HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT

FOR

LANDS AT 'ST. TERESA'S' TEMPLE HILL, MONKSTOWN, BLACKROCK, CO. DUBLIN

Technical Report Prepared For

Oval Target Limited

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1.0 INTRODUCTION

1.1 Background

AWN have been requested by Oval Target Limited, to carry out a Hydrological and Hydrogeological Qualitative Risk Assessment for a Strategic Housing Development.

The proposed development comprises 493 residential units delivered in a combination of new apartment buildings (ranging in height from 3- 10 storeys overall in height) and a relocated St. Teresa's Lodge.

St. Teresa's House provides for 6 apartments, comprising 5 no. 2-bed units and 1 no. 3-bed unit. The new build element of 487 units is set out in 11 no. residential development blocks (Blocks A1-C2 and D1 – E2) ranging in height from 3-10 storeys over basement comprising:

- Block A1 (5 storeys) comprising 37 no. apartments (33 no. 1 bed units and 4 no. 2 bed units)
- Block B1 (10 storeys) comprising 55 no. apartments (37 no. 1 bed units, 10 no. 2 bed units and 8no. 3 bed units)
- Block B2 (8 storeys) comprising 42 no. apartments (28 no. 1 beds, 9 no. 2 beds and 5 no. 3 beds)
- Block B3 (8 storeys) comprising 42 no. apartments (28 no. 1 beds, 9 no. 2 beds and 5 no. 3 beds)
- Block B4 (5 storeys) comprising 41 no. apartments (4 no. studio units, 4 no. 1 bed units, 27 no. 2 bed units and 6 no. 3 bed units).
- Block C1 (3 storeys) comprising 10 no. apartments (1 no. studio unit, 3 no. 1 bed units and 6 no. 2 bed units).
- Block C2 (3 storeys) comprising 6 no. apartments (2 no. 1 bed units, 4 no. 2 bed units,) together with a creche facility of 392 sq. m at ground floor level and outdoor play area space of 302sq.m
- Block C3 (1 storey plus basement level) comprising residential amenity space of 451 sq. m.
- Block D1 (6 storeys) comprising 134 no. apartments (12 no. studio units, 22 no. 1 bed units, 90 no. 2 bed units and 10 no. 3 bed units).
- Block E1 (6 storeys) comprising 70 apartment units (34 no. 1 bed units, 26 no. 2 bed units and 10 no. 3 bed units).
- Block E2 (6 storeys) comprising 50 units (1 no. studio unit, 29 no. 1 bed units, 18 no. 2 bed units and 2 no. 3 bed units).

Each residential unit has associated private open space in the form of a terrace/balcony.

Resident amenity space c. 451 sq. m. accommodating a gym and studio space at basement level; residents' lounge/café, work booths/meeting room and reception/foyer/parcel store at ground floor.

Crèche facility of 392. sq. m.

252 no. residential car parking spaces (161 no. at basement level and 91 no. at surface level) and 20 motorcycle spaces at basement level are proposed. 8 no. car parking spaces for creche use are proposed at surface level.

1056 no. bicycle parking spaces (656 no. at basement level and 400 no. at surface level).

15,099.7 sq. m. public open space in the form of a central parkland, garden link, woodland parkland (incorporating an existing folly), a tree belt, entrance gardens, plazas, terraces, gardens, and roof terraces for Blocks B2 and B3.

The surrounding environment can be described as predominantly residential. South Dublin Bay Special Area of Conservation (SAC)/ Special Protection Area (SPA)/ proposed Natural Heritage Area (pNHA) is located c. 300m to the north of the subject site.

1.2 Hydrological Setting

According to the EPA river network (EPA maps, https://gis.epa.ie/EPAMaps/ accessed on 07-09-2021), the nearest surface water receptors are the Carysfort-Maretimo Stream (also known as the Brewery stream) and the South Dublin Bay coastal waterbody.

Figure 1.1 Site Location in relation to Local Drainage and Natura Sites

A review of the EPA (2021) on-line database indicates there are no other NPWS protected areas in the vicinity of the Proposed Development site. The nearest protected areas is the mentioned South Dublin Bay SPA/SAC/pNHA which is c. 300m to the north of the site.

The Carysfort-Maretimo Stream flows along the northwestern boundary of the site towards the Dublin Bay.

1.3 Objective of Report

The scope of this desktop review is to assess the potential for any likely significant impacts on receiving waters within protected areas during construction or post development, in the absence of taking account of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures).

In particular, this review considers the likely impact of construction and operation impacts (construction run-off and domestic sewage) from the Proposed Development on water quality and overall water body status within the Dublin Bay, including bathing water locations. The assessment relies on information regarding design provided by the applicant as follows:

- Main Drainage Planning Report Proposed Strategic Housing Development St Teresa's Temple Hill, Monkstown, Blackrock, Co. Dublin. JJ Campbell and Associates Consulting Civil and Structural Engineers (JJC), December 2021;
- Flood Risk Assessment. Temple Hill, Blackrock. JBA Consulting, September 2021.

1.4 Description of Drainage

The nearest surface water receptors is Dublin Bay Coastal Water Body (WFD code: IE_EA_090_0000), which is located c. 300m to the north of the Proposed Development site (refer to Figure 1.1 above). The Carysfort-Maretimo Stream (Surface Waterbody code IE_EA_09B130400, EPA code: 09B13) is a watercourse that flows along the north-western boundary of the subject site and it also discharges into the Dublin Bay coastal water which hosts SAC, SPA and NHA habitats. Flood defences are in place along the Carysfort-Maretimo in the vicinity of the development. The stream is culverted under the Temple Road at the sites northwestern boundary.

Surface water from St Teresa's is currently conveyed through the combined sewer network within the site boundary. The public surface water drainage network on Temple Hill Road conveys storm water west to discharge onto the culverted Carysfort-Maremtimo stream. The site generally drains South-East to North West.

It is proposed to separate the storm runoff from the existing and proposed buildings and to use SuDS techniques to control stormwater discharge from the site. A storm water carrier pipe will be provided around the site to intercept runoff.

Due to the sloping topography of the site, it is proposed to make two surface water connections serving two zones each comprising approximately 50% of the site area (i) Surface Water Connection No 1 is for Zone 1 and connects to the existing public on the North East side of the site and (ii) Surface Water Connection No 2 is for Zone 2 and connects to the existing public sewer manhole on the North corner of the site (refer to Figure 1.2 below).

An attenuation system has been designed in order to discharge a greenfield run-off rate (i.e., the same level as under pre-development conditions) into the public sewer. An attenuation volume of 1,600m^3 is provided for the whole site. This storage is divided between a "stormtech" below-ground attenuation structure, situated adjacent to buildings E1 and E2, providing 800m^3 of storage and a reinforced concrete tank beside B2 under the road, also providing 800m^3 of storage. As these storage systems are connected independently to the local authority collection system, each connection is provided with a flow limiting device (Hydro-brake or similar) in order to discharge a greenfield run-off rate. The attenuation volume to be retained on site is to provide for a 1–in–100 year extreme storm event, increased by 20% for the predicated effects of climate change.

As part of the proposed development, SuDS features have been designed to prioritise interception and reduction of flow rates. The features that will be

incorporated into the design are green roofs, swales, infiltration trenches, permeable paving, etc. A petrol interceptor will be provided for underground carparks.

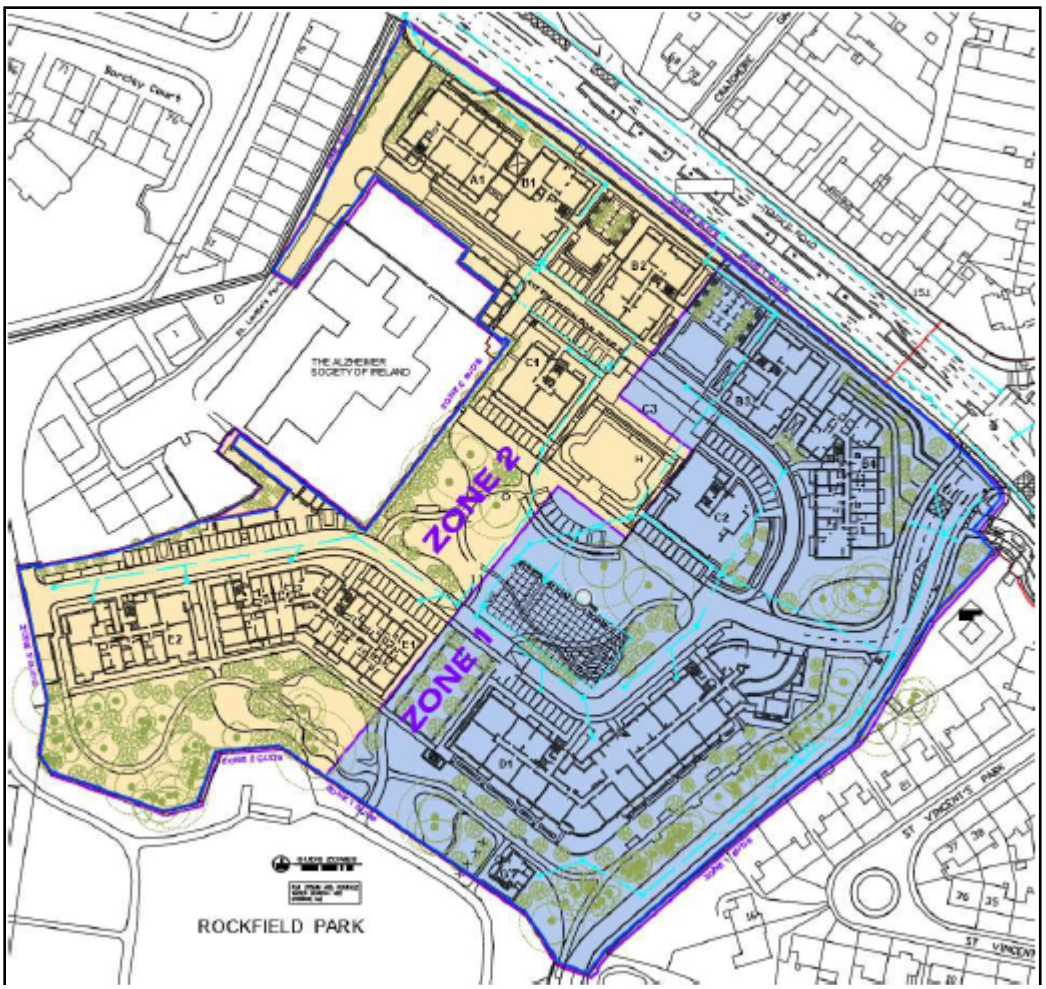

Figure 1.2 Surface Water Drainage Zones (Source: JJC, 2021)

Foul water from St Teresa's is currently conveyed through the combined sewer network within the site boundary. Temple Hill Road is served by a 1200mm diameter combined sewer. The combined sewers within St Teresa's Lands discharges to the 1200mm diameter combined sewer in Temple Hill Road. This trunk main is routed to the Dún Laoghaire West Pier pumping station where it is pumped to Ringsend Waste Water Treatment Works.

It is proposed that to drain foul water separately by gravity. The foul drain will connect to the existing 300mm diameter combined sewer located within the site boundary on Temple Road, it then discharges to an existing manhole on the public 1200mm diameter public combined public sewer.

The public foul water sewer eventually discharges to the West Pier pumping station (located c. 1.5 Km to the east of the site) which transfers wastewater to Ringsend Waste Water Treatment Plant (WWTP) where it is treated and ultimately discharges into South Dublin Bay (refer to Figure 1.3 below). The WWTP and pumping station operate under an EPA licence D0034-01.

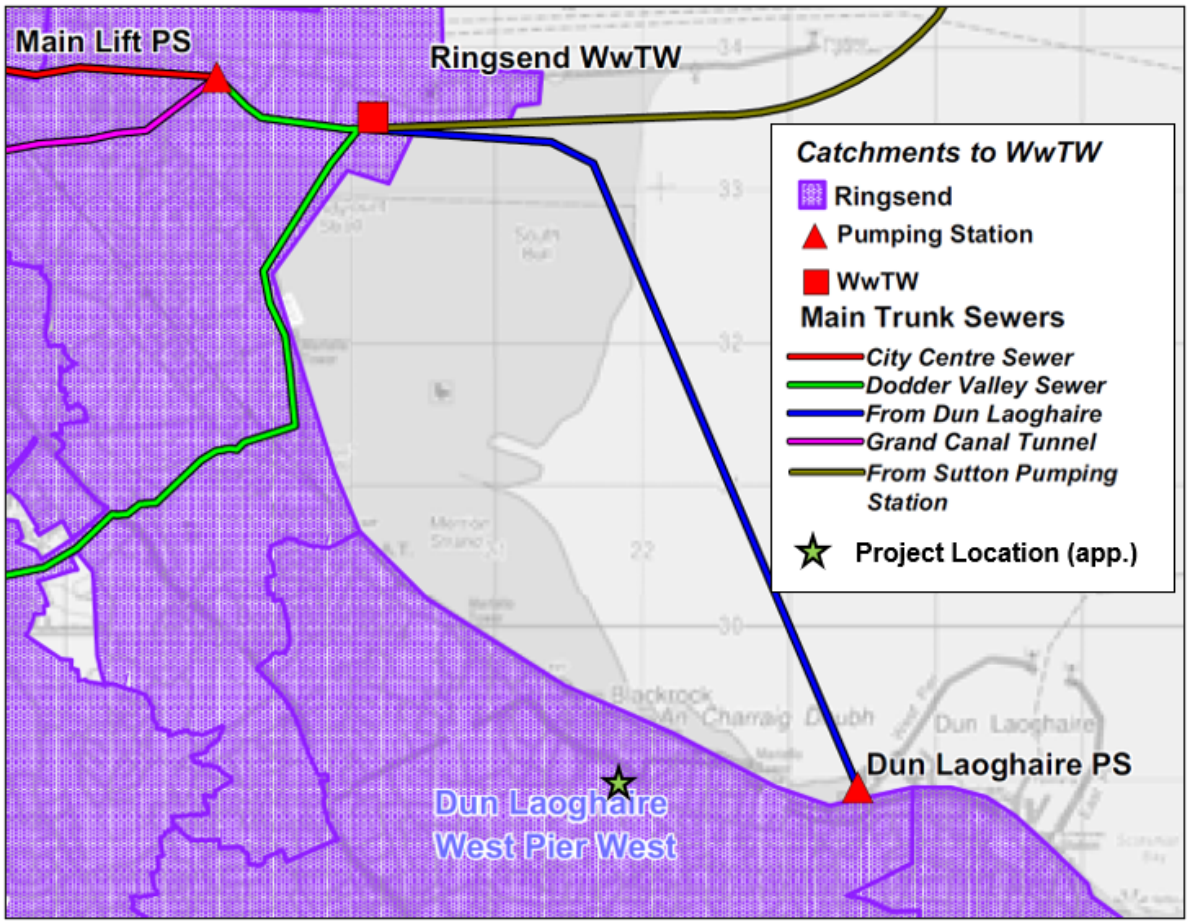

Figure 1.3 Indicative Foul Sewer from West Pier to Ringsend WWTP (Source: Greater Dublin Strategic Drainage Study, 2005)

According to the site specific Flood Risk Assessment carried out by JBA as part of the present application, the northern boundary of the site is within Flood Zone A (defended) and B (i.e., within the 1% and 0.1% AEP flood extents, respectively; in other words, where the probability of flooding from rivers is 1% and 0.1%, respectively). However, it is confirmed that the development is not at risk from the 0.1% AEP flood event. Flood defences are located along the Carysfort-Maretimo and provides protection from a 1% AEP standard. The 0.1% AEP event will result in inundation of the access road, but floodwaters will be prevented from entering the site.

A single apartment block intersects the Flood Zone A/B outline. Residential apartments will be restricted to the 1st floor level at 16.48mOD. The proposed basement / ground floor car park entrance is located in Flood Zone C (i.e., where the probability of flooding from rivers is less than 0.1% or 1 in 1000), with a freeboard of 600mm above the estimated 1% AEP flood level. All residential properties onsite are located in Flood Zone C. A barrier to the ingress of floodwater to the basement car park will be provided.

It should be noted that these measures, along with SuDS and the projected attenuation system are part of the design of the development and are not part of the potential mitigation measures. The assessment concluded that the proposed landscaping and overall development does not increase flood risk to areas downstream.

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 environs.

2.1 Hydrological Catchment Description

The proposed development site lies within the Liffey and Dublin Bay Catchment (Hydrometric Area 09) and River Dodder sub-catchment (WFD name: Dodder_SC_010, Id 09_16) (EPA, 2021).

The Environmental Protection Agency (EPA, 2021) on-line mapping presents the available water quality status information for water bodies in Ireland. The Coastal Waterbody Dublin Bay has a WFD status (2013 – 2018) of 'Good' and a WFD risk score of 'Not at risk'. The ecological status (which comprises biological and chemical status) of transitional and coastal water bodies during 2013-2018 for Dublin Bay is classed as 'good'. The most recent surface water quality data for Dublin Bay for the 2015–2017 assessment on trophic status of estuarine and coastal waters indicate that they are 'Unpolluted' (based on *Water Quality in Ireland*, EPA, 2021)'. Under the 2015 'Trophic Status Assessment Scheme' classification of the EPA, '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.

The pumping station at West Pier is designed to transfer wastewater to Ringsend WWTP for treatment prior to ultimate discharge to Dublin Bay. It is operated under the Ringsend WWTP licence. As described above, the catchment for this pumping station (like most in Dublin) contains combined drains (collection storm and foul) rather than just foul drainage. This can result in overcapacity for the existing storage and pumping capacity present during heavy and prolonged rainfall events.

In general, urban wastewater is pumped to Ringsend WWTP, with additional capacity in a holding tank. When the flow is 6-7 times the dry weather flow, there is an approved overflow to the long sea outflow pipe (which extends out into Dublin Bay) and when this capacity is exceeded there is allowed overflow through a short sea outfall at West Pier. The understanding behind this design is that during these conditions, the discharge is highly diluted by rainfall and this is a short-term event into a water body with significant dilution.

Dublin Bay hosts a number of swimming locations protected by the bathing water directive 2006/7. Water quality data is collected for nearby Seapoint bathing area sand is reported by the EPA on www.beaches.ie. The EPA bathing status is not based on single events, rather it is based on a review of data over 4 years (based on data collected during the bathing season only). Bathing classes are determined as Excellent (highest cleanest class), Good (Generally good water quality), Sufficient (The water quality meets the minimum standard) and Poor (The water quality has not met the minimum standard). A review of this data for the last four years, shows that despite these temporary overflows, the current EPA (2021) Bathing Water Quality report has classified nearby Seapoint Strand as 'Excellent' for the last four years 2017-2020.

As the Proposed Development will have no additional stormwater run-off from current during stormwater event, the development will therefore have no impact on the water quality in any overflow situation apart from a minor contribution from foul sewage. The maximum contribution of foul sewage (Peak flow of 16.38 l/s) from the

Proposed Development is 0.15% of the peak hydraulic capacity at Ringsend WWTP. It should be noted that the bathing status has no direct relevance to the water quality status of the Natura sites due to rapid mixing and dilution resulting in no measurable change in water quality within the overall water body.

2.2 Aquifer Description and Superficial Deposits

Mapping from the Geological Society of Ireland (GSI, 2021) indicates the bedrock underlying the site is classified as dominated by rocks from the Caledonian system. The site is located over rock Type 2p microcline porphyritic (Rock Unit new code: INDNLGRP) which is described as Granite with microcline phenocrysts.

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

- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Pl - 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)

Presently, from the GSI (2021) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a *Poor Aquifer (Pl), i.e. Bedrock which is Generally Unproductive except for Local Zones*. The proposed development lies within the Kilcullen Groundwater Body (GWB), classified as poorly productive bedrock. As such it is considered a significant pathway for groundwater migration between the site and Dublin Bay.

The proposed development is within the '*Kilcullen*' groundwater body (Ground Waterbody Code: IE_EA_G_003) and is classified under the WFD Status 2013-2018 (EPA, 2021) as having '*Good status'*. The WFD Risk Score system indicates the GWB as '*Not at risk*'.

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 (2021) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*High*' which indicates a general overburden depth potential of 3-5m. This shows that the aquifer is protected by low permeability glacial clays. The aquifer vulnerability class in the region of the site is presented as Figure 2.1 below.

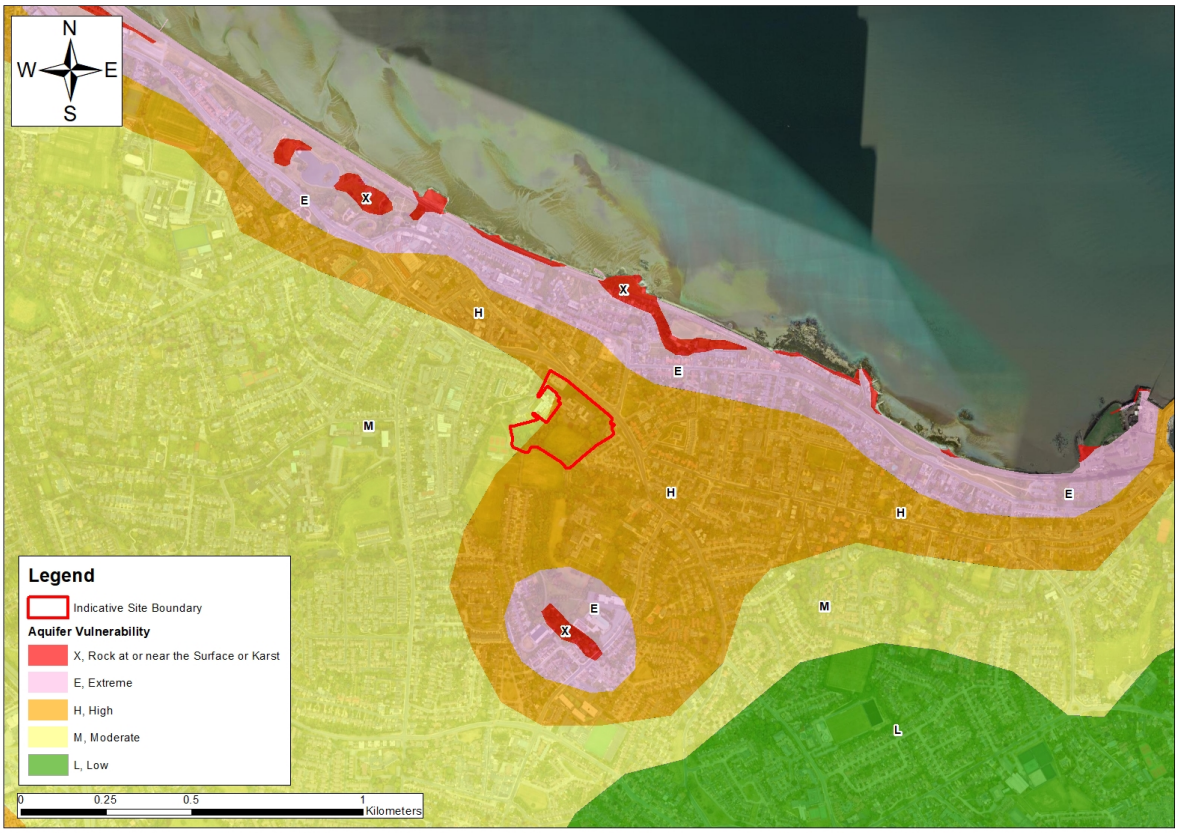

Figure 2.1 Aquifer Vulnerability

The GSI/ Teagasc (2021) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the area comprises Limestone till Carboniferous (TLs, i.e. Till derived from limestones) which is a low permeability subsoil.

On the basis of the hardstand already present together with the natural protection provided by the soil and poor hydraulic connectivity in the aquifer shows there is no likely pathway through the soil and aquifer to Dublin Bay. The potential for any leakage of oil, etc. to ground to migrate horizontally or vertically within the aquifer is considered to be relatively low with surface water being the most likely pathway for any accidental release.

3.0 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. The sources pathways and receptors are presented in the following sections with the overall impact presented in section 3.4.

3.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of undertaking the potential of any 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) Hydrocarbons or any hazardous chemicals will be stored in specific bunded areas. Refuelling of plant and machinery will also be carried out in bunded areas to minimise risk of any potential being discharged from the site. As a worst-case scenario, a rupture of a 1,000-litre tank to ground is considered. This would be a single short-term event.

(ii) Leakage may occur from construction site equipment. As a worst-case scenario an unmitigated leak of 300 litres is considered. This would be a single short-term event.

(iii) 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 particular phases of work this is again considered as a single short-term event rather than an ongoing event. If concrete mixing is carried out on site, the mixing plant will be sited in a designated area with an impervious surface.

(iv) Construction requires soil excavation and removal. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. These could be considered intermittent short-term events, i.e. if adequate mitigation measures incorporated in the Construction Environmental Management Plan (CEMP) fail.

(v) During the excavations for foundations and basement, no significant dewatering is expected given the low permeability overburden underlying the site. Bedrock would not be affected by excavations work given the expected depths of bedrock.

Operational Phase

The following sources are considered plausible post construction:

(i) The Proposed Development does not require any bulk chemical storage and therefore the potential for water quality impact is negligible.

(ii) The proposed development site includes car parking area at the site. Leakage of petrol/ diesel fuel may occur from these areas; run-off may contain a worst-case scenario of 70 litres for example.

(iii) The stormwater drainage system comprises green roofs, swales, infiltration trenches, permeable paving and petrol interceptors. The interception storage system will be designed in order to discharge following the characteristics of a greenfield run-off into the public stormwater sewer. As such the potential for silt laden runoff is low.

(iv) The development will be fully serviced with separate foul and stormwater sewers which will have adequate capacity for the facility and discharge limits as required by Irish Water licencing requirements. Discharge from the site to the public foul sewer will be sewage and grey water only due to the residential nature of the Proposed Development. The foul discharge from the site will join

the public sewer and will be treated at the Irish Water Ringsend Wastewater Treatment Plant (WWTP) prior to subsequent discharge to Dublin Bay.

This plant operates under an EPA licence (D0034-01) and is currently in the process of being upgraded to a PE of 2.4million to meet the increased demand of the Dublin area. The most recent Annual Environmental Report (AER 2020) shows it is currently operating for a PE peak loading of 2.27million while originally designed for 1.64million. However, the current maximum hydraulic load (832,269 m3/day) is less than the Peak hydraulic capacity as constructed (959,040 m3/day) i.e. prior to any upgrade works. These upgrade works (described in section 3.4 below) have commenced and comprise a number of phases and are ongoing and expected to be fully completed by 2025.

3.2 Assessment of Pathways

The following pathways have been considered within this assessment:

The potential for offsite migration due to any construction discharges is low as there is no significant pathway in the aquifer or through land ditches or streams.

(i) Vertical migration to the underlying limestone is minimised due to the identified '*High*' vulnerability existing at the site together with the hardstand already present at the site, resulting in moderate aquifer protection from any localised diesel/ fuel oil spills during either construction or operational phases. The site is underlain by [generally low permeable] Granite which the GSI classifies as a Poor Aquifer (Pl), 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 offsite migration through the underlying granite is considered low.

(ii) There is no 'direct' hydrological linkage for construction or operational run-off from the site to the Dublin Bay Natura 2000. There is however an 'indirect' pathway through the drainage sewer which ultimately discharges into the Carysfort-Maretimo Stream. This stream ultimately discharges to South Dublin Bay SAC/SPA/pNHA c. 300 m downgradient of the site

(iii) There is no 'direct' pathway for foul sewage to any receiving water body (as identified above). There is however an 'indirect pathway' through the public sewer, which is pumped from West Pier and ultimately discharges to the Irish Water WWTP at Ringsend prior to discharge to Dublin Bay post treatment.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

(i) Underlying [poor] Granite bedrock aquifer;
(ii) South Dublin Bay SAC/SPA/pNHA.

3.4 Assessment of Source Pathway Receptor Linkages

Table 3.1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk is also summarised below.

The potential for impact on the aquifer is low based on the low chemical storage on site. The overburden thickness, low permeability nature of till and a lack of fracture

connectivity within the granite bedrock aquifer will minimise the rate of off-site migration for any indirect discharges to ground at the site. As such there is no potential for a change in the groundwater body status or significant source pathway linkage through the aquifer to any Natura 2000 site.

There is no direct open-water pathway between the site and Dublin Bay. However, there is an indirect pathway through the stormwater drainage which would discharge into the Carysfort-Maretimo Stream which outfalls into Dublin Bay c. 300 m from the site. Should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak manage to enter the public sewer, the suspended solids will naturally settle within the drainage pipes and hydrocarbons will dilute to background levels (water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019); by the time the stormwater outfalls into the Dublin Bay.

Given the short distance from the site to the discharge point to the Dublin Bay (c. 210 m from the site) and based on this loading, the impact would be local and temporary due to dilution within the Carysfort-Maretimo Stream and bay. Overall, there would be no perceptible risk to water requirements for the Natura sites in Dublin Bay based on loading and high level of dilution in Dublin bay.

During operation, the potential for sediment runoff is low based on the SUDs design measures. In addition, the potential for hydrocarbon discharge is quite minimal based on an individual vehicle (70 litres) leak being the only source for hydrocarbon release. However, even if the operation of the proposed SuDS, and interceptor systems are excluded from consideration, there is no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009 and S.I. No. 77 of 2019) in the worst case scenarios described above at section 3.2. In addition, in the event of an overflow condition, the eventual discharge at West Pier would be highly diluted by rainfall and this is a short-term event into a water body with significant dilution. It can also be concluded that the in-combination effects of surface water arising from the proposed development taken together with that of other possible proposed residential developments will not be significant given the potential quantity of loading of contaminant (a worst-case scenario of 70 litres of leakage of petrol during the operation phase) and even if the attenuation and SuDS measures required to be included in the design of any such developments are not considered.

The peak wastewater discharge is calculated at an average wastewater discharge of 16.38 litres/sec. Sewage will be separated from stormwater on the site, and collected in the public sewer, and treated ultimately Irish Water's WWTP at Ringsend prior to discharge to Dublin Bay. As outlined in section 3.1 (iv), upgrade works have commenced in 2018 and are expected to be fully completed by 2025. The upgrade works will result in treatment of sewage to a higher quality than current, thereby ensuring effluent discharge to Dublin Bay will comply with the Urban Wastewater Treatment Directive by Q4 2023.

The project is being progressed in stages to ensure that the plant continues to treat wastewater to the current treatment levels throughout the delivery of the upgrade. The project comprises three key elements and underpinning these is a substantial programme of ancillary works:

- Provision of additional secondary treatment capacity with nutrient reduction (400,000 population equivalent);
- Upgrade of the 24 existing secondary treatment tanks to provide additional capacity and nutrient reduction, which is essential to protect the nutrient-sensitive Dublin Bay area; and

- Provision of a new phosphorous recovery process.

In February 2018, the work commenced on the first element, the construction of a new 400,000 population equivalent extension at the Ringsend Wastewater Treatment Plant. These works are at an advanced stage with testing and commissioning stages expected to be completed in the second half of 2021.

The 2019 planning permission facilitated upgrading works to meet nitrogen and phosphorus standards set out in the licence, which are temporarily exceeded currently. Works on the first of four contracts to retrofit the existing treatment tanks with aerobic granular sludge technology commenced in November 2020. Award of the second contract is due in Q3 2021 and the third and fourth contracts are scheduled to commence in late 2021 and mid 2023 respectively.

The application for the upgrade of the WWTP in 2012 and the revised upgrade in 2018 was supported by a detailed EIAR. As outlined in the EIAR, modelling of water quality in Dublin Bay has shown that the upgrades (which are now currently underway) will result in improved water quality within Dublin Bay. The 2018 EIAR predicts that the improvement in effluent quality achieved by the upgrade will compensate for the increase in flow through the plant. The ABP inspector's report summarises the positive findings of the modelling for the post WWTP upgrade scenario on Dublin Bay water quality in sections 12.3.5 and 12.3.12 of his report and the overall positive impact for human health and the environment in his conclusions in section 12.9.1

Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the Proposed Development as 16.38 litres/sec (which would equate to 0.15% of the licensed discharge at Ringsend WWTP [peak hydraulic capacity]), would not have a measurable impact on the overall water quality within Dublin Bay and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). This assessment is supported by hydrodynamic and chemical modelling within Dublin Bay which has shown that there is significant dilution for contaminants of concern (DIN and MRP) available quite close to the outfall for the treatment plant (Ringsend WWTP 2012 EIS, Ringsend WWTP 2018 EIAR; refer to Section 12.4.22, ABP-301798-18 Inspector's report). The most recent water quality assessment of Dublin Bay WFD Waterbody undertaken by the EPA (Water Quality in 2020: An Indicator Report, 2021) also shows that Dublin Bay on the whole, currently has an 'Unpolluted' water quality status (refer to www.catchments.ie).

With regard to bathing waters in Dublin Bay, as mentioned above the Proposed Development will have no impact on the water quality in any overflow situation apart from a minor contribution (0.15% of the peak hydraulic capacity at Ringsend WWTP) from foul sewage.

The assessment of the current proposal has also considered the effect of cumulative events, such as release of sediment laden water combined with a hydrocarbon leak on site. As there is adequate assimilation and dilution between the site and the Natura 2000 sites (Dublin Bay, which is c. 300 m from the site), it is concluded that no perceptible impact on water quality would occur at the Natura sites as a result of the construction or operation of this Proposed Development. It can also be concluded that the cumulative or in-combination effects of effluent arising from the Proposed Development with that of other permitted, proposed developments, or with development planned pursuant to statutory plans in the greater Dublin, Meath and Kildare areas, which will be discharged into Ringsend WWTP will not be significant having regard to the size of the calculated discharge

from the Proposed Development and having regard to the following:

- Recent water quality assessment for Irish Sea Dublin and Dublin Bay shows that they currently continue to meet the criteria for 'Unpolluted' water quality status (EPA, data until July 2021).
- The Ringsend WWTP upgrade which is currently being constructed will result in improved water quality by Q4 2023 to ensure compliance with Water Framework Directive requirements.
- All new developments are required to comply with SuDS which ensures management of run-off rate within the catchment of Ringsend WWTP.
- The natural characteristics of Dublin Bay result in enriched water rapidly mixing and degrading such that the plume has no appreciable effect on water quality at Natura sites.

As the Proposed Development will have no additional stormwater run-off during a stormwater event over and above the current level, surface water run-off from the development in the operational phase will therefore have no impact on the current water quality in any overflow situation at Dublin Bay. It should also be noted that the bathing status has no direct relevance to the water quality status of the Natura sites due to rapid mixing and dilution resulting in no measurable change in water quality within the overall water body.

Finally, in a worst-case scenario of an unmitigated leak and not considering the operation of the SuDS and interceptor already included in the design, no perceptible risk to any Natura Sites 2000 is anticipated given the distance from source to Dublin Bay protected areas (c. 300 m). Potential contaminant loading will be attenuated, diluted and dispersed near source area.

Table 3.1 below presents a summary of the risk assessment undertaken.

Source	Pathways	Receptors considered	Risk of Impact
Construction Impacts (Summary)			
Unmitigated leak from an oil tank to ground/ unmitigated leak from construction vehicle.	Bedrock protected by 3-5m low permeability overburden. Low fracture connectivity within the granite will limit any potential for offsite migration	Granit bedrock aquifer (poor important aquifer)	Low risk of migration through poorly connected fracturing within the granite rock mass (Poor Aquifer). No likely impact on the status of the aquifer/off site migration due to low potential loading, natural attenuation within overburden and discrete nature of fracturing reducing off site migration.
Discharge to ground of runoff water with High pH from cement process/ hydrocarbons from construction vehicles/run-off containing a high concentration of suspended solids	Indirect pathway through stormwater drainage to Dublin Bay water course (distance source-receptor: 300 m)	South Dublin Bay SAC/SPA/pNHA	Potential for local temporary exceedances of statutory water quality standards at outfall. However, no perceptible risk to water requirements for the Natura sites in Dublin Bay based on loading and high level of dilution in public sewer, the Carysfort-Maretimo Stream and in Dublin Bay.
Operational Impacts (Summary)			
Foul effluent discharge to sewer	Indirect pathway to Dublin Bay through public sewer	South Dublin Bay SAC/SPA/pNHA	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge (16.38 litres/sec which would equate to 0.15% of the licensed discharge at Ringsend WWTP), would not impact on the overall water quality within Dublin Bay and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive).
Discharge to ground of hydrocarbons from car leak	Indirect pathway through stormwater drainage to Dublin Bay water course (distance source-receptor: 300m)	South Dublin Bay SAC/SPA/pNHA	No perceptible risk – Negligible loading of chemical distance between the source and Dublin Bay is c. 300 m and significant dilution in the public sewer and the Carysfort-Maretimo Stream will ensure any released hydrocarbons are at background levels (i.e., with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009 and S.I. No. 77 of 2019 amendment)

Table 3.1 Pollutant Linkage Assessment *(without mitigation)*

4.0 CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desk top review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures) in place at the Proposed Development site.

There is no direct source pathway linkage between the Proposed Development site and open water (i.e. South Dublin Bay SAC/SPA/pNHA located c. 300 m from the proposed site). There are indirect source pathway linkage from the Proposed Development through the public stormwater sewer which discharges into the Carysfort-Maretimo Stream There is also an indirect connection through the foul sewer which will eventually discharge to the Ringsend WWTP and ultimately discharges to Dublin Bay. The future development has a peak foul discharge that would equate to 0.15% of the licensed discharge at Ringsend WWTP (peak hydraulic capacity).

It is concluded that there are no pollutant linkages as a result of the construction or operation of the Proposed Development which could result in a water quality impact which could alter the habitat requirements of the Natura sites within Dublin Bay.

Finally, in line with good practice, mitigation measures are included during construction to minimise the potential for any accidental releases off site. During operation, the potential for an impact to ground or storm water is negligible and there are design measures incorporated within the Proposed Development to manage stormwater run-off quality. 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 the implementation of mitigation measures during the construction or operational phases of the proposed development.

5.0 REFERENCES

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