann Website
- Surface water design calculations By DBFL
- Site Specific Flood Risk Assessment, By DBFL
- Infrastructure Design Report, By DBFL
- AWN Hydrological and Hydrogeological Risk Assessment