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Attachment-7-1-3-2

Surface Water and Ground Emissions Impact Assessment

Report Prepared For

Amazon Data Services Ireland Limited

Report Prepared By

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Our Reference

HB/0496WR01

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11 September 2024

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CONTENTS

1.0 INTRODUCTION

This report presents the assessment of emissions from the Site to water and ground as a result of the operation of the data storage facilities, to support an Industrial Emissions Licence review application, due to the expansion of the existing Installation (IE Licence P1181-01) to include a second data storage centre building and ancillary elements. Due to the interrelationships between these aspects a combined single impact assessment report has been prepared. Additionally, for this same reason the wider impacts of emissions to storm water and foul sewer have also been discussed herein.

This report was completed in a format consistent with the *Environmental Protection Agency's (EPA) Licence Application Form Guidance – Industrial Emissions (IE), Integrated Pollution Control (IPC) and Waste (EPA, 2018).*

The Application Form Guidance states that: *The expectation is for the 'receiving environment report' to be separate from the 'emissions impact assessment' but they are interrelated. Information may be combined in the 'impact assessment report', where it is logical to do so. In this case the reason for combining the reports should be clearly stated in the submitted report.*

Due to the nature of the localised impacts of the installation and the completion of baseline assessment (Attachment 4-8-2-Complete Baseline Report) and separate modelling reports for emissions to air (Attachment-7-1-3-2 Air Emissions Impact Assessment) and to noise (Attachment-7-1-3-2 Noise Impact Assessment), it is logical to combine the receiving environment report' and 'emissions impact assessment' into one report.

The extended Installation has no process emissions to ground, groundwater, or surface water.

The emission to storm sewer consists of storm water runoff from building roofs, yards and the road network. Residual cooling water (clean water applied for cooling) is discharged from the cooling systems to the storm sewer. There are no additives to the water during the cooling process. An assessment of the potential impact of the storm water discharge, specifically the cooling water discharge, is included as Appendix A to this report.

The storm water from the site discharges at 1 no emission point (SW1) to a storm water pipe along the eastern boundary of the site which discharges into the existing IDA storm water drainage network via a 300 mm connection. The storm water passes through hydrocarbon interceptors to ensure that the quality of the storm water discharge is controlled. This network is shown on Drawing 21_123G-CSE-00-XX-DR-C-1100 Surface Water Layout Plan. The IDA Park storm network ultimately discharges to the River Boyne at Drogheda, close to the Ramparts / St Dominics Park at a distance of c. 1.5km from the site.

Further detail on the storm water network and emissions is set out in Attachment 4-8-1 - Operational Report.

Domestic effluent arising from occupation of the Site, including from the Oldbridge Substation control building is discharged to the IDA foul sewer (at Emission Point SE1). Drainage of rainwater from the fuel top-up tank bund for Building A, rainfall which passes through the back-up generator exhaust stacks, and drainage from the Oldbridge substation transformer compound is also directed to foul sewer at Emission

Point SE1. Refer to Drawing 21_123G-CSE-00-XX-DR-C-1200 for the foul drainage layout. The foul network ultimately discharges into a regional pumping station before final treatment and disposal at Drogheda Wastewater Treatment Plant (WWTP).

Further detail on the foul water network and emissions is set out in Attachment 4-8-1 Operational Report.

The main substance of concern in respect of impacts on ground or surface water bodies is hydrocarbons from car park run-off or the unlikely event of an overspill from refilling the emergency generator fuel tanks.

2.0 ASSESSMENT OF STORM WATER EMISSIONS

2.1 METHODOLOGY

This assessment of the storm water emissions examines the potential impact on the surface water environment. It includes a review of both the known storm water emissions from the site as well as potential emissions through spills, accidents etc.

The existing surface water environment is described in terms of water quality with reference to environmental quality objectives and standards and any objectives and standards laid down for protected areas. This is followed by a summary and an assessment into the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

This assessment has been prepared from both a desktop review of existing information, and site specific investigations. The following is a list of sources of information consulted for use in this section:

- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information;
- Environmental Protection Agency (EPA) – www.epa.ie on-line mapping and database information;
- IGSL Site Investigation, Donore Road Drogheda, Industrial Development Authority, Clifton Scannell Emerson Associates, July 2000;
- Planning Application to Meath County Council Environmental Impact Assessment Report, Data Storage Facility Development Drogheda IDA Business and technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting December 2019;
- Drogheda Due Diligence Report, ADSIL, 08th March 2019 (ref:18_186);
- Stage 1 Flood Risk Assessment, Substation Facility Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting, 18th December 2019.

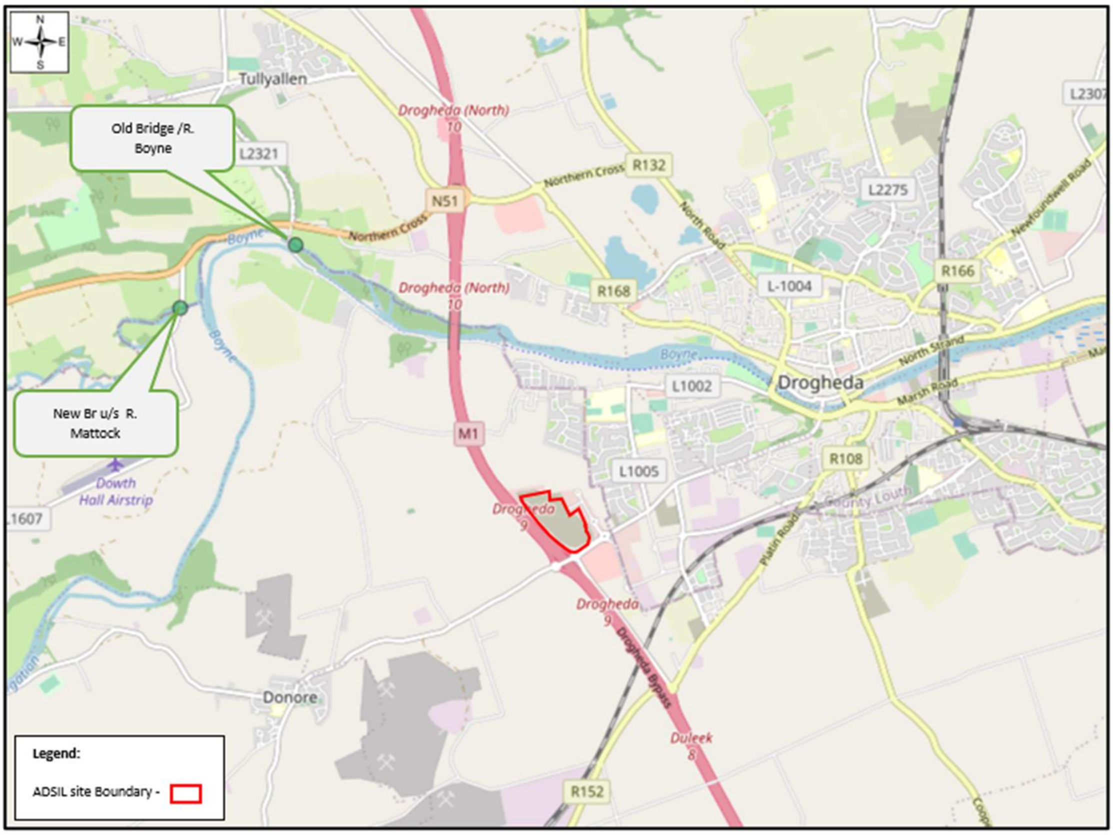
2.2 RECEIVING ENVIRONMENT

The existing surface water environment in terms of water quality with reference to environmental quality objectives and standards and any objectives and standards laid down for protected areas is described in Section 7.3 of the Baseline Report (Attachment 4-8-3).

The Site is within the catchment of the River Boyne which runs approximately 1km north of the site flowing in an easterly direction towards the Irish Sea. The Sheephouse Stream and Stagrennan Stream to the northwest and southeast of the site, respectively, discharge to the River Boyne but have no connectivity with the site.

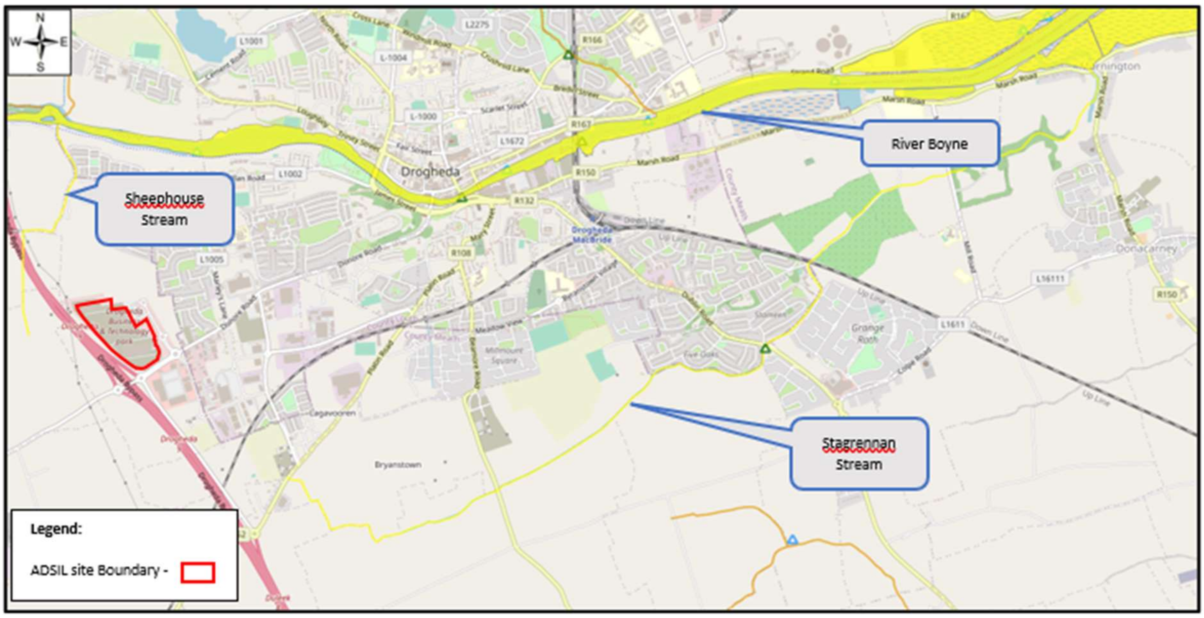
There are no streams on the site itself or along its boundaries. Storm water run-off is collected and discharged to the storm sewer within the IDA Business and Technology Park which eventually discharges to the River Boyne..

The Old Bridge (RS07B042200) water quality monitoring station located upstream of the Boyne Estuary (Insert 2.1) obtained a Q4- Good WFD status in 2020 and the water monitoring station at the River Mattock (Insert 2.1) discharging into the Boyne upstream of (RS07B042200) obtained a Q4- Good WFD status in 2020.



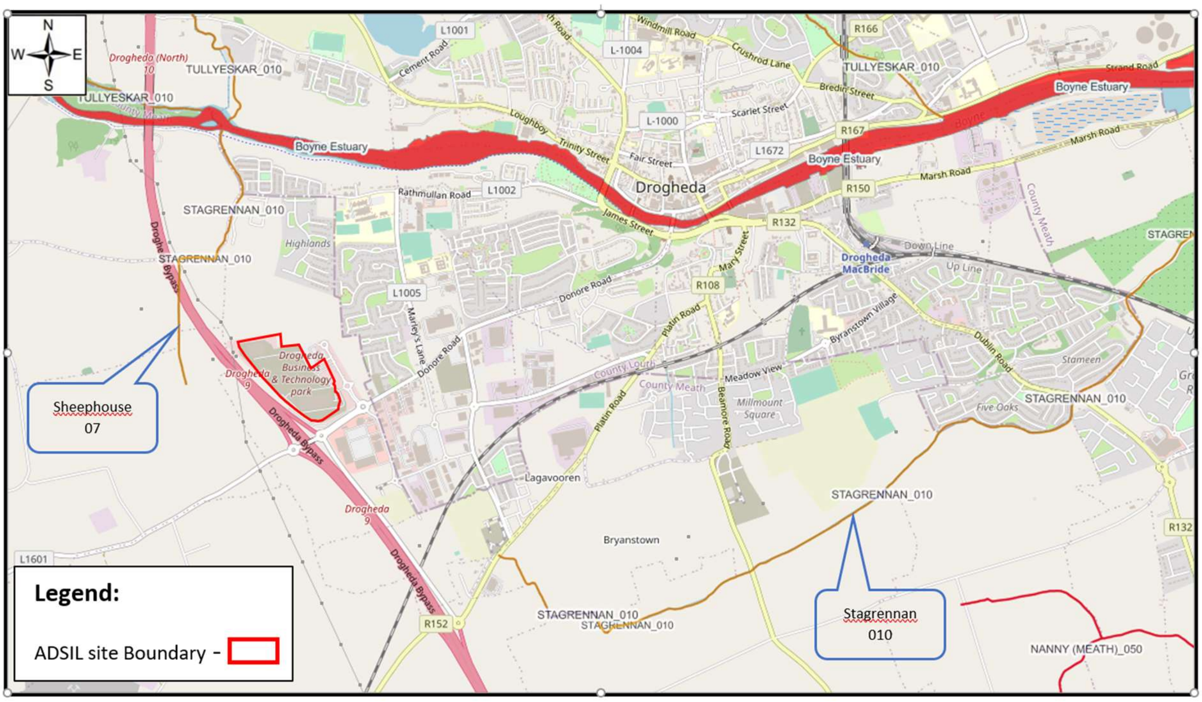
Insert 2.1 Hydrological Environment, illustrating the River Boyne and the Boyne Estuary flowing in a easterly direction.

The water quality status of the Sheephouse Stream, the Stagrennan Stream and the River Boyne Estuary is classified by the EPA as moderate as illustrated in Insert 2.2.



Insert 2.2 Hydrological Environment, illustrating the River Boyne (Boyne Estuary) flowing in a easterly direction, the Sheephouse Stream and the Stagrennan Stream classified as having moderate water quality status .

In accordance with the WFD, each river catchment within the former ERBD was assessed by the EPA and a water management plan detailing the programme of measures was put in place for each. Currently, the EPA classifies the Sheephouse Stream waterbody to the northwest and the Stagrennan stream to the southeast as being under review most likely due to a lack of information being currently available to assign a risk rating. The Boyne Estuary (transitional Water bodies) to the north currently has a rating of 1a, '*At risk of not achieving good status'.* Insert 2.3 presents the river waterbody risk EPA map.



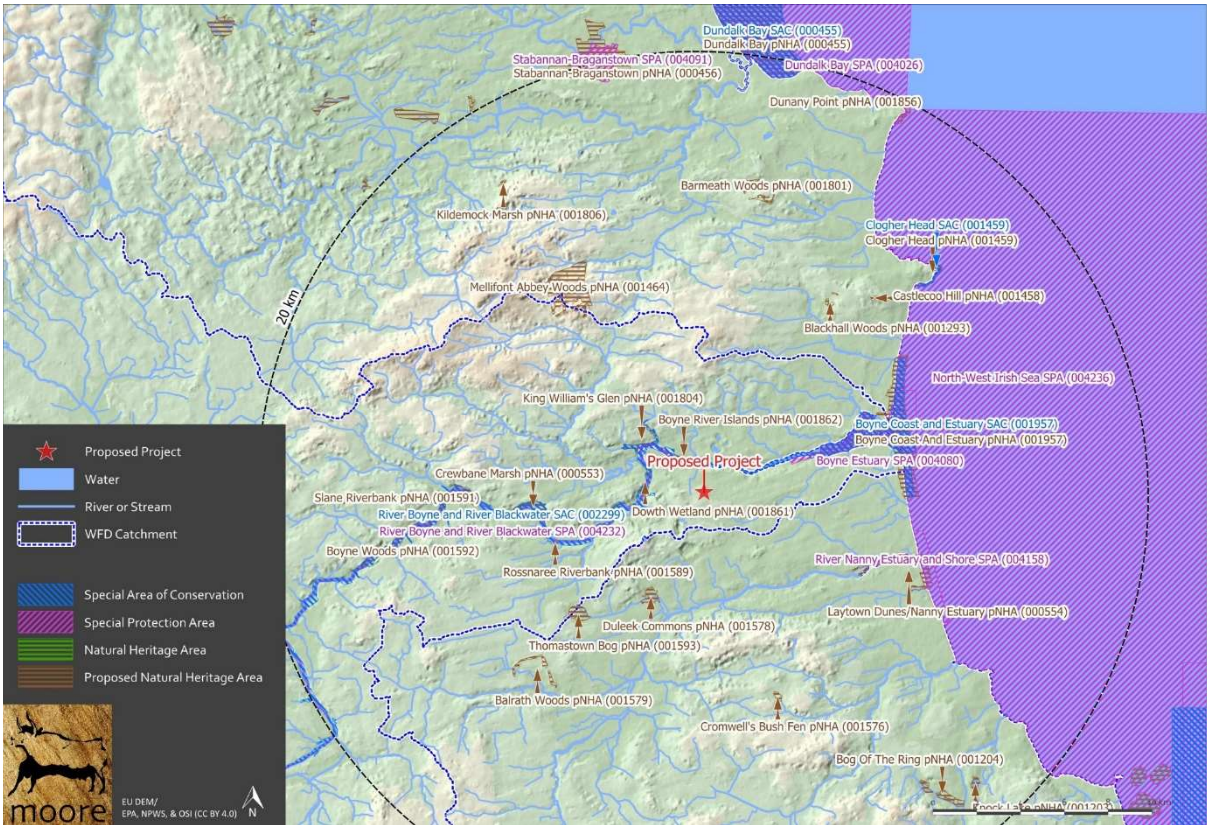
Insert 2.3 Hydrological Environment, illustrating the River Boyne (Boyne Estuary) flowing in a easterly direction and classified as 'at risk of not achieving good status'.

2.2.1 Sensitive areas or areas of special interest

Appropriate Assessment (AA) Screening Reports (Attachment-6-3-4-AA Screening-Planning-Mar-2020, Attachment-6-3-4-AA Screening-Planning-Apr-2022) and Natura Impact Statement (Attachment-6-3-4-NIS-Licence-Aug-2025) have been prepared by Moore Group and have been submitted with the licence review application. Figure 2.4 below presents the Site in relation to nearby European sites.

The nearest European sites to the Installation that are hydrologically connected are associated with the Boyne River and include the River Boyne And River Blackwater SAC (Site Code 002299), which is located approximately 1 km to the north, and the River Boyne and River Blackwater SPA (Site Code 004232), which is located approximately 1.28 km to the north. Downstream the waters of the River Boyne enter the River Boyne Estuary with its European sites, the Boyne Estuary SPA (Site Code 004080) and the Boyne Coast and Estuary SAC (Site Code 001957), which are located respectively approximately 3.95 km and 5.15 km to the north east of the Development, and then the NW Irish Sea SPA (Site Code 004236).

There is no direct hydrological connectivity to the River Boyne or to any other European sites within or outside the guideline 15 km zone of potential impact. There is an indirect hydrological link between the Installation and the River Boyne and River Blackwater SAC (Site Code 002299), Boyne Coast and Estuary SAC (Site Code 001957), and the Boyne Estuary SPA (Site Code 004080) through the storm water drainage from the site which discharges into the River Boyne via the IDA storm water drainage network.



Insert 2.4 Site Location, Showing European sites and NHAs/pNHAs in the vicinity of the Site

The lands in which the installation is located have no formal designations.

The NIS concluded that:

- with the implementation of management measures specifically with regard to controlled surface water discharges during the operation of the permitted Installation under an IE Licence, significant effects as a result of emissions to storm water on Natura 2000 sites within the zone of influence, including consideration of the indirect pathway via the stormwater network to the Boyne Coast and Estuary SAC (001957); the River Boyne and River Blackwater SAC (002299) and the Boyne Estuary SPA (004080) can be ruled out.
- on the basis of the best scientific knowledge available, and subject to the implementation of mitigation measures, that the possibility of any adverse effects on the integrity of the European Sites considered in the NIS, or on the integrity of any other European Site (having regard to their conservation objectives), arising from the Project, either alone or in combination with other plans or projects, can be excluded beyond a reasonable scientific doubt.

2.3 EMISSIONS TO STORM WATER AND ABATEMENT MEASURES

Details of the proposed storm water drainage are presented in Attachment 4-8-1 (Operational Report). Any accidental emissions of oil, petrol or diesel could cause contamination to storm water if the emissions enter the water environment unmitigated.

The primary potential impact relates to a failure or accidental spill of fuel (diesel, HVO or diesel/HVO blend), which is stored and used on site for the emergency backup generators. Fuel oil is stored in multiple locations across the Site.

Building A

- Fuel is supplied to the Building A generators from 1 no. 40,000L fuel top-up tank located to the north of Building A.
- Each of the 26 no. 6.82 MW_{th} emergency backup generators at Building A have a double-skinned belly tank (16,000 litres each).
- The 1 no. 1.55 MW_{th} emergency backup generator has a double skinned belly tank (1,500 litres)
- The 2-no. fire sprinkler pumps at Building A have 2 no. fuel tank (536 litres each).
- Fuel pipelines above ground are Carbon Steel, and below ground are Close Fit PLX (dual-contained pipe system).

Building B

- Fuel is supplied to the Building B generators from 1 no. 40,000L fuel top-up tank located to the north of Building B.
- Each of the 26 no. 6.79 MW_{th} emergency backup generators at Buildings B have belly tank (17,500 litres each).
- The 1 no. 2.02 MW_{th} emergency backup generator has a double skinned day tank (4,670 litres).
- Fuel pipelines above ground are Carbon Steel, and below ground are Close Fit PLX (dual-contained pipe system).

There is a total fuel tank capacity on site of 958,242 litres or 958.24 m^3. However, as per standard ADSIL policy, tanks are filled to 90% capacity (max.). It should be noted that the tanks cannot be filled more than 90% as an alarm will be activated and the system will automatically shut-off. Therefore, the expected maximum fuel storage on site is 862,418 litres, 862.42 m^3, which is approximately 741.68 tonnes of diesel, or 729.61 tonnes HVO. A combination of both may be used.

To minimise any impact on the surface water environment from material spillages, the fuel storage tanks are located above ground and fully contained. All containers are designed to be suitable for the chemicals stored within and in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004). The design of all bunds conform to standard bunding specifications - BS EN 1992-3:2006 *Eurocode 2 - Design of concrete structures - Part 3: Liquid retaining and containment structures*. The Operational Report (Attachment 4.8.1) outlines the fuel storage systems in detail.

A standard operating procedure for fuel unloading is in place at the Site to reduce the risk of spills. An on-site Emergency Response Plan (ERP) is in place. The Site maintains spill kits at all storage areas.

Rainwater runoff from impermeable areas of the Site is collected via the onsite storm water drainage network. This network will convey the storm water via hydrocarbon interceptors to the storm water system shown on Drawing 21_123G-CSE-00-XX-DR-C-1100 Surface Water Layout Plan. The storm water discharges offsite at 1 no. Emission Point (SW1). The fuel unloading bays contain drainage channels that direct storm water to network via hydrocarbon interceptors.

Drainage of rainwater from the fuel top-up tank bund for Building A, rainfall which passes through the back-up generator exhaust stacks, and drainage from the Oldbridge substation transformer compound is directed to foul sewer at Emission Point SE1.

There is 1 no. detention basin on site (6,144 m^3 capacity), which is located to the east of the Site. There is a storm water flow control device located downstream of the detention basin to reduce to the maximum permissible flow rate.

Prior to the site storm water network entering the detention basin, the storm water passes through hydrocarbon interceptors (and in the case of SW Outfalls 1 and 2, hydrodynamic solid separators) to ensure that the quality of the storm water discharge is controlled.

The storm water attenuation system discharges via the 1 no emission point (SW1) to a storm water pipe along the eastern boundary of the site which ties-in to current IDA storm water sewer via a 300 mm connection.

Trapped gullies are utilised in all storm water systems in the roads, turning bays and car park infrastructure so that sediment pollution to the local watercourses is minimised.

In accordance with BAT, clean storm water will be kept separate from contaminated wastewater and there will be no inherent risk of cross-contamination.

The only chemical stored in bulk onsite, that is hazardous to the environment, is diesel, HVO, or diesel/HVO blend. Fuel will be prevented from entering the detention basin by the hydrocarbon interceptors. The interceptors have level alarms that will be triggered if the interceptor is overloaded or malfunctions.

Due to the nature of the run-off, (storm water from buildings and roads only) and the inclusion of hydrocarbon interceptors at key locations, the proposed discharge is unlikely to contain more than trace hydrocarbons and metals. Therefore, it is considered that the emission of storm water will not contain significant quantities of Principal Polluting Substances *Environmental Protection Agency (Licensing)*

(Amendment) Regulations 2004 or Priority Substances or Priority Hazardous Substances of the *EC Environmental Objectives (Surface Waters) Regulations 2009, S.I. No. 272 of 2009*.

It is intended to install a manual penstock on the outfall prior to the discharge into the storm water main (Emission Point SW1). Once installed, the penstock will allow the outfall of the detention basin and drains to be closed off to inhibit the outflow in the event of a spill or a fire.

In the event of a fire at the Installation, firewater will be contained to prevent contamination of receiving waters. The onsite detention basin will be used for retention of potentially contaminated firewater in the event of a fire or accident and the contained water will subsequently be treated on site or disposed of by a licenced contractor.

2.4 SURFACE WATER IMPACT ASSESSMENT

The Installation will not have a noticeable impact on the surface water of the receiving environment. There is no connectivity to the Sheephouse Stream and no direct discharge from the site to the River Boyne. There is an indirect discharge of storm water via the IDA storm water drain, which ultimately to the River Boyne at Drogheda. A flow control system on the attenuation basin is in place to achieve the required discharge rate to the storm water drain.

There is a negligible risk of Principle Pollution Substances, Priority Substances or Priority Hazardous Substances (main polluting substances (as defined in the Schedule of EPA (Licensing)(Amendment) Regulations 2004, S.I. No. 394 of 2004) being discharged from the installation above the limits outlined in the Surface Waters Regulations (S.I. No. 272 of 2009 and amendments) via the storm water network due to the controls and procedures in place to prevent and minimise spills and the presence of interceptors within the storm water infrastructure at key locations. Mitigation measures in place to prevent and minimise spills have been implemented as outlined in Attachment 4-8-1 of this licence review submission.

An assessment of the impact of discharging evaporative cooling water from the Installation to storm water sewer has been carried out (refer to Appendix A for the full report). A conservative numerical analysis was undertaken, based on the existing assimilative capacity of the surface water body, i.e. the River Boyne. The assessment found that the effect of the evaporative cooling water discharge is considered to be temporary and not significant in terms of assimilative capacity of the river and that the evaporative cooling water discharge will not result in exceedances in the statutory threshold values for the parameters (chloride, alkalinity) in the River Boyne. The assimilative capacity of the River Boyne is sufficient to ensure that exceedances of these parameters do not occur under dry weather and mean flow conditions.

For the water quality parameters of interest, the evaporative cooling water discharge will provide dilution and as a result slightly increases the assimilative capacity in the River Boyne; the resultant capacity is adequate to achieve/ maintain the current 'Good' status of the river. Therefore, the discharge of evaporative cooling water from the Installation is not anticipated to have a noticeable impact on the River Boyne.

Based on this assessment, with incorporating mitigation measures, the Installation will not have a significant impact on the quality or water body status of the receiving surface water bodies. There is no relevant hydrological connectivity or biological connectivity to other European sites located within the zone of influence of the Installation.

3.0 ASSESSMENT OF GROUND AND/OR GROUNDWATER EMISSIONS

3.1 METHODOLOGY

This section addresses the potential for emissions to ground/groundwater. The scope and detail of this assessment is consistent with the extent and type of emissions to ground.

The existing receiving environment is described in terms of the existing groundwater quality. The potential impacts to aquifers, soils, sub-soils and rock environment of the Installation is summarised, including any impact on environmental media other than those into which the emissions are to be made. The assessment will be made against emission limit values where relevant.

This assessment has been prepared from both a desktop review of existing information, and site-specific investigations. The following is a list of sources of information consulted for use in this report:

- Geological Survey of Ireland (GSI) - on-line mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest, Bedrock Memoirs and 1:100,000 mapping;
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information;
- National Parks and Wildlife Services (NPWS) – Protected Site Register;
- IGSL Site Investigation, Donore Road Drogheda, Industrial Development Authority, Clifton Scannell Emerson Associates, July 2000;
- Planning Application to Meath County Council Environmental Impact Assessment Report, Data Storage Facility Development Drogheda IDA Business and technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting December 2019;
- Drogheda Due Diligence Report, ADSIL, 08th March 2019 (ref:18_186);
- Stage 1 Flood Risk Assessment, Substation Facility Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting, 18th December 2019.
- Planning Application to Meath County Council Environmental Impact Assessment - Data Storage Facility Development Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath, 2021.

3.2 RECEIVING ENVIRONMENT

The receiving environment with regards to ground/ground water is set out in Section 7.2 of the Baseline Report (Attachment 4-8-3). The site is underlain by a regionally important bedrock aquifer which has low vulnerability, with bedrock greater than 10 meters below ground level. There is a proven thickness of up to 12.6 metres of low permeability overburden proving protection to the aquifer.

3.3 EMISSIONS TO GROUND AND ABATEMENT MEASURES

The Installation has no proposed direct emissions to ground or ground water. The only potential impact of the Installation to ground and ground water would be from indirect emissions from fuel and other accidental spills that may occur.

There is a potential for leaks and spillages from the fuel tanks to occur on site. In addition to this there is a potential for leaks and spillages from vehicles along access roads, loading bays and in parking areas. Any accidental emissions of oil, petrol or diesel could cause contamination if the emissions enter the water environment unmitigated.

The primary potential impact relates to a failure or accidental spill of fuel which is stored and used on site for the emergency backup generators. Fuel is stored in multiple locations across the Site, as outlined in Section 2.3 of this report.

The Operational Report (Attachment 4-8-1) outlines the fuel storage systems in detail.

In order to minimise any impact on the underlying subsurface strata from material spillages, the fuel storage tanks are located above ground, there will be full containment and all containers are designed to be suitable for the chemicals stored within and in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004). The design of all bunds will conform to standard bunding specifications - BS EN 1992-3:2006 *Eurocode 2 - Design of concrete structures - Part 3: Liquid retaining and containment structures*. The Operational Report (Attachment 4.8.1) outlines the fuel storage systems in detail.

A standard operating procedure for fuel unloading is in place at the Site to reduce the risk of spills and an on-site Emergency Response Plan (ERP) is in place. The Site maintains spill kits at all storage areas.

There are green areas on site, however, potentially contaminating materials i.e., fuel are not contained or stored in these areas. The risk of a hydrocarbon spill within these areas is low.

There are robust control measures in place for the storage and transfer of fuel. Any accidental emissions of fuel is more likely to impact on the storm water network. Further information on mitigation measures with respect to storm water pollution controls is discussed in Section 2.4 above.

3.4 IMPACT ASSESSMENT

As there is no direct discharge, and no direct pathway to groundwater from this site, there is no likely potential impact on the soil environment or underlying groundwater body.

As there are no planned discharges to ground, there are no future likely exceedances of the thresholds outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010).

4.0 ASSESSMENT OF FOUL SEWER EMISSIONS

4.1 METHODOLOGY

This section assesses emissions to foul sewer from the installation. The assessment is based on guidance provided in the EPA's Industrial Emissions Licensing – Application Form Guidance and associated Emissions to Sewer Template documentation. The guidance defines “wastewater” as trade effluent or other matter other than domestic sewage or storm water.

The foul discharge from the installation will comprise domestic sewage generated from staff welfare facilities, and storm water run-off from the top-up fuel tank bund to the north of Building A and the Oldbridge Substation transformer compound, as well as rainfall which passes through the back-up generator exhaust stacks.

This section describes the nature and destination of the foul and storm water discharges to sewer and provides confirmation of connection capacity and consent from the relevant statutory authorities.

4.2 RECEIVING ENVIRONMENT

All foul discharge will be discharged to the on-site foul drainage network, drained to the offsite foul sewer that connects to the Drogheda Wastewater Treatment Plant (WWTP), operated by Uisce Éireann, and licensed by the EPA under Industrial Emissions Licence Reg. No D0041-01.

The Drogheda WWTP (Reg. D0041-01) is designed to provide tertiary treatment of Nitrogen and Phosphorus with a total treatment capacity of 62,758 m^3/day (as constructed) and a Plant Capacity Population Equivalent 101,600 as set out in the latest available Annual Environmental Report (2024).

The Uisce Éireann Meath Wastewater Treatment Capacity Register[1] as of August 2024 identifies Drogheda WWTP as having available capacity.

Treated effluent from the Drogheda WWTP is discharged to the Boyne Estuary. According to EPA Maps, the current Water Framework Directive (WFD) Status 2016-2021 for the Boyne Estuary (transitional Water bodies) (as of July, 2025) has a rating of 1a: '*At risk of not achieving good status'.* The Coastal Waterbody WFD Status 2016-2021 for the Boyne Estuary Plume Zone Bay, into which the Boyne Estuary discharges, is also *At risk of not achieving good status.*

4.3 EMISSIONS TO SEWER

The foul discharge from the installation will comprise domestic sewage generated from staff welfare facilities and storm water run-off, as described in Section 4.1. This is discharged to Emission Point SE1 to the east of the site. Refer to Drawing 21_123G-CSE-00-XX-DR-C-1200 of this Licence application for the foul drainage layout.

As per Drawing 21_123G-CSE-00-XX-DR-C-1200, once extended, there will be the following interceptors on the foul water network for the Installation:

- FR1 Class 1 Forecourt Hydrocarbon Interceptor – Foul effluent from Building B, and SW drainage from Building B fuel top-up tank and rainwater from backup generator exhaust stacks.
- FR2 Class 1 Bypass Hydrocarbon Interceptor – Foul effluent from Building A, and SW drainage from Building A fuel top-up tank and rainwater from backup generator exhaust stacks.
- FR3 Class 2 Full Retention Hydrocarbon Interceptor – SW drainage from Oldbridge Substation and Transformer Compound.

All hydrocarbon interceptors are equipped with the following:

[1] https://www.water.ie/connections/developer-services/capacity-registers/wastewater-treatment-capacity-register/Meath

- high level liquid sensors, which indicate when the liquid level in the hydrocarbon interceptor rises excessively and triggers an alarm:
- oil level detection systems, which detect the oil level based on conductivity and triggers an alarm; and
- Silt level sensors, which detect when silt accumulation reaches a pre-determined level and triggers an alarm.

These alarms are connected to the BMS/EPMS critical alarm. Should the interceptor alarms activate, they send an alarm signal to the BMS/EPMS critical alarm to alert Engineering Operations Technicians (EOTs).

There is no requirement for additional on-site treatment of foul sewage.

The foul sewer ultimately connects to the wider Uisce Éireann foul sewer network, then to the Drogheda WWTP.

4.4 IMPACT ASSESSMENT

Drogheda WWTP operates under an Industrial Emissions Licence issued by the Environmental Protection Agency (EPA) (Licence Reg. No. D0041-01). In fulfilling its functions, Uisce Éireann is required to operate the facility within the conditions set out in this regulatory framework. This includes compliance with discharge limits, monitoring requirements, and environmental protection standards to ensure the safe and effective treatment of emission to foul sewer while minimising impacts on the receiving environment.

Treated effluent from Drogheda WWTP is discharged to the Boyne Estuary. Taking into account the nature of the discharge, the presence of hydrocarbon interceptors at potential risk areas, the treatment capacity at Drogheda WWTP, and that foul water discharges from the Installation represent a negligible percentage of the overall influent volumes at Drogheda WWTP, it is considered that the emissions will not have a significant effect on the environment in the vicinity of the Drogheda WWTP discharge in the Boyne Estuary and eventually the Irish Sea, into which it flows.

5.0 REFERENCES

Environmental Protection Agency (2004) IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities.

Environmental Protection Agency (EPA). Envision water quality monitoring data, Available at: http://gis.epa.ie/Envision/. (Accessed: July 2024).

Geological Survey of Ireland. Available at: http://www.gsi.ie (Accessed: July 2024).

IGSL Ltd. IDA Donore Road Drogheda Site Investigation Report (IGSL; 2020)

IGSL Site Investigation, Donore Road Drogheda, Industrial Development Authority, Clifton Scannell Emerson Associates, July 2000.

National Parks and Wildlife Services (NPWS) – Protected Site Register

Planning Application to Meath County Council Environmental Impact Assessment Report, Data Storage Facility Development Drogheda IDA Business and technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting December 2019.

Drogheda Due Diligence Report, ADSIL, 08th March 2019 (ref:18_186).

Stage 1 Flood Risk Assessment, Substation Facility Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath, AWN Consulting, 18th December 2019.

Appendix A

Storm Water Impact Assessment

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TECHNICAL NOTE: STORMWATER IMPACT ASSESSMENT; DONORE ROAD, DROGHEDA, CO. MEATH.

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Record of Approval

Details	Written by	Approved by
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Title	Environmental Consultant	Director
Date	23 September 2025	23 September 2025

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1.0 INTRODUCTION

This report presents the assessment of the potential for water quality impacts as a result of the discharge of evaporative cooling water to storm water sewer at the Amazon Data Services Ireland Ltd. ("ADSIL" or 'the applicant') data storage facility (the subject 'installation' under this IED licence review application) located in Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath.

The existing Installation (Licence P1181-01) comprises 1 no. two-storey data storage facility building (Building A) with mezzanine floors at each level and ancillary elements. The elements of the facility include; data storage rooms, electrical and mechanical plant rooms, administration areas, emergency back-up generators, water storage tanks, loading bays, maintenance and storage spaces, fire sprinkler tanks, fire sprinkler pump house, security and utility spaces, screened plant and PV panels at roof level, underground water supply, foul and storm water drainage network, on site detention pond, internal road network, and site landscaping.

The extended Installation comprises 1 no. two-storey data storage facility building (Building B) with mezzanine floors at each level and ancillary elements. The elements of the facility include data storage rooms, electrical and mechanical plant rooms, administration areas, emergency back-up generators, water storage tanks, loading bays, maintenance and storage spaces, screened plant and PV panels at roof level, and underground water supply, foul and storm water drainage networks.

The overall site includes a 110kV substation (the Oldbridge Substation) and transformer compound.

This IE Licence review relates to the extension of the existing Installation (Licence P1181-01). The IE Licence site area is c. 18.623 hectares and will not be extended as the IE licence review elements are within the existing IE Licence boundary. The site layout is shown on Drawing 21_123G-CSE-00-XX-DR-C-0002 - Site Layout Plan included with this application.

The site storm water outfalls at 1 no. Emission Point (SW1) via the detention (attenuation) basin which discharges at SW1 into the existing 450 mm IDA storm sewer to the east of the site. The emissions to storm sewer consist of storm water runoff from building roofs, yards and the road network and residual evaporative cooling water (mains water that has passed through the cooling equipment).

The storm water drainage for the existing and extended Installation collects runoff from roofs, roads and other hard standing areas in a sealed system of pipes and gullies. The pipe network connects to the existing on-site storm water network for the existing Installation, which outfalls to the storm water detention basin located in the east of the site, adjacent to the site entrance.

The attenuation system outfalls via a carrier drain which discharges attenuated flows to the existing IDA Drogheda Business Park storm water drainage network. This network runs north in the Estate Road in the IDA Drogheda Business Park as shown on Drawing 21_123G-CSE-00-XX-DR-C-1100 included with the IE Licence review application. The IDA Park storm water network ultimately discharges to the River Boyne (c. 1.5 km hydrologically downgradient). Further details on the storm water network and emissions are set out in Attachment 4-8-1 Operational Report of the IED licence review application.

As described in the Operational Report submitted with the IED licence application (Attachment-4-8-1), the cooling units or Air Handling Units (AHUs) on the data storage facility roofs, for both the existing and extended Installation, provide conditioned air to maintain temperature, relative humidity and pressurisation in the data storage rooms. The cooling units for Buildings A and B operates under 2 modes;

- Free Cooling – Utilises outdoor air during normal atmospheric temperatures. No water is consumed in this mode.
- Evaporative (Adiabatic) Cooling – Uses mains water as the cooling medium when ambient temperatures exceed the capacity of free cooling.

Evaporative cooling utilises mains water (at ambient temperature) from the mains supply via on site storage as the cooling media. The majority of the evaporative cooling water is evaporated in this process. Prior to the cooling process, water is sanitised using ultraviolet disinfection. When water is used for cooling, it is recirculated in a closed loop system. When a conductivity of 1,500 µS/cm is reached, evaporative cooling water is automatically discharged to the onsite storm water network at ambient temperature. See the Operational Report, and Section 4.1 for further information.

The main objective of this study is to assess the likely impact of the worst case maximum discharge flow and maximum concentration evaporative cooling water discharge (recirculated evaporative cooling water from the AHUs) on the surface waterbody receptor (River Boyne) using a numerical analysis, based on the assimilative capacity of this surface water body.

2.0 METHODOLOGY

This assessment of the storm water emissions assesses the potential impact on the surface water environment i.e., the River Boyne at the Environmental Protection Agency (EPA) monitoring point downgradient of the site. It includes a desktop review of the emission (flow and quality) of evaporative cooling water from the Installation to the River Boyne.

A highly conservative approach is taken in assuming all of the evaporative cooling water reaches the River Boyne (undiluted by rainwater) when the river is at low and mean flow and there is no tidal influence on it. In reality, evaporative cooling water will likely accumulate in the storm water attenuation system until there is adequate rainfall for discharge to occur from the system. This will result in dilution of the evaporative cooling water in the Installation attenuation system, and once discharge occurs, there will be further dilution within the storm water network prior to reaching the River Boyne.

As described in the Operational Report (Attachment-4-8-1) submitted with the IE licence review application, the attenuation system at the extended and existing Installation comprises 1 no. detention basin (6,144 m^3 capacity) located in the east of the Site (see Drawing: 21_123G-CSE-00-XX-DR-C-1100-Surface Water Layout Plan). As mentioned above, all storm water from the Site storm water network outfalls at 1 no. emission point (SW1) that discharges attenuated flows to the existing IDA Business and Technology Park 450 mm storm sewer, via a 300 mm connection to the east of the Site.

The offsite storm water discharges to the River Boyne at an outfall near to the Ramparts / St Dominics Park, approximately 1.5 km to the northeast of the site.

2.1.1 Sources of Information

This assessment has been prepared from a desktop review of existing information. The following is a list of sources of information consulted for use in this section:

- Environmental Protection Agency (EPA, 2024) monitoring data, *www.catchments.ie*. which includes the following information: EPA monitoring stations; historical water quality data; and Water Framework Directive (WFD) Status, surface water bodies status and risk score.
- HydroNet (https://epawebapp.epa.ie/hydronet/#Flow) developed by the EPA that includes information on river flow, and the EPA Hydrotool for estimating flow.

The EPA has a water quality monitoring station in the River Boyne at Oldbridge (Obelisk Br), which is upstream of the site, from which information has been obtained by accessing the above EPA data sources.

According to the EPA, the River Boyne is a transitional waterbody (Boyne Estuary) in the storm water discharge point. This means that its hydrological conditions are influence by the tidal level. For the purpose of this assessment, this tidal influence has been disregarded from the calculations. This is a conservative approach, as tidal level would increase the potential dilution within the river.

The EPA does not have a water gauging station (flow monitoring) within the River Boyne. As there is no measured flow for the point of discharge, the EPA (2024) Hydrotool[1] has been used to estimate 95%ile (low flow) and 50%ile (average) flow (EPA Hydrotool ungauged ref. point 09-1459). The flow estimates represent flows that could be expected in rivers under naturalised conditions and do not take account of artificial influences of any kind such as water supply abstractions or wastewater discharges.

2.2 CALCULATION METHODOLOGY

2.2.1 Assimilative Capacity

The definition of assimilative capacity, as used by the EPA, is *'the ability of a body of water to cleanse itself; its capacity to receive waste waters or toxic materials without deleterious effects and without damage to aquatic life or humans who consume the water*'. Guidance carried out by the EPA and Water Services Training Group on the assessment of assimilative capacity details the following methodology.

The Assimilative Capacity is estimated for any parameter of concern using the following calculation:

$$Assimilative\ Capacity = (C_{max} - C_{back}) \cdot Q_{95} \cdot 86.4\ [kg/day]$$

Where:

- Q_{95} = Dry Weather or 95%ile flow in river stream (m^3/s);
- C_{max} = Maximum permissible concentration (mg/l) ;
- C_{back} = Background upstream concentration (mg/l);
- 86.4 = Time conversion factor from seconds to day.

Q_{95} is the flow rate in the River Boyne associated with a dry weather condition (DWF).

[1] https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/river-flow-estimates-hydrotool---read-me.php

C_{max} is the concentration associated with threshold values based on European regulations which are defined in Section 2.3 below for both the 95%ile hydrological conditions, and the also 50%ile flow in the river stream (Q_{50}).

C_{back} is the concentration associated with the quality data obtained by the EPA at its station located in the River Boyne (refer to Section 3.3 below) which is considered representative of the River Boyne where the IDA Business and Technology Park storm water network discharge point is located. Based on this data, the 95%ile value of these records have been considered as the C_{back} concentration.

2.2.2 Downstream Concentration

In order to assess the effect of the evaporative cooling water discharge on the River Boyne, the downstream concentration ($C_{D/S}$) has been estimated from the EPA quality data (C_{back}) and the expected ADSIL evaporative cooling water quality as follows.

Where:

$$C_{D/S} = \frac{C_{back} \cdot Q_{95} + C_{ADSIL} \cdot Q_{ADSIL}}{Q_{95} + Q_{ADSIL}}$$

- $C_{D/S}$ = Estimated concentrations at River Boyne immediately downstream of the storm water sewer discharge point (mg/l);
- C_{ADSIL} = ADSIL effluent concentrations (mg/l);
- Q_{ADSIL} = ADSIL effluence discharge rate (m^3/s).

2.3 EMISSION QUALITY AND FLOW

The criteria used to estimate the evaporative cooling water discharge volumes and quality has been provided by the Operator's Water Team and is presented below:

- A dry-bulb temperature of 30.4 degC and wet-bulb temperature of 21.2 degC is used for modelling water use for evaporative cooling. This is a conservative design criterion and is greater than the ASHRAE n=50 year temperature for Dublin Airport, Ireland (WMO: 039690). Water use is evaluated based on a theoretical peak day with 6 hours on evaporative cooling working at these peak weather conditions.
- Evaporative Cooling water discharge volume and quality is estimated based on the cooling systems operating at 3 cycles of concentration of the mains water supply via on site storage, per mains water quality analyses carried out on-site.

Estimated maximum evaporative cooling water concentrations and discharge flow from the site are presented in Table 2.1 below. To note 482 m^3/d is the maximum flow that could be expected within a 6-hour period at peak weather conditions, based on the conservative assumptions made. Generally, the discharge volume would be significantly less. However, under typical operating conditions, the site operates in free cooling mode, with no evaporative cooling required. As a result, there would be no cooling water discharge (with the exception of the anti-stagnation cycle) during these periods. During the anti-stagnation cycle discharge volume and quality is significantly less (mains water that has not been used for cooling) than the maximum cooling water discharge. Therefore, the assessment of the maximum cooling water discharge represents the worst-case scenario.

Parameter	Unit	Value [1]

Conductivity	µS/cm	1,500
TDS	mg/l	943
Alkalinity	mg/l	359
Ca (as CaCO3)	mg/l	550
Chloride	mg/l	42
Silicone (as SiO2)	mg/l	13.6
Sulphate (SO4)	mg/l	323
Barium	mg/l	0.150
Magnesium	mg/l	70
Potassium	mg/l	4.3
Sodium	mg/l	86
Discharge Flow	m^3/d	482

Note: 1. Data obtained from the Operator's water team

Table 2.1 *Estimation of evaporative cooling water discharge parameters*

2.4 THRESHOLD VALUES

The parameters of interest are based on the targets / thresholds for water quality established in current legislation.

The most recent Irish legislation set down as part of the Water Framework Directive to provide guidelines for river quality in Ireland is *EU Environmental Objectives (Surface Water) Regulations (S.I. 272/2009 and amendment S.I. 77/2019*) (known as the 'Surface Water Regulations').

The Surface Water Regulations has established ecological, biological and chemical conditions or 'Threshold Values' for the protection of surface water bodies whose status is determined to be high or good and measures requiring the restoration of surface water bodies of 'less than good status' (or good potential as the case may be) to 'not less than good status'.

The Surface Water Regulations does not provide Threshold Values for all parameters set out in Table 2.1 above. In order to establish the basis for discussion and assessment of the impact, this assessment has considered other water regulations beyond the Surface Water Regulations. The *EU (Drinking Water) Regulations (S.I. 122/2014 and amendment S.I. 464/2017* (known as the 'Drinking Water Regulations') establishes a number of monitoring parameters in respect of every water supplies for human consumption.

This assessment uses the parametric values listed in the Drinking Water Regulations to assess if the evaporative cooling water discharge from the site would alter the water quality of the receiving waterbody (i.e., River Boyne); when compared with available drinking water quality parameters monitored by the EPA in the River Boyne downstream of the site.

The parameters considered are also related to the characteristics of the ADSIL evaporative cooling water which are also part of the EPA monitoring suite. Refer to Table 2.2 below.

Parameter	Unit	Surface Water [1]		Drinking Water [2]
		95%ile	Mean	
Ammonia as N	mg/l	0.14	0.065	*n.v.*
Biological Oxygen Demand (BOD)	mg/l	2.6	1.5	*n.v.*
Orthophosphate as P	mg/l	0.075	0.035	*n.v.*

Parameter	Unit	Surface Water [1]		Drinking Water [2]
		95%ile	Mean	
Chloride	mg/l	250		250
Sulphate	mg/l	250		250
Alkalinity-total	mg/l	*n.v.*		*n.v.*
Conductivity	µS/cm	*n.v.*		2,500
TDS	mg/l	*n.v.*		*n.v.*
Calcium (as CaCO3)	mg/l	*n.v.*		*n.v.*
Silicone (as SiO2)	mg/l	*n.v.*		*n.v.*
Barium	mg/l	*n.v.*		*n.v.*
Magnesium	mg/l	*n.v.*		*n.v.*
Potassium	mg/l	*n.v.*		*n.v.*
Sodium	mg/l	*n.v.*		*200*

Notes: 1. EU Environmental Objectives (Surface Water) Regulations (S.I. 272/2009 and amendment S.I. 77/2019) (known as the 'Surface Water Regulations').
2. EU (Drinking Water) Regulations (S.I. 122/2014 and amendment S.I. 464/2017).
n.v.: No value

Table 2.2 Parameter and threshold values considered (mg/l)

3.0 EXISTING BASELINE CONDITIONS

The existing surface water environment in terms of water quality with reference to the Water Framework Directive environmental quality objectives and standards is described in Section 7.3 of the Baseline Report (Attachment 4-8-3) submitted with the IED licence review application.

There are no streams on the site itself or along its boundaries. Storm water run-off from the site will be collected and discharged at 1 no. emissions point (SW1) at the eastern boundary of the site which discharges into the existing IDA stormwater drainage network via a 300 mm connection. The IDA stormwater drainage network eventually discharges to the River Boyne approximately 1.5 km to the north of the subject site and is a transitional body at this point (Boyne Estuary, EU Code IE_EA_010_0100). Refer to Figure 3.1 below for the Hydrological Environment.

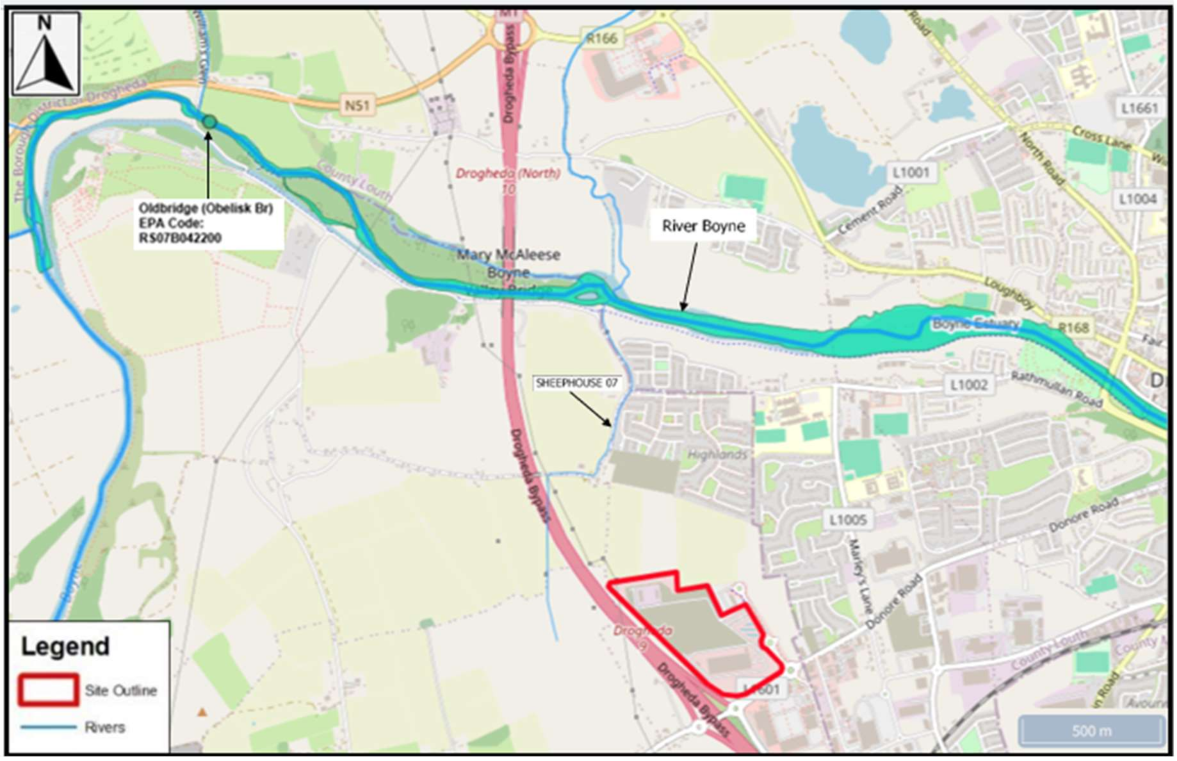

Figure 3.1 Hydrological Environment.

3.1 SENSITIVE AREAS OR AREAS OF SPECIAL INTEREST

The nearest European sites to the Installation that are hydrologically connected are associated with the Boyne River and include the River Boyne and River Blackwater SAC (Site Code 002299), which is located approximately 1 km to the north, and the River Boyne and River Blackwater SPA (Site Code 004232), which is located approximately 1.28 km to the north. Downstream the waters of the River Boyne enter the River Boyne Estuary with its European sites, the Boyne Estuary SPA (Site Code 004080) and the Boyne Coast and Estuary SAC (Site Code 001957), which are located respectively approximately 3.95 km and 5.15 km to the north east of the Development, and then the NW Irish Sea SPA (Site Code 004236).

There is no direct hydrological connectivity to the River Boyne or to any other European sites within or outside the guideline 15 km zone of potential impact (refer to Figure 3.2). There is an indirect hydrological link between the Installation and the River Boyne and River Blackwater SAC (Site Code 002299), Boyne Coast and Estuary SAC (Site Code 001957), and the Boyne Estuary SPA (Site Code 004080) through the storm water drainage from the site which discharges into the River Boyne via the IDA storm water drainage network.

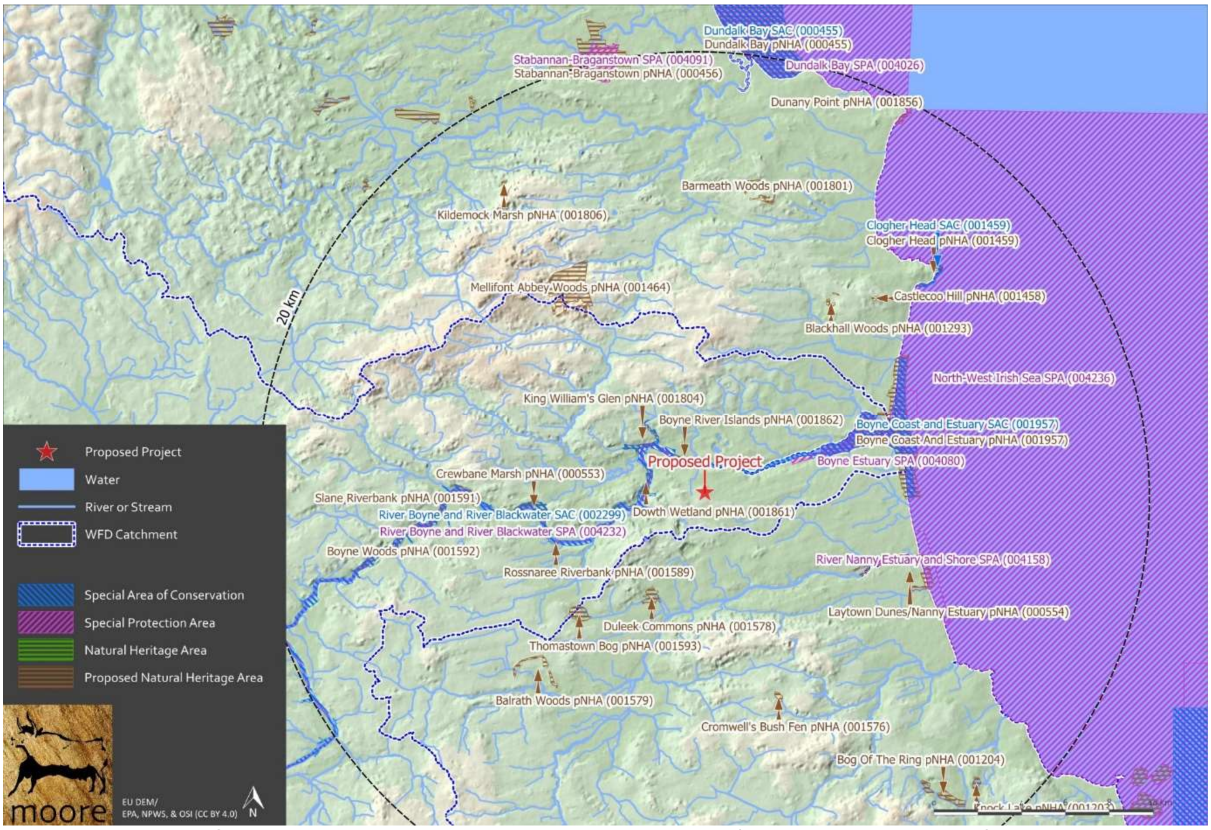

Figure 3.2 Site Location, showing European sites and NHAs/pNHAs in the vicinity of the Project

3.2 FLOW DATA

As noted in Section 2.1, in the absence of any available dataset at the actual stormwater discharge point and disregarding tidal influence of the River Boyne, it is assumed that the water flow at the IDA stormwater network discharge point to the River Boyne is the same as the sum of the following EPA Hydrotool ungauged reference points:

- EPA Hydrotool ungauged ref. point 07-1716 (River Boyne upstream of confluence with Mattock River) located c. 3.3 km upstream of the stormwater network discharge point;
- EPA Hydrotool ungauged ref. point 07-1100 (Mattock River upstream of confluence with River Boyne) located c. 3.3 km upstream of the stormwater network discharge point;
- EPA Hydrotool ungauged ref. point 07-1902 (Mell River upstream of confluence with River Boyne) located c. 150 m upstream of the stormwater network discharge point.

Based on the available information from the EPA (EPA Hydrotool), the River Boyne has a 95%ile flow (Q_{95}) of approx**. 6.08 m^3/s** (sum of EPA Hydrotool ungauged ref. points 07-1716 [5.988 m^3/s] + 07-1100 [0.087 m^3/s] + 07-1902 [0.005 m^3/s]). Likewise, the estimated 50%ile flow (Q_{50}) is **29.1 m^3/s** (sum of EPA Hydrotool ungauged ref. point 07-1716 [28.116 m^3/s] + 07-1100 [0.683 m^3/s] + 07-1902 [0.045 m^3/s]).

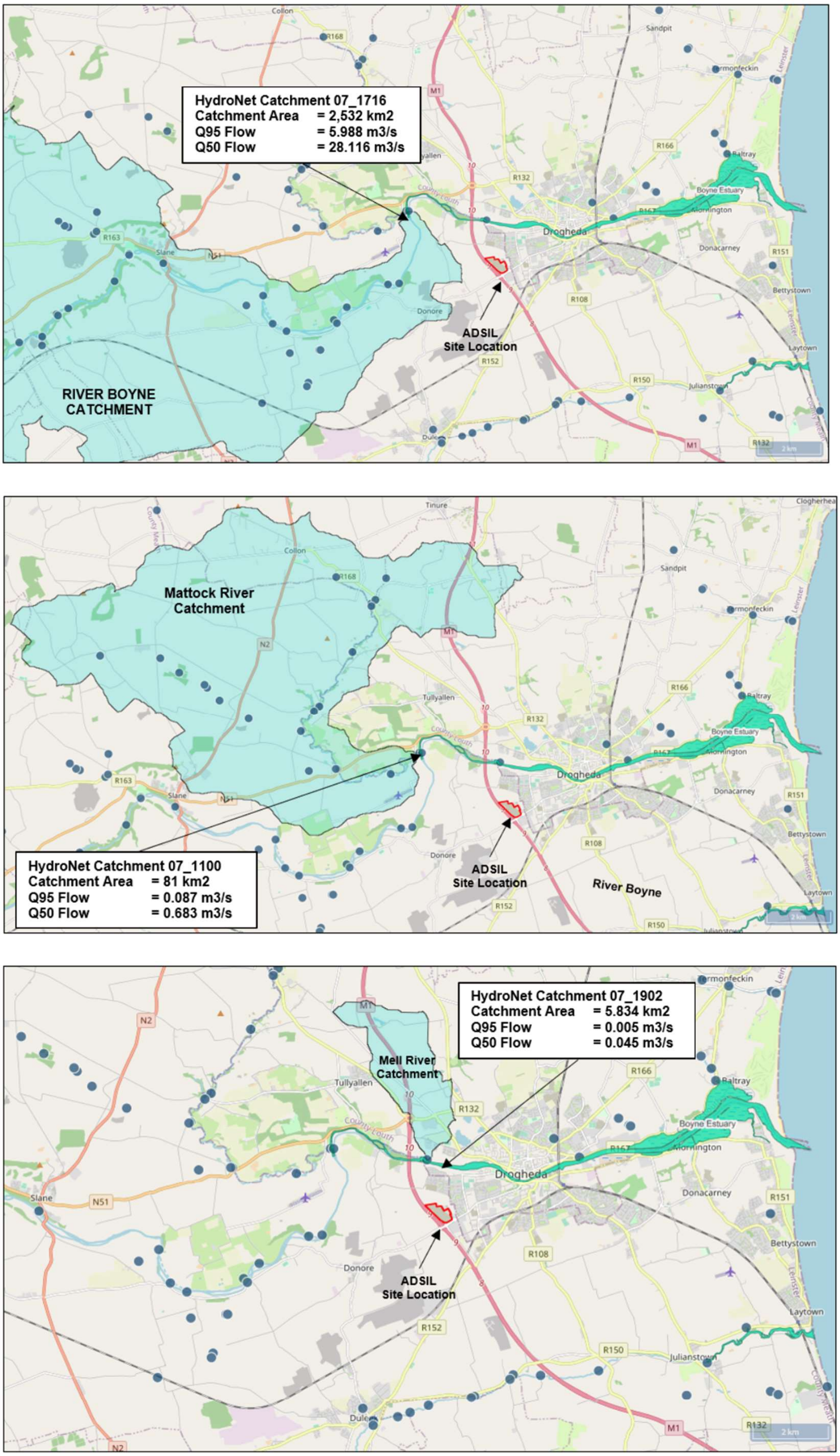

Figure 3.3 EPA Hydronet estimation points in the River Boyne

3.3 WATER QUALITY DATA

A review of available EPA surface water quality data has been undertaken. There is an active EPA monitoring station in the River Boyne Oldbridge (Obelisk) Bridge, (RS07B042200)) located approximately 2 km to the northwest of the site, which is upstream of the storm water network discharge point from the IDA storm water network (refer to Figure 3.1 above). As noted in Section 2.1, in the absence of any available dataset at the actual storm water discharge point, it is assumed that the water quality at the confluence is similar to that at the EPA Oldbridge (Obelisk) Bridge, (RS07B042200) station 2 km upstream.

The water quality data from Oldbridge (Obelisk) Bridge monitoring station is available for the period between 2007 to 2024 and this has been considered in this analysis. The monitoring data and concentration of the parameters of interest are presented below in Table 3.1. A comparison with the threshold values defined above in Section 2.4 is also shown. As can be seen in Table 3.1, the water quality for the 95%ile and mean conditions exceed the Surface Water Regulation's threshold values for BOD, and Orthophosphate as P for the 50%ile condition. BOD also is exceeded for the 95%ile, however, BOD is not exceeded for the mean condition (50%ile condition). Overall, the quality data is representative of the ''Good' to 'Moderate' historical water quality status of this river.

The aforementioned EPA monitoring on the River Boyne (RS07B042200) obtained a Q rating of Q4 Good Status (EPA, 2024).

The EPA classifies the WFD Ecological Status for the Boyne Estuary water body as having '*Moderate Status'* (Cycle Status 2016-2021) with a current WFD Transitional Waterbody risk of '*At risk of not achieving good status'.*

Sampled Date	Ammonia mg/l as N	BOD mg/l	ortho-Phosphate mg/l as P	Alkalinity-total mg/l as CaCO3	Chloride mg/l
TV 95%ile	*0.14*	*2.6*	*0.075*	*n.v.*	*250*
TV mean	*0.065*	*1.5*	*0.035*	*n.v.*	
23/01/2007	0.050	1.5	0.047	256	20
22/02/2007	0.071	2.2	0.061		
21/03/2007	0.031	1.5	0.037	260	
24/04/2007	0.012	1.4	0.007		
21/05/2007	0.006	**4.0**	0.009	324	22
27/06/2007	0.014	1.9	0.062		
24/07/2007	0.018	1.3	0.062		
29/08/2007	0.009	0.9	0.051	300	17
27/09/2007	0.008	1.3	0.032		
31/10/2007	0.012	1.1	0.042		
29/11/2007	0.042	1.3	0.071	260	20
13/12/2007	0.049		0.051		
29/01/2008	0.040	1.3	0.046		
26/02/2008	0.034	0.8	0.054	292	20
19/03/2008	0.024	1.9	0.037		
27/03/2008	0.01		0.019		
23/04/2008	0.014	1.8	0.011		
15/05/2008	0.005	2.0	0.03		
27/05/2008	0.009	1.4	0.003	248	21
25/06/2008	0.012	1.4	0.005		
16/07/2008	0.014	1.2	0.041		
19/08/2008	0.047	1.7	0.069	196	14
11/09/2008	0.023	1.2	0.055		
15/10/2008	0.05	2.0	0.064		
29/10/2008	0.025	1.1	0.041		
03/11/2008	0.02	1.0	0.007		
19/11/2008	0.029	0.8	0.041	288	16
08/12/2008	0.02	**3.0**	0.017		
10/12/2008	0.046	1.1	0.033		
05/01/2009	0.03	1.0	0.01	305	20
27/01/2009	0.065	1.3	0.039		
12/02/2009	0.057	1.2	0.035	300	18
16/02/2009	0.02	1.0	0.0025	290	20
09/03/2009	0.04	2.0	0.011	298	20
24/03/2009	0.009	1.2	0.018		
14/04/2009	0.02	1.0	0.0025	256	19
23/04/2009	0.012	1.6	0.005		
11/05/2009	0.005	1.0	0.0025	241	19
27/05/2009	0.022	1.7	0.032	264	17
15/06/2009	0.005	2.0	0.0025	277	20
25/06/2009	0.016	1.0	0.034		
20/07/2009	0.01	2.0	0.014	270	19
30/07/2009	0.02	1.1	0.047		
10/08/2009	0.02	1.0	0.013		19
26/08/2009	0.045	1.9	0.059	248	16
07/09/2009	0.02	1.0	0.027	295	16
23/09/2009	0.029	1.7	0.033		
05/10/2009	0.01	1.0	0.0025	309	20
29/10/2009	0.029	1.4	0.051		
02/11/2009	0.01	**5.0**	0.052	165	13
18/11/2009	0.078	2.5	**0.091**	212	14
07/12/2009	0.04	1.0	0.019	260	16
09/12/2009	0.066	1.2	0.043		
27/01/2010	0.071	1.5	0.034		
28/01/2010	0.06	1.0	0.005	244	20
17/02/2010	0.058	1.2	0.034	306	18
18/02/2010	0.06	1.0	0.006	305	18
09/03/2010	0.005	1.0	0.031	151	24
24/03/2010	0.009	1.2	0.016		
19/04/2010	0.01	1.0	0.0025	296	18
21/04/2010	0.011	1.7	0.015		
04/05/2010	**1.16**	**3.0**	**0.181**	197	28
26/05/2010	0.007	1.4	0.003	290	25
01/06/2010	**0.27**	2.0	0.0025	277	20
30/06/2010	0.01	2.0	0.005		
19/07/2010	0.01	2.0	**0.182**	122	18
29/07/2010	0.02	1.5	0.048		
09/08/2010	0.03	2.0	0.031	262	19
31/08/2010	0.012	1.1	0.01	260	23
01/09/2010	0.005	2.0	0.0025	251	23
28/09/2010	0.018	1.4	0.041		
18/10/2010	0.1	2.0	0.007	282	18
21/10/2010	0.015	1.2	0.03		
09/11/2010	0.06	2.0	0.034	196	14
24/11/2010	0.065	1.4	0.034	284	17
13/12/2010	0.04	1.0	0.027	139	24
15/12/2010	0.094	2.2	0.035		
13/01/2011	0.08	**3.0**	0.016	79	15
27/01/2011	0.047	1.1	0.029		

Sampled Date	Ammonia mg/l as N	BOD mg/l	ortho-Phosphate mg/l as P	Alkalinity-total mg/l as CaCO3	Chloride mg/l
17/02/2011	0.05	1.0	0.032	221	17
24/02/2011	0.048	1.1	0.032	260	17
29/03/2011	0.009	1.3	0.013		
30/03/2011	0.01	1.0	0.017	285	19
13/04/2011	0.005	1.0	0.0025	288	19
19/04/2011	0.009	1.6	0.01		
23/05/2011	0.02	1.0	0.0025	250	22
26/05/2011	0.009	1.3	0.003	262	22
02/06/2011	0.005	2.0	0.0025	231	22
23/06/2011	0.014	1.9	0.004		
13/07/2011	0.005	1.0	0.008	229	23
27/07/2011	0.008	2.3	0.005		
17/08/2011	0.01	**2.7**	0.005	242	22
31/08/2011	0.01	1.0	0.0025	216	37
12/09/2011	0.005	2.0	0.012	201	21
20/09/2011	0.021	2.1	0.04		
25/10/2011	0.09	**5.0**	**0.098**	149	14
02/11/2011	0.037	1.9	0.041		
07/11/2011	0.005	1.0	0.04	186	22
01/12/2011	0.04	1.0	0.027	226	15
06/12/2011	0.025	1.7	0.039	266	16
18/01/2012	0.029	0.8	0.032		
24/01/2012	0.02	1.0	0.02	278	18
15/02/2012	0.023	1.2	0.029		
21/02/2012	0.01	1.0	0.038	139	22
07/03/2012	0.024	1.3	0.025	296	18
27/03/2012	0.005	**4.0**	0.0025	291	19
12/04/2012	0.02		0.0025	275	20
09/05/2012	0.02	2.0	0.0025	279	18
23/05/2012	0.011	1.1	0.003	304	20
05/06/2012	0.005	1.0	0.0025	266	20
05/07/2012	0.029	1.3	0.048		
17/07/2012	0.01	2.0	0.01	304	11
21/08/2012	0.031	1.8	0.048	300	16
29/08/2012	0.02	**4.0**	0.012	280	15
17/09/2012	0.01	2.0	0.008	296	18
25/10/2012	0.01	1.0	0.013	304	16
31/10/2012	0.01	1.4			
28/11/2012	0.05	1.0	0.008	282	15
06/12/2012	0.05	1.0	0.01	307	18
06/12/2012		2.0	0.0125		17
23/01/2013	0.05	2.0	0.012	254	16
27/02/2013	0.04	1.0	0.012	311	17
21/03/2013	0.041	2.0	0.023	320	24
27/03/2013	0.03	2.0	0.013	256	19
18/04/2013		1.9			
30/04/2013	0.01	1.0	0.0025	284	18
07/05/2013	0.01	1.0	0.0025	288	18
29/05/2013	0.027	1.6	0.009		
05/06/2013	0.01	2.0	0.0025	276	18
27/06/2013	0.015	1.4	0.003		
08/07/2013	0.01	2.0	0.0025	251	23
25/07/2013	0.014	1.3			
06/08/2013	0.01	2.0	0.005	190	19
13/08/2013	0.013	**3.0**	0.011	232	20
12/09/2013	0.014	1.2	0.005		
23/09/2013	0.01	0.5	0.0025	243	28
07/10/2013	0.04		0.043	177	21
31/10/2013	0.037	2.0	0.043		
04/11/2013	0.03	0.5	0.031	245	17
20/11/2013	0.031	2.3	0.039	268	19
12/12/2013	0.021	1.0	0.031	302	20
06/01/2014	0.046	1.5	0.032	222	21
30/01/2014	0.055	0.5	0.029		
12/02/2014	0.042	0.5	0.025	247	22
18/02/2014	0.01	0.5	0.013	223	19
10/03/2014	0.023	1.2	0.005	269	19
13/03/2014	**0.333**	0.5	0.023		
14/04/2014	0.01	1.1	0.017	269	19
29/04/2014	0.011	0.5	0.009		
06/05/2014	0.01	0.5	0.005	282	21
28/05/2014	0.018	0.5	0.033	236	18
03/06/2014	0.01	2.0	0.024	261	19
19/06/2014	0.067	0.5	0.011		
15/07/2014	0.01	1.6	0.01	257	22
17/07/2014	0.027	1.0	0.003		
05/08/2014	0.091	2.5		179	16
08/09/2014	0.01	0.5	0.005	266	22
29/09/2014	0.031	0.5	0.0045	232	21
21/10/2014	0.03	0.5	0.012	263	19
28/10/2014	0.088	**7.1**	**0.081**	199	21

Sampled Date	Ammonia mg/l as N	BOD mg/l	ortho-Phosphate mg/l as P	Alkalinity-total mg/l as CaCO3	Chloride mg/l
10/11/2014	0.04	1.4	0.043	214	18
25/11/2014	0.068	0.5	0.022	237	17
01/12/2014	0.028	0.5	0.029	282	18
14/01/2015	0.028	0.5	0.026	257	19
21/01/2015	0.032	2.2	0.029		
18/02/2015	0.027	0.5	0.013	253	22
26/02/2015	0.06		0.025	225	19
18/03/2015	0.01	0.5	0.011	280	20
01/04/2015	0.073	**3.5**	0.03	224	15
16/04/2015	0.033	2.1	0.023	226	15
21/04/2015	0.01	0.5	0.013	277	21
06/05/2015	0.039	2.2	0.02	210	17
20/05/2015	0.041	1.8	0.014	261	17
17/06/2015	0.01	0.5	0.005	249	21
29/06/2015	0.058	1.4	0.0045	207	22
14/07/2015	0.1	0.5	0.0045	256	20
23/07/2015	0.021	1.0	0.005	266	24
05/08/2015	0.01	1.3	0.005	213	23
25/08/2015	0.1	**2.8**	0.049	168	19
09/09/2015	0.11	2.0	0.023	226	20
14/09/2015	0.024	1.0	0.005	242	23
05/10/2015	0.01	1.2	0.012	256	24
08/10/2015	0.038	2.4	0.021	265	22
25/11/2015	0.035	1.2	0.032	248	19
27/11/2015	0.071	2.0	0.03	294	16
08/12/2015	0.037	0.5	0.046	211	17
20/01/2016	0.046	0.5	0.035	282	18
15/02/2016	0.037	1.1	0.035	271	18
21/03/2016	0.01	0.5	0.027	300	19
18/04/2016	0.01	0.5	0.02	257	18
09/05/2016	0.01	0.5	0.005	283	20
08/06/2016	0.029	1.0	0.005	281	21
20/07/2016	0.033	0.5	0.021	269	20
17/08/2016	0.024	0.5	0.011	169	66
29/09/2016	0.01	0.5	0.047	273	19
25/10/2016	0.01	0.5	0.031	286	19
14/11/2016	0.025	0.5	0.039	273	20
07/12/2016	0.032	0.5	0.033	312	20
26/01/2017	0.021	0.5	0.036	334	20
16/02/2017	0.01	0.5	0.031	305	21
23/03/2017	0.14	**2.8**	**0.08**	222	20
06/04/2017	0.01	0.5	0.021	290	19
26/05/2017	0.01	1.1	0.005	234	22
08/06/2017	0.01	1.2	0.005	296	23
31/07/2017	0.01		0.013	278	23
10/08/2017	0.01	0.5	0.014	244	22
28/09/2017	0.028	1.1	0.02	270	20
25/10/2017	0.01	0.5	0.026	287	18
23/11/2017	0.084	**4.3**	**0.12**	179	17
14/12/2017	0.049	0.5	0.039	291	24
18/01/2018	0.14	1.7	0.028	250	24
08/03/2018	0.066	1.1	0.021	248	30
13/03/2018	0.034	0.5	0.015	264	25
12/04/2018	0.027	0.5	0.005	282	22
01/05/2018	0.01	0.5	0.005	313	22
15/06/2018	0.01	0.5	0.005	262	24
11/07/2018	0.01	1.4	0.005	237	28
14/08/2018	0.01	0.5	0.005	232	44
27/09/2018	0.01	0.5	0.005	244	31
24/10/2018	0.01	0.5	0.005	211	32
20/11/2018	0.028	0.5	0.018	189	27
05/12/2018	0.061	1.2	0.034	185	26
21/01/2019	0.025	0.5	0.017	294	26
21/02/2019	0.01	1.0	0.01	259	25
13/03/2019	0.025	1.0	0.025	216	24
09/04/2019	0.027	0.5	0.005	282	23
08/05/2019	0.01	0.5	0.005	261	24
20/06/2019	0.01	1.6	0.028	240	23
16/07/2019	0.01	1.1	0.005	254	26
07/08/2019	0.056	1.1	0.021	233	26
12/09/2019	0.01	0.5	0.018	261	23
15/10/2019	0.031	1.0	0.023	257	19
14/11/2019	0.039	1.2	0.045	245	19
04/12/2019	0.028	0.5	0.038	285	21
27/01/2020	0.028	0.5	0.033	304	21
13/02/2020	0.05	1.5	0.038	245	22
24/03/2020	0.02	0.5	0.011	196	19
21/04/2020	0.01	1.2	0.005	196	22
06/05/2020	0.01	1.3	0.005	209	23
10/06/2020	0.01	0.5	0.005	253	27
14/07/2020	0.027	0.5	0.025	191	23

Sampled Date	Ammonia mg/l as N	BOD mg/l	ortho-Phosphate mg/l as P	Alkalinity-total mg/l as CaCO3	Chloride mg/l
05/08/2020	0.023	0.5	0.038	207	22
17/09/2020	0.01	0.5	0.033	274	21
12/10/2020	0.025	0.5	0.03	275	20
10/11/2020	0.024	0.5	0.035	265	19
07/12/2020	0.023	0.5	0.028	288	20
13/01/2021	0.082	2.0	0.027	179	22
04/02/2021	0.062	1.1	0.045	213	18
23/03/2021	0.01	0.5	0.025	275	20
20/04/2021	0.01	1.2	0.005	290	23
04/05/2021	0.01	1.2	0.005	273	25
10/06/2021	0.01	1.3	0.005	282	22
27/07/2021	0.01	**4.1**	0.005	228	28
11/08/2021	0.034	1.2	0.03	187	21
23/09/2021	0.023	0.5	0.015	253	29
12/10/2021	0.025	0.5	0.017	175	23
09/11/2021	0.01	0.5	0.037	243	22
06/12/2021	0.023	0.5	0.021	244	22.5
19/01/2022	0.028	0.5	0.034	299	21.6
03/02/2022	0.021	0.5	0.05	310	23
22/03/2022	0.01	0.5	0.021	297	21.8
19/04/2022	0.01	1.1	0.012	280	23.5
03/05/2022	0.01	1.0	0.005	289	24
09/06/2022	0.01	2.3	0.005	236	24.2
12/07/2022	0.01	0.5	0.011	223	25.2
02/08/2022	0.02	0.5	0.005	226	29.0
22/09/2022	0.021	1.2	0.02	143	24
10/10/2022	0.022	0.5	0.049	187	22.6
08/11/2022	0.025	0.5	0.04	231	20.1
05/12/2022	0.053	1.4	0.054	242	20.3
18/01/2023	0.036	0.5	0.032	234	19
07/02/2023	0.023	0.5	0.029	276	21
23/03/2023	0.035	1.2	0.038	247	19
17/04/2023	0.023	0.5	0.019	263	20
09/05/2023	0.01	1.0	0.024	285	21
19/06/2023	0.01	1.2	0.005	254	26
18/07/2023	0.051	1.6	0.043	217	20
08/08/2023	0.023	1.1	0.049	226	16
19/09/2023	0.042	2.8	0.11	235	18
10/10/2023	0.031	0.5	0.048	288	18
06/11/2023	0.027	0.5	0.038	275	17
05/12/2023	0.04	0.5	0.031	315	19
30/01/2024	0.01	0.5	0.028	289	19
29/02/2024	0.021	1.4	0.033	303	20
11/04/2024	0.046	1.4	0.045	252	15
08/05/2024	0.01	0.5	0.02	294	20
05/06/2024	0.01	1.1	0.005	279	21
Data 95%ile	0.09	**2.8**	0.060	306	28
Data mean	0.03	1.3	0.025	253	22

XXX	*Over 95%ile threshold value (95%ile)*
XXX	*Over mean threshold value (95%ile)*
n.v.	*No value*

Table 3.1 *EPA Water Quality Data in the River Boyne (Data Source: https://catchments.ie/)*

4.0 ANTICIPATED EMISSION LOADING

4.1 PROCESS GENERAL BACKGROUND

As described in the Operational Report submitted with the IED licence review application (Attachment-4-8-1) the cooling units or Air Handling Units (AHUs) provide conditioned air to maintain temperature, relative humidity and pressurisation in the data storage rooms. The cooling units operates under 2 modes;

- Free Cooling – Utilises outdoor air during normal atmospheric temperatures. No water is consumed in this mode.
- Evaporative (Adiabatic) Cooling – Uses mains water as the cooling medium when ambient temperatures exceed the capacity of free cooling.

The evaporative cooling system initiates at temperatures above 28.9°C for Building A and above 30.5°C for Building B. During evaporative cooling mode the conductivity level in the cooling water sump increases, and when it exceeds 1,500 µS/cm, the system initiates a bleed-off process, whereby a portion of the sump water is discharged to the storm sewer and replaced with fresh mains water. A conductivity probe in the cooling water sump is used to determine the level. The cooling water bleed-off occurs gradually over a period of 4–6 hours while conductivity remains above the threshold.

During peak cooling the maximum discharge flow from the site is 482 m^3 per day. This maximum discharge quantity is considered to be conservative, as peak discharge is only likely to occur during extremely high ambient temperatures, typically exceeding 30.4°C.

The maximum discharge flow and maximum concentrations are only likely to occur under very high temperatures generally seen less than 5 days a year (during peak cooling > 30.4 ° C).

When cooling water discharge is not occurring, recirculated evaporative cooling water within the air handling unit (AHU) sumps is typically drained every 7 days to the storm water drainage network. This drain-down occurs only when the evaporative cooling system has remained unused for a continuous period of 7 days. The purpose of this regular drain-down is to prevent stagnation and minimise the risk of legionella growth within the system.

The maximum weekly drain-down volume across the site is 24 m^3, at a worst case this maximum drain down is all discharged in one day. However, this process is carried out sequentially throughout the week over a 4–6 hour period (per building) to prevent overloading the storm water drainage system. As the water has not been used for cooling, it remains equivalent in quality to the mains water that was supplied and is suitable for direct discharge to the storm water drainage network.

During the anti-stagnation cycle, the maximum weekly drain-down 24 m^3 is significantly less than the maximum cooling water discharge. Therefore, the assessment undertaken in this report of the maximum cooling water discharge 482 m^3 per day represents the worst-case scenario.

Winterisation is implemented outside of the cooling season, typically from 1 October to 31 March. During this period, the cooling water sumps are drained and not replenished, meaning no recirculation occurs in Building A and B during these months. Recirculation in Building A and B resumes from April to September, coinciding with the active cooling season.

Prior to the cooling process, water is sanitised using ultraviolet disinfection. When water is used for cooling it is recirculated in a closed loop system. When a conductivity setpoint of 1,500 µS/cm is reached, evaporative cooling water is automatically discharged to the onsite storm water network at ambient temperature.

During normal operations, no treatment chemicals are added to the evaporative cooling water. In accordance with ADSIL legionella management procedure, every cooling system is sampled annually for legionella bacteria. Cleaning of the cooling systems with hydrogen peroxide solution is only undertaken if positive legionella samples have been detected in the unit. Any residual hydrogen peroxide is oxidised by organics in the blowdown and the onsite storm drainage network and converted to water and oxygen prior to discharge via storm sewer. Further details on this process are provided in Section 4.3.2 of the Operational Report (Attachment-4-8-1).

No treatment chemicals are added to the evaporative cooling water. Prior to the cooling process, water is sanitised using ultraviolet disinfection. When water is used for cooling it is recirculated in a closed loop system. When a conductivity setpoint of 1,500 µS/cm is reached, the evaporative cooling water is automatically discharged to the onsite storm water network at ambient temperature. As the water is supplied from the Uisce Eireann mains, there is no risk of Principle Pollution Substances, Priority Substances or Priority Hazardous Substances (main polluting substances as defined in the Schedule of EPA (Licensing)(Amendment) Regulations 2004, S.I. No. 394 of 2004 being discharged from the Installation above the limits outlined in the Surface Waters Regulations (S.I. No. 272 of 2009).

See Figure 4.1 below which details the water flow and evaporative cooling water discharge process. It should be noted that there is no ***direct*** discharge from the site to the River Boyne; there is however, an ***indirect*** discharge via the IDA stormwater network to the east of the site, which subsequently discharges to the River Boyne. A flow control system at the outlet of the site storm water attenuation is used to achieve the controlled discharge rate to this IDA storm water network.

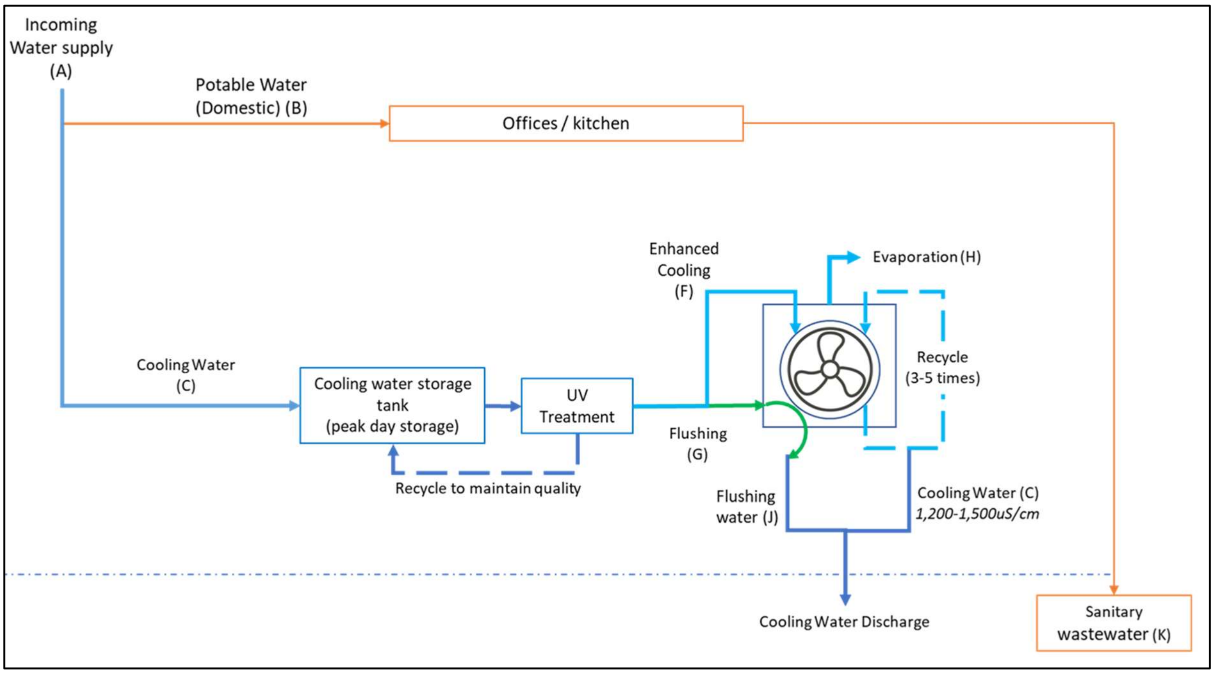

Figure 4.1 Flushing Process Diagram

4.2 EMISSION QUALITY AND FLOW

The expected concentrations for the parameters of interest and discharge flow from their flushing process are presented in Table 4.1 below. The parameters considered in the assessment are based on: (1) the data available from the Operator's Water Team (Table 2.1), and (2) the available data monitored by the EPA within the River Boyne (Oldbridge (Obelisk) Bridge, (RS07B042200)) (Table 3.1). However, where specific parameters of the Operator's data and the EPA data do not correspond, the impact assessment has not been undertaken. Ammonia as N, BOD and Orthophosphate as P have been included in the assessment as they are used by the EPA to assess the water quality status of a river under the WFD.

Parameter	Unit	Value
Ammonia as N	mg/l	0.01
BOD	mg/l	1
Orthophosphate as P	mg/l	0.03
Chloride	mg/l	42
Alkalinity	mg/l	359
Maximum Discharge Flow (95%ile scenario)	m^3/d	482
Maximum Discharge Flow (50%ile scenario)	m^3/d	482

Table 4.1 Emission Values (Source: Operator's Waters Team)

It should be noted that the parameters Ammonia as N, BOD and Orthophosphate as P have been assumed to be at the limit of detection in order to estimate the potential increase in assimilative capacity in the River Boyne due to possible dilution, given that the water quality in the river currently exceeds the established threshold values as set out in Table 2.2. For calculation purposes, it has been assumed that the discharge concentrations of these parameters are at the laboratory limit of detection reported in the EPA water quality data (refer to Section 3.3).

With regard to the discharge flow, two scenarios have been considered as follows:

- Dry Weather Flow or 95%ile: **482m^3/d** maximum evaporative cooling water discharge occurs during the Q_{95} in the River Boyne.
- Mean Flow or 50%ile: **482m^3/d** maximum evaporative cooling water discharge occurs during the Q_{50} in the River Boyne.

5.0 ASSESSMENT RESULTS

The assessment considers the assimilative capacity in the River Boyne without the evaporative cooling water discharge (Section 5.1) and with the evaporative cooling water discharge (Section 5.2).

5.1 RIVER BOYNE ASSIMILATIVE CAPACITY (NO EVAPORATIVE COOLING WATER DISCHARGE)

Based on the Q_{95} and the EPA water quality data presented above, the Assimilative Capacity (kg/d) was calculated using the formula in Section 2.2.1 above, for the Dry Weather Flow ('DWF') (or 95%ile condition). The results obtained are presented in Table 5.1 below.

Parameter	Q95 (m3/s)	CMAX (mg/l)	CBACK (mg/l)	Assim. Cap. (kg/d)
Ammonia	6.1	0.14	0.086	**28.120**
BOD		2.60	2.80	**-104.924**
Orthophosphate as P		0.075	0.060	**7.642**
Chloride		250	28.165	**116,379**

XXX	*Concentration over threshold value*
XXX	*Negative Assimilative capacity*

Table 5.1 Assimilative Capacity for 95%ile hydrological condition in the River Boyne

In addition, the assimilative capacity in the River Boyne was also estimated for a mean (or 50%ile) condition. The results obtained are presented in Table 5.2 below.

Parameter	Q50 (m3/s)	CMAX (mg/l)	CBACK (mg/l)	Assim. Cap. (kg/d)
Ammonia	29.1	0.065	0.034	**76.722**
BOD		1.50	1.307	**484.635**
Orthophosphate as P		0.035	0.025	**25.060**
Chloride		250	21.716	**573,961**

XXX	*Concentration over threshold value*
XXX	*Negative Assimilative capacity*

Table 5.2 Assimilative Capacity for 50%ile hydrological condition in the River Boyne

Table 5.1 and Table 5.2 shows that:

- Background concentrations (C_{BACK}) of Ammonia, BOD and Orthophosphate as P is below the threshold established under the Surface Water Regulations for this waterbody (C_{MAX}) during the mean flow condition (50%ile condition).
- This means that there is assimilative capacity within the River Boyne for these parameters of Ammonia, BOD and Orthophosphate as P during the mean flow condition (50%ile condition).
- Background concentrations (C_{BACK}) of Ammonia, and Orthophosphate as P is below the threshold established under the Surface Water Regulations for this waterbody (C_{MAX}) during the dry weather flow (95%ile condition).
- This means that there is assimilative capacity within the River Boyne for these parameters of Ammonia, and Orthophosphate as P d during the dry weather flow (95%ile condition).
- Background concentrations (C_{BACK}) of BOD during the dry weather flow (95%ile condition) inadequate assimilative capacity which is reflected by the negative value of the assimilative capacity. A negative assimilative capacity indicates that the waterbody is already at or above the EQS for that parameter under that flow condition.
- Background concentration (C_{BACK}) for Chloride is below the threshold established under the Drinking Water Regulations. This means that there is assimilative capacity within the River Boyne for this parameter (Chloride).

5.2 RIVER BOYNE ASSIMILATIVE CAPACITY (WITH EVAPORATIVE COOLING WATER DISCHARGE)

This scenario assesses the assimilative capacity of the River Boyne with evaporative cooling water discharge from the cooling systems for both the existing and extended

Installation, with emission values as presented in Table 4.1. The downstream concentrations in the River Boyne of the assessed parameters have been estimated (Refer to Table 5.3 below). It should be noted that:

- This scenario is conservative as it has assumed no dilution of evaporative cooling water discharge through the IDA storm water sewer;
- This assessment represents a maximum flow and maximum concentrations, which are only likely to occur under very high temperatures generally seen less than 5 days a year (during peak cooling > 34° C) as set out in Section 4.1.
- As explained in Section 4.2 above, 2 no. hydrological scenarios have been considered:
  - Dry Weather Flow or 95%ile: **482m³/d** maximum evaporative cooling water discharge from the Installation and Q_{95} in the River Boyne.
  - Mean Flow or 50%ile: This scenario estimates that the maximum **482 m³/d** discharge from the installation occurs 5 during the Q_{50} in the River Boyne.
- These scenarios are conservative, as they assume that the maximum evaporative cooling water discharge occurs continuously, regardless of river flow conditions or ambient air conditions. Therefore, this assessment based on the maximum cooling water discharge represents a worst-case scenario.

The results obtained for the Dry Weather Flow (DWF or 95%ile) condition are presented in Table 5.3 below.

Parameter	Q95 (m3/s)	Discharge Flow (m3/d)	CBACK (mg/l)	CADSIL (mg/l)	CD/S (mg/l)	Assim. Cap. (kg/d)
Ammonia	6.08	482	0.086	0.01	0.086	**28.156**
BOD			2.800	1	2.798	**-104.058**
Orthophosphate as P			0.06	0.03	0.060	**7.657**
Chloride			28.165	42	28.165	**116,372**
Alkalinity-total (*)			306.650	359	306	n/a

Concentration over threshold value:	XXX
Negative Assimilative capacity:	**XXX**

Table 5.3 Downstream Concentrations during the discharge scenario (DWF condition)

The results obtained for the mean (50%ile) condition are presented in Table 5.4 below.

Parameter	Q50 (m3/s)	Discharge Flow (m3/d)	CBACK (mg/l)	CADSIL (mg/l)	CD/S (mg/l)	Assim. Cap. (kg/d)
Ammonia	29.1	482	0.034	0.010	0.034	**74.208**
BOD			1.307	1.000	1.307	**468.824**
Orthophosphate as P			0.025	0.030	0.025	**24.233**
Chloride			21.716	41.775	21.720	**555,056**
Alkalinity-total (*)			252.863	359.455	252.883	n/a

Concentration over threshold value:	XXX
Negative Assimilative capacity:	**XXX**

Table 5.4 Downstream Concentrations during the discharge scenario (mean condition)

Table 5.3 and Table 5.4 show that:

- The evaporative cooling water discharge (C_{ADSIL}) will increase the chloride downstream concentrations ($C_{D/S}$) very marginally in terms of the assimilative capacity of the river for both hydrological conditions.
- Despite these changes, the concentrations of chloride and sulphate remain well within statutory limits, and the assimilative capacity of the river is maintained.

For the water quality parameters relevant to achieving 'Good' status under the Water Framework Directive (WFD)—namely Ammonia (as N), BOD, and Orthophosphate (as P)— Table 5.3 and Table 5.4 shows the following:

- The evaporative cooling water discharge provides a small dilution effect, slightly increasing the river's assimilative capacity, particularly under dry weather (Q95) conditions.
- Under dry weather conditions (Q95), the background BOD concentration in the River Boyne is 2.800 mg/l. Following discharge from the proposed Installation, the BOD concentration is calculated as 2.798 mg/l, indicating a negligible reduction. Therefore, the discharge does not contribute to any exceedance of water quality standards, and the assimilative capacity is not exceeded.
- The resultant assimilative capacity is adequate to achieve a 'Good' status as defined and established by the WFD (refer to S.I. 272/2009 and amendment S.I. 77/2019), with the only exception of BOD for the 95%ile hydrological condition. As such, the evaporative discharge of cooling water improves the water quality within the river.

6.0 CONCLUSION

In order to assess the impact of the evaporative cooling water discharge from the Installation on the receiving water course (River Boyne), a conservative numerical analysis has been undertaken, based on the existing assimilative capacity of the surface water body. This has been assessed for two hydrological conditions: dry weather (Q_{95} or 95%ile) and mean flow (Q_{50} or 50%ile).

The assessment is conservative as it considers that all of the evaporative cooling water discharge (at maximum discharge flow and maximum concentration) is discharged directly to the River Boyne. In reality, the Installation evaporative cooling water will discharge from the site at SW1 (discharge point) to the existing IDA storm water network to the east of the Site. The IDA network(s) eventually discharge to the River Boyne (c. 1.0 km hydrologically downgradient).

The parameters assessed in the assimilative capacity study were based on available EPA water quality data (for the closest monitoring stations which was located approx. 3.5 km upgradient of the storm water discharge point) which is used to determine the water body status as well as the characteristics of the evaporative cooling water discharge.

Overall, the effect of the evaporative cooling water discharge is considered to be temporary and not significant (i.e., an effect which causes noticeable changes in the character of the environment but without noticeable consequences) in terms of assimilative capacity of the Boyne River.

The maximum evaporative cooling water discharge will not result in exceedances in the statutory threshold values (as set out in Table 2.2) for the parameters (chloride, alkalinity) in the River Boyne. The assimilative capacity of the River Boyne is sufficient to ensure that exceedances of these parameters do not occur under dry weather (Q_{95}

or 95%ile) and mean (Q_{50} or 50%ile) flow conditions at the EPA monitoring station on the River Boyne.

For the water quality parameters of interest, based on the objectives for achieving good status in the river (Ammonia, Orthophosphate as P and BOD), the evaporative cooling water discharge will provide dilution and as a result slightly increases the assimilative capacity in the River Boyne; the resultant capacity is adequate to achieve/ maintain the current 'Good' status of the river. It should be noted that the River Boyne currently does have existing assimilative capacity for these parameters (i.e., Ammonia as N, BOD and Orthophosphate as P) under the mean (50%ile) flow conditions and is already at 'good' status.

In conclusion, based on the above assessment, the discharge of evaporative cooling water from the Installation is not anticipated to have a noticeable impact on the River Boyne.

7.0 LIMITATIONS AND ASSUMPTIONS

There are no low flow measurements or background water quality data available at the point of discharge into the River Boyne (located approx. 1 km north of the site).

In the absence of an available dataset for flow and water quality, the water quality and flow data from the EPA database and EPA Hydrotool is considered representative for the purposed of estimating the effect of the discharge on the receiving watercourse (River Boyne). The assessment has relied upon the estimated flows from the EPA Hydrotool in River Boyne and its tributaries. The Hydrotool flow estimates represent flows that could be expected in rivers under naturalised conditions and do not take account of artificial influences of any kind such as water supply abstractions or wastewater discharges.

The evaporative cooling water discharge volumes and quality are an estimate made by the Operator's Water Team. The criteria used to estimate the water use and evaporative cooling water discharge volumes and quality has been provided by the Operator's Water Team and is presented below:

- A dry-bulb temperature of 30.4 degC and wet-bulb temperature of 21.2 degC is used for modelling water use for evaporative cooling. This is a conservative design criterion and is greater than the ASHRAE n=50 year temperature for Dublin Airport, Ireland (WMO: 039690). Water use is evaluated based on a theoretical peak day with 6 hours on evaporative cooling working at these peak weather conditions.
- Evaporative cooling water discharge volume and quality is estimated based on the cooling systems operating at 3 cycles of concentration of the mains water supply, per mains water quality analyses carried out on-site.

In order to ensure a highly conservative assessment it has been assumed that the maximum discharge occurs regardless of river flow conditions or ambient air conditions. Therefore, this assessment based on the maximum cooling water discharge represents a worst-case scenario.

8.0 REFERENCES

EPA (2024). Environmental Protection Agency. Available on-line at: https://gis.epa.ie/EPAMaps/.

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EPA (2024). Hydronet Monitoring Data. Available on-line at: https://epawebapp.epa.ie/hydronet/