8 WATER

8.1 Introduction

This chapter has been prepared by Waterman Moylan Consulting Engineers.

This section describes the impact of the proposed development on the surrounding hydrological (surface water) and hydrogeological (groundwater) environment both during the construction and operation phases. The interaction between the surface water drainage proposed as part of the development will also be assessed in this chapter.

8.2 Study Methodology

The methodology followed for this section is in accordance with the EPA "Environmental Impact Assessment Reports, Draft Guidelines 2017".

The following information sources were used in the assessment of the local hydrology and hydrogeological aspects of the proposed development site.

- Geological Survey of Ireland (GSI) Website
- Environmental Protection Agency
- Office of Public Works (OPW) National Flood Hazard Mapping
- OPW Catchment Flood Risk and Management Studies
- DLRCC Drainage Record Maps
- Ordinance Survey Mapping
- Topographical Survey
- Site investigation reports and soakaway testing

The following methodology have been adopted for this assessment:

- Review of relevant information including where available Development Plans, existing drainage information and other relevant studies as outlined above; and
- Consultations with Dún Laoghaire-Rathdown County Council to agree drainage strategy.

8.3 The Existing Receiving Environment (Baseline)

The subject site is bounded to the north by Brewery Road, to the east by Stillorgan Road, to the southwest by the Leopardstown Tennis Club and to the southeast by existing residential developments.

Hydrology (Surface Water)

The subject site falls from south east to northwest ranging in level from 74.00m in the south east to 66.00m in the northwest.

The Carysfort Maretimo/Brewery Road Stream is a highly modified urban watercourse which traverses the north western boundary of the subject site. It is proposed to discharge surface water from site directly to this culverted stream which subsequently discharges to Dublin Bay.

Hydrology (Groundwater)

A review of the Environmental Protection Agency website database at https://gis.epa.ie/EPAMaps/ classifies the groundwater risk on the subject lands as 'Not at Risk'. The groundwater risk looks at the current water quality and trends and is used to highlight waterbodies that are at risk of deteriorating or being at less than good status in the future.

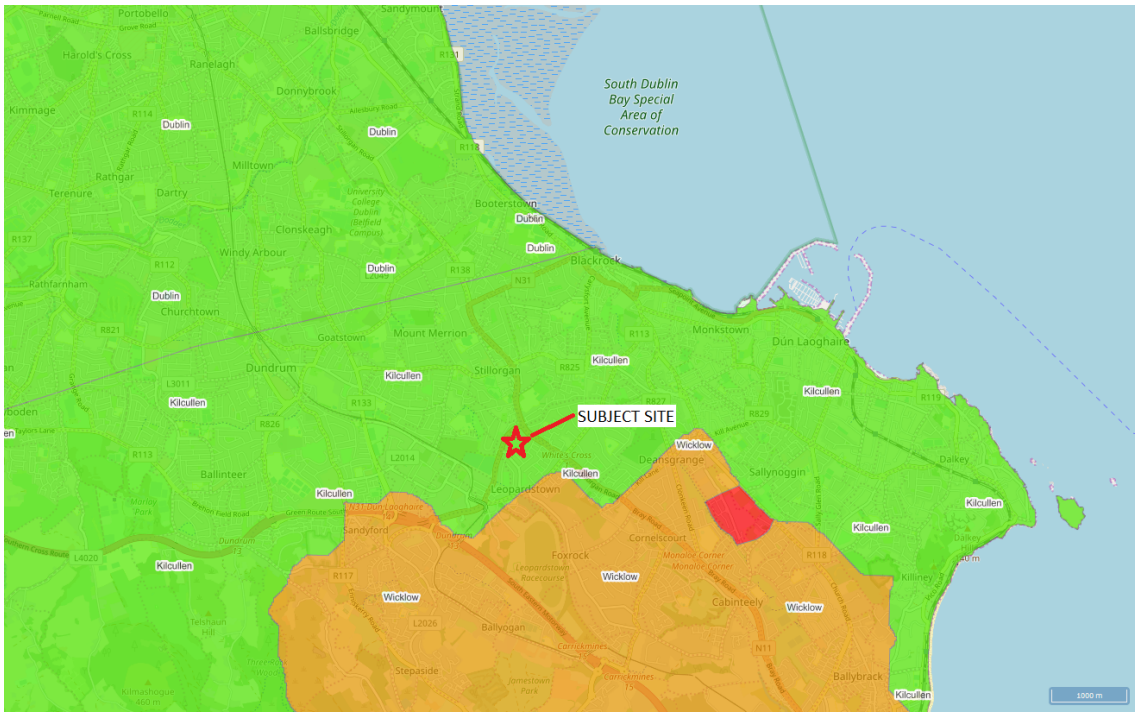

Figure 8.1 - Groundwater Risk (EPA)

GSI's aquifer classes are divided into three main groups based on their resource potential, and further sub-divided based on the type of openings through which groundwater flows. A review of the GSI database revealed that the aquifer below the subject lands is classified as PI, Poor Aquifer – Bedrock which is generally unproductive except for local zones.

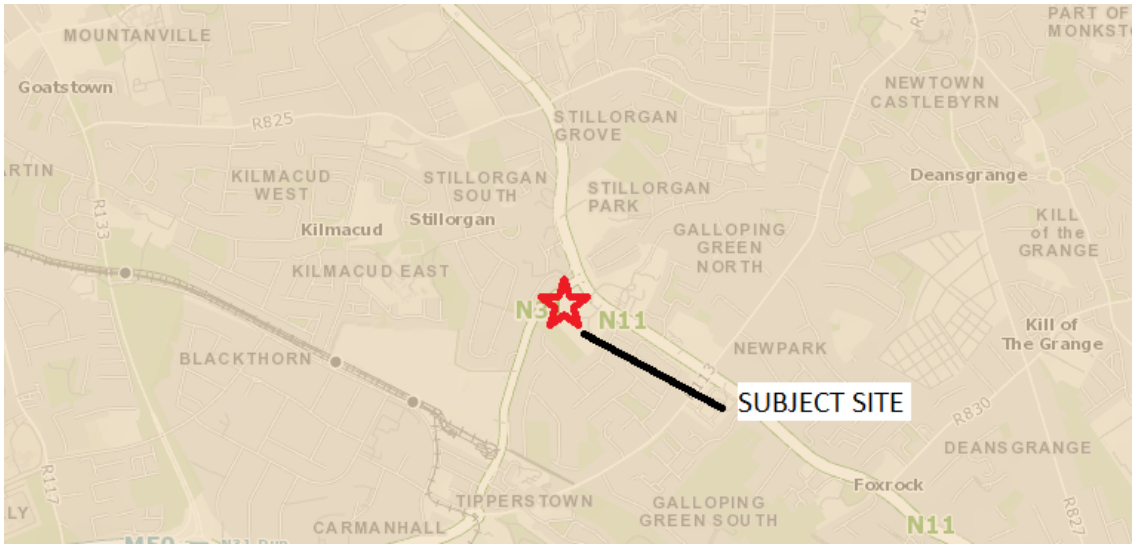

Figure 8.2 - GSI Aquifer

Flood Risk Assessment

A Food Risk Assessment has been prepared by Waterman Moylan Engineers and is available under separate cover. This Flood Risk Assessment has been carried out in accordance with the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009. The assessment identifies and sets out possible mitigation measures against potential risks of flooding from various sources. Sources of possible flooding include coastal, fluvial (river), pluvial (direct heavy rain) and groundwater.

The Office of Public Works Flood Mapping (CFRAM Mapping). indicates that a proportion of the site at the entrance and in the vicinity of Block N is at risk of flooding during the 1 in 1000 year storm event.

The flood risk assessment sets out the appropriate mitigation measures to ensure that risk from fluvial flooding is mitigated.

The risk from groundwater flooding was considered to be high given that groundwater was observed in three boreholes at a level of 2.8, 2.6 and 1.25m below ground level which equates of 67.4mOD BH2, 66.97 mOD in BH7 and 66.43mOD in BH09. The Flood Risk Assessment provides mitigation measures which are summarised below:

Adequate measures to waterproof the areas at risk, for example the basement carpark, must be put in place. In the event of ground water flooding the access road and surrounding green areas, this water can escape from the site via the overland flood routing as there is a rise in level from the access road to the basement entrance ramp and the building levels have been set higher than the surrounding access road levels. Therefore, there is low residual risk of flooding from ground water.

AA Screening

Indirect impacts from foul and surface discussed in the AA Screening commentary are addressed in the Biodiversity Chapter of this EIAR.

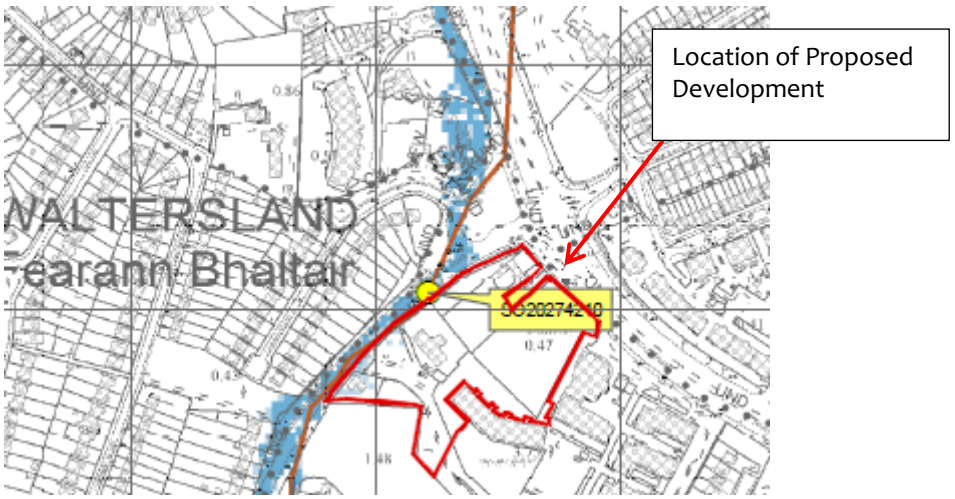

Figure 8.3 - Regional Fluvial Flooding Map (OPW, 2017)

In addition, The Carysfort Maretimo Fluvial Flood Extents study map (EO9CAR_EXFCD_F2_06 Sheet 6 of 7), dated 27 October 2017, as shown in Figure 8.3. indicates that a proportion of the site at the entrance and in the vicinity of Block N is at risk of flooding during the 1 in 1000 year storm event. It is noted that the flood map indicated a 1 in 1000 year food level of 63.28m OD. The corresponding road level in the same location of node SO20274210 is 66.11m OD, therefore the flood level indicated on the flood map cannot be considered accurate.

Furthermore, the primary area indicated as flooding is Brewery Road which falls steeply as it passes The Grange Development. The road level at the entrance to The Grange is 68.5m where as the road level at the N11 is 65.78m OD. The distance from The Grange entrance to the N11 is only 175m. We would note that the flooding shown on the flood map is most likely overland flow.

In order to ensure an adequate free board is achieved, in the absence of accurate flood levels, the existing levels on site were compared to the flood extents map. The existing vehicular entrance, which is at a level of 68.5m OD is indicated as being at risk of flooding during the 1 in 1000 year event. It is proposed that the finished floor level of Block N, adjacent to this entrance, will be 69.5m OD ensuring that an adequate free board is achieved.

In addition, safe access for emergency services can be maintained to the development during an extreme flood event via the Stillorgan Road from the south of the development. And safe access and egress for pedestrians can also be achieved by moving south from the building entrance towards the existing Grange development.

A summary of flood risk can be seen in table 8.1 below

Source	Pathway	Receptor	Likeli-hood	Consequence	Risk	Mitigation Measure	Residual Risk
Tidal	Irish Sea Coastal zone	Proposed Development	Low	High. Flooding of building and the basements	Very Low	None required	Very Low
Fluvial	Carysfort Maretimo	Proposed Development	Low	Moderate. Water ingress into the building and basements	Very Low	None required	Very Low
Pluvial	Private and Public Drainage Network	Proposed Development	High	High. Flooding of the building and basements	High risk of damage to the building and basements	Appropriate drainage design, over land flood routing and setting of appropriate floor levels	Low
Ground Water	Groundwater present in the ground seeping through basement walls and floor	Proposed Development	High	Moderate. Ground water ingress into basement	Low	Adequately waterproofing of basement structure if found necessary	Low
Human / Mechanical Error	Drainage network	Proposed Development	High	Moderate. Water ingress into the building and basements	Moderate risk of damage to the building	Maintenance strategy	Low

Table 8.1 Summary of the Flood Risks from each flooding type

8.4 Characteristics of the Proposed Development

In summary, the project provides for the demolition (total c.1,398 sq m GFA) of:

- The Grange Select Marketing Suite' (1 storey)
- 'Oaktree Business Centre' (2 storeys)
- 'The Lodge' (2 storeys)

and the construction of a new 'Build to Rent' residential scheme of 287 residential apartment units; residential tenant amenity space of 961.5 sq m; a crèche facility of 658 sq m; and a substation of 96.5 sq m in the form of 6 new blocks (Blocks H, J, M, N, P and Q) ranging in height from 1 - 11 storeys. The residential element of the scheme provides for the following development mix:

- 19 x Studio Units (6.6%)
- 125 x 1 Bedroom Units (43.6%)
- 143 x 2 Bedroom Units (49.8%)

A total of 100 no. car parking spaces, 596 no. cycle spaces and 5 no. motorcycle spaces are also proposed together with all associated site development works.

It is proposed that the surface water run-off from the development will drain via gravity to the existing sewer in Brewery Road. Surface water run-off will be restricted to 6.36 l/s greatly reducing the run-off rate from site. It will be necessary to treat and then store excess storm water within the site. This will be achieved by using a Sustainable drainage network of Green Roofs, Swales and Permeable Paving all discharging the treated water to underground storage tanks. Surface water run-off will be restricted by two separate hydrobrakes, which equate to a total outfall rate for the proposed development of 6.36 l/s. The storm water system will be designed to cater for the 1 in 100-year storm plus a 20% allowance for climate change.

Construction activities with a possible impact to surface water and groundwater features will include the following:

- Excavation of soil, sub-soil and vegetation.
- Infilling and landscaping will be undertaken.
- Excavation of basement.
- Temporary storage/use of fuel/oils on site will be required for construction machinery.

Operational Activities will include the following:

- The total hardstanding area will be increased. It is expected that the surface water will be discharged to the public surface water network following attenuation to greenfield run-off rate and discharged through a petrol / hydrocarbon interceptor. The attenuation system (underground) has a capacity of 544m3 and a hydrobrake system will be employed to manage the outflow.

8.5 Potential Impact of the Proposed Development

The potential impacts of the proposed development from both a hydrology (surface water) and hydrogeology (groundwater) perspective at construction and operational stages are outlined in the following sections.

Construction Stage

Significant amounts of site stripping and excavation will be required in order to construct the development. When the site has been stripped layers of sub-soil will be exposed to weathering and

there will be potential for erosion due to rainfall and subsequent runoff. The erosion of soil can lead to sediments being washed into the receiving watercourses /sewers at higher rates of runoff.

There is also potential during the development's construction stage that contaminants from cement/concrete be washed into the receiving watercourses / sewers.

There is a risk of pollution of groundwater / watercourses / soils by accidental spillage of oils / diesel from temporary storage areas or where maintaining construction equipment.

Foul water could be connected to the surface water drainage network resulting in the contamination of the receiving watercourses. Furthermore, if there is damage to any foul pipes, there is potential for contaminants to seep into the groundwater.

The construction of the proposed development has potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater.

Operational Stage

The proposed development will result in increased impermeable areas and there is potential for an increase in risk of higher rates of surface water runoff leading to increased downstream flooding.

There is a potential impact for the discharge of contaminants from the proposed development and road surfaces to the surrounding drainage sewers. These would include particulates, oil, soluble extracts from the bitumen binder etc. The quality of runoff from the site would be dependent on the time of year, weather, particulate deposition from the atmosphere and any gritting or salting carried out by the Local Authority. The time of year has a major bearing on the quality of storm water run-off - in particular the first rains after a prolonged dry period where accumulated deposits of rubber, particulates, oils, etc. are, washed away.

There is potential for leaks in the foul network to result in contamination of the groundwater.

Accidental spills of fuels/hydrocarbons and washing down into the drainage pipe network has the potential to impact on the receiving hydrogeology.

The operation of the proposed development has the potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater.

8.6 Potential Cumulative Impacts

Existing Grange Development

There are no additional impacts to those outlined in section 8.5.

Future Phase 2 Development

Evidently, the applicant does not control the entirety of remaining lands to provide consolidated development to the N11 frontage. This current application therefore relates to a Phase 1 development on lands that can deliver critically required residential units. OMP Architects have developed a phased Masterplan approach to provide an indicative future context for consideration by An Bord Pleanala, which is enclosed herewith. There has been a carefully considered design approach to development to ensure that the subject application can be delivered without compromising existing amenity or the future potential for development addressing the N11.

The Masterplan successfully integrates this new phase of development with the existing built fabric of The Grange. The approach has been to set the blocks around a central garden, which complements the existing scheme and delivers significant enhancements to the public realm.

Overall, it is estimated that there is potential for a further c. 250 units as part of a Phase 2 development.

As with Phase 1, Phase 2 will increase the impermeable areas and there is potential for an increase in risk of higher rates of surface water runoff leading to increased downstream flooding. However, no significant additional impacts are anticipated to arise as a result of any future development.

8.7 Do Nothing Scenario

In this scenario, surface water runoff would continue to be discharged to the receiving sewer at existing un-restricted discharge rates. The receiving watercourses and groundwater aquifers would remain in their current state and there would be no change.

8.8 Risks to Human Health

There is a risk to Human Health should the ground water or the existing water supply become contaminated during the construction or operational stages, and the water is consumed. In order to mitigate these risks the measures outlined below will be adopted.

8.9 Mitigation Measures

This section of the report will discuss mitigation measures to reduce the impact of the proposed development on the surrounding water environments during the construction and operation phase.

Construction Stage

A Construction Management Plan has been prepared for this application and in included under a separate cover. It is considered that the Construction Management Plan (CMP) will be updated by the appointed contractor. In order to minimise the potential impact of the construction phase of the proposed development on the surrounding surface water and groundwater environs, the following construction stage mitigation measures are to be included in the plan and be implemented in full.

- The contractor will appoint a suitably qualified person to oversee the implementation of measures for the prevention of pollution to the receiving surface water environment.
- To minimise the adverse effects, the prevailing weather conditions and time of year is to be taken into account when the site development manager is planning the stripping back of the site.
- Site stripping will be minimised as far as practicable.
- Settlement ponds / silt traps will be provided to prevent silt runoff into the existing sewers / watercourses during the drainage works.
- Regular testing of surface water discharges will be undertaken at the outfall from the subject lands. The location for testing and trigger levels for halting works will be agreed between the project ecologist and the site foreman at the commencement of works.
- Where silt control measures are noted to be failing or not working adequately, works will cease in the relevant area. The project ecologist will review and agree alternative pollution control measures, such as deepening or redirecting trenches as appropriate, before works may recommence.
- All fuels and chemicals will be bunded, and where applicable, stored within double skinned tanks / containers with the capacity to hold 110% of the volume of chemicals and fuels contents. Bunds will be located on flat ground a suitable distance from any watercourse or other water conducting features, including the cut off trenches.
- Foul and surface water pipes will be carefully laid so as to minimise the potential for cross connections which results in contamination of receiving watercourses.
- Site personnel inductions are to be conducted such that all site personnel are made aware of the procedures the best practice in relation to the management of surface water runoff and ground water protection.

- Where possible, precast concrete units are to be used to avoid on-site "wet" mix concrete usage. In situ concrete pours are to be managed in accordance with best practice to avoid overspills
- Concrete truck and wheel wash down facilities are to be provided in designated areas. Discharge from these areas is to be directed into the settlement ponds / silt traps.
- Topsoil for landscaping will be located in such a manner as to reduce the risk of washing away into local drainage or watercourses.

Operational Stage

The implementation of the following operation stage mitigation measures will minimise the impact on the hydrology and hydrogeology aspects of the development lands.

- The surface water drainage network has been designed in accordance with the CIRIA SUDS Manual and the Greater Dublin Strategic Drainage Scheme. The appropriate interception mechanisms and treatment train process has been incorporated into the design.
- Surface water outflow will be restricted to the equivalent greenfield runoff rate.
- Flow restrictors with attenuation storage will be used to slowdown and store surface water runoff from discharging above green field rates to the sewer.
- Attenuation systems will be constructed on-line to intercept the first flush during rainfall events after periods of dry weather.
- Sustainable urban drainage measures, including green roofs, permeable paving and filter strips/ swales will be provided to improve water quality.
- A petrol interceptor will be installed to prevent hydrocarbons entering the local drainage system.
- The attenuation storage systems will be constructed at a fall to maintain movement of water and thus prevent stagnation. Silt will be collected at a sump and removed periodically.
- Regular inspection and maintenance of the drainage network, including petrol interceptor.

8.10 Predicted Impacts of the Proposed Development

Construction Stage

Due to the proposed mitigation measures outlined above, and the implementation of a Construction Management Plan, the impact during construction stage on the hydrology and hydrogeological aspects of the lands is not significant.

Operational Stage

Due to the proposed mitigation measures outlined above many of the potential impacts will not arise during the operational phase of the proposed development on surface water and groundwater quality.

Surface water discharge from the site will be restricted by means of attenuation, therefore, no adverse impact in respect of flooding downstream will arise from the proposed development.

The installation of a Sustainable Urban Drainage System will ensure surface water runoff will be of high quality before discharge to the receiving culverted Brewery Stream in Brewery Road and will not have an impact on the receiving waters downstream of the development.

The impact following the operational phase mitigation measures outlined above is imperceptible.

8.11 Worst Case Scenario

The worst-case scenario in relation to hydrology and hydrogeology during construction phase would be the failure to implement the mitigation measures outlined above. This may result in the contamination of the receiving surface water network and / or groundwater.

A technical report prepared by AWN Consulting Ltd. (2019), which outlined the hydrological qualitative risks for the proposed development concluded that there would be no perceptible risks to downstream European sites for the following reasons:

- If any silt-laden run-off from construction enters the surface water sewer and culverted section of Brewery Stream which runs under Brewery Road, the suspended solids will naturally settle within the drainage pipes by the time the stormwater reached any open watercourse (Dublin Bay SAC/SPA/pHNA is located >2.5km away). Settlement is considered to occur within a distance of <0.5km.
- In the event of a (theoretical) 300 litre (worst case scenario) hydrocarbon leak fully discharging into the stormwater sewer during low flow conditions without mitigation, there is potential for some impact on surface water in the receiving Brewery Stream prior to dilution in the stream. This would be a short-term event. However, with the presence of an oil/petrol interceptor within the sealed basement car park area of the proposed development, there is no likely impact above statutory levels. Based on the possible loading of any hazardous material during construction and operation there is subsequently no potential for impact on Dublin Bay water quality status from an accidental discharge to stormwater which will discharge to the Brewery Stream.

In relation to the operation stage, the worst case would be the flooding of the surface water drainage network. In this regard, the network has been designed to accommodate a 20% increase in flows due to climate change. Finished floor levels have also been set with appropriate freeboard and an overland flood route through the site has been provided.

Implementation of the mitigation measures outlined in this document will reduce the risk of the worst case scenario occurring, making this unlikely.

8.12 Monitoring

Construction Stage

Implementation of the Construction Management Plan is required to protect the hydrology and groundwater elements of the subject lands during construction stage. Maintenance of the mitigation measures and monitoring of the management processed is required to ensure best practice.

The monitoring measures to be implemented include:

- Monitoring of the management and storage of dangerous chemicals and fuel.
- Monitoring and maintenance of the wheel wash facilities.
- Regular maintenance and monitoring of the sediment control measures.
- Monitoring and maintenance of the SUDS features, road gullies and, attenuation tanks during the construction phase of the development.

Operational Stage

Monitoring and maintenance of the SUDS features, road gullies, attenuation and flow control devices are imperative during the operation phase of the development.

8.13 Reinstatement

No reinstatement is anticipated on site with respect to the Water environment.

8.14 Interactions

The main interactions relating to this EIAR Chapter are Land & Soils, Biodiversity and Utilities.

During construction stage, the connection of wastewater services has the potential to impact ground water if wastewater were to leak from the network during the construction process. There are potential implications for the local populations if there is a disruption to utility services during the connection of the new services to the proposed development. The construction of the various services will also interact with construction traffic as outlined in the Traffic and Transport Chapter.

During the operation stage, the water supply and foul drainage services have a potential interaction with the available water supply and with potential pollution to natural water bodies.

In respect of Land & Soils, interaction between surface and ground water and the bedrock geology is feasible. Any impact will be negligible as the aquifer is at low risk and is not considered to be regionally important. The implementation of the mitigation measures outlined in this chapter will reduce the potential of surface contaminants into the underlying geology.

In respect of Biodiversity, there is interaction between hydrology and the downstream habitats present along the Carysfort Maretimo/Brewery Stream. The mitigation measures ensure that surface water runoff is treated to the required standards so that downstream habitats are not negatively impacted.

8.15 Difficulties Encountered

There were no particular difficulties encountered compiling the Water chapter of the EIAR.

8.16 References

Environmental Impact Assessment Reports – Draft Guidelines, (2017), Environmental Protection Agency

Environmental Protection Agency available at http://gis.epa.ie/EPAMaps/

Geological datasets available at www.gsi.ie

Greater Dublin Strategic Drainage Study (GDSDS), (2015), Dublin Drainage

OPW Eastern CFRAM study

OPW Flood Hazard Mapping