HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT SITE AT KNOCKRABO (PHASE II), MOUNT ANVILLE ROAD, GOATSTOWN CO. DUBLIN

Technical Report Prepared For

Knockrabo Investments DAC

Technical Report Prepared By

Hana Blandford
Environmental Consultant

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awnconsulting
A Trinity Consultants Company

The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

AWN Consulting Limited
Registered in Ireland No. 319812

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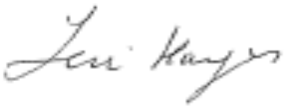
Signature		
Name	Hana Blandford	Teri Hayes
Title	Environmental Consultant	Director
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1.0 INTRODUCTION

1.1 Site Location & Hydrological Setting

AWN have been requested by Knockrabo Investments DAC to carry out a Hydrological and Hydrogeological Qualitative Risk Assessment for a Large-scale Residential Development ranging from 2- part 8 storeys (for a period of 7 years) with a total application site area of c. 2.54 hectares, at Knockrabo, Mount Anville Road, Goatstown, Dublin 14.

This report has been prepared as part of the planning documentation in support of the construction of 158 No. residential units (12 No. houses and 146 No. apartments (35 No. 1 beds, 81 No. 2 beds, 3 No. 3 beds and 27 No. 3 bed duplex units), a childcare facility and Community / Leisure Uses.

Development on the lands to the east of Knockrabo Way has already been completed by the applicant, comprising 69 no. apartments in 4 no. buildings, and 50 no. houses. The existing grant of planning DLRCC Register reference is D17A/1124.

There is no direct discharge to ground or surface water body proposed as part of this development. The nearest surface water receptor to the west is the River Slang which is c. 1.2km west of the proposed development site boundary; the Elm Park Stream is c. 1.0km at its nearest point to the north of the proposed development site (refer to Figure 1.1 below).

Figure 1.1 Site Location in relation to local drainage

A review of historical maps of this zone was conducted (Geohive web maps; OPW, 2024), and no additional historical rivers were identified in the vicinity of the proposed development site.

A review of the EPA (2024) on-line database indicates there is no protected conservation area (SACs or NHAs) in the vicinity of the proposed development site. The nearest protected conservation area are the South Dublin Bay SAC/pNHA and the South Dublin Bay and River Tolka SPA which are c. 2.7km to the northeast of the site.

1.2 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 Slang River, Elm Park Stream and ultimately South Dublin Bay. The assessment relies on information regarding design provided by Waterman Moylan (WM) as follows:

- Construction Management Plan. Proposed Residential Development Site Phase II at Knockrabo, Mount Anville Road, Goatstown (WM, May 2024).
- Flood Risk Assessment. Proposed Residential Development Site Phase II at Knockrabo, Mount Anville Road, Goatstown (WM, May 2024).

This report was prepared by Hana Blandford (BSc Agri-Env), and Teri Hayes (BSc MSc PGeol EurGeol). Hana is an Environmental Consultant at AWN, working on a range of projects involving EIA Reports, EPA licence applications and site visits carrying out Soil, Water and Air sampling for analysis. She holds a BSc. Agri-Environmental Science with structured electives in Earth Sciences from University College Dublin. 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.

1.3 Description of Drainage

The nearest surface water receptors lie to the north and to the west of the proposed development site (refer Figure 1.1 above). These are identified as follows:

- Slang River (WFD code: IE_EA_09D010900; EPA code: 09S04) which is located c. 1.2km to the east of the site. This stream flows towards the north where it joins the Dodder River (EPA Code: 09D01) c. 2.0Km to the northwest of the site. The Dodder River outfalls into the Liffey River at Ringsend.

- Elm Park Stream (WFD code: IE_EA_09B130400; EPA code: 09E01) which is located c. 1km to the north of the site. This stream site outfalls into South Dublin Bay at Merrion Gates.

The subject area is approximately 2.54 hectares (ha) and is currently greenfield. A topographic survey (OD Malin) of the area indicates that the site from south to north ranging in level from 76.5m in the south east to 59.6m in the north.

The site forms part of a broader site on which the construction of Phase 1 has already taken place (granted under Reg. Ref. D13A/0689) and drainage infrastructure is in place for this development.

There is an existing 225mm diameter foul sewer outfall in the northeast of the subject site which was constructed under Phase 1 of the Knockrabo development and was designed and built to drain the Phase 1 and 2 lands.

It is proposed to serve the subject site with a drainage network containing a series of 150mm and 225mm diameter pipes, which will outfall to the existing outfall in the northeast of the site as mentioned above. All foul drainage on the subject lands is proposed to drain separately via gravity to this existing on-site foul outfall. This foul sewer will eventually discharge to the Ringsend Waste Water Treatment Plant (WWTP) via the Dodder Valley Trunk Sewer, where it is treated and ultimately discharges to Dublin Bay. The WWTP operates under the EPA licence D0034-01.

It is proposed to drain surface water from the development by gravity to the existing public surface water drainage outfall pipe in the north-eastern corner of the development site. Storm water will discharge to the outfall at a controlled rate, limited to the greenfield equivalent runoff. Excess surface water runoff during storm events will be attenuated in new below ground stormwater attenuation tanks within the open space at the northern end of the site. The proposed surface water outfall pipe from the development is a 225mm diameter pipe laid at a gradient of 1:100, giving a capacity of 51.9 l/s. Therefore, the proposed outfall has more than adequate capacity to cater for restricted greenfield rate flows from the development lands. Surface water runoff shall be restricted via a hydro-brake or similar approved flow control device, limited to 13.43/s, before the outfall to the existing public surface water network, via a downstream defender.

The design of the surface water drainage network has taken cognisance of the objectives and guidance contained in the Greater Dublin Strategic Drainage Study (GDSDS). A series of SuDS elements are incorporated in the design, which will comprise treatment via the use of a green roofs, bio-retention tree piles, permeable paving, filter drains, and petrol interceptors. This will result in improvement in the rate of and quality of stormwater discharging from the site compared to current.

Attenuation storage is provided to limit the discharge rate from the site into receiving waters. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each. Based on these calculations, the required attenuation storage volume is 750m^3. This volume is sufficient for the 1-in-100-year storm, accounting for a 20% increase due to climate change.

The site will connect to the surface water network in Ardilea Downs which discharges into the Elm Park Stream approximately 1km to the north west, near the UCD campus. As such there is an indirect link through drainage with the Elm Park Stream. There is no direct or indirect connection with the Slang/ Dodder catchment.

According to the Flood Risk Assessment carried out by WM (2024), there would not be risk of flooding affecting the site from tidal and fluvial sources. The site lies within a Flood Zone C (i.e., where the probability of flooding from rivers is less than 0.1% or 1 in 1000).

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, 2024). The River Slang (Figure 1.1) - a tributary of the River Dodder - is located approx. 1.2Km west of the subject development site. From here the River Slang flows for approx. 1.7Km in a northerly direction before converging with the River Dodder which then flows north for a further ~4.9km before discharging into the Liffey Estuary lower transitional waterbody which in turn discharges into Dublin Bay coastal waterbody which includes Special Area of Conservation (SAC)/proposed Natural Heritage Area (pNHA). The Elm Park Stream rises in Goatstown c. 1.0Km north from the subject proposed development site, is culverted for part of its course and discharges through UCD before emerging in Elm Park Golf Course, from where the water course finally discharges to Dublin Bay just south at Merrion Gates, c. 2.7 Km to the northeast of the site.

The subject site is not developed. Therefore, internal runoff would remain within the site and presumably infiltrate through the subsoil. The proposed development will collect surface water and through a drainage network and attenuation system, discharge it into the public sewer which ultimately outfalls into the Elm Park Stream.

The EPA (2024) on-line mapping presents the available water quality status information for water bodies in Ireland. The River Slang and the River Dodder have a Water Framework Directive (WFD) status (2016-2021) of ‘Moderate’ and a WFD risk score of ‘At risk of not achieving good status’. This moderate status is related to its biological status (invertebrate and fish) and dissolved oxygen conditions (which fails in relation to its percentage saturation); all remaining chemical condition have been classified as ‘pass’. The EPA does not collect water quality data for the Elm Park Stream and does not have an assigned status and risk currently. However, it is likely to be in similar condition to the Slang.

The Dodder catchment discharges to the Liffey Estuary Lower which has a WFD status (2016-2021) of ‘Good’, and Dublin Bay has a WFD status of ‘Good’. The Liffey Estuary Lower waterbody has a WFD risk score of ‘At risk of not achieving good status’ while the Dublin Bay waterbody has a WFD risk score of ‘Not at risk’. The ecological status (which comprises biological and chemical status) of transitional and coastal water bodies during 2016-2021 for Dublin Bay is classed as ‘Good’. The most recent surface water quality data for the Dublin Bay on trophic status of estuarine and coastal waters indicate that they are ‘Unpolluted’ (based on Water Quality in 2021, EPA, 2022)’. 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 (refer to www.catchments.ie).

2.2 Aquifer Description and Superficial Deposits

Mapping from the Geological Society of Ireland (GSI, 2024) indicates the bedrock beneath the site and the surrounding area 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 (2024) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a '*Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones*'. The site of the Proposed Development is within the 'Kilcullen' groundwater body and is classified as 'Poorly productive bedrock'. The most recent WFD groundwater status for this water body (2016- 2021) is 'Good' with a current WFD risk score of '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 (2024) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*Moderate*' (to the northwest), '*High*' and '*Extreme*' (to the southeast) which indicates a general overburden depth potential of from 5-10 m ('*Moderate*' zone) to <3 m ('*Extreme*' zone). This shows that the aquifer is moderately protected by low permeability glacial clays. The aquifer vulnerability class in the region of the site is presented as Insert 2.1 below.

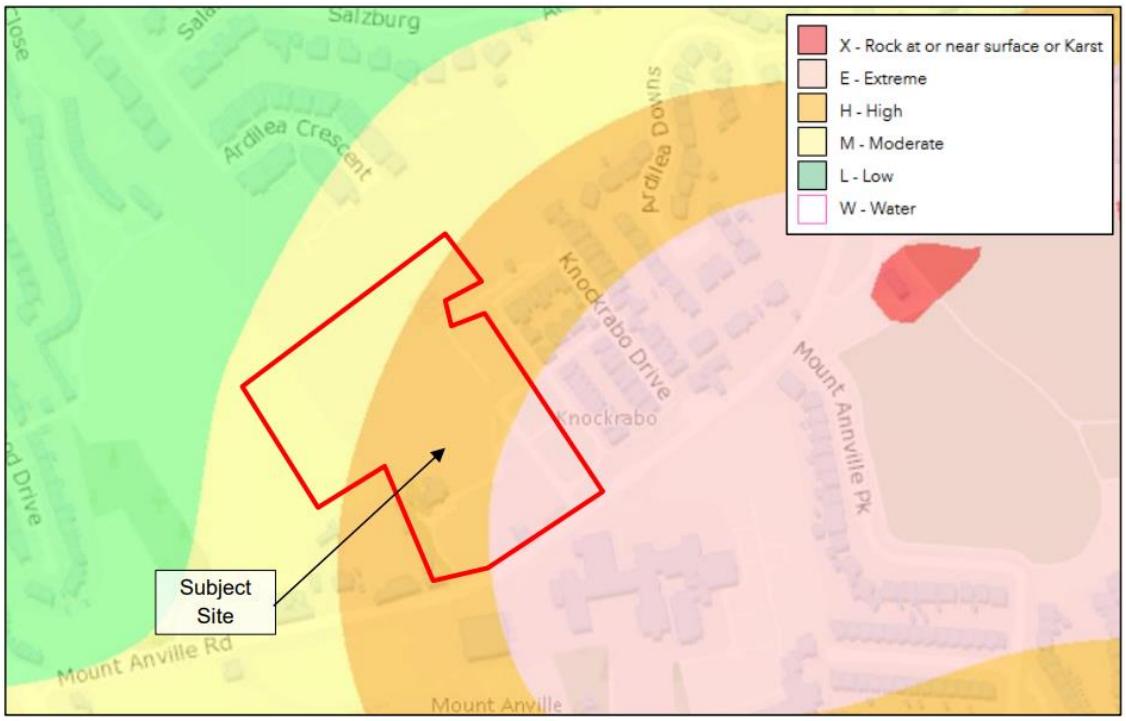

Figure 2.1 Aquifer Vulnerability

The GSI/ Teagasc (2024) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the residential area comprises Limestone till Carboniferous (TLs, i.e. Till derived from limestones).

Local site investigations carried out by Ground Investigations Ireland (GII, 2019, included as Appendix C in the Engineering Assessment Report undertaken by WM) have encountered competent bedrock at a depth of 2.3m below ground level (mbgl) to the northeast of the subject site. Infiltration tests undertaken by WM show that the site is underlain by sandy gravelly clay of very low permeability and therefore soakaways were not considered feasible for the design.

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.

<u>Construction Phase</u>

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 and potentially groundwater collection. Run-off could contain a high concentration of suspended solids during earthworks. This could be considered an intermittent short-term event, i.e. if adequate measures were not incorporated in the Construction Environmental Management Plan (CEMP).

(v) During the excavations for foundations and basements, no significant dewatering is expected given the low permeability overburden underlying the site.

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) Leakage of petrol/ diesel fuel may occur from car park/road areas, A worst-case scenario of 70 litres has been considered.

(iii) The stormwater drainage system comprises green roofs, bio-retention tree piles, filter drains, petrol interceptor, and a bounded attenuation storage tank. The storage system will discharge following the characteristics of a greenfield run-off into the existing public surface water sewer located at the northern boundary of the site. 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 WWTP is required to operate under an EPA licence and meet environmental legislative requirements as set out its licence.

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 2021) shows it is currently operating for a PE peak loading of 2.23 million while originally designed for 1.64million. However, the current maximum hydraulic load (864,774 m3 /day) is less than the peak hydraulic capacity as constructed (959,040 m3 /day) i.e. prior to any upgrade works.

Irish Water is working to provide infrastructure to achieve compliance with the Urban Wastewater Treatment Directive for a population equivalent of 2.1million in the second half of 2023. When all the proposed works are complete in 2025, the Ringsend Wastewater Treatment Plant will be able to treat wastewater for up to 2.4 million population equivalent.

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 even without mitigation is low as there is no significant pathway in the aquifer or through land ditches or streams.

(i) An accidental discharge to ground could have a local impact on the underlying aquifer as the soil cover is thin ('High' to 'Extreme' vulnerability). 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 off-site migration through the underlying granite is considered low. It has to be noted that the construction phase does not consider exposing the bedrock during its excavation works and the site will be covered in hardstand following development which will provide some protection and minimise any discharge to bedrock.

(ii) There is an indirect hydrological linkage for construction/ operation run-off (sediment laden waters or any small hydrocarbon leaks from the site) to South Dublin Bay SAC/SPA/pNHA through the public stormwater sewer and Elm Park Stream.

(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 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) Elm Park Stream; and
(iii) Liffey Estuary Lower and South Dublin Bay SAC/pNHA and South Dublin Bay and River Tolka SPA

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.

Construction Phase

The potential for impact on the aquifer is low based on the low chemical storage on site. The 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.

During the construction phase, there is no direct open-water pathway between the site and Dublin Bay. However, there is an indirect pathway through the stormwater drainage should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak manage to enter the public stormwater sewer that discharges into the Elm Park Stream which ultimately outfalls into the South Dublin Bay. However, the distance to this receptor is 2.4km from the site.

Should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak/tank leak manage to enter into the surface water sewer, the suspended solids will naturally settle within the sewer; however, in the event of a worst case hydrocarbon leak of 1,000 litres this would be diluted 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 reaches the nearest Natura 2000 Sites (South Dublin Bay SAC/SPA, c. 2.4 km downgradient from the site).

Operational Phase

Similarly, during operation, should any leak of hydrocarbon occur from a vehicle, the volume of contaminant release is low and combined with the significant attenuation within in the public stormwater sewers, hydrocarbons will dilute to background levels with no likely impact above 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.

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 during the operational phase, given the potential loading of contaminant (a worst-case scenario of 70 litres of leakage of petrol during the operation phase) and the attenuation and design measures (SuDS and attenuation tank) required to be included in the design of any such developments in the design.

The peak wastewater discharge is calculated at 7.02 l/s. The sewage discharge will be licensed by Irish Water, collected in public sewers and ultimately treated at 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. After commissioning stages, the Capacity Upgrade facility began accepting flows for treatment in November 2021). This facility will enable current treatment levels to be maintained during the remainder of the upgrade of the existing secondary treatment tanks.

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 and was completed in December 2021. In September 2021, the second contract was awarded, and its construction works commenced in November 2021, expected to take approximately 2 years to complete. The third contract was awarded in November 2021, with construction works commencing in early 2023, and is currently ongoing. The fourth contract was scheduled to commence in mid 2023 and is now actively progressing. As of late 2024, this contract is nearing completion.

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.

In addition, the EIAR report acknowledges that under the do-nothing scenario "the areas in the Tolka Estuary and North Bull Island channel will continue to be affected by the cumulative nutrient loads from the river Liffey and Tolka and the effluent from the Ringsend WWTP", which could result in a deterioration of the biological status of Dublin Bay (Irish Water, 2018). Nevertheless, these negative impacts of nutrient over enrichment are considered "unlikely" (Irish Water, 2018). This is because historical data suggests that pollution in Dublin Bay has had little or no effect on the composition and richness of the benthic macroinvertebrate fauna. Therefore, the do-nothing scenario predicts that nutrient and suspended solid loads from the WWTP will "continue at the same levels and the impact of these loadings should maintain the same level of effects on marine biodiversity". Therefore, it can be concluded that significant effects on the current status of the European sites within Dublin Bay from the current operation of Ringsend WWTP are unlikely. This conclusion is not dependent upon any future works to be undertaken at Ringsend.

Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the proposed development as 7.02 l/s (which would equate to 0.063% 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 2023: An Indicator Report, 2024) also shows that Dublin Bay on the whole, currently has an 'Unpolluted' water quality status (refer to www.catchments.ie).

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 (South Dublin Bay, which is c. 2.4 km from the site), it is concluded that no perceptible impact on water quality would occur at the Natura 2000 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 2024).
- The Ringsend WWTP upgrade which is currently being constructed will result in improved water quality by late 2024 (for a population of 2.1 million) and in 2025 (for a population of 2.4 million), ensuring 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 2000 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 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.

In addition, there is no long term discharge planned which could have an impact on the status of the water body. In the scenario of an accidental release (unmitigated leaks mentioned above) there is potential for a temporary impact only which would not be of a sufficient magnitude to effect a change in the current water body status.

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. 2.4 Km). 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 <3m to 5-10m low permeability overburden. Low fracture connectivity within the granite will limit any potential for off-site migration.	Granite bedrock aquifer (Poor Aquifer)	Low risk of migration through poorly connected fracturing within the granite rock mass (Poor Aquifer) and low permeability overburden. No likely impact on the status of the aquifer 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 Unmitigated run-off containing a high concentration of suspended solids	Indirect pathway through stormwater drainage and the Elm Park stream to Dublin Bay water course (distance source-receptor: 2.4 Km)	Elm Park Stream South Dublin Bay SAC/pNHA and South Dublin Bay and River Tolka SPA	No perceptible risk – Distance from source to Dublin Bay Natura sites (2.4 km approx.) Potential contaminant loading will be attenuated diluted and dispersed to below statutory guidelines within c. 0.5 km of the site i.e.no potential impact to the Natura sites
Operational Impacts (Summary)			
Foul effluent discharge to sewer	Indirect pathway to South Dublin Bay through public sewer (distance source-receptor: >5.7 km)	South Dublin Bay SAC/pNHA and South Dublin Bay and River Tolka SPA	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge (7.02 litres/sec which would equate to 0.063% 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 (70 litres worst case scenario)	Indirect pathway through stormwater drainage to Dublin Bay water course (distance source-receptor: 2.4 km)	South Dublin Bay SAC/pNHA and South Dublin Bay and River Tolka SPA	No perceptible risk – taking into account the extent of loading of contaminant, distance between the source and Dublin Bay is c. 2.4 km and significant dilution in the surface water sewer, 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, S.I. No.

			386 of 2015 and S.I. No. 77 of 2019).

Table 3.1 Summary of 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.

During construction and operation phases there is no direct source pathway linkage between the proposed development site and open water (i.e. South Dublin Bay SAC/pNHA and South Dublin Bay and River Tolka SPA). There are indirect source pathway linkages from the proposed development through public sewers which discharge to the Elm Park Stream which ultimately outfalls into Dublin Bay (2.7 km downgradient of the site). 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 0.063% 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 (without mitigation) of the proposed development which could result in a water quality impact which could alter the habitat requirements of the Natura 2000 sites within Dublin Bay.

Finally, in line with good practice, preventive measures are included during construction to minimise the potential for any accidental releases off site. These measures are to be included in the design of any such developments. 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 these measures.

5.0 REFERENCES

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