

**HYDROLOGICAL &
HYDROGEOLOGICAL
QUALITATIVE RISK
ASSESSMENT**
for
**Lands at Golf Lane, Glenamuck
Road, Carrickmines – Proposed
Mixed Development**

**Glenamuck Road, Carrickmines,
Co. Dublin**

Technical Report Prepared For

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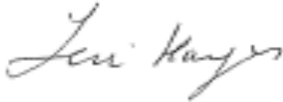
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1.0 INTRODUCTION

1.1 Site Location & Setting

AWN Consulting (AWN) was requested by John Spain & Associates (JSA) on behalf of the applicant, to undertake a hydrological risk assessment for a proposed mixed use scheme ('proposed development site') on lands situated at Glenamuck Road, Carrickmines, in Dublin 18 ('proposed development site'). The site lies approximately 4.40 km west of Killiney Bay and 5.50 km south of Dublin Bay.

The proposed development consists of a residential development of 482 no. residential units (all apartments), along with ancillary residential amenities, and provision of a childcare facility, gym, and local shop. The apartments will be separated into seven (7) no. blocks. Two basement levels are proposed to provide car parking spaces, bin stores, bicycle parking ancillary service plantrooms and circulation areas. There are three (3) no. ESB substations planned as part of the development. These will be located within Block A1, Block B and Block C. These will all be located on the ground floor. The proposed development includes landscaping, public, private, and communal open spaces.

The subject site is located to the south of junction 15 of the M50 Motorway, as shown below in Figure 1.1. The overall application site is approximately 2.56 hectares (Ha.) and is currently occupied by scrubland and demolished buildings. The site is bounded by Glenamuck Road to the west, Golf Lane to the south east and the M50 slip lane to the north. It is located to the north of Carrickmines and within Dun Laoghaire-Rathdown County Councils Development plan.

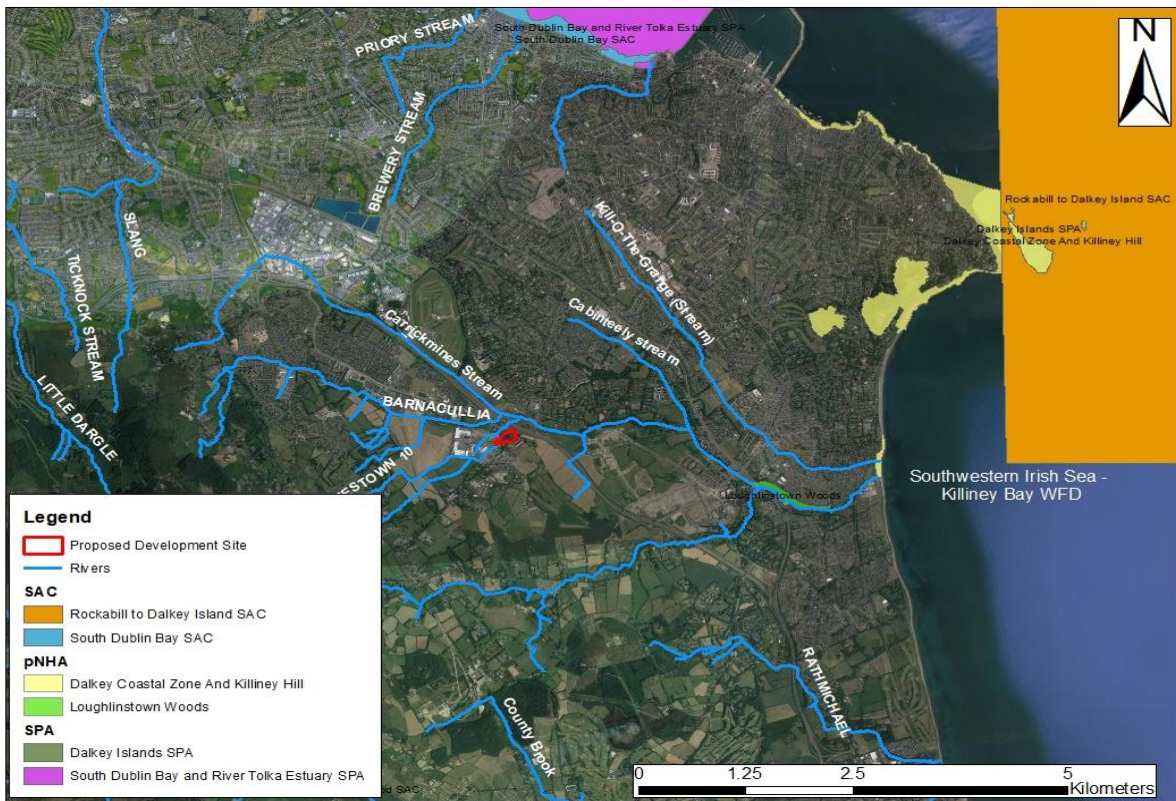
The surrounding environment can be described as a mix of both retail/commercial setting, with residential units. Dublin Bay Special Area of Conservation (SAC)/ Special Protection Area (SPA)/ proposed National Heritage Area (pNHA) is located to the north. Rockabill to Dalkey Island SAC is located to the east of the proposed development. The storm water discharges downgradient of Dublin Bay SAC at Southwestern Irish Sea – Killiney Bay waterbody and as such there is no hydrological link to Dublin Bay SAC. See figures (Figure 1.1 & Figure 1.2) below. There is a hydrological link with Killiney Bay which is connected to the Rockabill to Dalkey Island SAC.

Foul sewage is being discharge to Shanganagh Wastewater Treatment Plant (WWTP) which ultimately discharges to Killiney Bay.



Source: www.epa.ie

Figure 1.1 Site Location in relation to local drainage.



Source: www.epa.ie

Figure 1.2 Site Location in relation to the wider hydrological environment and Natura sites (proposed development site is noted by the redline boundary).

1.2 Objective of Report

The scope of this desk top review is to confirm any hydrological pathway to Natura 2000 sites and determine the risks to water quality based on the construction and operation of the proposed development.

In particular, this review considers the possible impact of construction run-off and domestic sewage from the proposed development on water quality and overall water body status within Killiney Bay (Southwestern Irish Sea – Killiney Bay coastal waterbody) and other Natura sites located in the vicinity of the proposed development (see Figure 1.2). The assessment relies on information regarding construction and design provided by DBFL Consulting Engineers.

This report is prepared by *Colm Driver* (BSc MSc). Colm is a hydrogeologist with experienced in water resource management and impact assessment. He has a Masters in Hydrogeology from Newcastle University. His specialist area of expertise is water resource management, contaminated land assessments, hydrogeological and hydrological risk assessments, and environmental impact assessment.

This report is reviewed by *Teri Hayes* (BSc MSc PGeol EurGeol). Teri is a hydrogeologist with over 25 years of experience in water resource management and impact assessment. She has a Masters in Hydrogeology and is a former President of the Irish Group of the Association of Hydrogeologists (IAH) and has provided advisory services on water related environmental and planning issues to both public and private sector bodies. She is qualified as a *competent person* as recognised by the EPA in relation to contaminated land assessment (IGI Register of competent persons www.igi.ie). Her specialist area of expertise is water resource management eco-hydrogeology, hydrological assessment, and environmental impact assessment.

2.0 ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS

A reliable Conceptual Site Model (CSM) requires an understanding of the existing hydrological and hydrogeological setting. This is described below for the proposed development site and surrounding hydrological and hydrogeological environments.

2.1 Hydrological Catchment Description and Existing Site Infrastructure

Figures 1.1 & 1.2 above show the site in relation to its hydrological setting and wider Natura sites.

The EPA (2020) on-line database indicates three watercourses (the Carrickmines Great Stream, Golf/Glenamuck Stream and Carrickmines Stream) within the general area of the proposed development site. The Carrickmines Great Stream is located approx. 160 metres northwest from the site. The Golf/Glenamuck Stream is located along the northern boundary of the site. Both these streams discharge into the Carrickmines Stream. The Carrickmines Stream is located approx. 240 metres northwest from the site. The local hydrological environment is shown in Figures 1.1.

EPA codes for these waterbodies are as follows:

- Carrickmines Great Stream: IE_EA_10C040350, EPA code: 10C66
- Golf/Glenamuck Stream: IE_EA_10C040350, EPA code: 10G19
- Carrickmines Stream: IE_EA_10C040350, EPA code: 10C04

The proposed development site lies within the Ovoca-Vartry Catchment 10 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 Carrickmines Stream discharges into the Shanganagh River which flows through the Loughlinstown Woods pNHA (site code – 001211) and outfalls into the Irish Sea (Southwestern Irish Sea – Killiney Bay coastal waterbody) c. 4.40 km east from the site, beside the Dalkey Coastal Zone and Killiney Hill pNHA (site code – 001206).

There is an extensive surface water network that surrounds the proposed development site. To the north of the site a 225 mm diameter sewer runs parallel to a newly installed foul sewer under Golf Lane due to a recent development in the vicinity. There is a surface water network in Golf Lane which runs north towards the M50 where it meets the surface water sewer from the site and discharges into the Carrickmines Stream culvert between the slipway and the motorway. There is also an extensive surface water network on Glemamuck Road, although it is believed that the surrounding area's surface water discharges into the Carrickmines Stream or tributaries. It is assumed that this system ultimately drains to Killiney Bay, 4.40 km east of the site. The stormwater infrastructure for the proposed development includes an oil-water interceptor within the drainage system on the site which will ensure management of water quality discharging from the development.

The Environmental Protection Agency (EPA, 2020) on-line mapping presents the available water quality status information for water bodies in Ireland. Killiney Bay has a WFD status (2013 – 2018) of 'Good'. Killiney Bay waterbody has a WFD risk score of 'Not at risk'. The ecological status of transitional and coastal water bodies during 2013-2018 for Killiney Bay is classed as 'Good' (taken from Map 4.1 EPA, 2019). The most recent surface water quality data for the Killiney Bay for the 2015–2017 assessment on trophic status of estuarine and coastal waters indicate that they are 'Unpolluted' (based on Map 10, EPA, 2018). 'Unpolluted' means there have been no breaches of the EPA's threshold values for nutrient enrichment, accelerated plant growth, or disturbance of the level of dissolved oxygen normally present, according to the 2015 'Trophic Status Assessment Scheme' classification of the EPA,.

At present all watercourses, i.e. the Carrickmines Great Stream, Golf/Glenamuck Stream and Carrickmines Stream, are classified as 'Moderate' for water quality by the EPA. The current EPA (2020) Bathing Water Quality report has classified nearby Killiney Bay as 'Good' for the last four years 2016-2019.

The WFD classifies the Shanganagh River and its' section that crosses the Loughlinstown Woods pNHA as 'Moderate Status' and 'Not at risk'. This moderate status is related to its biological status and phosphorous conditions (both classified as 'moderate'); all remaining chemical conditions have been allocated as 'Good'. Its most recent quality data (2018) also indicates that it is 'Slightly polluted'.

2.2 Aquifer Description & Superficial Deposits

The Geological Survey of Ireland GSI (2020) assigns the bedrock beneath the site and the surrounding area as dominated by rocks from the Caledonian era. The site is located over rock Type 3 muscovite porphyritic (Rock Unit new code: IDNLGR3) which is described as Granite with muscovite phenocrysts.

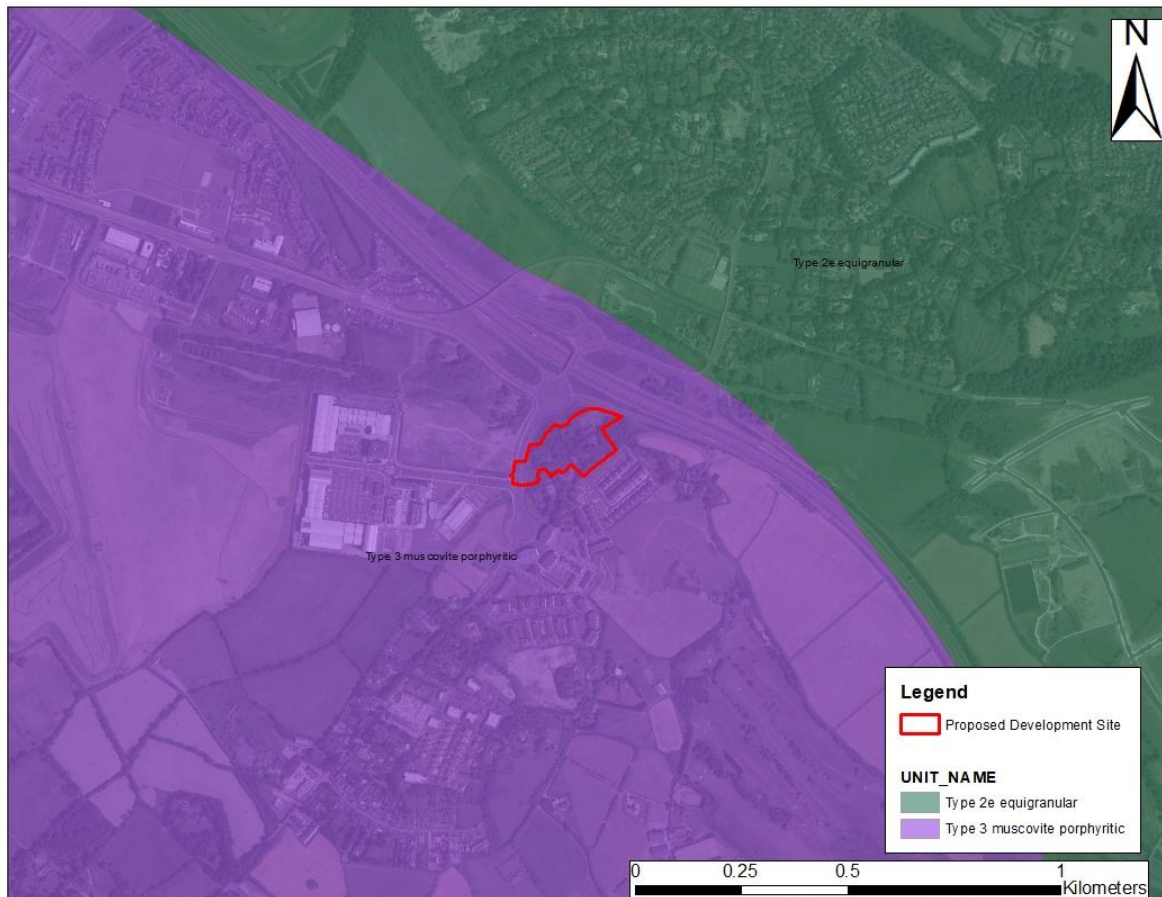


Figure 2.2 Bedrock geology in relation to the proposed development

The GSI also classifies the principal aquifer types in Ireland as:

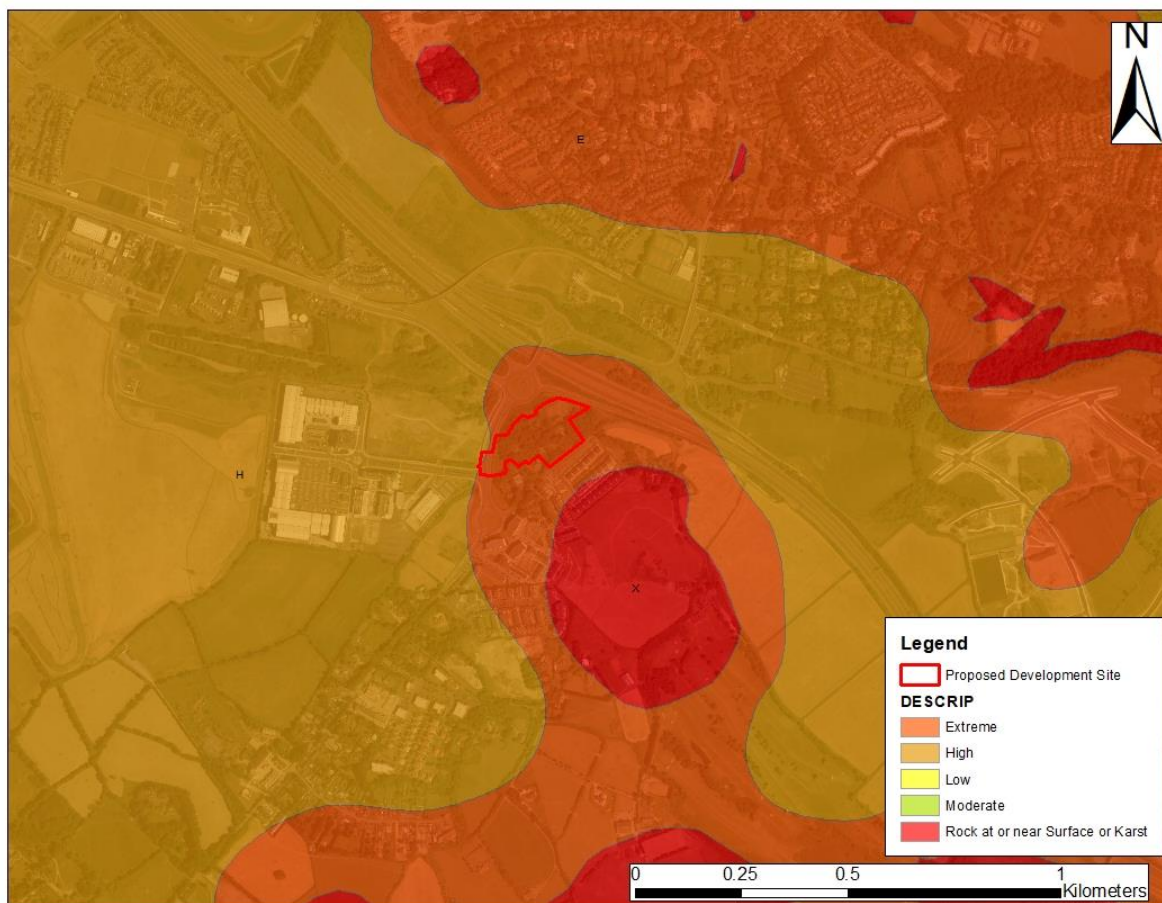
- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd - Regionally Important Aquifer (karstified diffuse)

Currently, according to the GSI (2020) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a *Poor Aquifer (PI)*, i.e. *Bedrock which is Generally Unproductive except for Local Zones*. The proposed development lies within the Wicklow Groundwater Body (GWB, IE_EA_G_076), classified as poorly productive bedrock. As such it is considered a potential pathway

for groundwater migration between the proposed development site and Southwestern Irish Sea – Killiney Bay (HA10).

The groundwater body in the region of the site (Wicklow GWB) is assigned under the WFD Status 2010-2015 (EPA, 2020) as '*Expected to achieve good status*'. The WFD Risk Score system indicates the GWB as '*Under Review*'.

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. The GSI (2020) guidance designates the bedrock aquifer vulnerability in the region of the site as '*Extreme*' which indicates a general overburden depth potential of <3m across the site. This suggests a thin subsoil thickness overlying the aquifer. The aquifer vulnerability class in the region of the site is presented in Figure 2.3 below.



Source: www.gsi.ie

Figure 2.3 Aquifer Vulnerability (site location indicated by red line)

There is no likely pathway through the soil and aquifer to Killiney Bay on the basis of the proposed hardstanding area, the distance to the bay, the natural protection provided by the soil and the poor hydraulic connectivity in the aquifer. The potential for any leakage of oil or chemicals to migrate horizontally or vertically within the aquifer is considered to be relatively low. Stormwater drainage is the most likely pathway for any accidental release.

3.0 REVIEW OF PROPOSED SITE DRAINAGE

According to the proposed plans, the surface water drainage system will be upgraded as part of the development. The new surface water drainage system will incorporate SuDs features and will collect any surface water run-off generated from the site. Attenuated surface water from the site will discharge to the existing surface water network – Golf/Glenamuck Stream. The final discharge point for the site will be this stream which bounds the site on the north-western side. The outlet will be located above the 10% AEP (Annual Exceedance Probability). Run-off from the new development and pavement is attenuated using two hydro-brakes as a flow control device. Surface water will be stored on site for up to a 1% AEP event. It is proposed to attenuate surface water runoff from the site to Greenfield Runoff as per GSDS and Dun Laoghaire County Council Development Plan. It is estimated that the greenfield run-off is 3.9 l/s for the 1.78 ha site area. However, there is 0.18 Ha of land comprising green open space, within this boundary draining to Golf Lane. There are no development proposals for this portion of the site nor do these areas drain into the proposed development's drainage system. Therefore, it has not been included as part of the attenuation calculation. The calculation was based on a site area of 1.60 Ha. The proposed development will have two (2) no. attenuation tanks with a total capacity of 780 m³. The site will also consist of green roofs, porous surfacing, raised planters, green areas, one (1) no. oil-water separator and bioretention areas.

There is an existing foul sewer located along the northern boundary of the proposed site. The flow generated from the residential and commercial lots of the development to the existing public foul system will be on average 2.56 l/s dry weather flow (DWF). This hydraulic loading has been determined using the Irish Water 'Code of Practice for Wastewater Infrastructure'. Peak foul flows (6 times DWF) are estimated to be 7.73 l/s. Car parking drainage at basement level will gravitate to the lowest point before passing through an interceptor. This will be pumped to the foul network. The proposed foul drainage layout for the development is largely reliant on slung drainage in the basement. Slung drainage will be located by foul stacks which will be drained at high level under the podium slab as the basement footprint covers the majority of the site. DBFL drawing 170046-3101 shows the layout of slung drainage which is designed based on a maximum 700 mm service void to reach the furthest points of the basement at the required gradients. The foul wastewater sewer will eventually discharge to the Shanganagh WWTP, which operates under an EPA Licence (D0038-01). Once treated it will be released into Killiney Bay.

A Stage 1 Flood Risk Assessment was completed by DBFL Engineers (2020) as part of the planning application. The site is located partially within Flood Zone A due to the Carrickmines Stream. The presence of the Golf/Glenamuck Stream is also located around the northern boundary of the site. However, this watercourse was not part of the flood modelling project CFRAMS.

Due to the identified flood risk for the site a full site-specific flood risk assessment was carried out. The findings can be found in DBFL reports 170063-Rep-002 – SSFRA. The surface water network, attenuation storage and site levels are designed to accommodate a 100-year storm event and includes climate change provision.

4.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is developed based on a good understanding of the hydrological and hydrogeological environment, plausible sources of impact and knowledge of receptor requirements. This in turn allows possible Source Pathway Receptor (S-P-R) linkages to be identified. If no S-P-R linkages are identified, then there is no risk to identified receptors.

4.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of assessing hydrological/ hydrogeological S-P-R linkages, all potential sources of contamination are considered *without taking account of* any measures intended to avoid or reduce harmful effects of the proposed project (mitigation measures) i.e. a worst-case scenario. Construction sources (short-term) and operational sources (long-term) are considered below.

Construction Phase

The following sources are considered plausible for the proposed construction site:

- (i) Accidental leakage may occur from construction site equipment refuelling or leakage from construction vehicles on site. As a worst-case scenario an unmitigated leak of c. 500 litres outside of a bunded area is considered. This would be a single short-term event.
- (ii) Use of wet cement is a requirement during construction. Run-off water from recent cemented areas will result in highly alkaline water with high pH. As this would only occur during phases of work this is again considered as a single short-term event rather than an ongoing event.
- (iii) The proposed development has only minor earthworks, as such unmitigated run-off will only likely contain low concentration of suspended solids.

These impacts could be considered as intermittent short-term events.

Operational Phase

No oil storage is required during operation of the proposed development. It is assumed that gas or electricity will be used for heating. Therefore, the only plausible leak is petrol/ diesel fuel from individual cars in basement parking areas, run-off may contain a worst-case scenario of 100 litres. The risk of a short-term release of oil is already considered under the construction scenario above i.e. without mitigation. The design does include that drainage from the car park area is through a petrol interceptor providing treatment before discharging to the storm sewer.

Three (3) no. ESB substations have been proposed as part of this development. These substations could be considered a potential source of contamination. Potential contaminants of concern include hydrocarbons. In a worst-case scenario, 100 litres could be released into the environment if mitigation fails from all three substations. The risk of a short-term release of contamination is considered low. The substations will contain a large bunded area to contain any potential spills and is checked by a Chartered Engineer and/ or Architect before use. Also, the event of all three substations failing at once is deemed extremely low. A formal final inspection of the completed substation buildings will be made by ESB Networks before acceptance of the buildings and before commencing work on the installation

of the electricity connections. This inspection requires the substations to be completed in accordance with ESB Networks' specification.

The development will be fully serviced with separate foul and storm sewers which will have adequate capacity for the facility as required by Irish Water licencing. Discharge from the site to the public foul sewer will be sewage and grey water. The foul discharge from the site will join the public sewer and will be treated at the Irish Water Shanganagh WWTP prior to subsequent discharge to Killiney Bay. This WWTP is required to operate under an EPA licence D0038-01 and must meet environmental legislative requirements as set out in such licence.

4.2 Assessment of Pathways

The following pathways have been considered (without mitigation measures) within this assessment with impact assessment presented in Section 4.4:

The potential for offsite migration due to any construction discharges is moderate as there is a pathway through the Golf/ Glenamuck stream which is located along the north-western boundary of the site.

- (i) The site is underlain by [generally low permeable] Granite which the GSI classifies as a *Poor Aquifer (PI)*, i.e. *Bedrock which is Generally Unproductive except for Local Zones*. 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.
- (ii) There is a direct hydrological linkage for construction or operational stormwater run-off from the site to the Golf/ Glenamuck Stream as stormwater discharges through the existing drainage infrastructure to this stream which indirectly discharges to Loughlinstown Woods pNHA and Killiney Bay (Southwestern Irish Sea - Killiney Bay WFD coastal waterbody). Killiney Bay is located c. 4.40 km downgradient of the site.
- (iii) There is no 'direct' pathway for foul sewage to any receiving water body. There is however an 'indirect pathway' through the public sewer which ultimately discharges to the Irish Water WWTP at Shanganagh prior to final discharge to Killiney Bay (Southwestern Irish Sea - Killiney Bay WFD coastal waterbody) post treatment.

4.3 Assessment of Receptors

The receptors considered in this assessment include the following:

- (i) Underlying [poor] Granite bedrock aquifer;
- (ii) the Carrickmines Great Stream, Golf/Glenamuck Stream and Carrickmines Stream (Hydrological Environment); and,
- (iii) the Southwestern Irish Sea - Killiney Bay WFD coastal waterbody which the Natura sites presented in Figure 1.2.

4.4 Assessment of Source Pathway Receptor Linkages

Table 4.1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk to waterbodies is also summarised below.

Should any silt-laden stormwater from construction manage to enter the public stormwater sewer i.e. without on-site mitigation, the suspended solids will naturally settle within the surface water drainage system or naturally settle within 500 metres of the site. The overall distance to the discharge to Killiney bay is 4.40 km. Standard mitigation e.g. the use of a silt buster or similar methods allow settlement of any silt laden stormwater during construction. These methods will be incorporated into the construction plan design to minimise any impacts on stormwater drains.

In the event of a [theoretical] 500 litre [worst case scenario used] hydrocarbon leak, during construction – there is a direct pathway to an open water receptor (Golf/ Gleanamuck Stream) or storm sewer as there is drainage infrastructure is currently present on site. This stream is located at the north-western boundary of the site. Should any contaminated run-off reach an off site storm sewer without mitigation, based on the site loading, this will have attenuated and diluted well within 1 km of the site. Based on the distance to Killiney Bay (4.40 km) and dilution within the storm sewer there is no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 and amendments within Killiney Bay.

Following construction, the infrastructure design includes one. oil water interceptor. However even without the interceptors, in the event of a car leak, there is adequate dilution prior to outfall at Killiney Bay. As such there is no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 and amendments where the stormwater outfalls to Killiney Bay as a result of the proposed development.

The average daily wastewater discharge of 2.56 l/s and peak flow discharge is 7.73 l/s (Source: DBFL, 2020).

The sewage discharge will be licensed by Irish Water, collected in the public sewer, and treated at Irish Water's WWTP at Shanganagh prior to treated discharge to Killiney Bay. This WWTP is required to operate under an EPA licence (D0038-01) and to meet environmental legislative requirements. The peak foul discharge calculated for the proposed development is well within the capacity of the WWTP. Even without treatment at the Shanganagh WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.62% of the licensed discharge (peak hydraulic capacity) at Shanganagh WWTP and would not impact on the overall water quality within Killiney Bay and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). (Note: the average effluent discharge equates to approx. 0.002% of the licensed discharge (peak hydraulic capacity) at Shanganagh WWTP).

The Southwestern Irish Sea - Killiney Bay WFD coastal waterbody (WFD code IE_EA_100_0000) has been classified by the WFD (2013-2018 period) as having 'High' status and 'Not at risk'. This means this WFD is 'Unpolluted', i.e. there have been no breaches of the EPA's threshold values for nutrient enrichment, phytoplankton and invertebrate status/potential or disturbance of the level of phosphorous and dissolved oxygen normally present. The most recent surface water quality data for the Southwestern Irish Sea - Killiney Bay WFD (2019-2020) indicate that they are 'Unpolluted'.

The assessment has also considered the effect of cumulative events, such as release of sediment-laden water combined with a minor hydrocarbon leak on site. As the potential hazard loading is low and short term in nature, it is concluded that

no perceptible impact on water quality at the Killiney Bay would occur. It can also be concluded that the cumulative or in-combination effects of effluent arising from the proposed development with that of other developments discharging to Shanganagh WWTP will not be significant having regard to the size of the calculated discharge loading from the proposed development.

Source	Pathways	Receptors considered	Risk of Impact
<p><u>Construction Impacts</u> Unmitigated leak from a construction vehicle or small bunded tanks on site</p>	Vertical migration to bedrock ('Extreme' vulnerability)	Granite bedrock aquifer (Poor aquifer)	Moderate risk of localised impact to shallow weathered Granite due to low thickness of protective clayey overburden. No likely impact on the status of the aquifer due to the volume of leak indicated and limited nature of bedrock fractures with depth reducing off site migration.
<p>Discharge to ground of runoff water with high pH from cement process</p> <p>Unmitigated run-off containing a high concentration of suspended solids</p>	Indirect pathway through stormwater drainage to the hydrological environment	Carrickmines Great Stream; Golf/ Glenamuck Stream; Loughlinstown Woods pNHA; and Killiney Bay (Southwestern Irish Sea WFD coastal waterbody)	Moderate risk of contaminated water reaching the local hydrological environment – Golf/ Glenamuck Stream (without mitigation in place) due to the direct hydrological link. There is a low risk of exceedance above S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 and amendments based on the low hydrocarbon loading. No impact at discharge point – Killiney Bay – based on the low loading and distance to this receptor.
<p><u>Operational Impacts</u> Foul effluent discharge to sewer</p>	Indirect pathway to Southwestern Irish Sea through public sewer, however main pathway is via Shanganagh WWTP	Killiney Bay (Southwestern Irish Sea WFD coastal waterbody)	No perceptible risk – The peak effluent from the development site is negligible in comparison to the licensed discharge at Shanganagh WWTP (peak discharge is 0.62% of the licensed discharge at the WWTP, while the average foul discharge is 0.002%). There would not be an impact on the overall water quality within Killiney Bay and the current Water Body Status of 'Unpolluted' (as defined within the Water Framework Directive).
Discharge to ground of hydrocarbons from minor hydrocarbon sources: carpark leak and/ or ESB Substations	Indirect pathway through stormwater drainage to the hydrological environment	Carrickmines Great Stream; Golf/ Glenamuck Stream; Loughlinstown Woods pNHA; and Killiney Bay (Southwestern Irish Sea WFD coastal waterbody)	No risk of a temporary impact (without mitigation) due to low chemical loading at the development site and distance to Natura sites allowing adequate attenuation and dilution. Potential contaminant loading will be attenuated, diluted, and dispersed near the source area.

Table 4.1 Pollutant Linkage Assessment (*without mitigation*)

Note 1: This assessment is based on the current licenced discharge from the Shanganagh WWTP.

An assessment of plausible source pathway receptor linkages shows there is no impact as a result of construction or operation of the proposed development, which could result in any change to the current water regime (water quality or quantity) within the hydrological environment and Killiney Bay (Southwestern Irish Sea - Killiney Bay WFD coastal waterbody).

5.0 CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desktop review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any mitigation measures in place at the proposed development site.

During operation, there is a 'direct' Source-Pathway linkage between the proposed development site and open water (i.e. Golf/Glenamuck & Carrickmines streams; Loughlinstown Woods; and Southwestern Irish Sea – Killiney Bay) due to the stormwater drainage connecting to the Golf/Glenamuck stream. However, 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. With the operation of an attenuation system on site (two attenuation tanks and oil/water separator), it can be concluded that there is no impact from the proposed development on the stormwater drainage emitting from the site.

Finally, and in line with good practice, appropriate and effective mitigation measures have been included in the construction design, management of construction programme and during the operational phase of the proposed development. These specific measures will provide further protection to the receiving soil and water environments. However, the protection of downstream European sites is in no way reliant on these measures.

6.0 REFERENCES

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