HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT for PROPOSED DEVELOPMENT at SANTA SABINA, SUTTON

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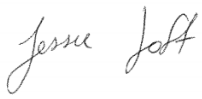
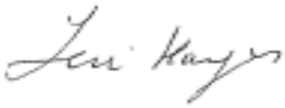
Signature		
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1.0 INTRODUCTION

1.1 Site Location & Hydrological Setting

Planning permission is sought for a strategic housing development at this site that formerly formed part of Santa Sabina Dominican College and Convent Complex, Greenfield Road, Sutton, Dublin 13. St. Dominic's Convent Santa Sabina, located to the east of the application site, is a protected structure (RPS No. 0794).

The development comprises alterations to the development permitted under Reg. Ref.: F17A/0615 (currently under construction)

It is recommended that this report should be read in conjunction with a number of other environmental reports which have been produced to accompany the proposed alterations, these include: Construction Environmental Management Plan (CEMP), a Best Available Techniques (BAT) assessment, the Ecology report, and Natura Impact Statement.

The site is currently under development, and the proposed alterations are located entirely on lands zoned RS- Residential. The lands surrounding the site consist of residential buildings and the grounds of St. Fintan's Church. The site has a topography range of approx. +5 mOD (North) to +4 mOD (South).

Figure 1.1 Site Location in relation to regional drainage (hydrological setting)

The site currently drains to ground and the proposed development will drain, following appropriate treatment by an oil interceptor to an existing storm sewer located between the adjacent St Fintans church lands and the development site and ultimately discharges to Dublin Bay.

1.2 Objective of Report

The scope of this desk top review is to develop a conceptual site model in order to identify any potential source pathway receptor linkages to a Natura 2000 site as a result of the construction and operation of the proposed development.

In particular, this review considers the likely impact of construction run-off and domestic sewage from the proposed development on water quality and overall water body status within Dublin Bay SAC/ SPA/ pNHA (EPA Site code: 000206 (EPA, 2019)) which is located circa. 50 m south of the proposed development (see Figure 1.1). The assessment relies on information regarding construction and design provided by DBFL Consulting Engineers (DBFL, 2020) for the site as outlined in their '*Engineering services Report:* (Report ref: 190008-DBFL-XX-XX-RP-C-3002., dated February 2020).

This report is prepared by *Teri Hayes* (BSc MSc PGeol EurGeol). Teri is a Senior Hydrogeologist/Director with over 25 years' 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). Teri's specialist area of expertise is water resource management, eco-hydrogeology, hydrological assessment and environmental impact assessment.

1.3 Description of Site Drainage

There is no direct discharge to an open stream/Dublin Bay proposed as part of this development. The proposed drainage from the site will directly discharge to public stormwater and to public foul sewer (via initial private foul drainage), for surface water run-off and foul wastewater, respectively.

The nearest surface water receptor (Dublin Bay) lies to the south of the proposed development site (refer Figure 1.1 above). There is no open-water linkage between the proposed development and this water body but there is an indirect linkage through the public stormwater and foul sewers.

The alterations on the current development consist of the proposed upgrade of associated infrastructure to service the development including a network of foul water and surface water drains, as well as a water main. The design will incorporate separate storm and foul sewer lines, with foul discharging to Ringsend Waste Water Treatment Plant (WWTP) through the IW sewer network.

Stormwater drainage from the site will drain to an attenuation tank (under construction) to an existing storm sewer located between the adjacent St Fintans church lands and the development site [190008-DBFL-XX-XX-DR-C-3000(P07)].

Stormwater is attenuated on site within the attenuation tank (574 m^3) as mentioned previously). A hydro-brake will be located on the stormwater outflow at a design limited total outflow rate for the proposed development of 6.1 l/s. Surface water run-off from the proposed development will then discharge along with surrounding stormwater to Dublin Bay SAC/ SPA/ pNHA, located 50 m to the

south of the site, An petrol interceptor is located on the stormwater system above the attenuation tank.

Foul sewage is domestic only and will discharge to the existing onsite IW foul sewer (190008-DBFL-XX-XX-DR-C-3001 (Foul water network layout)). It is understood that a connection to the foul water sewer is feasible without any upgrade and in accordance with Irish Water requirements and consultation has been undertaken with IW to confirm the capacity is available within the network for a capacity flow of up to 5.4 l/s. Therefore, the proposed outfall has adequate capacity to cater for the calculated flows from the development. The foul sewer eventually discharges to Ringsend (WWTP).

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

The proposed development site lies within the Mayne SC_010 WFD sub- catchment (EPA ID 09_17). The EPA (2019) WFD river sub basin is the Howth stream. The nearest stream is Howth Stream (EPA code: 09H230880) which is located to the east and upgradient of the site. There is no hydrological/hydrogeological pathway to this receptor. The Howth stream is relatively small (<1.3 km), it drains an area of 10.5 km. The stream flows in a generally north direction and discharges into the Irish Sea.

The project site is located next to the Dublin Bay. The Dublin Bay and Baldoyle Bay (EPA online site code: 00206 and 00070 respectively) waterbody includes Special Area of Conservation (SAC), Special Protection Area (SPA), and proposed Natural Heritage Area (pNHA). The Environmental Protection Agency (EPA, 2019) on-line mapping presents the available water quality status information for water bodies in Ireland. Dublin Bay and Irish Sea has a WFD status (2013 – 2018) of '*Good*'. Dublin Bay and Irish Sea waterbody has a WFD risk score of '*Not at risk'*. The ecological status of transitional and coastal water bodies during

2013-2018 for Dublin Bay and Irish sea is classed as 'good' (taken from Map 4.1 EPA, 2019). The most recent surface water quality data for the Dublin Bay and Irish sea for the 2015–2017 assessment on trophic status of estuarine and coastal waters indicate that they are '*Unpolluted'* (based on Map 10, EPA, 2018)'. 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 current EPA (2019) Bathing Water Quality report has classified Dollymount Strand as 'sufficient' for 2015 and 'good' 2016 – 2018.

2.2 Aquifer Description & Superficial Deposits

The Geological Survey of Ireland GSI (2019) classifies the bedrock beneath the overall site and the surrounding area as dominated by rocks from the Waulsortian Limestones. The online GSI (2019) tool classifies the bedrock as Massive unbedded lime-mudstone which are over 1200 m thick in the Shannon Estuary area but are more typically 300 - 500 m thick (Rock Unit new code: CDWAUL). There is a fault located to the south east of the site location.

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 (2019) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a *Locally Important Aquifer (LI), i.e. Bedrock which is Moderately Productive only in Local Zones*. The proposed

development lies within the Dublin Groundwater Body (GWB, IE_EA_G_008), classified as '*Moderately Productive'*.

The proposed development area groundwater body is classified as '*Moderately Productive only in Local Zones'*. Presently, the groundwater body in the region of the site (Dublin GWB) is classified under the WFD Status 2010-2015 (EPA, 2019) as '*good'*. 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 (2019) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*High vulnerability*' indicating an overburden thickness of 3 -5 m, and part of the subject site lies within the '*Extreme vulnerability' area.* This indicates a general thin overburden depth potential of <3 m of rock, indicating limited [if any] protection of the underlying aquifer. 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 (2019) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the study area, underlying namely Marine Beach Sands which reflects the location of the site next to Dublin Bay (50m).

Recharge to ground (where feasible) is considered best practice in regard to SUDS designs (Greater Design Strategic Drainage Study -Dublin City Council,) and CIRIA guidance documents is also the approach for the proposed development which will provide a mix of SUDS approaches (green roof, porous paving and infiltration trenches) to ensure run-off is of high quality.

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.

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. As part of the existing development (Reg. Ref.: F17A/0615) the attenuation tank, petrol interceptor and discharge connection is being installed. The CEMP includes for full containment for any small storage of hydrocarbons if required. Any significant storage of hydrocarbons is not envisaged during construction or operation, as construction vehicles will be refuelled off site and the site will be heated by gas/electricity during operation

<u>Construction Phase</u>

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

(i) The CEMP includes for full containment for any small storage of hydrocarbons if required. Any significant storage of hydrocarbons is not envisaged as construction vehicles will be refuelled off site and the site will be heated by gas/electricity during operation

(ii) Leakage could 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 concreted 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.

(iv) Construction requires soil excavation and removal and import. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. This could be considered an intermittent short-term event, i.e. if mitigation measures were not incorporated in the Construction Environmental Management Plan (CEMP).

Operational Phase

The following sources are considered plausible post construction:

(i) The development will be serviced by natural gas or electricity. In any event, the risk of a short-term release of oil is already considered under the construction scenario above. No other fuel/ hazardous materials form part of the development plans.

(ii) Leakage of petrol/ diesel fuel may occur from individual cars in parking areas, run-off may contain a worst-case scenario of 70 litres for example. The worst-case scenario risk of a short-term release of oil is already considered under the construction scenario above i.e. without mitigation. It is noted that a proposed oil/ petrol interceptor is to be provided at the site which will provide mitigation for a local car leak to surface, if required. If there is incidental flows from this area it will drain to the foul network.

(iii) 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 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 WWTP prior to subsequent discharge to Dublin Bay. This WWTP is required to operate under an EPA licence (D0034-01) and must meet environmental legislative requirements as set out in such licence. Permitted upgrade works (An Bord Pleanála, 2012: Ref 29N.YA0010), which include for an increase in treatment capacity, are on-going at the Ringsend plant. It is expected that these works will be completed in 2020. In April 2019, An Bord Pleanála granted permission for further upgrade works to the Ringsend WWTP. These further upgrade works are on-going and it is expected that the plant will be fully upgraded by 2025[1], providing greater treatment capacity along with other projects which to some extent address capacity issues Note 1.

Note 1: Irish Water (IW) have a number of projects which have receive planning or are within the planning process which will result in greater capacity for wastewater treatment for the greater Dublin area.

In particular, the following key projects are applicable:

(i) Ringsend WWTP upgrade – An application for the upgrade was lodged with An Bord Pleanála in June 2018 and planning permission was granted in April 2019. Upgrade works are scheduled to increase the treatment capacity from 1.64 million p.e. to 2.4million p.e. This upgrade is currently programmed to be complete in 2025.

(ii) Greater Dublin Drainage Project – A planning application was lodged with An Bord Pleanála in June 2018, an oral hearing held in March 2019 and a decision is currently awaited.

(iii) 9C sewer duplication. A planning application for this project was lodged with FCC on 11th May 2017 and FCC granted planning permission on 5th July 2017. Construction has commenced in summer 2019 and will be completed by September 2022.

(iv) The Liffey Siphons refurbishment project – Construction of this project commenced in May 2018 and is expected to be completed in December of this year.

3.2 Assessment of Pathways

The following pathways have been considered within this assessment with impact assessment presented in Section 3.4:

- The potential for vertical migration to the underlying marine sands exists due to the recorded Extreme vulnerability present at the site, and limited aquifer protection from any localised diesel/ fuel oil spills during either construction or operational

[1] https://www.water.ie/projects-plans/ringsend/faqs/

phases. The site is underlain by high permeable subsoil of sand and gravels which is overlain by well-drained soil which the GSI classifies as a *locally important Aquifer (LI), i.e. Bedrock which is Moderately Productive only in Local Zones*.

-There is no open water hydrological linkage with Dublin Bay located farther down-gradient. However, an 'indirect pathway' does exist through the public stormwater sewer network which ultimately discharges to Dublin Bay (50 m downgradient).

-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 final discharge to Dublin Bay post treatment.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

(i) Highly permeable subsoil of sand and gravels;
(ii) Dublin Bay;
(iii) Bathing Water Quality sites -Dollymount Strand.

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.

There is a pathway for contamination to the underlying aquifer based on the permeable sub soils and the aquifer vulnerability map. The bedrock is '*Moderately Productive only in Local Zones'*.

Standard mitigation as outlined in the CEMP to allow settlement of any silt laden stormwater during construction will be incorporated into the construction plan design to minimise any impacts on stormwater discharge. However, should any silt-laden stormwater from construction manage to enter the public stormwater sewer the suspended solids will naturally settle within the drainage pipes and not likely reach the outfall to Dublin Bay SAC/SPA/pHNA. As such there is no perceptible risk of water quality impacts arising from the development, and therefore there is no possibility of undermining the conservation objectives of any of the qualifying

interests or special conservation interests of the European sites as a result of hydrological and/or hydrogeological impacts.

The CEMP includes for full containment for any small storage of hydrocarbons if required. Any significant storage of hydrocarbons is not envisaged as construction vehicles will be refuelled off site and the site will be heated by gas/electricity during operation. With the presence of an oil/ petrol interceptor in place during operation of the proposed development, there is no likely impact above statutory thresholds in the off-site stormwater drainage from individual car leaks. Based on the possible loading of any hazardous material during construction and operation there is no potential for impact on Dublin Bay water quality status from an accidental discharge of fuel to stormwater.

Based on a value of 200 litres/person/day (l/p/day) for residential units and an occupancy of 386 people (2.7 average per unit) within 143 units and floor area. The average wastewater discharge is calculated at 0.9 l/sec and the Peak Foul DWF is calculated to be 5.4 l/sec.

The sewage discharge will be licensed by Irish Water, collected in the public sewer and treated at Irish Water's WWTP at Ringsend prior to treated discharge to Dublin Bay. This WWTP is required to operate under an EPA licence (D0034-01) and to meet environmental legislative requirements. The plant has received planning (2019) and is being upgraded with increased treatment capacity over the next five years. The foul discharge, calculated for the proposed development is well within the 'minimum' capacity of the proposed outfall, i.e. 54 l/sec to the Irish Water foul sewer line. Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.048% of the licensed discharge (peak hydraulic capacity) at Ringsend WWTP and 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). (*Note: the average effluent discharge equate to approx. 0.008% of the* licensed discharge (peak hydraulic capacity) at Ringsend WWTP). 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 (WWTP 2012 EIS, WWTP 2018 EIAR).

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 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 Ringsend WWTP will not be significant having regard to the size of the calculated discharge from the proposal.

There have been a number of breaches of the EPA licence for the Ringsend WWTP, due to stormwater overflows etc. However, recent water quality assessment shows that these overflows have not been shown to have had a longterm detrimental impact on the water body status. Map 4.1 in the 2019 EPA Water quality in Ireland (2013-2018) shows that the ecological status of transitional and coastal water bodies during 2013-2018 for Dublin Bay and Irish sea is classed as 'good'. The water quality status information for Dublin Bay and Irish Sea has a WFD status of '*Good*' (2013-2018). The WFD risk score for both waterbodies is '*Not at risk'*, and the surface water quality data for the Dublin Bay and Irish sea (2015-2017) indicate that they are '*Unpolluted*' based on Map 10 in the 2018 EPA Indicators Report.

The 'Good' bathing water status (issued by the EPA for the downgradient Dollymount Strand) will be unchanged by the proposed development. The existing and proposed foul and storm sewers are 'separate' in compliance with the Building Regulations and Dublin City Councils '*Regional Code of Practice for Drainage works and Irish Waters Code of Practice for Wastewater Infrastructure'*. As such, there is no potential for sewage-laden water from the proposed development to enter the local stormwater network ultimately discharging at Dublin Bay.

Source	Pathways	Receptors considered	Risk of Impact (without mitigation)
Construction Impacts Unmitigated leak from a construction vehicle.	Vertical movement due to the permeable underlying beach sands and gravels (Extreme aquifer vulnerability)	Limestone aquifer	Moderate to high risk of localised impact to shallow limestones due to shallow thickness of overburden. No likely impact on the status of the aquifer based on the nature & volume of hazard present some natural attenuation
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 to Dublin Bay	Dublin Bay (SAC/ SPA/ pNHA)	No likely impact due to low contaminant loading and attenuation and significant dilution near discharge point
Operational Impacts Foul effluent discharge to sewer	Indirect pathway to Dublin Bay through public sewer, however main pathway is via Ringsend WWTP	Dublin Bay (SAC/ SPA/ pNHA)	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge from the site would equate to 0.048% of the licensed discharge at Ringsend WWTP Note 2. This 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 carpark leak	Indirect pathway through stormwater drainage to Dublin Bay		No likely impact due to low contaminant loading and short-term nature of any likely impact.

Table 3.1 Pollutant Linkage Assessment *(without mitigation)*

Note 2: This assessment is based on the current licenced discharge from the Ringsend WWTP. Irish Water (IW) have a number of projects which have receive planning or are within the planning process which will result in greater capacity for wastewater treatment for the greater Dublin area. In particular, the following key projects are applicable: Ringsend WWTP upgrade, Greater Dublin Drainage Project, 9C sewer duplication, and The Liffey Siphons refurbishment project.

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” in place at the proposed development site that are intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures).

It is concluded that while there is an indirect source pathway linkage from the proposed development site via the public sewer and the Ringsend WWTP, the impact of foul effluent from the proposed development will not result in any change to the current regime (water quality or quantity) in any of the Dublin Bay Natural 2000 Sites. There is no other resultant indirect source pathway linkage from the proposed development which could give rise to any such change.

During construction there is potential for a localised spill of hydrocarbons or run—off of water with high suspended solids if unmitigated at the site. It is concluded that there is no likely impact on water quality status within the bay due to the low contaminant loading and attenuation and significant dilution near discharge point. Finally, as outlined in the CEMP report prepared by DBFL (2020), and in line with good practice, mitigation measures have been included in the construction design, management of construction programme and during operation of the proposed development. These specific measures will provide further protection to the receiving soil and water environments.

5.0 REFERENCES

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