UISCE ÉIREANN : IRISH WATER

Ringsend Wastewater Treatment Plant Upgrade Project
Environmental Impact Assessment Report

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Enhancing Society Together

Volume 2 - Introduction
Part A: Report

June 2018

Preface

The structure of the Environmental Impact Assessment Report (EIAR) for the proposed Ringsend Wastewater Treatment Plant Upgrade Project (the Proposed Upgrade Project) is outlined in the preface at the start of each Volume of the EIAR for clarity. The Proposed Upgrade Project is located at two sites; the Wastewater Treatment Plant (WwTP) at Ringsend, Dublin 4 and a site proposed for the Regional Biosolids Storage Facility at Newtown, Dublin 11. Volume 1 and Volume 2 provide general information on the overall Proposed Upgrade Project. Volume 3 addresses the Ringsend WwTP component of the Proposed Upgrade Project and Volume 4 addresses the Regional Biosolids Storage Facility component of the Proposed Upgrade Project. Volume 5 provides drawings and large format images for both components. The volumes and sub-section titles are summarised as follows:

Volume 1: Non-Technical Summary

Volume 1 provides a non-technical summary of the information contained in Volumes 2, 3 and 4.

Volume 2: Introduction

Part A: Report

Volume 2 Part A provides a general introduction, outlines the EIA process, describes the scope of the Proposed Upgrade Project and presents the consideration of alternatives.

Part B: Appendices

Volume 2 Part B supplies data that is supplemental to the information in Volume 2 Part A and other volumes of the EIAR.

Volume 3: Ringsend Wastewater Treatment Plant

Part A: Report

Volume 3 Part A describes the environmental impacts specific to the Ringsend Wastewater Treatment Plant component of the Proposed Upgrade Project.

Part B: Appendices

Volume 3 Part B supplies data that is supplemental to the information in Volume 3 Part A and is specific to the Ringsend Wastewater Treatment Plant component of the Proposed Upgrade Project.

Volume 4: Regional Biosolids Storage Facility

Part A: Report

Volume 4 Part A describes the environmental impacts specific to the Regional Biosolids Storage Facility component of the Proposed Upgrade Project.

Part B: Appendices

Volume 4 Part B supplies data that is supplemental to the information in Volume 4 Part A and is specific to the Regional Biosolids Storage Facility component of the Proposed Upgrade Project.

Volume 5: Drawings

Part A: Ringsend Wastewater Treatment Plant Upgrade

Volume 5 Part A illustrates the information detailed in Volume 3 and is specific to the Ringsend Wastewater Treatment Plant component of the Proposed Upgrade Project.

Part B: Regional Biosolids Storage Facility

Volume 5 Part B illustrates the information detailed in Volume 4 and is specific to the Regional Biosolids Storage Facility component of the Proposed Upgrade Project.

Table of Contents

List of Figures

List of Tables

Glossary & Abbreviations

Acronym	Description
AA	Appropriate Assessment
ABP	An Bord Pleanála
AER	Annual Environmental Reports
AGS	Aerobic Granular Sludge
am	Before midday
BF	Biological Filters
BGL	below ground level
Biocake	Dewatered, digested biosolids (not thermally dried)
Biofert	Thermally dried biosolids. May or may not be digested
BOD	Biochemical Oxygen Demand
BOD_5	Biochemical Oxygen Demand
c.	circa (approximately)
CA	Competent Authority
Capacity (of the Ringsend WwTP)	The capacity is expressed as an annual average daily capacity and the plant will be designed to cater for significant daily, weekly and seasonal variations outside of this value
CAS	Conventional Activated Sludge
CBOD	Carbonaceous BOD
CEMP	Construction Environmental Management Plan
CEPT	Chemically Enhanced Primary Treatment
CIE	Córas Iompair Éireann
CIRIA	Construction Industry Research and Information Association
COD	Chemical Oxygen Demand
cSAC	Candidate Special Area of Conservation
CSO	Central Statistics Office
CU	Capacity Upgrade
CUC	Capacity Upgrade Contract. Contract commenced in 2018 for elements of works permitted under planning application ref 29N.YA0010
daa	Dublin Airport Authority
DB	Design and Build
DBO	Design Build Operate
DCC	Dublin City Council
DHI	Danish Hydraulic Institute
Discharge Licence	EPA Wastewater Discharge Licence for the WwTW. The EPA issued a licence for Ringsend WwTP (licence reference number D0034-01) in 2010
DSA	Deep Shaft Aeration
EBPR	Enhanced Biological P-Phosphorus Removal
EEC	European Economic Community

EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ELPS	Expansion Lift Pumping Station
ELV	Emission Limit Values
EMRWMP	Eastern and Midlands Regional Waste Management Plan
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
Fe	Iron
FFL	Finished Floor Level
FOG	Fats, Oils and Grease
GDD	Greater Dublin Drainage
GDSDS	Greater Dublin Strategic Drainage Study
Ha / ha	Hectares
HGV	Heavy Goods Vehicles
IFAS	Integrated Fixed-film Activated Sludge
ILPS	Intermediate Lift Pumping Station
ISO	International Organisation for Standardisation
IW	Irish Water
JBB	JB Barry & Partners Ltd.
kg	Kilogram
km	Kilometre
kV	Kilovolts
kWh	Kilowatt-hour
l	Litre
LSOT	Long Sea Outfall Tunnel
m	Metre
MBR	Membrane Bioreactor
mg	Milligram
MLPS	Main Lift Pumping Stations
mm	Millimetre
MPN	Most Probable Number
MWh	Megawatt-hour
N	Nitrogen
Nereda	Nereda ® (also referred to as Nereda within this report) is the registered trade name for a wastewater treatment technology that purifies wastewater using the unique features of aerobic granular biomass. It is also referred to as aerobic granular sludge (AGS) technology.
NH4	Ammonium
NH4-N	Ammonium as N
NIA	Natura Impact Assessment

NIS	Natura Impact Statement
NL	Netherlands
No.	Number
NOx	Nitrogen Oxide
NWCPO	National Waste Collection Permit Office
NWSMP	National Wastewater Sludge Management Plan
OCU	Odour Control Units
OEMP	Operation Environmental Management Plan
OHSAS	Occupational Health and Safety Assessment Series
P	Phosphorous
PE	The amount of wastewater received at a treatment plant (and its design capacity) is measured in units known as population equivalent (or PE). The wastewater received from all sources, e.g. industrial, tourism, commercial, residential, etc., is converted into these units, with one unit of PE representing the wastewater treatment load typically generated by a single person
pH	Potential of Hydrogen (scale used to specify acidity or basicity)
pm	After midday
PPS1	Process Proving Stage 1
PPS2	Process Proving Stage 2
PS	Primary Sludge
PS	Pump Station
PST	Primary Settlement Tank
PV	Photovoltaic
PVC	Polyvinyl Chloride
RBSF	Regional Biosolids Storage Facility
RHDHV	Royal HaskoningDHV
s	Second
SI	Statutory Instrument
SAGS	Surplus Aerobic Granular sludge
SAS	Surplus Activated Sludge
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control And Data Acquisition
SE	South East
SEA	Strategic Environmental Assessment
SID	Strategic Infrastructure Development
SOx	Sulfur Oxide
SPA	Special Protection Area
STP	Sewage Treatment Plant
Struvite	Recovered phosphorus from wastewater treatment in crystal or granular form
SuDS	Sustainable Drainage System
SW	South West

The Consultant	A consortium of T. J. O'Connor and Associates, J. B. Barry and Partners, and Royal HaskoningDHV
TJO'C	TJ O'Connor & Associates Consulting Engineers
TJO'C/JBB/RHDHV	A consortium of T. J. O'Connor and Associates, J. B. Barry and Partners, and Royal HaskoningDHV
TN	Total
TON	Total Oxidized Nitrogen
TSS	Total Suspended Solids
TU	Toxic Unit
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UV	Ultraviolet
UWWT	Urban Waste Water Treatment
UWWTD	Urban Waste Water Treatment Directive
viz	"Namely" or "as follows"
WFD	Water Framework Directive
Wt	Weight
WwTP	Wastewater Treatment Plant
yr	Year

Section 1: Introduction

1.1 Overview

This Environmental Impact Assessment Report (**EIAR**) for the Ringsend WwTP Upgrade Project (the Proposed Upgrade Project) has been prepared on behalf of Irish Water (the **Applicant**). This EIAR accompanies a planning application made directly to An Bord Pleanála (ABP) under the provisions of Section 37 (Strategic Infrastructure Development) of the Planning and Development Act 2000, as amended (the **Act**).

1.2 Project Background

1.2.1 Existing Approved Development

On 9 November 2012, An Bord Pleanála (ABP) granted approval to Dublin City Council under Section 226 of the Act, for the upgrade to Ringsend Wastewater Treatment Plant in accordance with plans and particulars, including an Environmental Impact Statement and Natura Impact Statement, lodged with the ABP on 13 April 2012 (ABP Reference Number: 29N.YA0010).

The proposed extension to Ringsend Wastewater Treatment Plant (**WwTP**) sought to expand the existing plant at Pigeon House Road, Ringsend, Dublin to a capacity of 2.4 million population equivalent (PE). The proposed extension included the following elements of works:

- Additional secondary wastewater treatment capacity at the wastewater treatment works site (approximately 400,000 PE) including associated solids handling and ancillary works.
- Various WwTP process improvement works, known as 'surgical works'.
- A 9 kilometre Long Sea Outfall Tunnel (LSOT), commencing at an onshore inlet shaft approximately 350 metres east of the wastewater treatment works and terminating in an underwater outlet riser/diffuser in Dublin Bay.
- Road network and access improvements in the vicinity of the site.

Two applications were made to amend the 2012 Approval and were approved by ABP under section 146B of the Planning and Development (Strategic Infrastructure) Act 2006. The approved amendments are as follows:

- Provision of a temporary access to the WwTP site on the north boundary of the site along Pigeon House Road, temporary removal of two areas of landscaping bunds located on the eastern perimeter and the provision of an internal circulation road and adjustment of the site boundary fence in the south east corner of the site (ABP Reference Number 29N.YM00020, June 2016).
- Omission of three previously approved construction site compounds and provision of three new temporary construction site compounds (ABP Reference Number 29N.YM0004, January 2018).

In the context of this EIAR, these permitted works are referred to collectively as the "**2012 Approval**". Some elements of these works have been advanced as follows:

- Various LSOT preparatory works including road improvements, tunnel boring machine power supply cable laying.
- Some surgical works have been completed while others are in progress.
- Construction of access road to the South East of the WwTP.

- Construction of additional secondary wastewater treatment capacity (in progress).
- Construction of temporary access on northern boundary.

1.2.2 Proposed Development

Permission is now being sought from ABP, pursuant to Section 37A of the Act, as amended, for permission for development comprising of two principal components:

- **Ringsend WwTP**: Revised upgrade works at the Ringsend WwTP; and
- **RBSF**: A Regional Biosolids Storage Facility at Newtown, North Road, Dublin 11.

1.2.2.1 Ringsend WwTP

The Proposed Development to be carried out by Irish Water at the Ringsend WwTP comprises revisions to the 2012 Approval. The Proposed Development will continue to facilitate the expansion of the existing wastewater treatment plant, within the confines of its current site, to its eventual design capacity of 2.4 million population equivalent, as permitted in the 2012 Approval. However, this will now be achieved primarily through the introduction of aerobic granular sludge (AGS) technology within the plant. The introduction of this technology will facilitate the continued use of the existing outfall whilst still adhering to the parameters set by the Urban Waste Water Treatment Directive. Therefore, the 9 kilometre Long Sea Outfall Tunnel, associated onshore inlet shaft and construction compound will be omitted.

The following additional development works are now proposed at the Ringsend WwTP:

- Reconfiguration and retrofitting of the existing sequencing batch reactors (SBR) to facilitate the use of AGS technology; and
- Associated works including provision of:
  - Phosphorus Recovery Facility
  - Sludge Pasteurisation Building
  - Treated effluent emergency/maintenance by-pass culvert
  - Temporary access road off Pigeon House Road and temporary bund removal to be made permanent
  - Ancillary site development and landscape works
  - Underground electricity connection (within SPA)

It is also proposed to include two construction compounds, previously approved in January 2018 (ABP Ref 29N.YM0004) as part of the Proposed Upgrade Project, thereby extending the duration of their approved temporary use from 3 years to 10 years. The third compound (C3) approved as part of that application will not be required beyond the 3 year planning lifetime and therefore, is not included in the present planning application.

1.2.2.2 Regional Biosolids Storage Facility (RBSF)

The RBSF, which forms part of the Proposed Development, is at an 11 Ha site at Newtown, Dublin 11 and will include the following elements:

- Demolition of existing buildings and some site infrastructure;
- 2 no. biosolids storage buildings, including solar panels on the roof of one building;
- Administration and welfare building with staff parking;
- Internal roads;

- 2 no. weighbridges;
- HGV parking area;
- HGV cleaning area;
- Odour control units with ventilation stacks;
- Site services, including electricity supply substation;
- Landscaping and site boundary treatment; and
- Use of the existing vehicular access off the R135 regional road.

1.2.3 Scope of EIAR

The EIAR being submitted with this planning application considers the impact of the overall Proposed Upgrade Project and not simply the works for which permission is now being sought at Ringsend WwTP.

The scope of the EIAR comprises the works and activities associated with the Proposed Development, for which permission is being sought and described in section 1.2.2 above, together with the development works (the common elements[1]) that will be progressed from the 2012 Approval and the proposed omission of the LSOT. The proposals for a Regional Biosolids Storage Facility at Newtown, Dublin 11 are also considered in the EIAR. This approach results from pre-application consultation with ABP.

Therefore, when referring to the proposed works it is important at this stage to clearly define the project for the purposes and scope of this EIAR.

- **Proposed Upgrade Project -** The term 'Proposed Upgrade Project' refers to the elements of the 2012 Approval being progressed and the Proposed Development being applied for under Section 37E.

The Proposed Upgrade Project consists of two components as follows:

- **WwTP Component -** The term 'WwTP component' is used to refer to works and activities associated with the Ringsend WwTP as described in Section 1.2.1 and 1.2.2.1 above. Volume 3 of this EIAR focuses on the WwTP component.
- **RBSF Component -** The term 'RBSF component' is used to refer to all works associated with the proposed Regional Biosolids Storage Facility at Newtown Dublin 11, as described in Section 1.2.2.2 above. Volume 4 of this EIAR focuses on this RBSF component.

Figure 1-1 provides a schematic that illustrates the 2012 Approval, the new development proposals for Ringsend WwTP and RBSF, and these proposals in the context of this EIAR.

[1] *Refer to section 3.3.2 Proposed Works, Table 3-6: Proposed works at Ringsend WwTP for common elements.*

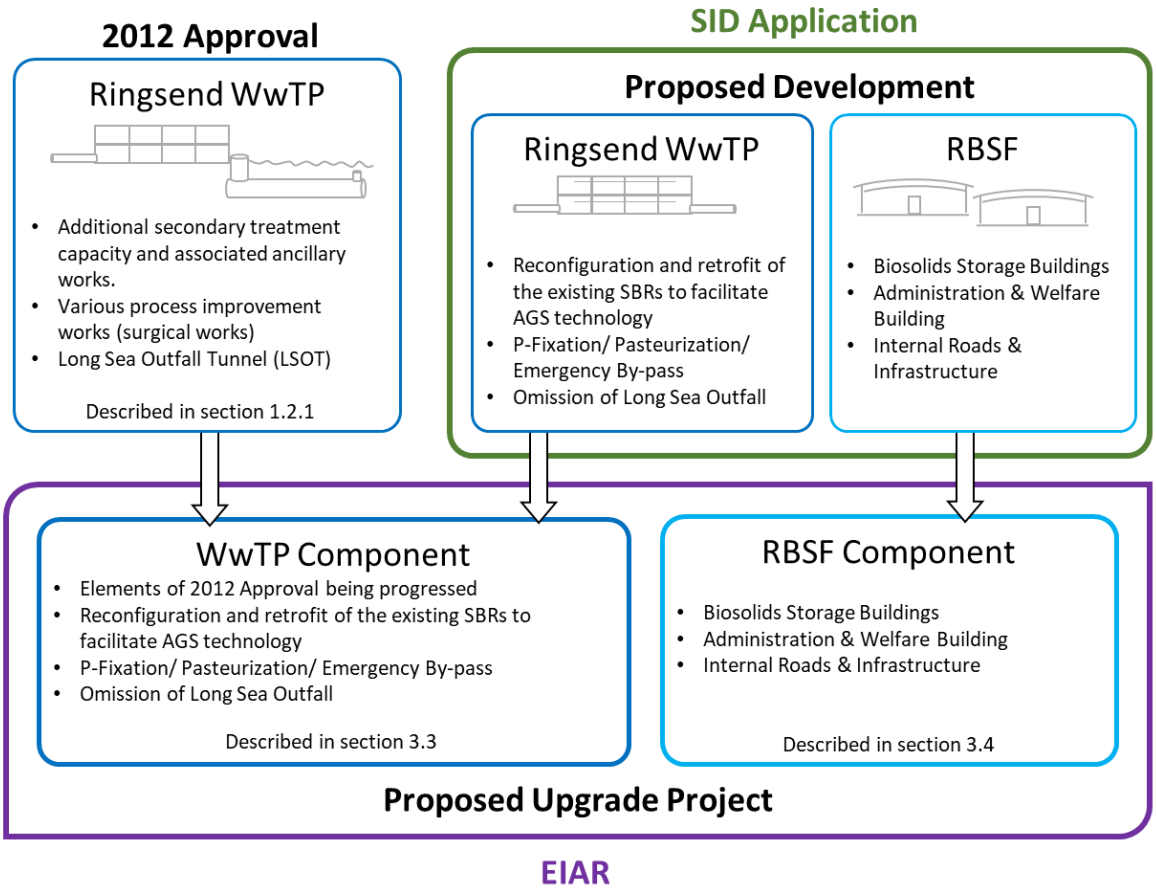

Figure 1-1: Project background and approach to EIAR

1.3 The Applicant

Irish Water is a subsidiary of the Ervia Group (formerly Bord Gáis Éireann), which was incorporated as a company under the Water Services Act 2013. At present, Ervia's responsibility lies in the delivery of gas, water infrastructure and services in Ireland, nationwide.

In January 2014, all functions previously conferred on water services authorities (except excluded functions) were transferred to Irish Water under the Water Services (No. 2) Act 2013. In addition, the Ringsend WwTP property was transferred to Irish Water in April 2015 under SI No. 146/2015 - Water Services (No. 2) Act 2013 (Property Vesting Day) (No. 4) Order 2015. Furthermore, capital investment decisions, along with the implementation of capital programmes in an economical and efficient manner across the country are now the responsibility of Irish Water.

The transfer of these functions to Irish Water provided a unique opportunity to conduct a thorough review of elements of the Ringsend WwTP, particularly the proposed expansion plans which included the design as applied for by Dublin City Council and subsequently approved under the 2012 Approval.

This application has been prepared by a design team in conjunction with the Applicant, led by a consortium of T. J. O'Connor and Associates, J. B. Barry and Partners, and Royal HaskoningDHV.

1.4 Statement of Need

1.4.1 WwTP Component

In 2001, the Lower Liffey Estuary was designated a 'sensitive area' under the Urban Waste Water Treatment Directive (UWWTD). This designation was of major significance for Ringsend WwTP, requiring the removal of nutrients from the treated effluent before discharge to the Lower Liffey Estuary.

In 2010, a discharge authorisation licence (D0034-01) was granted by the EPA for the Greater Dublin Area agglomeration (also referred to as the Ringsend agglomeration) which is served by Ringsend WwTP. The licence applies Emission Limit Values (ELV) of 10 mg/l and 1 mg/l in respect of Total N (nitrogen) and Total P (phosphorus). The Ringsend WwTP does not currently possess the necessary nutrient reduction treatment facilities to achieve these standards. The level of treatment will be increased to a higher standard (specifically involving nutrient reduction) utilising AGS technology, to ensure that the effluent will comply with the UWWTD and to achieve the emission limit values as set out in Schedule A of the EPA discharge licence. The EPA licence will be subject to a review process by the EPA following completion of the planning process.

The Ringsend WwTP is currently overloaded. There is also a requirement to provide for the future growth in demand arising from the connected catchment. The Proposed Upgrade Project will increase the treatment capacity[2] of the plant from 1.64 million PE at present to the proposed 2.4 million PE. The design also provides for the technology and infrastructure required so that the level of treatment will be increased to a higher standard (specifically involving nutrient removal) to comply with the UWWTD and to achieve the emission limit values as set out in Schedule A of the EPA discharge licence.

The Proposed Upgrade Project is also a core pillar of a wider strategy for wastewater treatment facilities in Dublin, as outlined in the 'Greater Dublin Strategic Drainage Study' (GDSDS). This study recommended that Ringsend WwTP be expanded to the maximum capacity achievable at the existing site. When, at a future date, the load at Ringsend WwTP approaches its maximum capacity, it is proposed that flows will be diverted from the northern part of the Ringsend catchment to a new Regional WwTP in North Dublin, now designated as the Greater Dublin Drainage (GDD) project. Such diversions are envisaged at discrete intervals over an extended timescale (with the first diversion expected to arise in the 2020's). This strategy is to ensure that there will always be spare treatment capacity, or operational 'headroom', at Ringsend WwTP to allow for future development in, and intensification of, the core city area.

The Proposed Upgrade Project will enable the upgraded WwTP to meet the level of treatment required by the UWWTD and to achieve the emission limit values as set out in Schedule A of the EPA discharge licence and all current National and European Legislative requirements.

1.4.2 RBSF Component

The *National Wastewater Sludge Management Plan* (NWSMP), published by Irish Water in 2016, sets out Irish Water's strategy for managing wastewater sludge (the generation of which is an inevitable result of the operation of WwTPs) over the next 25 years. The NWSMP considers all aspects of

[2] The capacity is expressed as an annual average daily capacity. The WwTP will be designed to cater for significant daily, weekly and seasonal variations outside of this value.

wastewater sludge management, including treatment, transport, storage and reuse/disposal. The NWSMP identifies reuse of treated wastewater sludges (biosolids) on agricultural land (under nutrient management plans) as the preferred outlet in the short to medium term. However, there are constraints on land spreading due to seasonal factors and as such the biosolids must be stored during the winter and summer months. The development of regional facilities for the storage of biosolids from wastewater treatment plants is recommended in the NWSMP. In line with the adopted strategy, a new Regional Biosolids Storage Facility (RBSF) is proposed as part of the Proposed Upgrade Project. Following a non-statutory consultation process conducted in 2017, it is proposed to locate the RBSF in Newtown, Dublin 11. The purpose of the RBSF is to store treated biosolids that will be produced at the Ringsend WwTP and the proposed WwTP for North County Dublin (the Greater Dublin Drainage (GDD) Project). No treatment of the biosolids will take place at the proposed RBSF.

1.5 Background to EIA

In 2012, both an- EIA and an AA were undertaken by ABP of the existing and approved development prior to making its decision to approve this project. Under the 2012 Approval, Irish Water currently have ABP consent to upgrade the Ringsend WwTP to a 2.4m PE capacity in a manner which requires the provision of the Long Sea Outfall Tunnel. However, by utilising AGS technology it is now possible to omit the Long Sea Outfall Tunnel and continue to discharge the final effluent at the current location on the Lower Liffey Estuary.

Following pre-planning discussions between ABP and Irish Water, it has been agreed that this proposed revision to the 2012 Approval must be the subject of a new project-specific EIA and AA before a decision on development consent may be made.

The screening and scoping exercises undertaken in the preparation of this EIAR were informed in part by two recent High Court judgments, (*O'Grianna vs An Bord Pleanála,* [2014 IEHC 632] and *Edenderry Power Limited*, [2014 No. 38 J.R.]) which relate to the consideration of cumulative environmental impacts as part of the overall assessment of a project. In both decisions, the judgements confirmed that the integral elements of a project must be examined as part of the EIA process.

A by-product of the wastewater treatment process is the creation of biosolids. In the case of Ringsend WwTP, biosolids are currently produced in two forms, referred to as Biocake and Biofert. These biosolids form a normal part of wastewater treatment and are recovered through the spreading on agricultural lands, at specified times of the year. Outside of these times, the biosolids are stored. It was determined that the storage of biosolids produced by the Ringsend WwTP is integral to the overall Proposed Upgrade Project. The implications of these judgements for the Proposed Upgrade Project require the inclusion of as the RBSF within this planning application.

Further detail on the requirements of EIA and the EIA Process is provided in Section 2:The EIA Process.

1.6 EIA Team

Article 5(3)(a) of amended EIA Directive (2014/52/EU) (EIA Directive) states that "the developer shall ensure that the environmental impact assessment report is prepared by competent experts". The Draft *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* issued by the EPA in August 2017 highlights the need for competent experts to be involved in the EIA process and in the preparation of the EIAR.

The EIAR for this project has been prepared by a consortium of J. B. Barry & Partners, T. J. O'Connor & Associates and Royal HaskoningDHV with additional specialist input provided by competent experts in a variety of disciplines. Responsibility for individual sections of the EIAR is as listed in Table 1-1. A list of experts who have contributed to this EIAR, their qualifications, experience and any other relevant credentials is provided in Appendix 1A.

Table 1-1: EIAR sections and competent experts

EIAR Section	Consultant
Non-Technical Summary	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Introduction	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
EIA Process	Stephen Little & Associates
Existing Environment	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
The Proposed Upgrade Project	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Consideration of Alternatives	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Planning and Policy Context	Stephen Little & Associates
Population	Stephen Little & Associates
Water	DHI & Limnos
Biodiversity - Marine	Aquafact
Biodiversity - Terrestrial	Natura
Land and Soils	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Air	AWN Consulting
Noise and Vibration	AWN Consulting
Odour	Royal HaskoningDHV
Climate	AWN Consulting
Cultural Heritage	Dr. Charles Mount
Material Assets	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Traffic	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Landscape	Brady Shipman Martin Macro Works*
Human Health	Dr. Fiona Donnelly
Environmental Interactions	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Summary of Mitigation	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Summary of Residual Impacts	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Cumulative Impacts	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Risk	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV
Overall Co-ordination and Management of the EIAR	J.B. Barry/T.J. O'Connor/Royal HaskoningDHV

* For glint and glare assessment only

1.7 Separate Consent Processes

Strategic Infrastructure Development (SID) planning applications, such as the proposed Ringsend WwTP Upgrade Project, are governed by the Planning and Development Act 2000 as amended, including the Planning and Development (Strategic Infrastructure) Act 2006 (together, the Act). The Act provides for SID applications, inclusive of an EIAR, being made directly to ABP under Section 37 of the Act.

In addition to the planning permission, the consents and considerations described in the following subsections are also required for construction and operation of the Proposed Upgrade Project.

1.7.1 The Waste Water Discharge (Authorisation) Regulations 2007

Under Regulation 28(1) of the Waste Water Discharge Regulations 2007 as amended, the Ringsend WwTP requires a discharge licence to discharge treated effluent to waters.

The Environmental Protection Agency (EPA) granted a wastewater discharge licence (D0034-01) (the EPA Licence) for the Greater Dublin Area Agglomeration in 2010, which was subject to a technical amendment in 2016. The Licence covers discharge from the current outfall location in the Lower Liffey Estuary (a designated nutrient sensitive water). The EPA Licence includes emission limit values for nitrogen and phosphorus. The existing WwTP is operating beyond its design capacity and does not have treatment processes required for the removal of nutrients. Consequently, the effluent from the WwTP does not comply with the emission limit values in the EPA Licence (BOD, COD, Suspended Solids, Nitrogen and Phosphorus). The Proposed Upgrade Project will provide the additional capacity and level of treatment required to ensure that the Ringsend WwTP is compliant with the UWWTD and the emission limit values as set out in Schedule A of the EPA discharge licence issued in 2010.

The EPA is a statutory consultee who will review the EIAR and can also make submissions to ABP in relation to the Proposed Upgrade Project. Furthermore, the EPA may review the existing licence at any time in accordance with Regulation 14 of the Waste Water Discharge Regulations 2007, as amended. The EPA licence will be, in the usual way, subject to a review process by the EPA following completion of the planning process. In making a decision on an application for a licence or for a review, the EPA is required to undertake an environmental impact assessment and have regard to its' findings.

1.7.2 Building Control (Amendments) Regulations 2014

The Building Control Act 1990 and the Building Control (Amendment) Regulations 2014, provide an enforcement framework to ensure improved quality in construction and health and safety of buildings. A Code of Practice has been issued by the Department of Environment, Community and Local Government outlining the necessary online certification steps required to ensure compliance with the applicable legislation. The certification is not aimed at water or effluent quality standards rather it aims to ensure compliance with building regulations and associated design and construction controls. A Certifier and any Assigned Certifiers will be appointed, by Irish Water, to ensure full compliance with the relevant legislation.

1.7.3 Habitats Directive 92/43/EEC and Directive 2009/147/EC;

Consenting Authorities are required to undertake an Appropriate Assessment (AA) of a proposal under Article 6(3) of the Habitats Directive. Under Section 177S(2)(g) of the Act, ABP is the designated Competent Authority to undertake Appropriate Assessments for Strategic Infrastructure Development applications.

The Proposed Upgrade Project was subject to AA screening to determine, on the basis of a preliminary assessment and objective criteria, whether it alone and in combination with other plans or projects, could have significant effects on a legally designated conservation areas (known as 'Natura 2000' sites) in view of the site's conservation objectives.

Following screening, it was determined that the likelihood for significant effects could not be excluded. Accordingly, a Natura Impact Statement (NIS) has been prepared to inform an Appropriate Assessment under Article 6(3) of the Habitats Directive, examining the likelihood of significant effects on the Natura 2000 sites of the Proposed Upgrade Project.

The NIS is a separate document from the EIAR and examines the potential impacts of the Proposed Upgrade Project on sites in the Natura 2000 Network, as outlined above.

The finalised NIS will be submitted to ABP for Appropriate Assessment along with the EIAR for Environmental Impact Assessment. If it can be concluded on the basis of AA that there will be no adverse effects on the integrity of a Natura 2000 site, the Proposed Upgrade Project can proceed to authorisation, in which case the normal planning or other requirements will apply in reaching a decision to approve or refuse.

1.7.4 Waste Management (Registration of Sewage Sludge Facility) Regulations 2010 (as amended)

In addition to normal planning requirements, the RBSF will need to be registered with the Local Authority under the Waste Management (Registration of Sewage Sludge Facility) Regulations 2010 prior to the commencement of operation. The facility will subsequently be operated in accordance with any conditions that may be imposed as part of that Certificate of Registration.

Waste Permit and the Certificate of Registration Database register for waste facility permits and certificates of registration issued by local authorities has transferred to the National Waste Collection Permit Office (NWCPO). The register is hosted at http://facilityregister.nwcpo.ie/.

1.7.5 Additional Project Consents / Project Compliance

This EIAR may inform other Project consents and/or Project compliance requirements to facilitate construction and operation of the Proposed Upgrade Project, as appropriate.

1.8 Structure of EIAR

This EIAR has been completed in accordance with the requirements as set out in the EIA Directive, (2014/52/EU) and relevant guidelines and documentation, including:

- Draft Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2017)
- Advice Notes for Preparing Environmental Impact Statements Draft (EPA, 2015)
- Guidance on the preparation of Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52EU) (EU, 2017)
- Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive)
- Circular PL 8/2017 - Implementation of Directive 2014/52/EU - Advice on Electronic Notification Requirements

The EIAR for Proposed Upgrade Project comprises five volumes:

- Volume 1: Non-Technical Summary
- Volume 2: Introduction
- Volume 3: Ringsend Wastewater Treatment Plant
- Volume 4: Regional Biosolids Storage Facility
- Volume 5: Drawings

A content summary is provided in the preface at the beginning of each volume.

Section 2: The EIA Process

2.1 Introduction

The purpose of this Section of the EIAR is to demonstrate the process that has been undertaken in the preparation and submission of this EIAR. This EIAR has been prepared in accordance with Article 1(2)(g) of the EIA Directive 2014/52/EU (the EIA Directive), which describes an EIA as a process consisting of:

- *"the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);*
- *the carrying out of consultations as referred to in Articles 6 and, where relevant, Article 7;*
- *the examination by the competent authority of the information presented in the environmental impact assessment report and any supplementary information provided, where necessary, by the developer in accordance with Article 5(3), and any relevant information received through the consultations under Articles 6 and 7;*
- *the reasoned conclusion by the competent authority on the significant effects of the projects on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and*
- *the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a"*

The EIA process is described in the EU guidelines (2017) as "*The process of carrying out an Environmental Impact Assessment as required by Directive 2011/92/EU, as amended by Directive 2014/52/EU on assessment of the effects of certain public and private Projects on the environment. The EIA process is composed of different steps: preparation of the EIA Report, publicity and consultation and decision-making.*"

The structure and general sequence of this EIAR follows the EPA Draft Guidelines (2017), as illustrated in Figure 2-1 below. The process consists of the following steps or stages:

- **Screening -** Determining whether an EIA is required or not;
- **Scoping -** If an EIA is required, then the scope of the EIAR is established;
- **EIAR -** An EIAR is prepared by the Applicant as part of the consent application. The EIAR sets out among other things a statement of the likely significant effects, if any, which the proposed project, if carried out, would have on the environment;
- **EIA -** Once the application is lodged, the competent authority (CA) (in this case, ABP) examines the EIAR, circulating it to statutory consultees while also making it available to the public. In addition to its own consideration of the information presented in the EIAR the CA takes account of other information submitted by the applicant, certain authorities and the public during the consent process; and
- **Consent Decision -** The consent decision is a key milestone which marks the end of the formal EIA process. The implementation of mitigation measures and any monitoring measures contained in the EIAR and consent decision continues after the formal EIA process is complete.

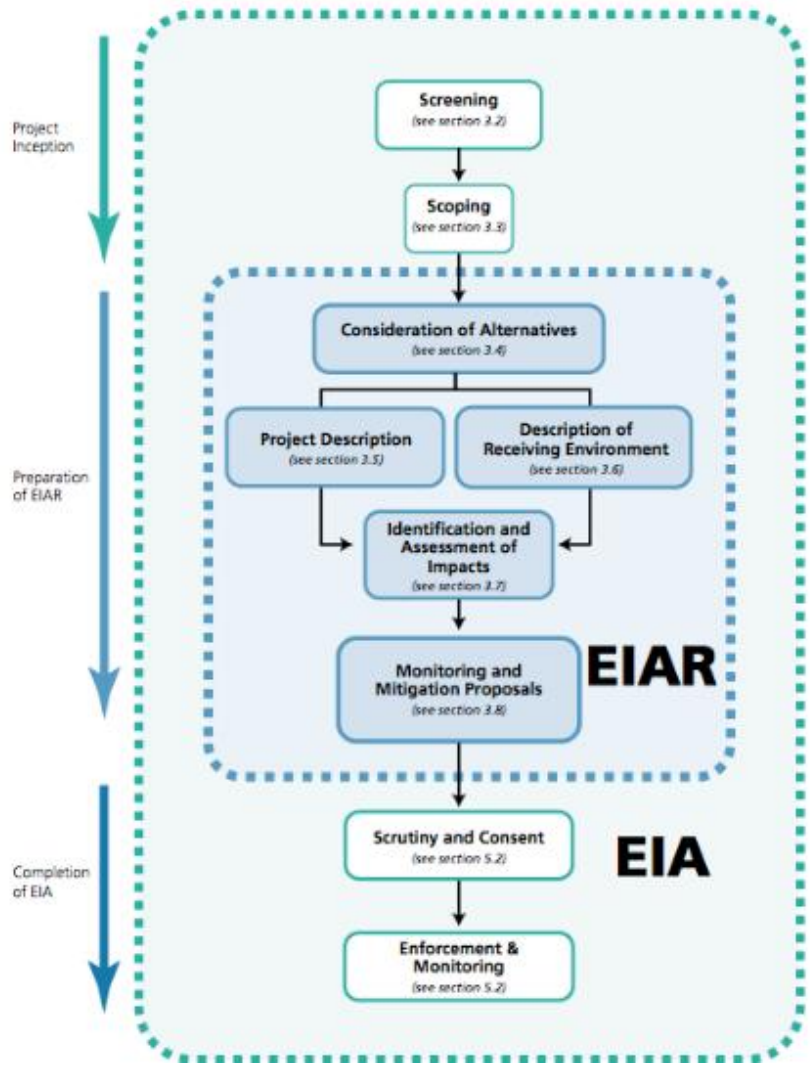

Figure 2-1: The position of an EIAR within the EIA process [3]

2.1.1 EIA Directive, Legislation and Guidelines and Circulars

The development of this EIAR has been informed by the EIA Directive (2014/52/EU), National Legislation, EU and EPA guidelines and other guidelines and circulars.

This EIAR adheres to the fundamental principles of the EIA process as outlined in the EU Guidelines (2017) and EPA Draft Guidelines (2017). The Guidelines set out the matters that must be addressed in an EIAR which include:

- Anticipating, Avoiding and Reducing Significant Effects;
- Assessing and Mitigating Effects;
- Maintaining Objectivity;
- Ensuring Clarity and Quality;
- Providing Relevant Information to Decision Makers; and
- Facilitating Better Consultation.

[3] *Source: Revised EPA Guidelines on the Information to be contained in EIAR, Draft August 2017, Section 2, pg.11*

2.2 EIAR Project Description

It has been noted in Section 1.2.3 that the EIAR being submitted with this Planning Application is tasked with considering the impact of the Proposed Upgrade Project and not simply the works for which permission is now being sought at Ringsend WwTP. This is due to the requirement for an EIAR to consider a 'Project' as a whole, as opposed to what is being proposed under this planning application. The scope of this EIAR is as described in section 1.2.3.

2.3 Screening

The Proposed Upgrade Project was screened early in the design phase to establish the requirement for an EIA. In accordance with the EIA Directive, EU Guidelines (2017), EPA Draft Guidelines (2015 and 2017) and applicable legislation, the project was examined in the context of 'type of development' and 'thresholds'.

Article 4(1) and Annex I of the EIA Directive (2014/52/EU) lists projects for which an EIA is mandatory, whereas Article 4(2) and Annex II lists project types for which an EIA may be required.

The projects requiring Environmental Impact Assessment are transposed from the EIA Directive into Irish legislation through Section 172 of the Act. Irish Legislation also confirms where an EIA of a project is required through the Fifth Schedule of the Planning and Development Regulations 2001 as amended ('the Regulations'). The Fifth Schedule of the Regulations lists classes of development where an EIA is mandatory under Part 1 and where an EIA may be required under Part 2. Where a project falls within a criterion for a type of development and/or exceeds a threshold as listed in Part 1 or Part 2, then it must be subjected to EIA.

2.3.1 Consultation on Screening

Consultation on screening for EIA has taken place between the Applicant and ABP as part of the Strategic Infrastructure Development (SID) pre-planning application process.

2.3.2 Project Type and Thresholds

A detailed description of the Proposed Upgrade Project is provided in Section 1.2 of this Volume. For the purposes of this section, the Proposed Upgrade Project comprises two components - the Ringsend WwTP component and the RBSF component. The WwTP Component will result in a WwTP with a design capacity for 2.4 million PE. This component falls within Class 13 of Part 1 of the Fifth Schedule of the Regulations, namely:

> *"Waste water treatment plants with a capacity exceeding 150,000 population equivalent as defined in Article 2, point (6), of Directive 91/271/EEC. "*

The Proposed Development also falls within the classes of development prescribed under Part 3 of the Seventh Schedule of the Act relating to Strategic Infrastructure Development applications under Section 37 of The Act, namely:

> *"A waste water treatment plant with a capacity greater than a population equivalent of 10,000, and for the purpose of this provision, population equivalent shall be determined in accordance with Article 2, point 6, of Council Directive 91/271/EEC"*

It was determined by ABP on the 26 March 2018 that the Proposed Development is considered to be a development which is a Strategic Infrastructure Development in accordance with Section 37 of the Act. Furthermore, Section 37E of the Act states:

> *"An application for permission for development in respect of which a notice has been served under section 37B(4)(a) shall be made to the Bord and* ***shall be accompanied by an environmental impact statement*** *in respect of the proposed development" (*Emphasis added)

Consequently, it was determined that an EIAR should be prepared and submitted to ABP as part of the SID application process.

2.3.3 Inclusion of the RBSF Component within the Planning Application and EIAR

Section 3.5.7 of the EPA Draft Guidelines (2017) confirms that 'off-site' or 'secondary' projects also need to be considered at screening stage. These include projects specifically required for the main or overall development which take place at a distance from the site or may arise largely because of the existence of the principal project.

In 2016, Irish Water published its National Wastewater Sludge Management Plan (NWSMP). The NWSMP identified the need to develop a dedicated biosolids storage facility to serve greater Dublin and to support the upgrade of the Ringsend WwTP and the development of the GDD project. The Applicant commenced a site selection process for the facility in February 2017 which resulted in the selection of a preferred site at Newtown, Dublin 11.

As the RBSF is regarded as an integral part of the overall Proposed Upgrade Project, it is appropriate to include it within the scope of the EIAR. The assessment of impacts of the RBSF component of the Proposed Upgrade Project are contained in Volume 4 of this EIAR.

2.4 Scoping

The scoping stage of the EIAR is a process of determining the content and extent of the matters which should be covered in the environmental information to be submitted in the EIAR.

The scoping exercise considered such matters as:

- Content, structure, and format of the EIAR;
- Methods and criteria to be used in predicting and evaluating impacts;
- Likely significant impacts of the project, during its construction and operational phase;
- Scope of the study required for each of the EIAR environmental topics;
- Available data and information and determination of where additional surveys and investigations are required;
- Alternatives and mitigation measures to be considered as part of the project;
- Legislative requirements; and
- Any additional consultation requirements.

While formal meetings with ABP have shaped the EIAR and the appropriate environmental topics, a period of non-statutory consultation was facilitated in order to further determine environmental considerations.

As part of the scoping stage, the following reports were prepared and issued to the relevant prescribed bodies, local authorities and advertised to members of the general public for comment:

- WwTP component - *The Environmental Impact Statement and Natura Impact Statement Scoping Report,* March 2016. – Appendix 2A
- RBSF component - *Scoping for Environmental Impact Assessment Report and Natura Impact Statement*, August 2017. – Appendix 2B

Public consultation and input into the EIA scoping process is set out in Section 2.5.

2.5 Consultation Process

The Proposed Upgrade Project put forward for consideration has been informed by extensive consultation undertaken throughout the scoping stage of the EIA. The details of meetings with various statutory bodies, non-statutory bodies, stakeholders and the general public are outlined in the following sub-sections.

2.5.1 WwTP Component

2.5.1.1 Pre-Application Consultation

An Bord Pleanála

Under Section 37B (1) of the Act, the prospective applicant is required to enter into pre-application consultation with ABP in relation to development specified in the Seventh Schedule of the Act.

Having regard to this requirement, nine pre-application consultation meetings were held between ABP and the Applicant. The dates of these meetings are set out in Table 2-1.

Table 2-1: Dates of pre-application meetings held with An Bord Pleanála

Name of Consultee	Date
An Bord Pleanála – Meeting No. 1	22 September 2015
An Bord Pleanála – Meeting No. 2	9 December 2015
An Bord Pleanála – Meeting No. 3	16 February 2016
An Bord Pleanála – Meeting No. 4	22 July 2016
An Bord Pleanála – Meeting No. 5	15 December 2016
An Bord Pleanála – Meeting No. 6	15 March 2017
An Bord Pleanála – Meeting No. 7	2 June 2017
An Bord Pleanála – Meeting No. 8	21 September 2017
An Bord Pleanála – Meeting No. 9	30 January 2018

In addition to the meetings between the Applicant and ABP, ABP held pre-application discussions with Dublin City Council (11 January 2016) and the EPA (3 February 2016) separately. These meetings formed part of ABP's information gathering exercise which sought comments from Dublin City Council and the EPA in relation to the Proposed Upgrade Project. These meetings identified the relevant issues around certain key environmental factors relating to proper planning and sustainable development for the area.

Dublin City Council

The Applicant has also undertaken ongoing engagement with Dublin City Council. The formal introduction of the project was presented to Dublin City Council on 4 August 2015. This meeting, and subsequent meeting, as listed in Table 2-2, informed the scope of the planning application and EIAR.

Table 2-2: Dates of pre-application meetings held with Dublin City Council

Name of Consultee	Date
Dublin City Council – Planning Department	4 August 2015
Dublin City Council – Planning Department	8 Feb 2016
Dublin City Council – Planning Department	12 April 2016.
Dublin City Council – Planning Department	7 October 2016
Dublin City Council – Planning Department	31 October 2017
Dublin City Council – Planning Department	8 February 2018

In addition, various departments have been engaged with, namely:

- Planning Department;
- Environment Department;
- Water Services Department;
- Parks Department;
- Roads and Traffic Planning Department;
- Bathing Water Section;
- Heritage Officer; and
- Conservation Officer.

Table 2-3 sets out the topics relevant to the environmental impact assessment which were raised during consultation with Dublin City Council.

Table 2-3: Dublin City Council headline items

Environmental Headline Item	Description	Outcome
General	Support the proposed sewage treatment capacity expansion and the provision of adequate infrastructure to allow for sustainable growth.	This has been reflected in the Need for the scheme, and in the Population and Human Health Sections of the EIAR.
General	Senior Planner in the Conservation Section, Biodiversity Officer would be key DCC figures in the assessment of any application to ABP.	Dublin City Council will be a statutory consultee and issued with the EIAR for inspection.
Biodiversity	New cSAC at Rockabill to Dalkey and UNESCO Biosphere designation for Dublin Bay since the 2012 Approval was granted.	The newly designated sites have been included within the scope of the Volume 3, Section 5: Biodiversity Marine and more specifically in the Natura Impact Statement.
Water	Project needs to ensure that it will not negatively impact on Bathing Water Quality Standards in Dublin Bay.	The newly designed site will adhere to the Bathing Water Quality Standards. The AGS technology in the newly designed site will result in improved levels for *e-coli* and Total Suspended Solids, resulting in improved UV disinfectant performance. Volume 3, Section 4 provides detail on water quality impacts.

2.5.1.2 EIAR Scoping Consultation

As part of the continued scoping of appropriate environmental impacts, Irish Water conducted a comprehensive period of statutory public consultation between 14 March 2016 and 17 May 2016 for the WwTP Component. Irish Water issued a copy of the Scoping Report to both prescribed bodies and key stakeholders during the Scoping stage of the project. It is included in Appendix 2A.

The prescribed bodies and key stakeholders that were contacted in respect of the WwTP component of the Proposed Upgrade Project are outlined in Table 2-4.

Table 2-4: Prescribed bodies and key stakeholders – Ringsend WwTP

Prescribed Bodies and Key Stakeholders	
Minister for Transport, Tourism and Sport	National Transport Authority
Minister for Communications, Climate Action and Environment	Eastern and Midlands Regional Authority
Health Service Executive	Planning Authority - South Dublin County Council
Minister for Agriculture, Food and the Marine	National Roads Authority (now Transport Infrastructure Ireland)
Minister for Housing, Planning and Local Government	The Heritage Council
Minister for Culture, Heritage and the Gaeltacht	An Comhairle Ealaíon
Inland Fisheries Ireland	Fáilte Ireland
An Taisce	Planning Authority – Dublin City Council
Planning Authority - Meath County Council	Planning Authority - Dun Laoghaire Rathdown County Council
Planning Authority - Kildare County Council	Planning Authority - Fingal County Council
Irish Aviation Authority	Minister for Jobs, Enterprise and Innovation
Birdwatch Ireland	Commission for Energy Regulation (now Commission for Regulation of Utilities)
Health and Safety Authority	Dublin Port Company
Electricity Supply Board	Planning Department Electricity Supply Board
Environmental Protection Agency	Dun Laoghaire Harbour Company
Gas Networks Ireland	Dublin Airport Authority
Office of Public Works	Geological Survey of Ireland

Public Consultation and Open Days

In addition to the formal engagement with prescribed bodies and stakeholders alike, public open days, online information and a direct phone line facilitated the provision of information relating to the Proposed Upgrade Project.

During the period between 14 March 2016 to 17 May 2016, Irish Water ran a media outreach campaign through the Irish Water Press Office and also developed a website for the Ringsend Wastewater Treatment Plant Upgrade Project (https://www.water.ie/projects-plans/ringsend/) where a copy of the Scoping Report was located along with relevant information.

A regular eZine Newsletter was circulated to interested parties and updates on the project are provided on https://www.water.ie/projects-plans/ringsend/ throughout this planning application process.

Public Consultation open days were also held in Ringsend, Dun Laoghaire, Killiney, Clontarf, and Sutton. The times and dates of these events are listed in Table 2-5.

Table 2-5: Ringsend WwTP public consultation open days

Location	Venue	Day, Date	Time
Sutton	Marine Hotel Sutton Cross, Dublin 13	Thursday, 21 April 2016	10am – 2pm
Clontarf	Clasac Centre, Alfie Byrne Rd, Dublin 3	Thursday, 21 April 2016	4pm – 7pm
Ringsend	Shelbourne Park Stadium, South Lotts Road, Ringsend	Friday, 6 May 2016	2 pm – 8 pm
Killiney	Fitzpatrick Castle Hotel, Killiney Hill Road, Killiney	Tuesday, 26 April 2016	10am – 2pm
Dun Laoghaire	Royal Marine Hotel Marine Road, Dun Laoghaire	Tuesday, 26 April 2016	4pm – 8pm

In the above public consultation, submissions by nearby residents and the wider public were received. The issues raised in these submissions made for the WwTP Component are detailed in Appendix 2C. The range of topics have been summarised and grouped under particular headline items, as shown in Table 2-6.

Table 2-6: Public consultation headline items

Ringsend WwTP		
Environmental Headline Item	**Description**	**Outcome**
Water	A number of concerns were raised in relation to water, including concerns about any potential negative impacts on the quality of the sea water and impacts on marine life. There were concerns in relation to the impact of any additional wastewater flows from the plant. It was expressed in a number of submissions that any impacts should be monitored.	Water Quality addressed in Volume 3, Section 4: Water. Potential impacts on marine biodiversity addressed in Volume 3, Section 5
Biodiversity	Queries and questions on the flora and fauna of the surrounding environment were highlighted in several submissions, with particular emphasis on the Brent Geese habitat. It was expressed that there is a need to monitor and safeguard against any potential negative impacts on the biodiversity of the area.	Potential Impacts on Biodiversity Fauna addressed in Volume 3, Section 5 (Marine) and Section 6 (Terrestrial). A Natura Impact Statement has also been prepared and submitted as part of this planning application.
Population and Human Health	A number of submissions received pertaining to the health of the population in relation to air quality and water quality. Disruptions to the public were also a key concern in many submissions and these related to potential noise, vibration, main water, gas, electricity and traffic disruptions. Submissions recommended detailed mitigation measures to be prescribed and regular monitoring during construction and operation.	Particular impacts that have the potential to be associated with human health are provided under relevant environmental headings (e.g. Section 8 Air and Climate, Section 9 Noise and Vibration, Section 12 Material Assets), and potential Human Health impacts are considered in Volume 3, Section 3. Mitigation measures are detailed under relevant environmental headings and are summarized in Volume 3, Section 17.

Ringsend WwTP		
Environmental Headline Item	**Description**	**Outcome**
Land and Soils	A query was made as to where the extra sludge will go and if this will be dealt with in the planning application.	Wastewater sludge is processed and treated to generate Biosolids, for re-use on agricultural and silvicultural lands. This is addressed in Volume 4, Section 19.5
Air and Climate	Concerns were expressed in relation to what odours might come from the plant and how this would affect the public.	A dedicated Odour section has been prepared as part of this EIAR. See Volume 3, Section 10.
Climate	The environment was evident in many submissions and it was felt by many that any potential negative impact on the environment should be minimised and monitored.	Potential Climate impacts are identified and addressed in Volume 3, Section 8.
Landscape and Visual	Several submissions were concerned that the plant would have a visual impact on the area. Queries were raised about the choice of Ringsend as the location for the plant.	Potential Landscape and Visual Impacts have been described and assessed in Volume 3, Section 14. Potential alternatives to the project are described and assessed in Volume 2, Section 4.
Cumulative and Indirect Impacts	Queries were raised in a number of submissions about the direct and indirect impacts of the plant and the potential effects that the WwTP would have over time on the surrounding area.	Potential cumulative and indirect impacts are described and assessed in Volume 3, Section 19.
Other queries	There were a number of queries and comments in relation to the functions of the plant, the future of the plant and the engineering process. There were also a number of specific queries which included: - Operational Monitoring requirements - Alternative locations for the WwTP and outfall	Potential alternatives to the project are described and assessed in Volume 2, Section 4.

Consultation Reports

The findings of the public consultation exercise for the WwTP Component of the Proposed Upgrade Project is compiled and presented in the *Scoping of Environmental Impact Statement & Natura Impact Statement; Report on Public Consultation*, provided in Appendix 2C.

2.5.2 RBSF Component

2.5.2.1 Pre-Application Consultation

An Bord Pleanála

As part of the pre-application consultations held with ABP for the Proposed Upgrade Project, it was agreed that the RBSF Component of the project be included within the overall scope of the EIAR and planning application.

Fingal County Council

Engagement with Fingal County Council regarding the RBSF Component began with a formal presentation of the project on 17 October 2017, which outlined the Proposed RBSF Component. This meeting, and further meetings, held with Fingal County Council are listed in Table 2-7.

Table 2-7: Dates of pre-application meetings held with Fingal County Council

Name of Consultee	Date
Fingal County Council – Planning Department	17 October 2017
Fingal County Council – Planning, Parks and Landscape, Traffic, Environmental Health	17 November 2017
Fingal County Council – Planning, Water Services, Environment	8 December 2017
Fingal County Council – Planning Department	2 February 2018

In addition, various departments have been engaged with, namely:

- Roads
- Water Services
- Parks and Landscape
- Environment

The following topics relevant to the environmental impact assessment were raised during the consultation with Fingal County Council:

Table 2-8: Fingal County Council Consultation headline items

Environmental Headline Item	Description	Outcome
Traffic	Impact on traffic at junctions near the proposed site during operation.	Traffic Volumes and associated impacts are considered in Volume 4, Section 13 of this EIAR
Odour	Level of odour emitted during operation	Odour control mitigation measures will be employed. Odour and associated impacts are considered in Volume 4, Section 10 of this EIAR.
Water	Implementation of sustainable drainage systems (SuDS)	SuDS will be employed in the design and operation of the RBSF. This is considered in Volume 4, Section 4 of this EIAR.
Water	Containment of spills or washout of stored biosolids material	The facility is designed to contain planned and unplanned washout from the buildings and run-off from the site. It is considered in Volume 2, Section 3 and Volume 4, Section 4.
Water	Management of water in relation to vehicle cleaning facilities	The proposed design of the vehicle cleaning incorporates water saving measures and wash-down water will discharge to the foul drainage system. It is considered in Volume 2, Section 3 and Volume 4, Section 4.
Noise	Management of noise during operation	The proposed design incorporates features to avoid noise from vehicles and mechanical equipment. It is considered in Volume 2, Section 3 and Volume 4, Section 9.
Landscape	Provision of appropriate architectural and landscape design.	Architectural designs and landscaping plans have been integrated into the design. This is considered further in Volume 4, Section 14 of this EIAR.
Climate and energy	Provision of renewable energy supply.	Solar Panels will be incorporated in the design and operation of the RBSF.

2.5.2.2 Site Selection Consultation

The Application undertook a site selection process to find a location for a RBSF during 2017. The process involved three stages. The stages of non-statutory public consultation to facilitate engagement were:

- Stage 1. Methodology for Site Selection
- Stage 2. Identification of Potentially Suitable Sites
- Stage 3. Identification of Preferred Site

The proposed methodology for selection of a suitable site for the RBSF was first set out in the *Stage 1 Report – Site Selection Methodology* which was published by the Applicant on 2 February 2017. That Report provided the background to the project and explained the proposed methodology for shortlisting potential suitable sites. In seeking feedback during the four-week consultation period between the 2 February and 2 March 2017, the Applicant invited submissions relating to the approach to site selection, the general siting considerations and criteria set out in the report, and about additional factors that should be taken into consideration.

As the selection process progressed a shortlist of potential sites was identified. The sites and the further details of the methodology adopted in selecting them were provided in *Stage 2 Report – Identification of Potential Sites*. The Report was published on 11 May 2017 and the second round of public consultation, took place between the 11 May and 15 June 2017. Three public information events were held during this period. At this stage the Applicant invited submissions in relation to opinions on the five potential sites, any additional information on the potential sites to be aware of, and any other factors that be considered in choosing the preferred site.

The *Stage 3 Report – Identification of Preferred* Site was published on the 29 August 2017 in conjunction with the scoping report for the EIAR and NIS. The purpose of the Stage 3 Report was to identify the preferred site for the proposed RBSF and to outline the methodology that had been adopted to identify it. A third round of consultation took place from 29 August 2017 to 10 October 2017. At Stage 3, the Applicant asked was there any additional information on the preferred site to be aware of and for opinions on the indicative layout of the preferred site. As described in the next section, the Applicant also asked for opinions on the proposed methodology for the assessment of environmental impacts and for any other factors that should be considered in assessing the environmental impact of the project.

In addition to the formal engagement with prescribed bodies and stakeholders alike, public open days, online information and a direct phone line facilitated the provision of information relating to the site selection process for the RBSF Component of the Upgrade Project.

During the non-statutory public consultation periods for the RBSF, a website was set up by the Applicant (https://www.water.ie/projects-plans/national-projects/biosolids/) where a copy of the site selection reports along with relevant information regarding site selection process could be found.

A regular eZine Newsletter for the site selection process was also provided on https://www.water.ie/projectsplans/nationalprojects/biosolids/

A summary of public events at Stage 2 is provided in Table 2-9. The Stage 3 public consultation event was held in conjunction with the consultation on EIAR Scoping as per Table 2-11.

Table 2-9: RBSF Stage 2 Site Selection Public Consultation Open Days

Location	Venue	Day, Date	Time
Dunboyne	The Oak Centre, Maynooth Road, Dunboyne, Co. Meath	Monday 22 May 2017	1pm-7pm
Saggart	Citywest Hotel, Saggart, Co. Dublin	Wednesday 24 May 2017	1pm-7pm
Newpark	White House Hotel, Newpark, Dublin	Thursday 25 May 2017	1pm-7pm

The site selection reports are provided in Appendix 4D, Appendix 4E and Appendix 4F to Volume 2. The consultation reports for Stage 1 and Stage 2 are provided with the site selection reports.

2.5.2.3 EIAR Scoping Consultation

As part of the continued scoping of appropriate environmental impacts, the Applicant conducted a public consultation for the RBSF component of the Proposed Upgrade Project between 29 August 2017 and 10 October 2017. The Applicant issued a copy of the Scoping Report to both prescribed bodies and key stakeholders during the Scoping stage of the project.

The prescribed bodies and key stakeholders that were contacted in respect of the Regional Biosolids Storage Facility are outlined in Table 2-10.

Table 2-10: Prescribed bodies and key stakeholders - RBSF

Prescribed Bodies and Key Stakeholders	
Minister for Transport, Tourism and Sport	National Transport Authority
Minister for Communications, Climate Action and Environment	Eastern and Midlands Regional Authority
Health Service Executive	Planning Authority - South Dublin County Council
Minister for Agriculture, Food and the Marine	National Roads Authority (now Transport Infrastructure Ireland)
Minister for Housing, Planning and Local Government	The Heritage Council
Minister for Culture, Heritage and the Gaeltacht	An Comhairle Ealaíon
Inland Fisheries Ireland	Fáilte Ireland
An Taisce	Planning Authority – Dublin City Council
Planning Authority - Meath County Council	Planning Authority - Dun Laoghaire Rathdown County Council
Planning Authority - Kildare County Council	Planning Authority - Fingal County Council
Irish Aviation Authority	Minister for Jobs, Enterprise and Innovation
Birdwatch Ireland	Commission for Energy Regulation (now Commission for Regulation of Utilities)
Health and Safety Authority	Dublin Port Company
Electricity Supply Board	Planning Department Electricity Supply Board
Environmental Protection Agency	Dun Laoghaire Harbour Company
Gas Networks Ireland	Dublin Airport Authority
Office of Public Works	Geological Survey of Ireland

Public Consultation and Open Days

In addition to the formal engagement with prescribed bodies and stakeholders alike, public open days, online information and a direct phone line facilitated the provision of information relating to the RBSF Component.

A period of non-statutory public consultation was held between August and October of 2017 for the RBSF. A website for the RBSF was set up by Irish Water (https://www.water.ie/projects-plans/national-projects/biosolids/) where a copy of the Scoping Report along with relevant information regarding this aspect of the project can be found.

A public consultation open day was held in Newpark, at the date and time in Table 2-11.

Table 2-11: RBSF Public Consultation Open Day

Location	Venue	Day, Date	Time
Newpark	White House Hotel, Newpark, Dublin	Tuesday, 12 September 2017	1pm – 8pm

In response to further requests for consultation, additional meetings were held as follows:

- Meakstown Community Council - 31 January 2018 at the Willows Football Club, Jamestown Road.
- Peter McVerry Trust - 18th April 2018 at 29 Mountjoy Square East, Dublin 1.

A range of topics in relation to the proposed RBSF were discussed at both meetings.

This consultation has enabled the project team to interact with the general public in the local and wider area, whereby the team provided details regarding the project and facilitated discussion with all interested parties in attendance. Consideration has been given to the submissions, comments, and suggestions received in the preparation of the EIAR and the NIS.

In the above public consultation, submissions by nearby residents and the wider public were received. The issues raised in these submissions made for the RBSF are detailed in Appendices 2D. The range of topics have been summarised and grouped under particular headline items, as shown in Table 2-6: Public consultation headline items. The range of topics have been summarised and grouped under particular headline items, as shown in Table 2-12.

Table 2-12: Public consultation headline items

Environmental Headline Item	Description	Outcome
Odour	The level of odour arising from the facility and the impact of this on the neighbouring community were concerns raised by several stakeholders.	The design of the RBSF is described in Volume 2, Section 3 and a dedicated Odour section has been prepared as part of this EIAR - See Volume 4, Section 10.
Noise	Noise pollution from traffic to/from the facility was cited as a concern by a number of stakeholders.	The assessment of Noise, including noise surveys is provided in Volume 4, Section 9.
Landscape and Visual	The size and scale of the facility, and the location of the buildings was referenced by a number of stakeholders in their submissions.	The site layout, architectural design and landscape design are described in Volume 2, Section 3. The landscape and visual impact assessment is provided in Volume 4, Section 14.

Environmental Headline Item	Description	Outcome
Water/ Hydrology	The impact that flooding and surface water at the preferred site would have on the local environment was flagged as a concern. Feedback outlined the need to safely capture and treat any run-off water from the site, including wastewater from wheel washing activity.	The design of the RBSF is described in Volume 2, Section 3, which includes an explanation of the drainage proposals. A Flood Risk Assessment has been carried out and is submitted with the planning application. The assessment of impact on Water is described in Volume 4, Section 4.
Traffic	A number of submissions questioned the routes that would be used to haul material to and from the RBSF. These related to both the routes to/from the source of the biosolids and to/from the spread lands. Meakstown Community Council noted their concerns regarding operational traffic to and from the facility in their submission. They expressed a concern that traffic would increase in and surrounding the area of Meakstown.	The assessment of impact on traffic for the RBSF, which included traffic surveys near the site, is described in Volume 4, Section 13. The routes to the site are shown in Volume 2, Section 3 and Volume 4, Section 13.

Consultation Reports

The findings of the public consultation exercise for the RBSF Component is compiled and presented in the *Stage 3 Consultation Report*, provided in Appendix 2D.

2.6 EIAR Structure

The composition of this EIAR is in accordance with EPA Draft Guidelines (2017) which requires that information contained within an EIAR should be in accordance with Article 3(1), Article 5(1) and any additional information specified under Annex IV under the Directive 2014/52/EU.

Following the detailed consideration of the 'screening' and 'scoping' stages described above, the layout and structure of this EIAR is separated into five Volumes, each containing specific sections as follows:

- Volume 1: Non-Technical Summary
- Volume 2: Introduction
- Volume 3: Ringsend Wastewater Treatment Plant
- Volume 4: Regional Biosolids Storage Facility
- Volume 5: Drawings

Following on from the layout, the structure of the EIAR is shown in Table 2-13.

Table 2-13: Structure of EIAR

Volume	Sections
Volume 1	Section 1 – Non-Technical Summary
Volume 2	Section 1 – Introduction Section 2 – The EIA Process Section 3 – Description of the Proposed Upgrade Project Section 4 – Consideration of Alternatives
Volume 3	Section 1 - Existing Environment

Volume	Sections
	Section 2 - Planning and Policy Context Section 3 - Population and Human Health Section 4 - Water Section 5 - Biodiversity – Marine Section 6 - Biodiversity – Terrestrial Section 7 - Land and Soils Section 8 - Air and Climate Section 9 - Noise and Vibration Section 10 - Odour Section 11 - Cultural Heritage Section 12 - Material Assets Section 13 - Traffic Section 14 - Landscape Section 15 - Risk Management Section 16 - Environment Interactions Section 17 - Summary of Mitigation Section 18 - Summary of Residual Impacts Section 19 - Cumulative Impacts
Volume 4	Section 1 - Existing Environment Section 2 - Planning and Policy Context Section 3 - Population and Human Health Section 4 - Water [Section 5 is not used in Volume 4] Section 6 - Biodiversity – Terrestrial Section 7 - Land and Soils Section 8 - Air and Climate Section 9 - Noise and Vibration Section 10 - Odour Section 11 - Cultural Heritage Section 12 - Material Assets Section 13 - Traffic Section 14 - Landscape Section 15 - Risk Management Section 16 - Environment Interactions Section 17 - Summary of Mitigation Section 18 - Summary of Residual Impacts Section 19 - Cumulative Impacts
Volume 5	Part A - Ringsend Wastewater Treatment Plant Part B - Regional Biosolids Storage Facility

Article 5(1) and Annex IV of the EIA Directive provides detail on the information to be included in an EIAR. Table 2-14 provides a checklist of the information referred to in Article 5(1) with a confirmation of where the relevant information is contained within the EIAR.

Table 2-14: Article 5(1) checklist

Information Referred to in Article 5(1)	Located in EIAR
1. Description of the project, including in particular:	
(a) a description of the location of the project;	Volume 2 Section 3
(b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;	Volume 2, Section 3
(c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;	Volume 2 Section 3
(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.	Volume 2, Section 3 Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Volume 2, Section 4
3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Volume 3, Section 1 Volume 4, Section 1
4. A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
5. A description of the likely significant effects of the project on the environment resulting from, inter alia:	
(a) the construction and existence of the project, including, where relevant, demolition works;	Volume 2, Section 3,
(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;	Volume 2, Section 3 Volume 3, Section 12 Volume 4, Section 12
(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);	Risks to Human Health- Volume 3, Section 3 Volume 4, Section 3 Cultural Heritage Volume 3, Section 15 Volume 4, Section 15

Information Referred to in Article 5(1)	Located in EIAR
(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;	Volume 3, Section 19 Volume 4, Section 19
(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
(g) the technologies and the substances used.	Volume 2, Section 3
The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
8. A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19
9. A non-technical summary of the information provided under points 1 to 8.	Volume 1
10. A reference list detailing the sources used for the descriptions and assessments included in the report.	Volume 3, Sections 3 to 19 Volume 4, Sections 3 to 19

2.6.1 Section Layout

Each environmental topic contained within Volumes 3 and 4 of this EIAR, has been structured according to EPA Draft Guidelines (2015) and will generally be presented under the following headings.

2.6.1.1 Introduction

Each Section will be introduced by the specialist, providing an overview of the relevant matters to the individual assessment.

2.6.1.2 Methodology

Provides detail on the guidelines and methodologies relevant to the assessment.

2.6.1.3 Existing Environment

The existing environment, also referred to as the baseline situation, for both the WwTP component and the RBSF component of the Proposed Upgrade Project is provided in Section 1 of Volumes 3 and 4 respectively.

In individual Sections, this existing environment contains a summary of the existing environment, focusing on aspects of the project relevant to the individual assessment.

2.6.1.4 Characteristics of the Project

The characteristics of the project included in each section is a summary description of the component of the Proposed Upgrade Project, focusing on the elements that are relevant to the individual assessment. A detailed description of the Proposed Upgrade Project is provided in Volume 2, Section 3: Description of Proposed Upgrade Project.

2.6.1.5 Potential Impact

Under each environmental heading, the potential impacts of the relevant component of the Proposed Upgrade Project, as provided in Volume 2, Section 3, are described. It is noted at the outset that both the EU Directive (2014) and the EPA Draft Guidelines (2017) refer to both '*impacts*' and '*effects*' and these terms are often used interchangeably. For clarity, this section follows the general consensus in considering '*impacts*' being defined as the changes resulting from the provision of a project, and '*effects*' being defined as the consequences of identified impacts.

In accordance with the EPA Draft Guidelines (2017), potential effects may include direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project.

The assessment of Impacts will also consider a "Do-Nothing" impact where appropriate. In other words, a description of the environment as it would be in the future if the Proposed Upgrade Project were not carried out.

The assessment of any potential impacts in each environmental topic is described in terms of 'Quality', 'Significance', 'Magnitude', 'Probability', 'Duration', and 'Type'. The description and criteria for describing and rating impacts and effects are outlined in greater detail under section 2.7 below.

2.6.1.6 Mitigation Measures

A description of any specific mitigation measures envisaged to avoid, permit, reduce or, if possible, eliminate any significant adverse effects on the environment identified under the assessment of potential impacts described above.

2.6.1.7 Residual Impacts

This section describes the assessment of the specific direct and indirect impacts of the Proposed Upgrade Project. Residual Impacts are predicted impacts remaining after mitigation measures have been applied. The predicted impacts are discussed having regard to their character, magnitude, duration, consequences and significance and also their cumulative impact.

Where there is uncertainty in the EIA, then a 'worst case' impact is also considered for both the construction and operational phases of the development, which takes each respective environmental topic into consideration.

2.6.1.8 Monitoring

A description of any proposed project monitoring of effects on the environment which might be necessary, covering the monitoring methods and the agencies responsible for their implementation.

2.6.1.9 Difficulties Encountered

Where present, each discipline section within the EIAR outlines constraints/difficulties encountered during preparation of the EIAR, if any.

2.6.1.10 References

Provides details of the documents and information used to inform the assessment.

2.6.2 Consideration of Main Alternatives

According to the Environmental Impact Assessment Guidelines (August, 2017), and Annex IV(2) of the EIA Directive, the EIAR must contain:

> *"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."* (page 34)

In accordance with those requirements, details contained within this EIAR relating to the consideration of reasonable alternatives, both for the WwTP component and the RBSF component of the Project, are outlined under Section 4.

2.6.3 Risk Management

This section of the EIAR identifies how the potential for accidents and disasters relevant to the project have been identified and how those risks have been managed. This is in accordance with Article 3(2) of the EIA Directive, which states:

> *"The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned".*

The details contained within this EIAR relating to risk management are outlined under Volume 3, Section 15 (Ringsend WwTP) and Volume 4, Section 15 (RBSF).

2.6.4 Environmental Interactions

This section of the EIAR identifies the interactions between the various environmental aspects covered in Sections 3 - 14 of Volumes 3 and 4 of the EIAR. This Section is directed by Article 3(1)(g) of the EIA Directive 2014/52/EU, which requires "*the interaction between the factors referred to in points (a) to (d)*".

The details contained within this EIAR relating to Environmental Interactions are outlined under Volume 3, Section 16 (Ringsend WwTP) and Volume 4, Section 16 (RBSF).

2.6.5 Summary of Mitigation

This section of the EIAR collates and summarises the mitigation measures that have been identified in the individual sections. These include mitigation measures that are embedded into the design of the plant, appropriate management practices and the provision of commitments relating to construction activities.

The details contained within this EIAR relating to the summary of mitigation are outlined under Volume 3, Section 17 (Ringsend WwTP) and Volume 4, Section 17 (RBSF).

2.6.6 Summary of Residual Impacts

This section of the EIAR collates and summarises the residual impacts which remain following the implementation and incorporation of the mitigation measures and environmental commitments summarised under Section 17 - Summary of Mitigation.

The details contained within this EIAR relating to the summary of residual impacts are outlined under Volume 3, Section 18 (Ringsend WwTP) and Volume 4, Section 18 (RBSF).

2.6.7 Cumulative Impacts

This section of the EIAR considers the potential cumulative impacts and resulting effects arising from the components of the Proposed Upgrade Project (Ringsend WwTP component and RBSF component) when combined with other existing and/or approved projects.

The details contained within this EIAR relating to cumulative impacts are outlined under Volume 3, Section 19 (Ringsend WwTP) and Volume 4, Section 19 (RBSF).

Of particular consideration in this EIAR is the Cumulative Interactions between the Proposed Upgrade Project and GDD Project. Each of these three sites (Ringsend WwTP, RBSF and GDD) are geographically remote from each other. However, both the Ringsend WwTP and GDD projects identify the RBSF as an integral part of their proposed projects. The RBSF is required to receive biosolids from both installations for storage prior to land spreading during the planting seasons each spring and autumn. The cumulative interactions between Ringsend WwTP Upgrade and GDD projects is discussed in Volume 4, Section 19.

2.7 Assessment of Impacts

The main purpose of an EIAR is to identify, describe and present an assessment of the likely significant impacts of a project on the environment. This informs the assessment process on whether to grant consent for a project and, if granting consent, identify conditions that may be attached to the permission. The type and characteristics of the impacts are clearly set out in Annex III(3) and Annex IV(5) of the EIA Directive.

The following section outlines the approach to describing environmental impacts and effects in this EIAR. The methodology adopted closely follows that set out in the EPA Draft Guidelines (2017) and as outlined in Table 2-15 below.

This methodology has been applied across all sections to assist in the clarity of assessment and to provide consistency in the description of effects. The criteria provided in Table 2-15 are used where applicable - all categories of terms do not need to be used for every effect.

Table 2-15: Description of effects

Type	Description
Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving of the reproductive capacity of an ecosystem, or by removing nuisances or by improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects ''Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see Determining Significance below)	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound An effect which obliterates sensitive characteristics.
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions.
Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Type	Description
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful	**Momentary Effects** Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).
Describing the Types of Effects	**Indirect Effects or Secondary Effects** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	`Worst case' Effects The effects arising from a project in the case where mitigation measures substantially fail. It can also be a worst case assumption where there is uncertainty in the assessment or in the effectiveness of mitigation measures.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

2.7.1 Determining Significance

Table 2-15 above provides seven categories by which to determine the significance of an impact. Figure 2-2 below is an illustration provided in the EPA Draft Guidelines (2017) of how the *character of a predicted impact to the sensitivity of the receiving environment* can determine the significance of the impact.

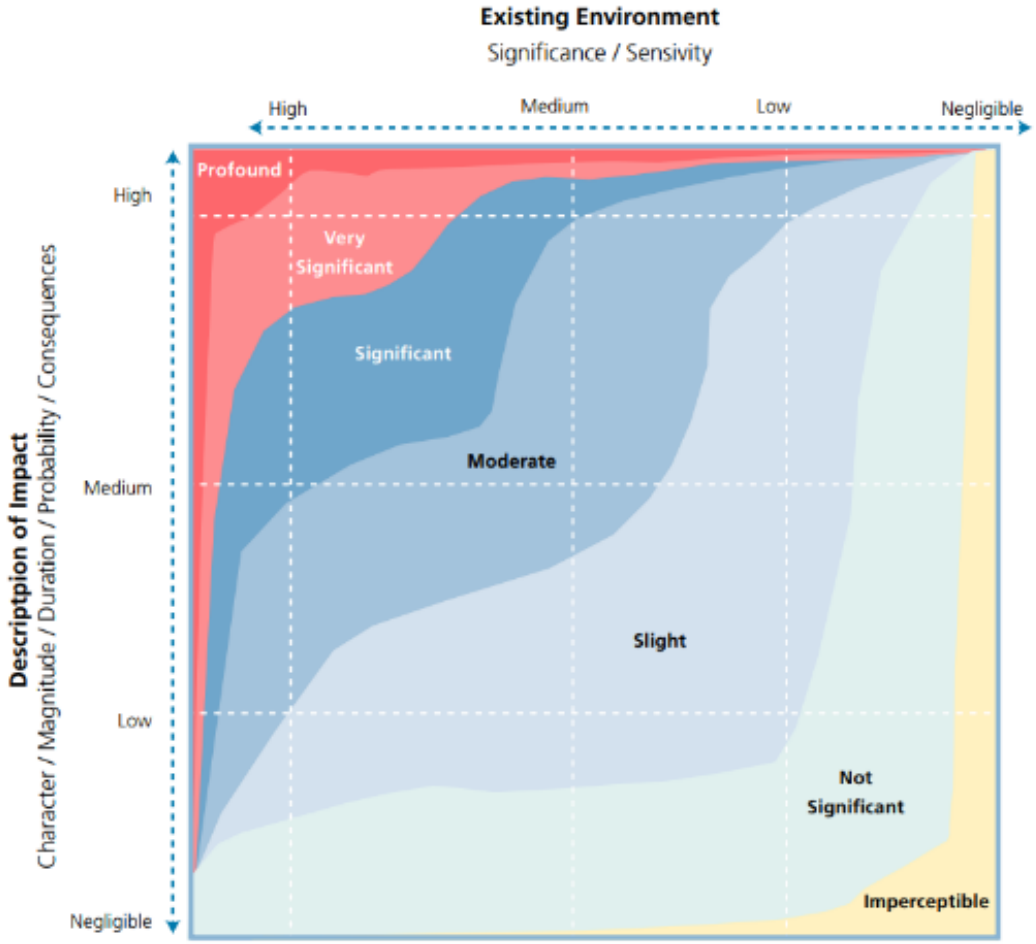

Figure 2-2: Chart showing typical classifications of the significance of impact. Source: EPA Draft Guidelines (2017)

2.8 Difficulties Encountered During EIAR Preparation

Where present, each discipline section within the EIAR outlines constraints / difficulties encountered during the preparation of this EIAR, if any.

2.9 Submissions in Relation to the EIAR

2.9.1 Statutory Consultation

As part of the Strategic Infrastructure Development (SID) application process to ABP, there is an additional period (7 weeks) of statutory public consultation. During this period, written submissions may be made in writing to ABP on or before the dates indicated in the public notices following the submission of the planning application.

As part of the SID application process, a dedicated website has been prepared by the Applicant which contains all the plans, particulars and EIAR documents of the application to ABP. The plans, particulars and EIAR submitted as part of this application can be found at the following website www.ringsendwwtpupgrade.ie.

This allows interested parties a further opportunity to comment on the Proposed Upgrade Project and EIAR.

Furthermore, at the direction of ABP, the following prescribed bodies have also been formally notified of the lodgement of the planning application and have been provided with a copy of the application, including the EIAR and the NIS:

- The Minister for Housing, Planning, Community and Local Government
- The Minister for Communications, Climate Action and the Environment
- The Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs (Development Applications Unit)
- Department of Transport, Tourism and Sport
- Environmental Protection Agency
- Dublin City Council
- Fingal County Council
- South Dublin County Council
- Dun Laoghaire-Rathdown County Council
- Kildare County Council
- Meath County Council
- Wicklow County Council
- National Transport Authority
- The Eastern and Midland Regional Assembly
- An Chomhairle Ealaíon
- Fáilte Ireland
- The Heritage Council
- Waterways Ireland
- The Health and Safety Authority
- The Health Service Executive
- An Taisce - the National Trust for Ireland.
- Inland Fisheries Ireland
- Transport Infrastructure Ireland
- Department of Agriculture, Food and the Marine

Each of the above prescribed bodies have been formally notified of the lodgement of the application. Receipt of correspondence by way of a cover letter, outlining the preferred number of copies for each body, accompanies the planning application.

2.9.2 Public Consultation

This EIAR accompanies a planning application for SID. As part of the application process, a newspaper notice and site notice will be erected which informs the public of the applicant's intention to lodge an application for SID.

The newspaper notice will be published in national and local newspapers circulating in the area of local authorities. Site notices will be erected on the subject sites, in accordance with planning notice requirements, informing members of the public passing the subject site.

These public notices inform the public of the SID application being made directly to ABP, the Proposed Development as applied for, and that this EIAR accompanies the application. The notices inform the public where the application and this EIAR can be viewed and purchased at the reasonable cost of making a copy. The locations for viewing and or purchasing this EIAR, and planning application material are as follows:

- Website, available at: www.ringsendwwtpupgrade.ie;
- Dublin City Council: Civic Offices, Wood Quay, Dublin 8;
- An Bord Pleanála: 64 Marlborough Street, Dublin 1; and
- Fingal County Council: The Offices of Fingal County Council, Main Street, Swords, County Dublin and Grove Road, Blanchardstown, Dublin 15.

Submissions or observations may be made only to ABP at 64 Marlborough Street, Dublin 1, during the period of 7 weeks relating to:

i) The implications of the Proposed Development for proper planning and sustainable development of the area concerned;
ii) The likely effects on the environment of the Proposed Upgrade Project if carried out; and
iii) The likely significant effects of the Proposed Upgrade Project on a European Site, if carried out.

Any submissions/observations must be accompanied by a fee of €50 (except for certain prescribed bodies) and must be received by ABP not later than 5.30pm on 30 July 2018 and must include the following information:

i) The name of the person making the submission or observation, the name of the person acting on his or her behalf, if any, and the address to which any correspondence relating to any correspondence relating to the application should be sent;
ii) The subject matter of the submission or observation; and
iii) The reasons, considerations and arguments on which the submission or observation is based in full (Article 217 of the Planning and Development Regulations 2001, as amended, refers).

In accordance with the requirement to make information available electronically, as outlined in circular PL8/2017 issued by Department of Housing, Planning and Local Government, the EIAR and other planning documents associated with the Proposed Development are provided online at: www.ringsendwwtpupgrade.ie.

Section 3: Description of Proposed Upgrade Project

3.1 Introduction

Volume 2, Section 1 of this EIAR provides a background and description of this Proposed Upgrade Project, which is generally summarised here as comprising the following two components:

WwTP Component

- Proposed upgrade of the Ringsend WwTP, including works as approved by ABP under the 2012 Approval being progressed i.e. common elements (see Table 3-6) and proposed revisions under this Section 37E Application.

RBSF Component

- Proposed Regional Biosolids Storage Facility at Newtown, Dublin 11.

Sections 1 and 2 also provide details on the Applicant, the need for the Proposed Upgrade Project, and the background to the EIA that has been undertaken in the development of this proposal.

In accordance with Article 5(1) of the EIA Directive, Section 3 provides a detailed description of the Proposed Upgrade Project, comprising information on the site, design, size and other relevant features of the project. Section 3 includes detail on the specific characteristics of the overall Proposed Upgrade Project, such as the location, the physical characteristics of the proposed development, the main characteristics of the operational phase and the type and quantity of the expected residues and emissions.

The descriptions and characteristics as provided in this Section have been used to identify and inform potential impacts that may be associated with the Proposed Upgrade Project.

3.2 Wastewater Treatment Plant Design Basis

3.2.1 Overview of Wastewater Parameters and Wastewater Treatment

To assist in the reading of this section of the EIAR, a brief explanation of the main parameters used to measure and characterise wastewater is provided along with an outline of wastewater treatment processes used.

3.2.1.1 Wastewater Parameters

Urban wastewater is characterised in terms of its physical, chemical and biological constituents. The main parameters used to characterise wastewater are summarised in Table 3-1.

3.2.1.2 Wastewater Treatment

Wastewater treatment typically involves physical, chemical or biological processes depending on the required effluent standards. The processes in use (sequentially) at Ringsend and their function are set out in Table 3-2.

Table 3-1: Wastewater Parameters

Parameter	Function
BOD_5 Biochemical Oxygen Demand	BOD_5 is a measure of the amount of oxygen used by organisms while consuming organic matter in wastewater. The standard test is carried out over 5 days.
PE Population Equivalent	Population Equivalent is the measure commonly used to express the comparison between the pollution loads in household sewage produced by one person and industrial, institutional and commercial facilities services. Under the UWWT Directive, 1 PE is defined as 60 gm BOD_5
COD Chemical Oxygen Demand	COD is another measure of the amount of oxygen used to oxidise organic matter. The test does not differentiate between biodegradable and non-biodegradable organic matter.
Total Suspended Solids	The total of the organic and inorganic solids in wastewater
Phosphorus	Phosphorus is a nutrient found in all wastewaters. Where phosphorus is a growth limiting nutrient in a water body, the discharge of a wastewater containing phosphorus can stimulate the growth of vegetation in the water body. It exists in various forms in wastewater and in the environment generally.
Nitrogen	Nitrogen is also a nutrient and it exists in various forms in wastewater including oxidised nitrogen (nitrates and nitrites), ammonia and organic nitrogen. The total of ammonia and organic nitrogen is Kjeldahl Nitrogen

Table 3-2: Wastewater Treatment Processes

Stage	Function
Preliminary	Grit removal. screening to remove large solids and items such as rags. Fats, oils and grease (FOG) removal.
Primary Settlement	Settlement to remove suspended solids and associated BOD
Secondary	Biological treatment stage to remove organic material. Biological removal of nitrogen and phosphorus is also incorporated in this process stage. The activated sludge process is the most common form of biological treatment used in major treatment plants. Activated sludge is a biomass of microorganisms and bacteria which aerobically break down the organic content of the wastewater. The process is used in a range of different tank configurations and control set-ups. Sequencing Batch Reactors (SBRs) as used in Ringsend is one such form.
Disinfection	Disinfection to remove pathogenic microorganisms is carried out by UV dosing of the treated effluent (on a seasonal basis)

3.2.2 Historical Loading at Ringsend WwTP

The upgrade of the Ringsend WwTP is required to extend its existing capacity, which is already, and has been for the last 8 years, operating over its design capacity, as the data presented below demonstrates.

In 2017 the total load arising from within the wastewater collection network served by the Ringsend WwTP was approximately 1.8 million PE, which is in excess of the design capacity (1.64 million PE) of the existing treatment plant. The annual average influent load for the period 2010 to 2017 is summarised in Table 3-3.

Table 3-3: Annual Average Influent Loading[4]

Year	Million Population Equivalent
2010	1.65
2011	1.74
2012	1.65
2013	1.76
2014	1.78
2015	1.93
2016	1.81
2017	1.83

3.2.3 Future Wastewater Design Capacity and Loads

3.2.3.1 Design Capacity

The need for additional wastewater treatment capacity to serve the Greater Dublin region was identified in the Greater Dublin Strategic Drainage Study (GDSDS[5]). This study set out a vision for the future management of wastewater within the Greater Dublin region, and was subsequently the subject of a Strategic Environmental Assessment (SEA) in 2008, following which it was incorporated into development plans.

To cater for growth in both the medium and long term, the GDSDS study made recommendations on wastewater infrastructure which included the optimisation of the capacity of existing WWTPs together with the provision of new infrastructure. For the Ringsend WwTP the achievable capacity within the confines of its current site is 2.4 million PE and Irish Water is proposing to upgrade the current WwTP to achieve this capacity. Irish Water is separately progressing other projects which include the provision of a new wastewater treatment facility in north Dublin (GDD) together with alterations to the drainage network to facilitate the required diversion of flows from the Ringsend catchment.

In 2017 Irish Water carried out a review of current loadings on WwTPs in Greater Dublin as well as future growth in the region. This document titled *Greater Dublin Drainage Strategy; Overview & future Strategic Needs* (GDDS) (May, 2018) is enclosed with this planning application for further information. This review examined 2016 Census data, CSO Regional Population Projections and a Demographic Study carried out in 2014 by Irish Water as part of the Water Supply Eastern and Midlands Region Project. In particular, it provides updated projections for the 12 years' passage of time and extended the design horizon from 2031 to 2050.

The GDDS report formed the basis for the most likely projected growth scenario within the Ringsend catchment, which is anticipated to be in region of 2.712m PE by the 2040 design horizon. This growth

[4] Annual Environmental Reports (AER) prepared by DCC and IW submitted to EPA. Available on the EPA website https://www.epa.ie/enforcement/prtr/map/

[5] This study is available online http://www.greaterdublindrainage.com/gdsds/

scenario provides a 20% allowance for headroom for industrial/domestic growth which may be disproportional to the most likely scenario.

Figure 3-1: Historic and projected loadings for the Ringsend catchment (Carbonaceous reduction)

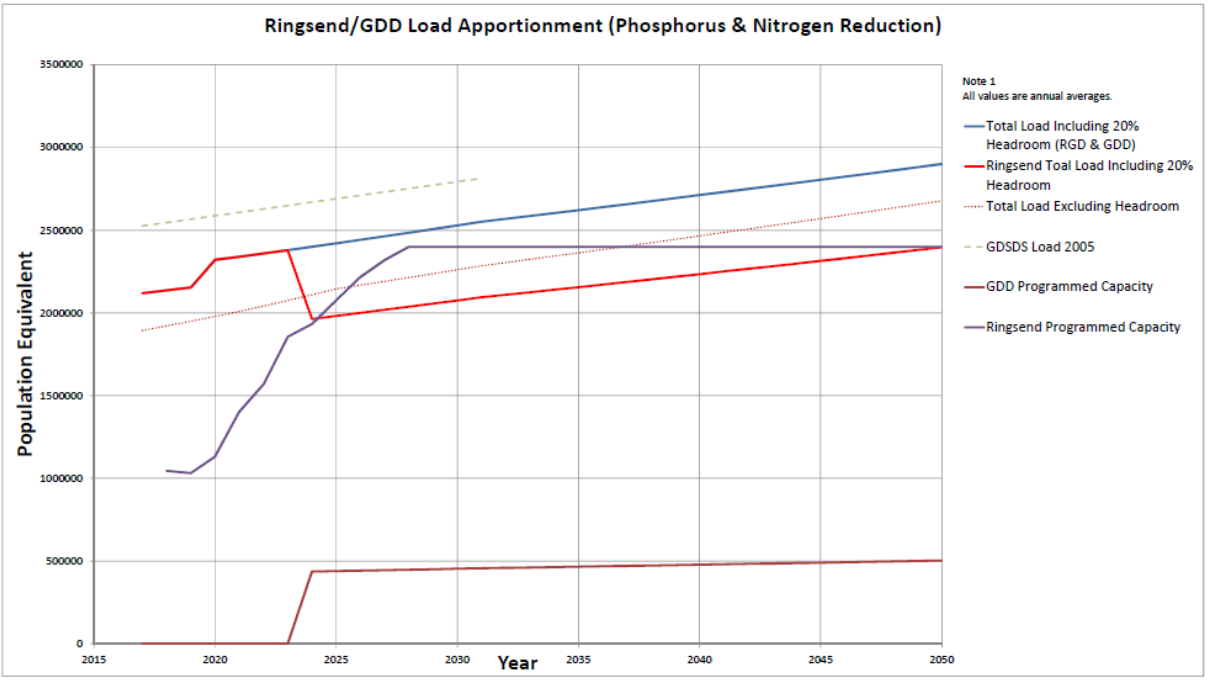

Figure 3-2: Historic and projected loadings for the Ringsend catchment (Phosphorus and Nitrogen reduction)

The projected loadings for the Ringsend catchment together with the required additional capacity are shown in Figure 3-1. The programmed capacity for the Ringsend WwTP (Ringsend Programmed Capacity) is denoted by a green line in this graph. This shows an increase in the projected capacity following the completion of a current construction contract for a capacity upgrade/extension by 2021. At this stage, there will be a greater capacity in terms of reduction of BOD and SS. It is expected to be 2.4m PE.

There is a proposed follow-on programme of retrofitting new technology until 2028 to meet nitrogen (N) and phosphorus (P) emission limit values, which is the subject of this planning application. Figure 3-2 is provided to illustrate the programmed capacity for phosphorus and nitrogen at the Ringsend WwTP (purple line on the graph). It is expected that the treatment capacity of 2.4m PE in terms of P and N will be achieved by 2028.

The Applicant is investigating the options of providing increased capacity by enhancing the treatment capability of the existing SBRs along with the use of the AGS solution so that the 2.4M pe capacity for P and N can be realised sooner. This would also facilitate compliance with required effluent standards being achieved in 2022, (pending planning approval in 2019). This work is at an early stage at present therefore this application is based on a programme for completion of the Proposed Upgrade Project being up to 2028.

The loadings on the Ringsend catchment are projected to reach approximately 2.4 million PE by 2024 depending on the actual growth realised in the catchment. As well as the development of the treatment plant at Ringsend, Irish Water is separately progressing other projects for the provision of a the GDD wastewater treatment facility in North County Dublin together with alterations to the drainage network to facilitate the required diversion of flows from the Ringsend catchment. The additional capacity is expected to be constructed by 2024 together with provisions for intercepting the Blanchardstown Catchment (9C) and part of the North Fringe (NF) Catchment and transferring these flows to the new WwTP. This proposed division of the catchment is shown in Figure 3-3.

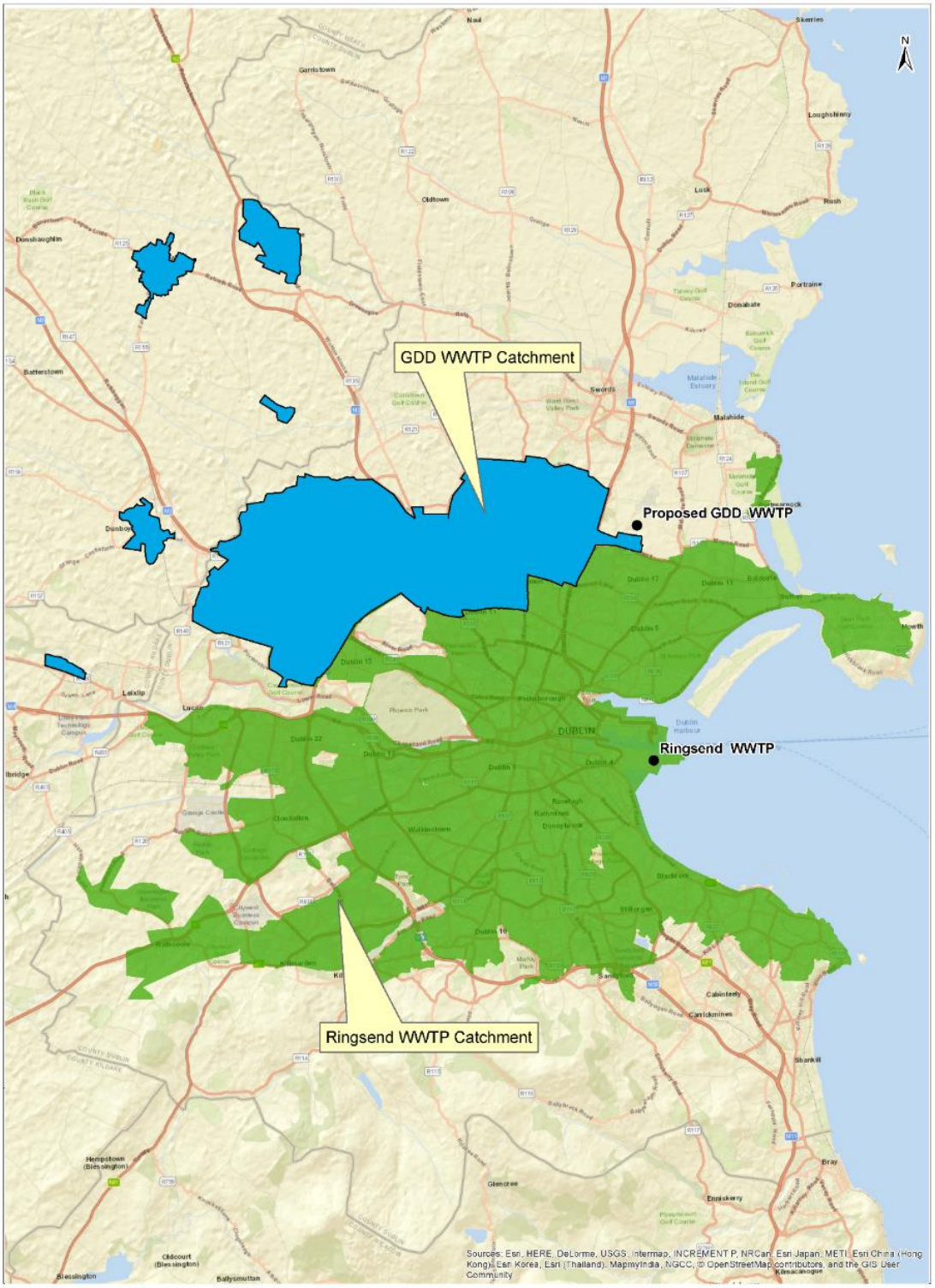

Figure 3-3: Future Ringsend WwTP and GDD catchments

3.2.3.2 Design Parameters

Having regard to historical loading data and variability in loading, the proposed design capacities for the treatment plant is presented in Table 3-4. The design of the upgraded Ringsend WwTP is based on the average load shown in Table 3-4 below, with provision to cater for individual daily variations around the average, described as the peak daily design within the table.

Table 3-4: Design parameters

Parameters	Units	Raw Influent	
		Average	Peak Daily Design
Population Equivalent	PE	2,400,000	4,350,000
Volume	m^3/day	600,000	2,100,800
Peak Flowrate	m^3/s	Not applicable	13.8
Biochemical Oxygen Demand (BOD)	kg/ day	144,000	261,000
Chemical Oxygen Demand (COD)	kg/ day	319,000	583,000
Suspended Solids	kg/ day	151,000	329,000
Ammonia	kg/ day	15,700	21,600
Kjeldahl Nitrogen	kg/ day	21,900	31,200
Total Phosphorus	kg/ day	3,450	5,000

3.2.4 Treated Effluent Standards

3.2.4.1 Relevant Legislation

Legislation that is applicable to the treated effluent discharge from the Ringsend WwTP is as follows:

- Water Framework Directive (WFD); (2000/60/EC) European Communities (Water Policy) Regulations, 2003 (SI No. 722 of 2003)
- Urban Wastewater Treatment Regulations 2001 (SI No. 254 of 2001); and Council Directive 91/271/EEC concerning urban wastewater treatment (UWWT Directive)
- Bathing Water Directive. EU Directive on bathing water (2006/7/EC) Bathing Water Quality Regulations 2008 (SI No. 79 of 2008)

The Water Framework Directive (2000/60/EC) establishes a framework for the protection of surface waters and groundwaters within Member States and requires that Member States implement a range of measures to classify, assess and improve water bodies to a 'good status'. The implementation of measures to reduce the impact of our wastewater discharges and thus improve water quality and meet the requirements of the WFD is a key objective of Irish Water.

Under the EU UWWT Directive and related Irish regulations, the Lower Liffey Estuary is designated as a 'sensitive' water body and, as a consequence, for continued discharge at the existing outfall location, nutrient (nitrogen and phosphorus) removal is required for existing and future loads.

The Bathing Water Directive establishes procedures and standards for designated bathing waters. The minimum required standard for bathing waters is *sufficient*. To protect designated bathing waters in Dublin Bay, disinfection of treated effluent is required on a seasonal basis.

3.2.4.2 Treatment Standards

The upgraded Ringsend WwTP is designed to meet the treatment standards set out in Table 3-5, and to comply with the UWWT Directive. The current discharge licence (D0034-01) will be subject to a review process by the EPA following completion of the planning process.

Table 3-5: Treatment standards

Parameter	Emission Limit	Comment
pH	6 - 9	-
Toxicity	5 TU	-
Faecal Coliforms	100,000 MPN/100ml	Bathing Season
BOD_5	25 mg/l	Annual 95th Percentile. Peak Limit: 50 mg/l
COD	125 mg/l	Annual 95th Percentile. Peak Limit: 250 mg/l
Suspended Solids	35 mg/l	Annual 95th Percentile. Peak Limit: 87.5mg/l
Total Nitrogen	10 mg/l	Annual Average
Total Phosphorus (as P)	1 mg/l	Annual Average

Water quality modelling has been carried out to assess the dispersal, dilution, and decay of the final effluent parameters on the receiving waters and to demonstrate compliance with the above directives. This is described in detail in Volume 3, Section 4: Water.

3.2.5 Sludge Generation

The treatment of wastewater results in the production of two types of raw sludge which require treatment and processing, viz:

- Primary Sludge (PS) – solids removed in the primary settlement tanks
- Surplus Activated Sludge (SAS) or, in the case of the aerobic granular sludge (AGS) technology, Surplus Aerobic Granular Sludge (SAGS) – growth in sludge biomass arising from biological treatment.

These two raw sludge types produced in wastewater treatment are distinct from the biosolids products that result from the subsequent sludge treatment processes. Currently, there are two biosolids products, viz:

- Biocake – treated sludge with a dry solids content of circa 26%.
- Biofert – treated sludge which is thermally dried and has a dry solids content in excess of 90%.

Biosolids are defined in the *Code of Good Practice for the Use of Biosolids in Agriculture* (1999) as "the organic by-product of urban wastewater treatment which, by being treated to an approved standard, can be used beneficially as a fertiliser/soil conditioner in agriculture".

Following the Proposed Upgrade Project and the introduction of a phosphorus recovery process, it will be possible to recover nutrients required for growth. This third[6] biosolids material can also be called struvite. The production of struvite is discussed in section 3.3.4.

[6] *Biosolids are described in the Code of Good Practice for the Use of Biosolids in Agriculture (1999) as rich in "macro and micro nutrients required for healthy plant and animal growth. It contains Nitrogen, Phosphorus and Potassium. It can also provide Magnesium…."*

All material produced from the wastewater treatment process is classified as a waste and the outputs are managed as such: e.g. treated wastewater is discharged to the environment under authorisation of the EPA, whilst the biosolids are managed to land using Nutrient Management Plans assessed and monitored by local authorities.

3.2.5.1 Historical Sludge Production

The quantity of sludge generated is directly related to both the influent loading, and the wastewater treatment processes utilised. The estimated current average daily sludge production is 55 tonnes dry solids of PS and 52 tonnes dry solids of SAS. However, it should be noted that these figures are averages and that solids loads vary considerably about the mean values. Maximum values are of the order of 1.4 times the average and occurring over 1 week per month.

3.2.5.2 Future Sludge Production

Following the proposed upgrade of the wastewater process and provision of additional treatment capacity, two sludge types (PS and SAS) will continue to be generated. The quantity of sludge generated will increase pro rata with loading and will also increase as a result of an improvement in the effluent quality. At present the average suspended solids in the treated effluent is approximately 35 mg/l and this is expected to improve to an average value of circa 20 mg/l with the introduction of AGS technology for the biological treatment stage of the wastewater. With the introduction of biological phosphorus (P) removal to the wastewater treatment process, the characteristics of the sludge generated will also change, specifically its phosphorus content. This change to the sludge and how it is addressed in the upgraded WwTP is discussed 3.3.4.

3.2.5.3 Biosolids Quality and Use

The current end-use outlet for treated wastewater sludge from the Ringsend WwTP is recovery in agriculture. There continues to be a demand for nutrients such as nitrogen and phosphorus for use in agriculture in Ireland as current uses deplete both of these resources continuously.

In accordance with the NWSMP, reuse on land remains the preferred outlet in the short to medium term and the treated sludge product from Ringsend WwTP will continue to meet the relevant standards to allow for such land spreading. The provision of a RBSF is described in section 3.4 and land spreading is addressed in Volume 4, Section 19: Cumulative Impacts

3.3 WwTP Component of the Proposed Upgrade Project

3.3.1 The Site

Works for the upgrade of the Ringsend WwTP will be carried out within the site of the existing wastewater treatment plant, shown in Figure 3-4. There will also be temporary construction compounds near the site and temporary working areas at two locations immediately outside the WwTP boundary, as indicated in Figure 3-4. The existing treatment facility is divided by the Pigeon House Road. The area to the north of the Pigeon House Road (river side) currently accommodates the storm water holding tanks and comprises 3.5 hectares. The area to the south of the Pigeon House Road comprises 11 hectares. The separate areas proposed for construction compounds and temporary working areas are described later in this section.

Figure 3-4: Proposed upgrade project – WwTP site location

3.3.2 Proposed Works

The works at the Ringsend WwTP on Pigeon House Road under the Proposed Upgrade Project involves elements of the 2012 Approval being progressed, including amendments approved under section 146 B of the Planning and Development Act, and the Proposed Development now being applied for under Section 37E. These facilities are required to provide for the increased capacity of 2.4 million PE and to achieve the required effluent standards, without the need for the LSOT.

The elements of works are summarised in Tables 3-6. The locations of each of the works are shown on drawing Y15710-PL-921, provided in Volume 5, Part A , and are also indicated on Figure 3-6, Figure 3-7 and Figure 3-8. Further details of the various works are described in Appendix 3A.

The RBSF component of the Proposed Upgrade Project at Newtown, Dublin 11 is described separately in section 3.4.

Table 3-6: Proposed works at Ringsend WwTP

Ref. No.	Description	2012 Approval (defined in section 1.2.1)	Proposed Development (defined in section 1.2.2)
Long Sea Outfall Tunnel (LSOT)			
	9-kilometre tunnel and all associated works including the onshore inlet shaft.	✓	To be omitted
Wastewater Treatment			
W1	Installation of additional pump in existing Inlet Pump Structure	✓	
W2	Extend lamella packs in existing Primary Settlement Tanks	✓	
W3	Additional secondary or biological treatment capacity comprising new SBR units, i.e. 6 tanks on two levels (3 on each level) Associated inlet feed pumping station - Expansion Lift Pumping Station (ELPS)	✓	
W4	Reconfiguration, replacement of internal pipework and channels in up to 24 existing SBR tanks to facilitate the use of the AGS process technology		✓
W5	New effluent fine screens to further improve final effluent quality	✓	
W6	Installation of additional UV lamps in existing outlet channel to cater for increased flow rate		✓
W7	Modifications to the existing Intermediate Lift Pumping Station (ILPS)		✓
Sludge Treatment			
S1	Additional sludge thickening facilities	✓	
S2	New Sludge Pasteurisation Building		✓
S3	New anaerobic sludge digester	✓	
S4	New phosphorus recovery facility building		✓
S5	Post Digestion Centrifuges	✓	
Ancillary Facilities			

Ref. No.	Description	2012 Approval (defined in section 1.2.1)	Proposed Development (defined in section 1.2.2)
A1	Electrical Upgrade - Connection of existing ESB power cables to site Additional diesel generators		✓
A2	Construction access onto Pigeon House Road and haul road with accommodation works (i.e. small bund removal)	✓ Site entrance approved for construction period (29N.YM0002)	✓ Site entrance to be retained on a permanent basis
A3	Provision and upgrade of odour control facilities at the inlet works and sludge facilities to ensure compliance with odour standards	✓	
A4	New bypass connection from final effluent culvert to existing connection to storm tanks		✓
A5	Modification to the sludge and fats oils grease (FOG) removal systems in the existing primary settlement tanks (PSTs).		✓
	The works to be carried out also include interconnecting pipework, pumps, valves and associated chambers; upgrades of existing equipment, as well as related provision for upgrades of electrical, instrumentation and control systems (including SCADA) and the reconfiguration, where relevant of internal site roads and underground utilities		
Construction Compounds (Temporary)			
C1	Compounds C1 southwest of WwTP	✓ Approved for 3 years under 29N.YM004	✓ Extend temporary use until December 2028
C2	Compound C2 to north of main WwTP near storm tanks	✓ Approved for 3 years under 29N.YM004	✓ Extend temporary use until December 2028
C3	Compound C3 northeast of WwTP	✓	Not Required after 2021
	Compound Long Sea Outfall Tunnel		To be omitted

3.3.3 Wastewater Stream Modifications

The proposed works will provide for modifications to the wastewater treatment line, as summarised in Table 3-7. For clarity, the descriptions provided for works included in the 2012 Approval include '2012' in parenthesis and the description of works under the Proposed Development include '2018' in parenthesis. A schematic drawing showing the modifications to the wastewater treatment line (liquid stream) is provided on drawing Y15710-PL-918 Volume 5, Part A.

Table 3-7: Proposed Modifications Wastewater Stream

Ref	Proposed Modification	Purpose
W1 (2012)	Installation of additional pump in existing Inlet Pump Structure	Increase in influent and inter-stage pumping capacity
W2 (2012)	Extend lamella packs in existing Primary Settlement Tanks	Increase in primary treatment capacity
W3 (2012)	Additional secondary or biological treatment capacity comprising 6 no. new SBR tanks.	Increase in biological treatment capacity
W4 (2018)	The use of aerobic granular sludge (AGS) as the activated sludge medium in the biological treatment phase. Feed pipework, sludge collection pipework and effluent collection channels in up to 24 existing SBR tanks are configured to promote the growth of AGS	Increase in biological treatment capacity to reduce nitrogen and phosphorus
W5 (2012)	New effluent fine screens	Increase in removal of Total Suspended Solids from treated effluent
W6 (2018)	Installation of additional UV lamps in existing outlet channel to cater for increased flow rate	Increase in disinfection capacity may be required because of increase in design loading and continuation of discharge of treated effluent via existing outfall.
W7 (2012)	Modifications to the existing Intermediate Lift Pumping Station (ILPS)	Will facilitate flow control and distribution

3.3.4 Sludge Stream Modifications

3.3.4.1 Phosphorus

Phosphorus is a finite resource and an important mineral and nutrient required for food production and plant and human/animal growth. It is usually found in its phosphate form in wastewater. This ability of phosphorus to support photosynthesis and growth can lead to eutrophication through excess plant growth and decay in receiving waters. This is one of the reasons why phosphorus is usually limited by environmental regulators as a pollutant, in waters deemed sensitive to eutrophication. In Ringsend, the phosphorus limits have been set at 1mg/l as Total-P (any form of phosphorus) by the EPA. The EPA on the other hand has also published research[7] on phosphorus and indicated that its recovery is simple and technically feasible and that "Long-term national strategies in relation to wastewater treatment and sludge management should consider the implications for potential phosphorus recovery."

Additionally, phosphates have been linked to process inefficiency and the clogging of pipes and scaling of other wastewater treatment equipment in many wastewater treatment plants. Any increased scaling has the potential to: increase energy use; reduce process efficiency; and, require significantly increased maintenance associated with the removal of such deposits.

These drivers have led to the development of several techniques for successful recovery of phosphates from wastewater. Using AGS technology, there is an opportunity to increase the amount of phosphorus

[7] *Ryan et al., EPA STRIVE Series No. 189 - Identification and evaluation of phosphorus recovery technologies in an Irish context (2014)*

made available in the process cycle and allow its recovery through a number of proprietary 'phosphorous fixing' techniques. The recovered phosphorus can then be made available for agronomic benefit through its use as a fertiliser and can eliminate a further need for chemically manufactured fertilisers. Compound fertilisers in Ireland have been traditionally sold in Ireland based on their Nitrogen, Phosphorus and Potassium (NPK) ratio e.g. 10-10-20. In practice, through Nutrient Management Plans, these ratios are often adjusted when spreading or injecting soils with fertilisers to meet their growth requirements.

Figure 3-5: Physical characteristics of the struvite material

The recovered phosphorus is known as "struvite" (see Figure 3-5) and is currently distributed directly into the fertiliser market e.g. Crystal Green®[8] is marketed as 5-28-0 with 10% Magnesium.

The phosphorus recovery unit will be installed in a dedicated building as part of a tendered service to Irish Water. The tender will require the provider to efficiently maximise the recovery of phosphorus to meet Irish Water's stated aims of increased sustainability. The service provider will also establish routes to market and assist in the achievement of new regulatory approvals associated with classifying the material as a product. The dedicated building will allow for storage prior to direct distribution to market providers. After commissioning of the recovery unit, it is expected that market trials will follow before the recovered fertiliser can be formally declared a product through the EPA's end of waste approval mechanism. Equally, the fertiliser will have to gain approval under REACH regulations[9] from the Health and Safety Authority.

Until the struvite is declared as a product by the EPA, it will be handled in the same manner as other biosolids generated at the Ringsend WwTP. During this time, which might be up to 2 years, struvite will

[8] *crystalgreen.com (Website accessed May, 2018)*

[9] *Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) is a European Union regulation (2006). REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment.*

be stored at the RBSF for certain months of the year. Storage of biosolids is explained further in section 3.4.

The main benefits from the recovery of phosphorus as struvite are as follows: increased P-recovery and consequent reductions in emissions to the environment; and the creation of a high-value fertiliser in line with the objective of the *Code of Good Practice for use of Biosolids in Agriculture* which displaces a need to extract minerals, manufacture and ship chemical fertilisers. Since struvite will be recovered on-site from the sludge and wastewater, it can be trans-shipped directly from the recovery site reducing associated transport movements with the manufacture of this material. All of these benefits when combined have the potential to significantly lower the overall carbon-footprint associated with the use and manufacture of fertilisers/biosolids.

3.3.4.2 Proposed Modifications to Sludge Stream

The various modifications to the existing sludge stream which are proposed to provide for the increase in sludge production, the optimisation of existing facilities, and the recovery of phosphorus are shown in Table 3-8. A schematic drawing showing the modifications to the sludge stream is provided on drawing Y15710-PL-918 Volume 5, Part A.

Table 3-8: Proposed modifications sludge stream

Ref	Proposed Works	Purpose
S1 (2012)	Additional sludge thickening facilities	To cater for the future surplus activated sludge loads and without the need for co-settlement of these sludges in primary tanks (as existing). Will improve performance of primary settlement tanks
S2 (2018)	Provision of a new pasteurisation stage in dedicated building	Provides for pasteurisation of primary sludge. Will optimise use of thermal hydrolysis plant.
S3 (2012)	New anaerobic sludge digester	To ensure sufficient capacity for the digestion of all sludge arising on the site
S4 (2018)	New phosphorus recovery facility building	To control P levels in re-circulated sludge liquors
S5 (2012)	Post Digestion Centrifuges	To cater for the increase in loads and to provide for the independent production of Biocake

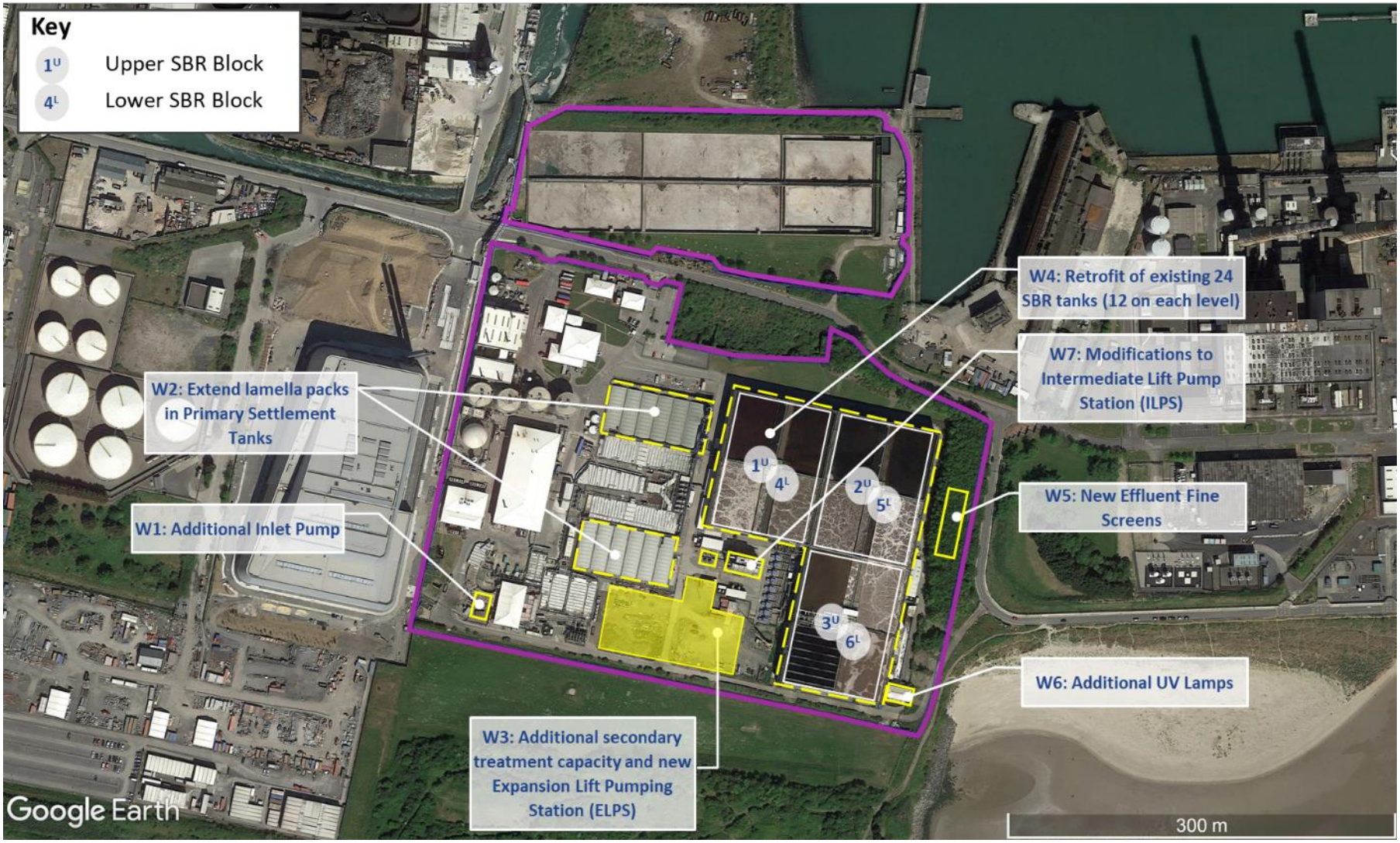

Figure 3-6: Wastewater stream upgrades

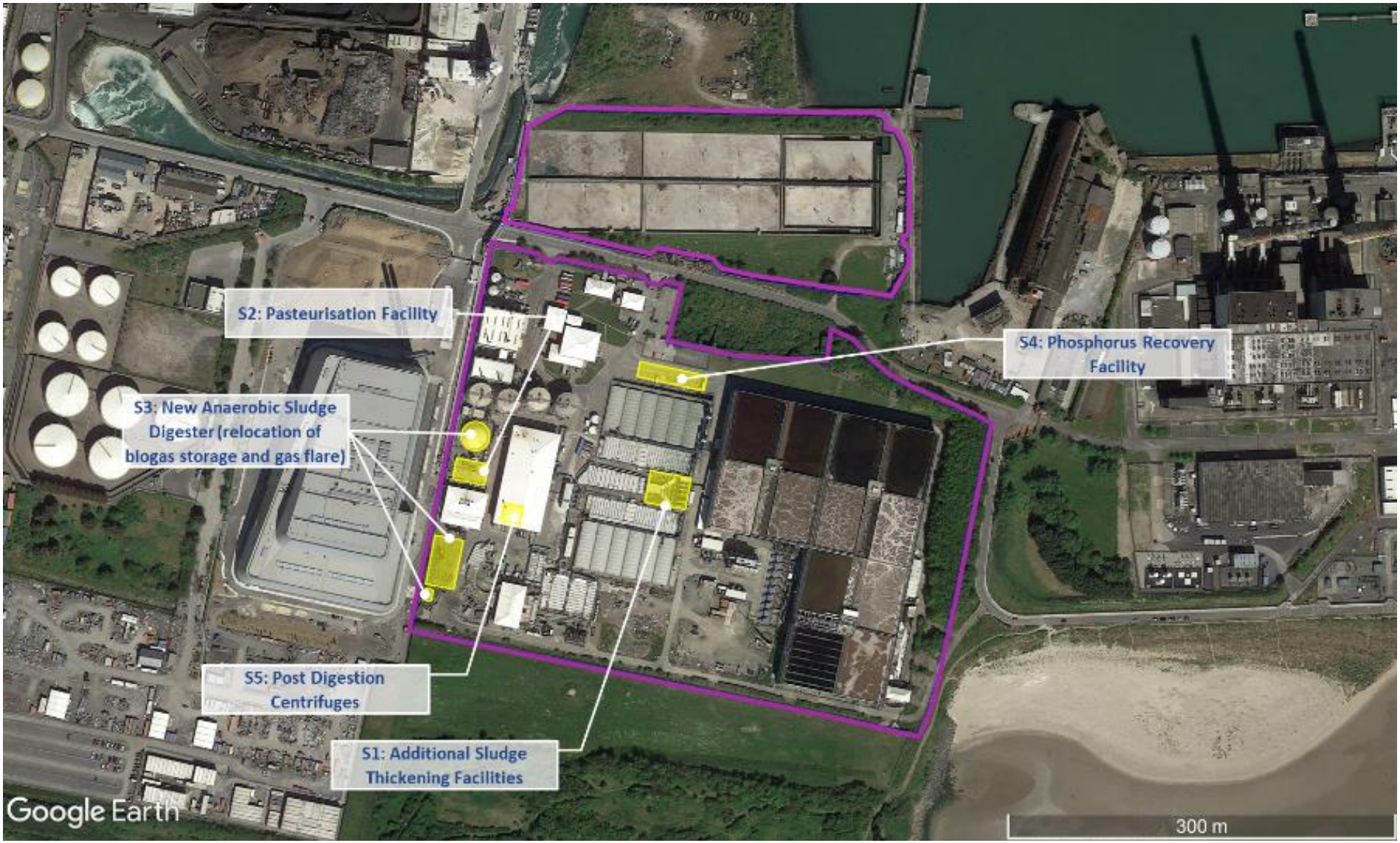

Figure 3-7: Sludge stream upgrades

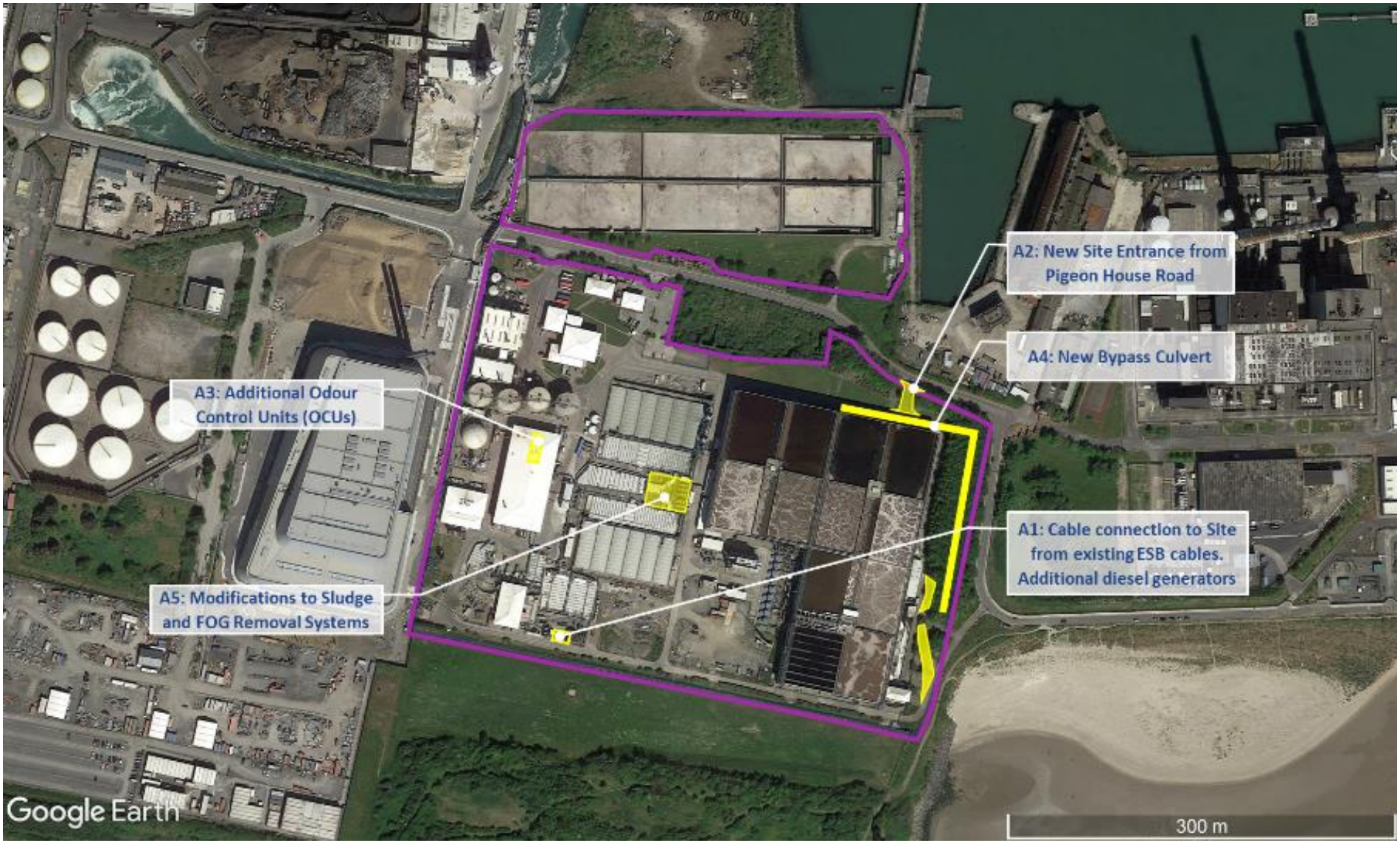

Figure 3-8: Ancillary upgrades

3.3.5 Construction and Commissioning Phase

3.3.5.1 Procurement

The proposed works and facilities at Ringsend WwTP, as described above, will be provided through a number of construction and installation contracts. These contracts will be procured through Design/Build/Operate (DBO), Design/Build (DB) and Employer Design contract types. The DB and DBO form of contract will allow:

- Contractors to offer innovation in both the design and construction of the facility
- Maximum access to proprietary technologies for use on the facility.

The construction of additional secondary treatment capacity comprising new SBR units based on the 2012 Approval is proceeding on the basis of a DBO contract.

These contracts will be based on the proposals in the 2012 Approval and the revisions now proposed as described herein. Any design flexibility provided for in these contracts will be limited by regulatory, technical and operational constraints, including mitigation measures relating to this EIAR and conditions of the planning consent.

3.3.5.2 Construction Programme

The proposal to upgrade the treatment facilities at Ringsend WwTP will involve significant interaction with the existing plant and will necessarily be carried out on a phased basis over a period of 7 to 10 years.

The programme has several requirements, constraints and interdependencies which impact on when the works need to, or can, be undertaken. These include:

- Overall objective of achieving the nitrogen and phosphorus (and other) treatment standards required by the UWWT Directive and providing the required capacity to treat the incoming load to the plant;
- Requirement to increase sludge handling capacity commensurate with increased loading to the plant;
- Requirement to maintain the existing treatment plant in operation during the construction phase;
- Restricted work areas available;
- Procurement procedures

Construction activity commenced in early 2018 on the contract for the provision of additional secondary treatment capacity permitted under the 2012 Approval. Construction activity on the site of the Ringsend WwTP is expected to continue until 2028 i.e. if the full SBR retrofit of the AGS technology is carried out, subject to planning permission being granted. The intensive period for construction activity is in 2019 and 2020 when the capacity upgrade works are being carried out and which will overlap with the retrofit of SBR tanks in the upper deck.

An indicative programme showing when the various work elements are expected to be carried out is shown on drawings Y15710-PL-921, provided in Volume 5, Part A. An extract from that drawing is shown in Figure 3-9. Additional construction phasing ‘snapshot’ drawings are included drawings Y15710-PL-922 to 924. The snapshot drawings, set at half yearly intervals, show which construction activity is expected to be underway in each period. Whilst the programme is date driven, construction activity

sequencing and duration will alter as a result of issues that can impact on any project of this scale and complexity. All construction periods indicated are subject to change depending on, for example, the contractor's construction approach, weather conditions and typical construction issues that can arise to delay or disrupt the works.

Where possible mitigation measures will be implemented to minimise delays. Should opportunity arise to bring forward any of the construction works and to expedite the overall completion date, the programme may also be altered.

It should be noted that the site must remain operational at all times and cater for the needs of the Greater Dublin catchment during the construction of the upgrade works.

Necessary flexibility will be required to provide for situations such as:

- Extended duration of routine maintenance requirements.
- Inclement weather conditions affecting load to the treatment plant as well as directly on construction.
- Mechanical, electrical or process malfunctions.
- Reduced treatment capacity when existing SBR tanks are out of service to facilitate retrofitting of internal pipework and before the secondary treatment capacity extension is commissioned.

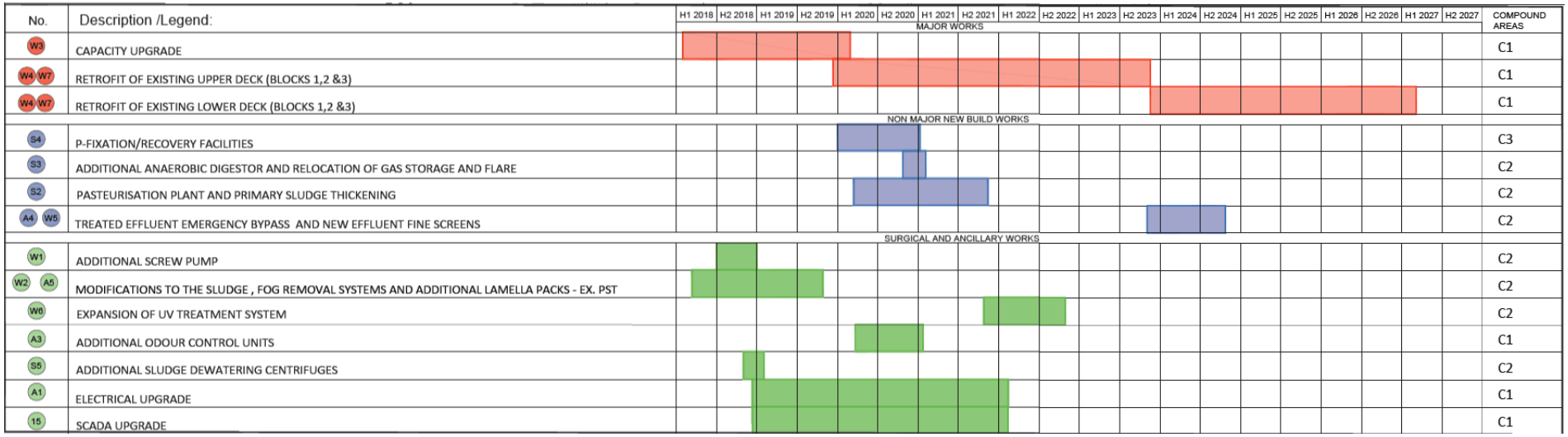

Figure 3-9: Construction programme

3.3.5.3 Works Compound Areas

To facilitate construction works and plant installation, a number of compound areas are being made available for the contractor. The locations of these compound areas and access routes from public roads are shown on Figure 3-10, Figure 3-11, and Y15710-PL-960 included in Volume 5, Part A.

Figure 3-10: Compound areas locations

Compound C1

The site is located on the adjacent lands to the southwest of the Ringsend facility and comprises 3.01 ha, as shown on drawing Y15710-PL-961, provided in Volume 5, Part A. The lands are owned by Dublin Port Company and were used by Covanta as a construction compound to facilitate the works within the Waste to Energy facility. At present the compound area is utilized as a car park, welfare facilities, storage area and temporary site offices in the form of portacabins. The compound is currently accessed from Shellybanks Road and it is proposed that Compound C1 will continue to be accessed from Shellybanks Road. The compound will also be accessible from South Bank Road. It is envisaged that the compound will be maintained in its existing use as a car park facility, storage area and site offices. A letter of consent has been provided by Dublin Port Company.

Pedestrian access will be provided into the works site via a 3 metre wide temporary access, from the compound to the WwTP via the DWtE site, with a double gate entry at each end. The new temporary access road from compound C1 will be enclosed with a palisade fencing with screening. A letter of consent has been provided by DCC and DWtE with regard to inclusion of this temporary access within this planning application.

Compound C2

The Compound C2 site is located to the north of the existing Ringsend WwTP Upgrade works and comprises approximately 0.75 ha, with 0.64 ha owned by the Applicant and the remaining portion owned by DCC. A letter of consent has been provided by DCC to include their lands within this planning application. The site is currently unused and is bounded to the north by the storm tanks for the Ringsend

WwTP and to the south by the north wall of Pigeon House Fort. The site is currently accessed from Pigeon House Road through an existing 3.7 m entrance gate. The proposed site compound will require shared access to facilitate entry for the WwTP operator and Irish Water for the ongoing operation and maintenance of the Ringsend WWTP storm tanks.

As the existing access is part of protected structure (i.e. Pigeon House Fort), a more suitable access arrangement for HGV movements is shown on Y15710-PL-962, provided in Volume 5, Part A.

It is envisaged the compound will be utilised for the storage of materials and plant throughout the proposed upgrade works. Concrete traffic barriers will be utilised on the compounds southern boundary to protect the north wall of Pigeon House Fort. The installation of the concrete barriers will be an obligation for the contractor as part of the mitigation measures to protect the north wall of Pigeon House Fort as outlined in Volume 3, Section 11: Cultural Heritage. The contractor will strip the topsoil, which is considered shallow subsurface works, within Compound C2 and install a free draining hardcore finish. Following the works, it is intended to reinstate the area to its current condition.

The contractor will also be required to use a steel structure to protect the existing piers of the entrance against accidental impact created by construction works, see Volume 3, Section 11: Cultural Heritage.

Compound C3

The site is located to the northeast of the existing Ringsend WwTP and comprises approximately 0.73 ha. The site is owned by Dublin City Council. The site is accessed from Pigeon House Road and bounded by a disused Power Plant on the west and an ESB facility to the east.

Concrete traffic barriers will be utilised on the compounds western boundary to protect the Pigeon House Power Plant, see Volume 3, Section 11: Cultural Heritage. The installation of the concrete barriers will be an obligation for the contractor as part of the mitigation measures to protect the Pigeon House Power Plant. To facilitate entry to Pigeon House Harbour by the Dublin City Council, access to the site compound will be shared. This access is denoted on drawing Y15710-PL-963, provided in Volume 5, Part A.

This compound will not be required longer than the three year period, as per the planning permission granted under Section 146B in January 2018 (ABP Ref 29N.YM0004.)

3.3.5.4 Access

Access to the wastewater treatment plant site for construction will be made available as described below and shown in Figure 3-11.

Access X1

This is the existing access to the main operational part of the wastewater treatment plant site on Pigeon House Road. It will be utilised for construction activity within the operational area of the existing wastewater treatment plant.

Access X2

This access is located east of Access X1. Construction of this access will be carried out in 2018 under the 2012 Approval as amended by ABP. Use of this construction access onto Pigeon House Road and haul road with accommodation works (i.e. small bund removal) on a permanent basis is included within this planning application.

Access X3

This access is located at the southeast corner of the WwTP site. The access is from Pigeon House Road and a spur road constructed under 2012 Approval.

Access X4

This access is located at the southwest corner of the WwTP site. A temporary pedestrian access is to be provided from Compound C1.

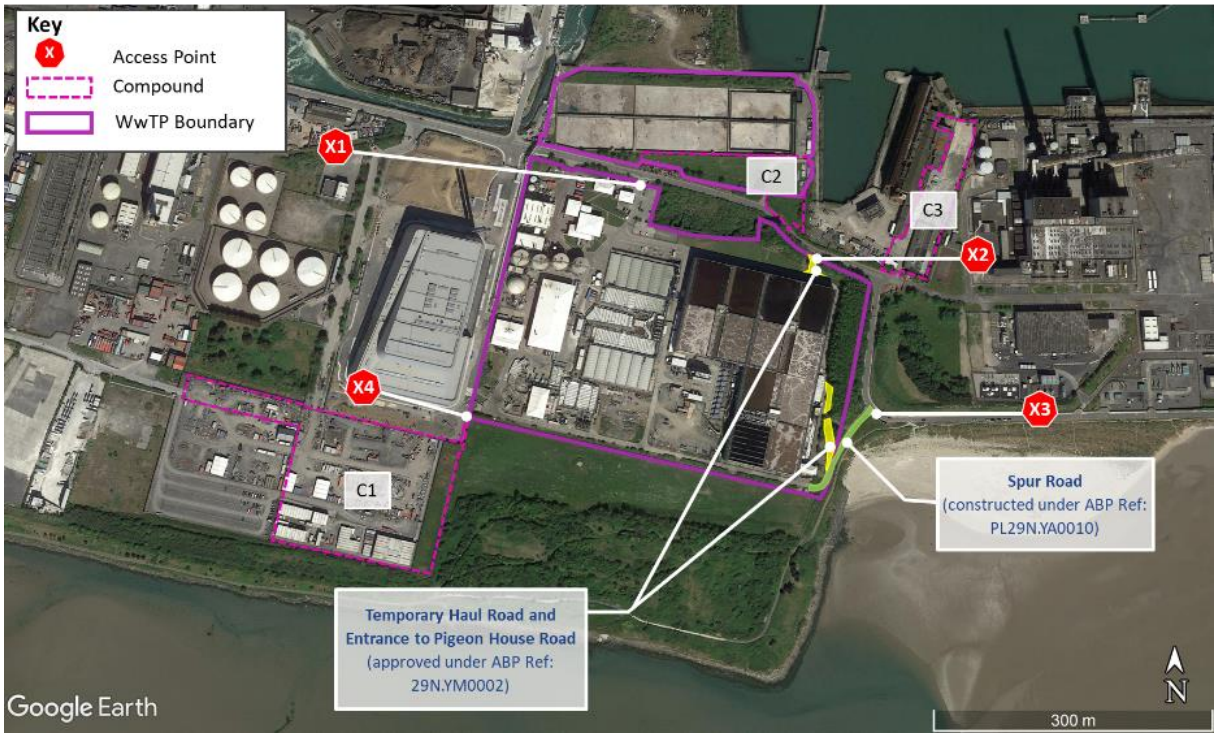

Figure 3-11: WwTP access locations

3.3.5.5 Characteristics of Construction

The main characteristics of the construction and installation activities at the Ringsend WwTP are summarised as follows and are described in further detail below.

- Major Works
- Non-Major - New Build Works
- Surgical and Ancillary Works.

Major Works

These are construction and installation works considered to be of significant scale having regard to the type of construction activity (civil, building, mechanical, electrical) involved, including requirements for construction plant and labour resources; materials delivery; and the anticipated value and duration of the works. They are summarised in Table 3-9.

Figure 3-12: SBR tanks – Upper deck blocks 1, 2 and 3 and lower deck blocks 4, 5 and 6

Table 3-9: Major works

Ref	Works Description	Main Components
W3 (2012)	Additional Secondary Treatment Capacity	• 6 No. treatment tanks and associated buffer tanks on a piled foundation, in reinforced concrete in a two-tier configuration with common wall construction and having approximate overall plan dimensions of 110 m x 38 m and a construction height of 21 metres. The approximate volume of reinforced concrete is circa 11,000 m^3. These tanks will be fitted out with influent and sludge pipework, flow collection channels, air pipework and diffusers, air blowers and pumps. • The construction of a new pumping station (ELPS) to feed settled wastewater to the new AGS reactor tanks • Ancillary facilities to include electrical, process monitoring and control equipment.
Upper Deck W4 (2018)	Retrofit of Existing SBR Tanks	• There are twelve SBR tanks on the upper deck which operate in 3 No Blocks each with 4 tanks. These Blocks are shown in Figure 3-12. The retrofit of up to 24 of these tanks, which is required to allow the operation of the AGS process, will necessarily be carried out on a phased basis, three separate phases for Blocks 1 to 3. • The main components and associated characteristics of this element of the construction works are: ○ Emptying and decommissioning of each tank and retrofitting with new internal mechanical equipment influent and sludge pipework, flow collection channels, air pipework and diffusers as required for the operation of the AGS process. The retrofit works will be carried out on a phased basis and the contents of the tanks will be transferred to other tanks which remain operational; ○ Removal of some internal dividing walls in each tank of the existing reactors; ○ Construction of new internal dividing walls to create sludge buffer capacity and water level adjustment capability within the reactors;

Ref	Works Description	Main Components
		○ Fitting out with influent and sludge pipework, treated effluent collection channels, air pipework and diffusers; ○ Reconfiguration of influent feed pipework – to include new pipe feed; ○ Replacement and upgrade of existing air blower equipment and associated pipework; ○ Ancillary facilities to include electrical, process monitoring and control equipment. • Tower crane expected to be required.
Lower Deck W4 (2018)	Retrofit of Existing SBR Tanks	• There are also 12 existing SBR tanks on the lower deck with the same overall dimensioning as the upper deck tanks. These also operate in 3 No. blocks each of 4 tanks. The lower deck blocks are numbered 4 to 6 and are located under tanks 1 to 3 respectively in the upper deck. The retrofit of these tanks, which is required to allow the operation of the AGS process, will necessarily be carried out on a phased basis. • The main components and associated characteristics of this element of the construction works are the same as for the upper Deck. However, the tanks are only accessible from the intermediate area dividing the Upper and Lower decks and hence construction activity will be more constrained. • Tower crane not expected to be required. • Mobile crane expected to be required.

Figure 3-13: SBR tanks, view 2

Non-Major New Build Works

Non-Major New Build Works comprise construction works considered to be of significantly lower scale to the Major Works and are also related to the type of construction activity involved, requirements for construction plant and labour resources; materials; and the anticipated value and duration of the works. They are summarised in Table 3-10.

Figure 3-14: Construction of non-major new build works

Table 3-10: Non-major new build works

Ref	Works Description	Main Components
S4 (2018)	Phosphorus Recovery Facility	• The Phosphorus Recovery facility will be a proprietary process system requiring mechanical handling systems installed within an industrial type building unit. The system will extract phosphorus from the liquid or sludge stream and produce a struvite granular product which can be taken off site for various beneficial uses. The granules will be similar in form to artificial fertiliser and typically small measuring 1 to 2 mm in length. The granules will be removed from site in covered trucks with approx. 20 m^3 of struvite per truck load. • The main components and associated characteristics of this element of the construction works are: ○ Building of dimensions of approximately 38.5m x 15.5m x 20m high. This will be an industrial type building utilising PVC coated insulated cladding of similar construction to other facilities on site; ○ It is expected that the building will be constructed on a piled foundation with a reinforced concrete floor slab; ○ Fitting out with silos, liquid and (depending on the process technology utilised) sludge handling pipework; struvite (product) handling, bagging and/or truck loading equipment; ○ Ancillary facilities to include electrical, process monitoring and control equipment. • Tower crane not expected to be required

Ref	Works Description	Main Components
		• Mobile Crane expected to be required
S3 (2012)	Anaerobic Digester	• These works comprise the provision of an additional anaerobic digestion tank (there are 4 existing tanks on site). To facilitate construction of the additional unit the existing biogas holder and gas flare will be relocated. • It is expected that the digestion tank will be constructed in glass coated steel (as existing) or reinforced concrete with an external cladding. • The main components and associated characteristics of this element of the construction works are: ○ Tank – 18 metre diameter x 18.5 metres high. See Volume 5, Part A, Drawing Y15710-PL-954. ○ It is expected that the new digestion tank will be constructed in glass coated steel bolted panels (as existing) or other material suitable for use. ○ Reinforced concrete base on piled foundation ○ Ancillary facilities to include electrical, process monitoring and control equipment. • Tower crane not expected to be required • Mobile crane expected to be required
S2 (2018)	Pasteurisation Plant	• The main components and associated characteristics of this element of the construction works are: ○ Building of approximate dimension of 31.5 metres x 14.5 m x 8.5 m high. This will be an industrial type building utilising PVC coated insulated cladding of similar construction to other facilities on site; ○ It is expected that the building will be constructed on a piled foundation with a reinforced concrete floor slab; ○ Fitting out with pasteurisation equipment, pumps and associated pipework. Much of the internal plant equipment may be delivered prefabricated for installation on site; ○ Ancillary facilities to include electrical, process monitoring and control equipment. • Tower crane not expected to be required. • Mobile crane expected to be required
A4 (2018)	Emergency Bypass	• These works comprise the provision of an underground precast reinforced concrete culvert connecting the existing outfall culvert at the eastern boundary of the site to the existing internal bypass allowing discharge to the storm tanks. • The main components and associated characteristics of this element of the construction works are: ○ Underground culvert, approximately 3.65 metres wide x 2.3 m high and 252 m in length. ○ Materials: Concrete • Tower crane not expected to be required. • Mobile crane expected to be required

Figure 3-15: Phosphorus recovery facility location (S4)

Figure 3-16: New anaerobic digester (S3)

Figure 3-17: Pasteurisation plant (S2)

Surgical and Ancillary Works

These works comprise low scale construction activity involving minor works of short to medium term duration requiring small numbers of labour and plant resources. The work typically involves mechanical plant installation and/or upgrade; electrical installation and/or upgrade; together with, where necessary, associated minor building and/or civil works.

For clarity, the descriptions provided for works included in the 2012 Approval include '2012' in parenthesis and the description of works under the Proposed Development include '2018' in parenthesis. Reference numbering to distinguish between wastewater stream (W), sludge stream (S) and ancillary works (A) (see Table 3-6) are also provided.

The works are generally located within the operational area of the existing facility and are described in Table 3-14.

Table 3-11: Surgical and ancillary works

Reference		Description
W1 (2012)	Additional Screw Pump	This involves the installation of an additional screw pump in an existing concrete structure.
W7 (2012)	Modifications to the Existing Intermediate Lift Pump Station	The existing intermediate lift pumping station will be fitted with new pumps and associated delivery pipework to connect flows to the retrofitted SBR tanks.
A5 (2018)	Modifications to the collection of sludge and FOG from the PSTs	These modifications comprise of civil, mechanical and electrical works.
W6 (2018)	UV Expansion	Installation of additional UV lamps in existing outlet channel.
A3 (2012)	Additional Odour Control Units (OCU)	These are typically proprietary systems used to store filter media required to remove the odorous components of extracted air. Filter dimensions will be circa 3 m x 3 m x 3m. The filter units and associated mechanical equipment (main units are extraction fans) are typically skid mounted on concrete plinths. See Vol. 3, Section 10: Odour for further Odour detail.
A2 (2012)	New Access and Internal Recirculation Road[10]	These are ground works comprising road construction and adjustments to fencing including the provision of a new entrance gate and are required firstly to facilitate general construction activity. It is noted that the site entrance was to be provided for the construction period but it is now proposed to retain on a permanent basis.
S5 (2012)	Additional Sludge Dewatering	Additional sludge dewatering centrifuges will be installed inside the existing sludge building. The work involved is of a mechanical and associated electrical nature.
A1 (2018)	Electrical Supply Upgrade	Increased Power Supply - Connection of ESB power supply cables to site: This involves excavation to expose existing underground high voltage cables on the southern boundary of the site and at the edge of, and within, the Brent Geese SPA. The cables will then be connected to the main power building on the site. The duration of the works is expected to be approximately 2 to 3 months and will be carried out in the period between March and September. Increased Power Supply: Installation of diesel driven generating plant to supplement on site power generation in the event of mains power failure, or to provide additional power during periods of peak demand.

[10]Under the Proposed Development this site entrance will be retained permanently to provide better access to the site for maintenance.

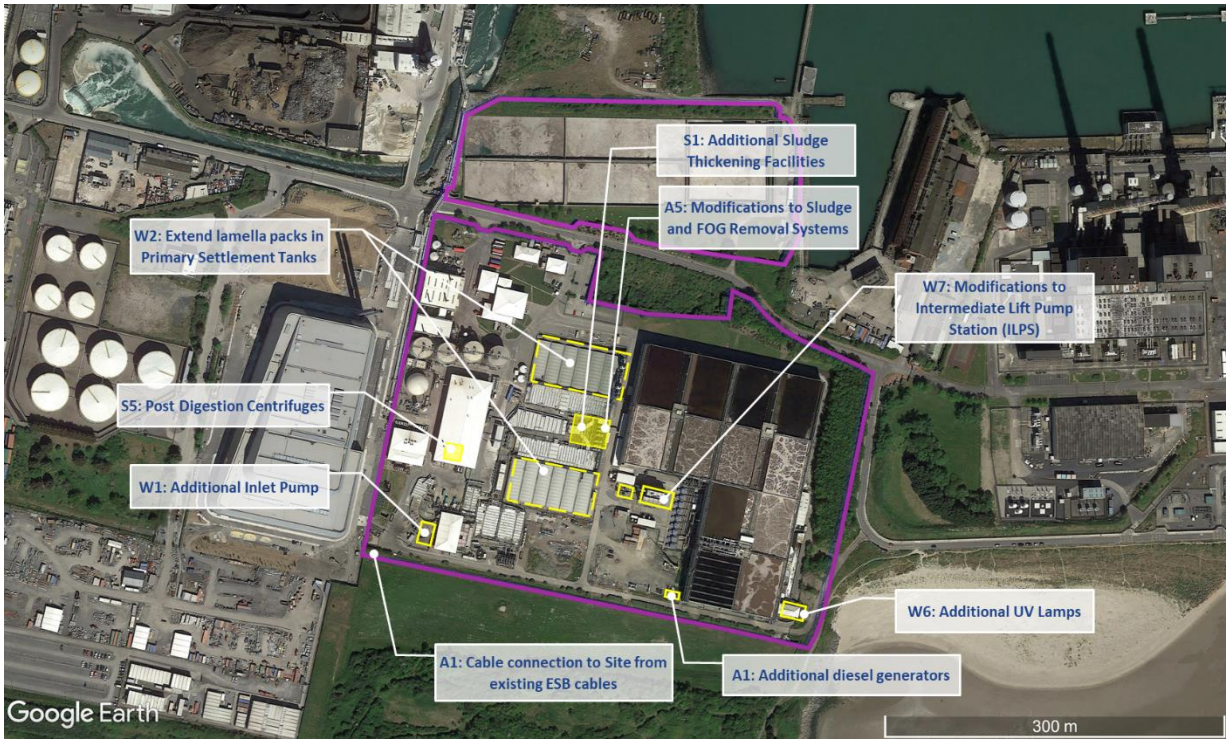

Figure 3-18: Construction of surgical and ancillary works

3.3.5.6 Mitigation Measures during Construction

The Ringsend WWTP will experience a reduction in treatment capacity during the winter of 2019/20, (subject to planning permission being granted) while there are parallel construction activities happening on site. Specifically, there is expected to be 9-month construction overlap between the 400,000PE Capacity Upgrade and the SBR Retrofit. During this period the average effluent quality is estimated as shown in Table 3-12.

Table 3-12: Effluent quality

Parameter	Unit	(Expected) Value Effluent SBR
		5 blocks
BOD	mg/l	18
COD	mg/l	79
TSS	mg/l	32
NH_4-N	mg/l	15
TON	mg/l	3

The reduction in the effluent quality arises from the increased flow through the remaining 5 blocks, with one block out of operation. There will be an increase in the number of storm water overflows from approximately 1.2% of influent to 2.5-3.3% of influent, but outside of the bathing season, so no resultant impact on bathing areas.

Chemically Enhanced Primary Treatment (CEPT)

To further mitigate the reduction in treatment capacity during this period, CEPT can be, if needed, introduced as a temporary measure. CEPT is the process by which chemicals are added to wastewater prior to the primary sedimentation step - in the Ringsend case the lamella primary settlement tanks.

The chemicals, typically metal salts (like ferric and alum salts) and at times combined with polymers (Poly Electrolytes), cause suspended particles to clump together through coagulation and flocculation. The improved settling of the chemically bound particles results in extra removal of suspended solids, accompanied by extra COD and BOD removal, compared to regular primary treatment. In parallel phosphorus is also chemically bound and precipitated. This enhanced treatment efficiency in the PST would reduce the load to the secondary treatment stage. Application of CEPT for 100% of the flow should increase the BOD removal percentage in primary settling from approximately 35% to 55%, thereby reducing the load to the biological stage. This would offset the effect of reduced biological treatment capacity.

3.3.5.7 Construction Environmental Management Plan

An Outline Construction Environmental Management Plan (CEMP) for the WwTP Component of the Proposed Upgrade Project is provided in Volume 3, Appendix 17A. The Outline CEMP is based on best practice and the latest recommendations of the Construction Industry Research and Information Association (CIRIA Guidelines). The CIRIA Guidelines is user-friendly reference tool that provides practical advice about managing construction on site to minimise environmental impacts. Contract-specific CEMPs, based on the Outline CEMP, will be prepared by the respective contractors for each contract at construction stage.

3.3.5.8 Commissioning

As is normal with a facility of this nature, commissioning of the process and equipment is an integral part of the construction phase. The commissioning with associated testing requirements is required to confirm that both the process and the equipment provided are operating as required.

As the AGS system is a biological process, it requires (in common with all activated sludge type processes) the development of a sufficient quantity of biomass to reach the required performance levels. To minimise the commissioning time, seeding sludge required for the additional secondary treatment tanks will come from the operational PPS2 Tank 3B and will significantly reduce the time period to achieve full performance. Similarly, commissioning of the SBR retrofit shall avail of seeding sludge from both the PPS2 Tank 3B and the operational Capacity Upgrade (CU). In the event of any shortcoming in available seeding sludge, the option remains to import seeding sludge from the three other operational AGS plants in Ireland. However, the preferred process includes usage of PPS2 Tank 3B and CU seeding sludge.

3.3.6 Operational Phase

3.3.6.1 Residues and Emissions

Biosolids

Following treatment of sludge, three biosolids products will be transported from site ultimately for reuse on agricultural land. The three products and the estimated annual quantities for the design capacity are shown in Table 3-13.

Comparative quantities with the period 2010 to 2017 in terms of dry solids are shown in Figure 3-20 below. Allowing for the respective moisture contents, the quantities of Biosolids to be removed from site at the design loading are shown in Figure 3-20.

Table 3-13: Annual average tons per year of biosolids

Product	Dry Solids	Wet Wt[11]
	tonnes/yr	tonnes/yr
Biocake	12,100	46,500
Biofert	15,300	16,700
Struvite	5,500	6,000
Total	**32,900**	**69,200**

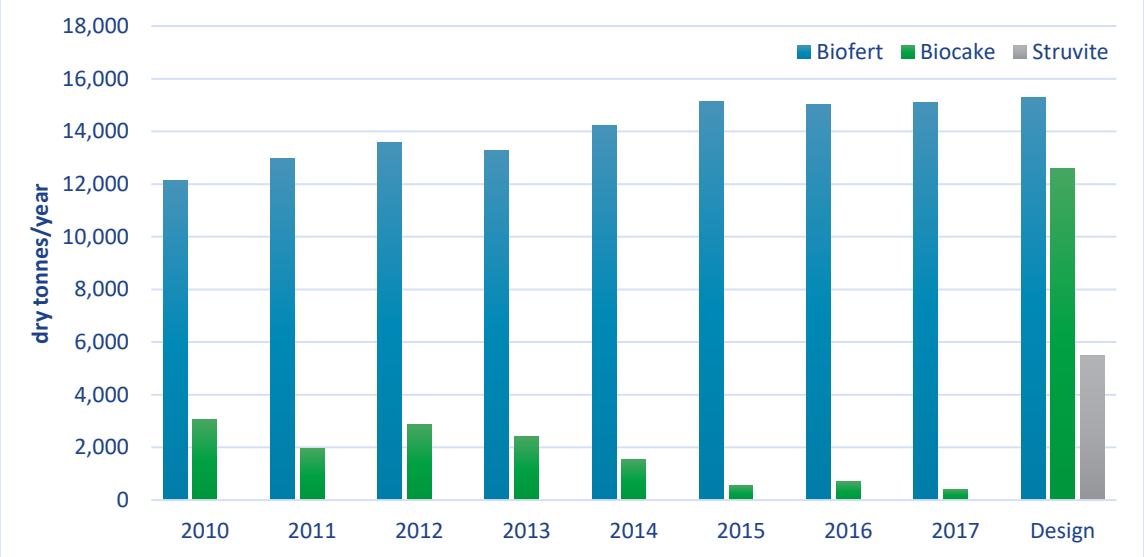

Figure 3-19: Quantities of dry biosolids

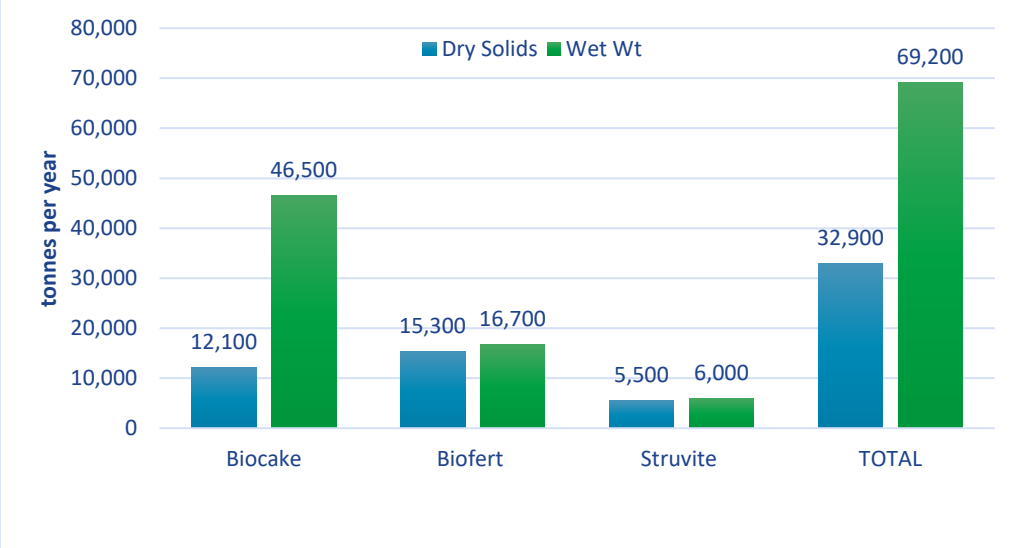

Figure 3-20: Quantities of biosolids at design capacity

[11] *The products have differing dry solid contents (Biocake c26%; Biofert c92%; Struvite c92%)*

Odour

There had been a history of odour problems at Ringsend WwTP dating back to before the commencement of the operations phase of the current facility in 2003. To address those problems, several permanent odour control improvements have been implemented at the Ringsend WwTP. These included the covering of the Inlet Works and the Primary Settlement Tanks, and controlled venting of malodour through odour control units. Additional odour control units have been installed on the sludge stream. Also, an enhanced focus on operational management has reduced odorous emissions with the result that odour complaints are now at a very low level.

Screenings and Grit

Large solids, rags, and grit are removed in the Preliminary Treatment stage of the treatment plant. The materials extracted are washed to remove organic material and then dewatered. The organic material and liquid is returned to the flow.

The screenings and grit are all removed off site by licenced waste operators and disposed to licenced landfill facilities. The quantity of screenings and grit material removed off site varies year on year. In 2015, 1,462 tonnes of grit was removed and this represents the largest quantity of grit removed in the past 5 years.

The quantity of grit material arising is expected to increase with the increased loading. A total grit off site quantity of 1,900 tonnes per annum has been adopted as the design figure commensurate with an influent loading of 2.4 million PE. Refer to Section 17 on Traffic for further analysis of operational traffic.

3.3.6.2 General Operations and Management

Operation and Maintenance Staff

Due to the scale, complexity and nature of the Ringsend WwTP facility, operation and maintenance staff are required to be on site on a 24 hour/7 day basis. At present, there is a staff complement of approximately 50 including process, operations and facilities engineers, mechanical fitters, electricians, general employees, administration and management staff. There are two operating shifts per day with changeover at 8 am and 8 pm. It is expected that there will be a marginal increase in overall staff numbers when the plant upgrade is complete.

Environment and Incident Management

The Operator has in place certified health and safety (OHSAS 18001) and environmental (ISO 14001) management systems. The management systems provide for the monitoring of environmental and safety performance and implementation of continuous improvement through associated action programmes. These programmes are frequently and routinely monitored by Irish Water and will continue to be developed over the operating life of the plant.

Operating protocols are in place with Irish Water and local authority maintenance operatives responsible for the management and operation of the drainage network connected to the treatment plant, including the Main Lift Pumping Stations (MLPS) at Ringsend, Sutton PS and Dun Laoghaire PS and which provide advance warning of abnormal loadings which might arise at the treatment plant.

In accordance with its EPA wastewater discharge licence, procedures are in place to notify the EPA of emergencies, exceedance of licence conditions and where environmental pollution has, or may have, taken place.

Environmental Monitoring

An extensive monitoring programme of ambient water quality is currently in place covering water bodies in the Greater Dublin agglomeration. The results from this monitoring programme are provided in Annual Environmental Reports submitted to the EPA[12].

Existing odour, noise and dust monitoring programmes will be further developed having regard to the environmental assessments and recommendations and proposals included in this EIAR. All monitoring programmes shall be described in detail in the CEMP.

3.3.6.3 Energy Efficiency

Irish Water's commitments, in terms of energy efficiency, are designed to reflect national targets set out in the *Public Sector Energy Efficiency Strategy* (DCCAE, 2017) and in Ireland's *National Planning Framework* (Government of Ireland, 2018) which states National Policy Objective 56 as "Sustainably manage waste generation, invest in different types of waste treatment and support circular economy principles, prioritising prevention, reuse, recycling and recovery, to support a healthy environment, economy and society."

As set out in *The National Framework for Sustainable Development in Ireland – Our Sustainable Future*, energy efficiency is one of the key areas of opportunity in the transition to an innovative, low carbon and resource efficient society.

In January 2014, public water services assets transferred to Irish Water from all local authorities. Irish Water has since been working with SEAI and local authorities, and they have developed an approach to track the energy performance of the sector before, during and after this transition, with the aim of meeting national objectives.

Irish Water aims to be "33% more energy efficient in the abstraction, treatment, distribution, collection, treatment and the return to the environment of every cubic meter of water and wastewater against a 2009 baseline" and has implemented an energy policy to achieve this goal.

Irish Water's energy policy includes specific commitments to:

- Continuous improvement and certification to ISO 50001
- Improving energy efficiency and replacing inefficient plant and process
- Designing, building and operating assets to ensure energy efficiency
- Including energy efficiency performance and reporting future contracts
- Encouraging the use of innovative technologies
- Using renewable energy where feasible
- Measuring energy performance indicators (e.g. per PE treated)

Irish Water currently operates Ringsend WwTP to ISO 50001, the energy management standard, through a DBO contractor. Ringsend WwTP is a leading site in terms of energy management in the wastewater sector. Biogas is currently harvested and stored to provide power during periods of high level demand for electricity (known as 'peak-lopping') or the use of renewable energy and biogas to

[12] *Annual Environmental Reports are available on the EPA website https://www.epa.ie/enforcement/prtr/map/*

displace peak loads. The use of equipment is also scheduled in order to minimise the amount of energy required at peak times. The WwTP objectives include further efficiencies under this standard. The maintenance of this standard when combined with the proposed new treatment techniques will allow further benefits in measured energy efficiency.

The proposed design includes innovations and new processes to help achieve higher levels of energy efficiency and resource efficiency. For example, energy efficiency gains are expected from the use of AGS technology and this has been evidenced in early trials at Ringsend WwTP (Q4 2017) through improved aeration and mixing. The nature of the AGS process with its high biomass loading also means that changes in influent quality (e.g. surge and first flush loads) have much lower relative impact. Consequently, the addition of AGS technology will lead to better environmental outcomes through higher consistency in treatment and improved discharge compliance.

The current process operates a Thermal Hydrolysis Plant (THP) providing for a more complete breakdown of digestible material, thereby maximising the amount of organic matter available for conversion to biogas. Biogas is distributed to the combined heat and power (CHP) train (4 No. 1 MW engines) and excess biogas is fed to the steam boiler to raise steam for processing. Extra gas, when required, is drawn from the natural gas supply to the site to supplement processing.

The proposed process train of AGS and THP coupled with anaerobic digestion provides the opportunity for increased biogas production and potentially more renewable energy that can be recovered and reused. The treatment of greater wastewater loads in terms of biodegradation, sludge removal and nutrient recovery to higher environmental standards will require new or additional processes and consequent energy demands. The current design may be able to accommodate some of these growth scenarios due to efficiencies.

However, if enough extra biogas is produced as the wastewater supply and loading profile increases, Irish Water will consider replacing the existing CHP train to an upgraded train. This would likely involve replacing the installed systems with larger and more efficient units in line with Irish Water's energy policy. Otherwise, the next natural review point for this may be at the asset end of life of the current generation sets.

The Maximum Import Capacity (MIC) on-site will be constrained to 10 MVA due to new supply arrangements with the ESB. Additional on-site generation capacity (up to 3MVA) will also be required to continue to provide for peak lopping and more resilient operations. This will ensure greater protection of assets; leading to a longer asset life. It will also create economic and energy efficiencies and assist with the management of variable loads that can arise from the network supplying Ringsend WwTP.

The nature and type of any new generation capacity will be designed in accordance with energy efficient design criteria set by Irish Water which currently incorporates objectives including the following:

- ISO50001 Energy Management System requiring:
  - consideration of energy performance improvement;
  - operational control of new equipment;
  - implementing criteria for assessing energy consumption, use and efficiency;

and,

- ISO55001:2014 Asset Management System requiring:
  - establishment of asset management objectives;
  - setting criteria for process planning and operational controls.

In summary, Irish Water will continue to use Ringsend WwTP as a flagship site for the recovery of renewable energy and other resources in line with its commitments to: sustainable development; asset management; and, continuous improvement, to achieve economic and energy efficiency.

3.4 RBSF Component of Proposed Upgrade Project

The RBSF component of the Proposed Upgrade Project is defined in Section 1.2.3 and described in further detail in this section. The purpose of the development of the RBSF is to provide a facility, serving the Greater Dublin region, for the storage of treated wastewater sludge (biosolids) prior its re-use on agricultural lands. The sources of biosolids to be stored at the RBSF are the Ringsend WwTP and the GDD WwTP.

3.4.1 Location

The location for the proposed RBSF is at a site in Newtown, Dublin 11. It comprises approximately 11 hectares of partially developed land and is situated off the R135 road, on the western side of the N2 national road. It is approximately 1.6 km north of Junction 5 (Finglas) on the M50 motorway and 1.5 km west of Dublin Airport. The proposed site is to be known as the Regional Biosolids Storage Facility (RBSF). The location of the RBSF and the haulage routes from the biosolids sources is shown in Figure 3-22.

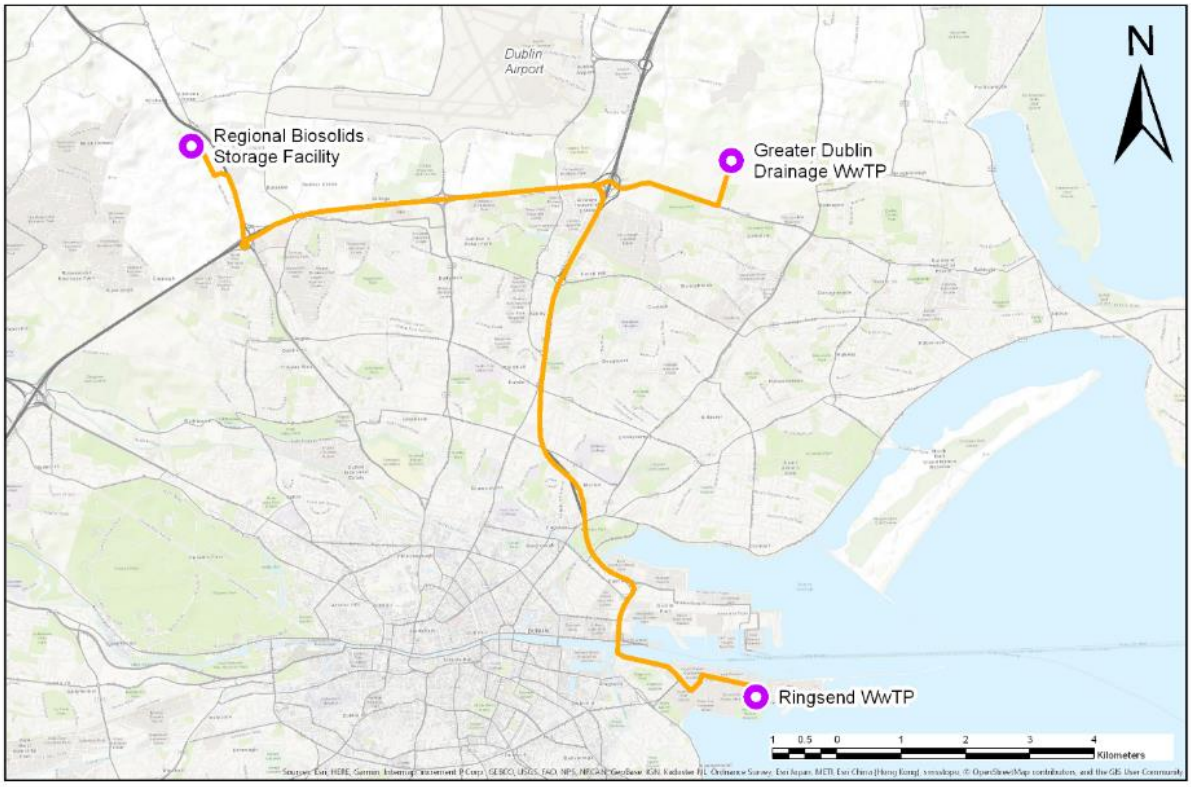

Figure 3-21: Location of RBSF and biosolids sources

3.4.2 Characteristics of the RBSF

3.4.2.1 Need for Storage Facility

The purpose of the RBSF is to store treated biosolids that will be produced at the Ringsend WwTP and the proposed GDD WwTP. The *National Wastewater Sludge Management Plan* (Irish Water, 2016) (NWSMP) identifies reuse of treated wastewater sludge (biosolids) as a fertiliser on agricultural land as the preferred outlet in the short to medium term. Constraints on land spreading due to legislation and due to demand for the product require that biosolids must be stored during certain times of the year. The development of regional facilities for the storage of biosolids from wastewater treatment plants is recommended in the NWSMP. In relation to sludge storage in greater Dublin the NWSMP concluded:

> "*In line with the approach taken to other facilities in this Plan, the development of Sludge Storage Facilities will no longer be considered solely on a per-plant or per-county basis. Where appropriate, Sludge Storage Facilities will be developed to serve a number of local plants and/or a wider regional need. In particular, the upgrade to the Ringsend WwTP sludge hub and the proposed GDD WwTP will result in a significant increase from current sludge volumes with a consequent increase in storage requirements. Therefore, a dedicated sludge storage facility should be developed in conjunction with the expansion of Ringsend to meet its requirements and take account of other future needs in the region*".

Biosolids from Ringsend WwTP are currently stored at a facility in Thornhill, Co. Carlow. The Thornhill facility has a certificate of registration from Carlow County Council for a maximum annual throughput of 25,000 tonnes of biosolids. It is proposed to transition to the use of the RBSF on a phased basis if and when the RBSF is permitted by ABP, constructed and available for use.

The proposed facility will be used solely for storage purposes. No treatment of the biosolids will take place at the facility.

3.4.2.2 Biosolids Description

Organic and inorganic matter in the wastewater (both solid and dissolved) end up in a sludge arising from the treatment process which is subject to further separate treatment on the relevant WwTP site. The sludge is treated to recover gas (the energy from which is used to run the plant), to reduce its volume, and to kill pathogens (bacteria and viruses). The treatment process results in 'biosolids', a biologically stable product with pathogens (viruses, bacteria) reduced to the extent that renders it safe for use in agriculture, and containing high levels of plant nutrients, e.g. nitrogen and phosphorus. The level of pathogen reduction from the treatment process is such that the treated sludge material can be transported and stored without any further health protection measures being necessary, subject however to compliance with all applicable waste regulations.

At the Ringsend WwTP the treated sludge is also currently dewatered or dried to give two products for transport to storage: a 'cake' (approximately 26% dry solids) or a dry granular material (approximately 92% dry solids). Both of these materials are high in nutrients and are used as soil conditioners and fertilisers in agriculture. Both are generically termed 'biosolids', i.e. a fully treated sludge product which is biologically stable, has a low odour with pathogens reduced to the extent that renders it safe for use in agriculture. The cake material is known as "biocake" and the drier granular material is known as "biofert".

Following the proposed upgrade at the Ringsend WwTP, through the application of the AGS technology, there is an opportunity to increase the amount of phosphorus made available in the process cycle and

allow its recovery through a number of proprietary 'phosphorous fixing' techniques. The recovered phosphorus can then be made available for agronomic benefit through its use as a fertiliser and can eliminate a further need for chemically manufactured fertilisers. The recovered phosphorus is known as "struvite" and is commonly distributed directly into the fertiliser market. It will be necessary for struvite to be declared a product through the EPA's "end of waste" approval mechanism and, as a fertiliser, will require approval under REACH regulations from the Health and Safety Authority. Until the struvite is declared as a product by the EPA, it will be handled in the same manner as other biosolids generated at the Ringsend WwTP.

3.4.2.3 Storage Requirements

The Applicant is applying to ABP for planning approval for development of the RBSF based on a 20-year design horizon (up to 2040), that the facility will have the capacity to store already treated wastewater sludge from Ringsend WwTP and the proposed GDD WwTP[13], giving a total requirement of approximately 3.0 million PE. Irish Water will review the storage requirements within Greater Dublin in the medium to long term and develop the proposed RBSF further within the space provided on the selected site if and as required. This further development would require planning consent before it could proceed, but the site has capacity for further storage facilities should they be needed.

The estimated quantities of biosolids generated at Ringsend WwTP are described in section 3.3.6.1. A summary of estimated quantities of biosolids, based on the estimated wastewater load (including headroom), from each source is provided in Table 3-14.

Table 3-14: Storage volume requirement for biosolids

Year	Source	Biosolids Type	Annual		Storage Period	
			Dry Tonnes (tDS)	Wet (Tonnes)	Wet (Tonnes)	Volume (m^3)
2021	Ringsend WwTP	Biocake	11,400	43,700	14,000	13,340
		Biofert	15,300	16,650	5,400	12,200
					Total	**25,540**
2025	Ringsend WwTP	Biocake	7,700	29,640	9,500	9,100
		Biofert	15,300	16,650	5,400	12,200
	GDD WwTP	Biocake	4,880	19,520	6,250	6,000
					Total	**27,300**
2040	Ringsend WwTP	Biocake	10,900	42,000	13,460	12,800
		Biofert	15,300	16,650	5,400	12,100
	GDD WwTP	Biocake	7,900	31,700	10,200	9,700
					Total	**34,600**

Notes: Figures are rounded. Bulk density of biofert is approximately 440 kg/m3 and biocake is approximately 1050 kg/m^3.

[13] Sludge at GDD WwTP will be treated at a Sludge Hub Centre (SHC) on the site of the WwTP. In addition to the sludge from the WwTP, the SHC which will treat wastewater sludge imported from the WwTPs serving other towns and villages in the area of Fingal.

Fertilisers, such as biosolids, are not permitted to be spread on land between 15 October and 12 January in the areas of the country where there is the most likely demand, for the biosolids to be stored at the RBSF. These rules are set out by the Department of Agriculture, Food and Marine to comply with the European Union's Nitrates Directive. Storage volumes will be provided at the RBSF to cater for a 4 month period to allow for the non-growing periods in winter and summer.

Table 3-14 shows that the total storage required at the RBSF by 2040 is estimated at 35,400 m^3. Storage will be provided in two buildings at the RBSF site and will be provided on a phased basis, as described in more detail in the following sections.

Additionally, struvite will be produced at the Ringsend WwTP as a by-product to wastewater treatment process following the commissioning of the phosphorus recovery system at the beginning of 2021. Irish Water may not be in a position to apply for the "end-of-waste" approvals and/or REACH approvals until the P-recovery technique is selected as the standard to be attained and quality of product cannot be assessed unless specific techniques are known. There will be a need for an alternative disposal route pending these approvals, and for an interim period there is a requirement to facilitate its reuse under traditional waste regulated channels of land-spreading.

In the short term it is likely that struvite will be stored in segregated bays at the RBSF until market arrangements are firmly established. Unlike biocake and biofert, struvite will typically be bagged on the WwTP site to facilitate transfer to the fertiliser industry. However, in the interim situation, the product will be delivered in bulk to the RBSF. The annual quantities of struvite are expected to be in the region of 6,000 tonnes per year based on the design load for the Ringsend WwTP. Sufficient storage can be provided at RBSF for the required storage months in the expected interim period.

3.4.3 Proposed Works

3.4.3.1 Site Layout

The site is owned by Fingal County Council and the local authority was granted approval by ABP in 2006 for a waste recovery facility at the proposed RBSF site. The planned activities included recovery of construction and demolition waste, wastewater sludge treatment, biological waste treatment and waste transfer for municipal waste. Details of the previous planning application are provided in Volume 4, Section 2. Certain enabling works, including drainage works, internal access roads, boundary fencing, and electricity and telecommunications infrastructure have been carried out at the proposed RBSF on the basis of the 2006 approval.

The site is accessed from the R135. Vehicles arriving to the site from the M50 approach from the south and turn left into the site. The road outside the site includes a clearly marked left turning slip lane for the site. Vehicles leaving the site turn left on to the R135 for all routes.

The site comprises mainly sections of grassland separated by a road network. The development works that were completed include a road network, boundary fencing, administrative building, weighbridge areas, drainage systems, and other site services. An ESB 110 kV overhead transmission line and a 38 kV underground cable both cross the southwestern corner of the site. The existing site layout is shown in Figure 3-23 and drawing Y17702-PL-003 in Volume 5, Part B. The site boundary is shown as a purple line.

The site generally slopes from east to west. There is a difference of approximately 2 to 3 metres between the highest and lowest areas on the site. A tributary of the Huntstown Stream, which in turn is a tributary of the River Ward, flows along the western and southern boundary of the site. The site naturally drains to this watercourse.

The proposed RBSF will be located in the northern part of the site as shown Figure 3-23. There is no development proposed in the southern part. This area is reserved for possible future requirements, which would require planning consent under a separate application before it could proceed.

Figure 3-22: Existing site

3.4.3.2 Biosolids Storage Buildings

The storage volume requirements outlined in section Table 3-14 will be provided in two storage buildings. Each building will be approximately 105 m long and approximately 50 m wide.

The two storage buildings will be located centrally, toward the northern end of the site. Their location allows the utilisation of some of the existing infrastructure on the site and is such that, a new internal road can be provided around the perimeter of the buildings. The road will allow vehicular access to the storage buildings and for vehicles to travel past the buildings and around the site in one direction. The distance from the site boundary and the buildings is at least 25 m on the western side of the site and 70 m on the eastern side. The longest side of each building will be orientated northwest to southeast and the buildings will be parallel to one another. The location of the storage buildings is shown in Figure 3-23 and on drawing Y17702-PL-004 in Volume 5, Part B.

At the highest point, the roof level will be approximately 15.2 m above ground level and the eaves level of the building will be approximately 12 m above ground level. Haulage vehicles bringing biosolids to and from the storage facility will access the buildings from the eastern end and will exit from the western end. Entry and exit doors for vehicles will be located at either end of each building. In addition to security doors at each entry and exit point for HGVs, a lightweight inner door (known as a fast-action door) that can be opened and closed quickly will be provided so that the duration that the doors are open is minimised. Separate doors will be provided for pedestrian access.

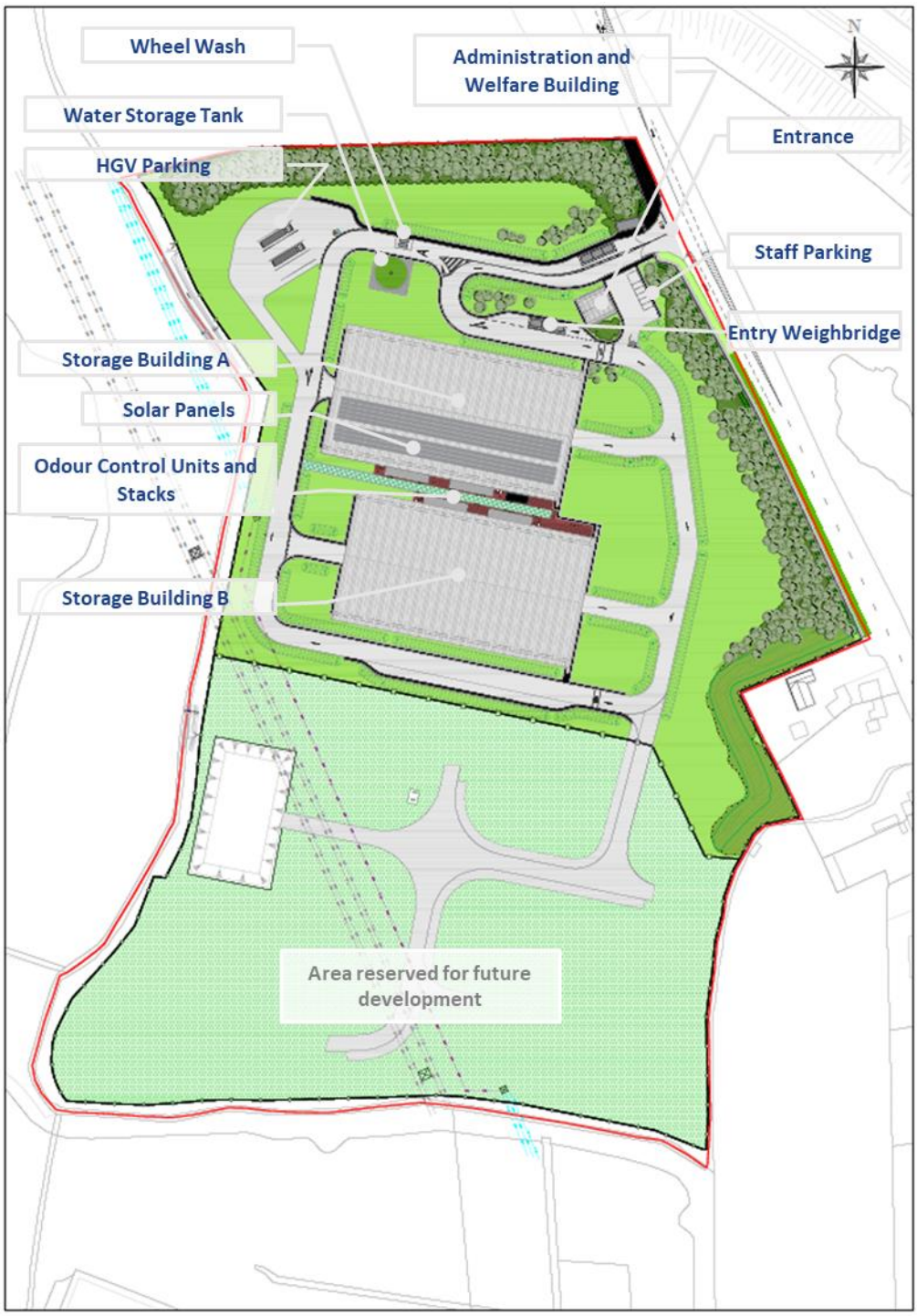

Figure 3-23: RBSF proposed site layout

Haulage vehicles will tip biosolids inside the buildings (only) during operation. The building height is determined by the tipping height of the trailers of the haulage vehicles when they are within the building.

The architectural design of the storage buildings incorporates a curved roof. The curved roof profile results in a visual blurring of the buildings' roof apex. The roof is visually separated from the walls by a 'shadow band' and the footprint of the buildings is staggered. The slanting front façade of both buildings extends beyond the side walls of the building into the landscape. The external envelope will comprise insulated metal cladding panels, which will clad the entire perimeter of the building. As shown in the

architectural drawings, Y17702-PL-007 and Y17702-PL-009, provided in Volume 5, Part B, the colour of the panels will generally be grey and silver. This architectural design is provided to enhance the visual perception of the development from the most prominent views of the site.

The architectural design is described in further detail in the Architectural Concept Statement, which is enclosed with the SID application for the Proposed Development.

Storage Capacity

The storage capacity of the buildings is related to the quantities of biocake and biofert expected be stored at the facility. Biocake can be stacked between 3 m to 4 m high and biofert can be stacked approximately 7m high, thus making the storage of biofert more efficient. The estimated volumes to be stored are outlined in Table 3-14.

The two storage buildings could store over 48,000 m^3 of biofert. However, it is estimated that the volume of biofert at Ringsend WwTP requiring storage will only reach approximately 12,700 m^3. On the other hand, the storage buildings will have an approximate capacity of 26,200 m^3 if all biosolids were in the form of biocake.

3.4.3.3 Administration and Welfare Building

A building for general management of operations and welfare facilities for staff working at the facility will be provided near the entrance gate. The building will contain an office, a meeting room, a canteen, toilets and a changing room with shower. A parking area will be provided beside the Administration and Welfare Building and will provide up to 10 parking spaces for staff and visitors.

The architectural design incorporates a curved roof to compliment the design of the storage buildings. The overall dimensions of the one-story building will be 10 m wide and 13 m long. The height of the ridge will be approximately 3.8 m above ground level.

3.4.3.4 Weighbridges

The operator of the RBSF will be required to keep records of biosolids quantities arriving to, and departing from, the site. Two weighbridges will be provided at the RBSF. A weighbridge for weighing haulage vehicles will be located on the entrance road approximately 150 m from the entrance to the site, allowing arriving vehicles to queue safely away from the public road. A separate lane will be provided at the weighbridge to allow vehicles to pass by parked vehicles.

A second weighbridge will be provided on the exit route from the site to weigh vehicles leaving the RBSF. The design proposes that the weighbridges will be automatically operated and controlled from the administration building. Neither of the existing weighbridge kiosks will be retained.

3.4.3.5 HGV Parking Area

A parking area for 4 haulage vehicles will be provided in the northwest corner of the site. This area is provided for HGVs to park during working breaks or for checking vehicles before recommencing their journeys.

3.4.3.6 Electrical Services

The existing electricity substation at the northeast corner of the site is 4.8 m long by 4.3 m wide. It will be rebuilt at the same location to bring it into line with current ESB standards. A new customer electrical room will adjoin the substation. This room is a requirement identified during consultation with ESB.

Overall, the footprint of the substation and customer electrical room will be approximately 9.2 m long and 4.4 m wide. They are shown on drawing Y17702-PL-006 in Volume 5, Part B.

Electrical supply will be brought from the customer electrical room to a mechanical and electrical control building (referred to hereafter as 'Control Building') and onward to the mechanical and electrical equipment within the storage buildings. Where feasible existing underground ducting routes on the site will be retained. The Control Building will be located between the storage buildings.

Solar Panels are proposed on the roof of Storage Building A to contribute to the energy requirements of the RBSF. These are discussed in section 3.4.5.6.

3.4.3.7 External Lighting

External lighting will be provided along the internal roads, pedestrian routes and around the buildings and other plant rooms. It is possible that a portion of the existing lighting columns and associated ducting and chambers on the site will be retained and incorporated in the proposed site layout. This will be subject to review at detailed design stage. Road-side lighting columns will be approximately 6m high and the lighting columns in the HGV parking area will be 8m high. They are shown on drawing Y17702-PL-014 and Y17702-PL-023 in Volume 5, Part B.

3.4.3.8 Water Supply

An existing water supply on the site will provide potable water to the Administration and Welfare Building and it will supplement the supply to the Wheel Cleaning Area. The watermain will be extended around the storage buildings to provide a water supply for firefighting purposes as shown on drawing Y17702-PL-020 and Y17702-PL-021 in Volume 5, Part B. The watermain will be supplied by a fire water holding tank located to the southwest corner of the two storage buildings, as shown on drawing Y17702-PL-020 and Y17702-PL-024 in Volume 5, Part B.

3.4.3.9 Wheel Cleaning Area

A wheel cleaning area will be provided in the northeast corner of the site beside the HGV parking area, near the exit route for HGVs. Within the storage buildings, biosolids will be stored in bays either side of the vehicle route through each building, therefore minimising the amount of biosolids material that can get caught in the tyres of the HGVs passing through. Nonetheless, there is potential for HGVs to track the material out of the building as they exit. The wheel cleaning will be provided to clean the HGVs and prevent tracking biosolids beyond this area or on to the public road.

Details of an indicative system is provided on drawing Y17702-PL-024 in Volume 5, Part B. Water for wheel cleaning equipment will be mainly supplied from a rainwater harvesting system, in accordance with Irish Water policy to incorporate water conservation designs for non-potable applications within its facilities, where appropriate. The supply may be supplemented by a mains water, when required. Typical wheel cleaning systems recycle approximately 50% of the water used. The wash down material from HGVs will be collected in a silt chamber, in which silt and solids will settle out. The overflow water from the silt chamber will flow to a wash-down separator where oil and fuel will be captured. It will then flow to the foul drainage system on the site and in turn, will discharge to the public sewer. Solid material collected in the settlement chamber will be removed by a licenced contractor who will haul the material to an appropriate waste facility.

3.4.3.10 Surface Water Drainage

Rainfall run-off from building roofs, road surfaces and other impermeable areas within the area of the proposed development will be conveyed in a new drainage system, incorporating a treatment train comprising of sustainable drainage systems (SuDS). The surface water treatment train approach follows guidance from the *Greater Dublin Strategic Drainage Study (Appendix A, Glossary, Volume 3, Environmental Management)* and *SuDS Manual (C753)* (CIRIA, 2015). The proposals are summarised as follows:

Rainwater Harvesting System

- A rainwater harvesting system, incorporating a storage tank, will collect run off from the roofs of both storage buildings and will be designed in accordance with Section 11.3 of the *SuDS Manual.*

Permeable pavement

- A maintenance access road between the buildings will be constructed of reinforced grass or a similar permeable pavement.

Swales

- Dry Swales (a grassed channel with a filter drain directly beneath) will convey other surface run-off, including roads and footpaths, to an underground attenuation area at the northwest corner of Storage Building A. Dry swales are proposed following consultation with DAA (the authority responsible for the operation of Dublin Airport). DAA raised concern regarding the potential for areas of open water to develop and attract birds. The incorporation of a filter drain (referred to as a 'dry swale') will avoid standing water within the swales.

There is an existing underground attenuation area, comprising of plastic storage units surrounded in filter stone, in the northwest corner of the site. It will be expanded to cater for the RBSF element of the Proposed Upgrade Project. There is an existing discharge point from this attenuation area into the adjacent watercourse which will be retained. At the discharge point to the stream a flow control device will be provided to limit discharge flows to acceptable levels (equivalent to the greenfield run-off). An emergency shut-off device will also be provided in order to prevent discharge to the stream in the event of a fuel spillage from a vehicle or wash-out from the storage buildings due to firefighting water.

Swales and detention basins will be lined with a geotextile membrane to mitigate against risk of pollution to groundwater. In addition to the SuDS features, grit traps will be provided in the sumps of road gullies. Furthermore, and oil/fuel separator will be provided prior to the connection to the existing retention area to capture pollutants in run-off on roads and parking areas within the site.

The swales, permeable pavement and detention basin will be constructed in accordance with details provided in the *SuDS Manual (C753)*. Chambers and surface water pipes will be in accordance with the *Greater Dublin Region Code of Practice for Drainage Works* (Dublin Region Local Authorities).

3.4.3.11 Foul Drainage

Foul drainage requirements will be accommodated in the existing foul drainage network on the site. Foul drainage pipes currently drain to a pump station in the southern part of the site. This pump station is connected to the public sewer via an existing rising main, which connects to a pump station outside the site on the opposite side of the R135.

Provision of foul drainage is required for the following elements of the proposed development:

Administration and Welfare Building

- Wastewater from the Administration and Welfare Building from general daily activities, such as showers, toilets and canteen.

Wheel Cleaning Area

- Wastewater from the Wheel Cleaning Area, as described in the earlier paragraphs in this section.

Storage Buildings

- Surface run-off at the entrance to the storage buildings will be connected to the foul drainage network, rather than the surface water network, due to the potential for biosolids content. Any run-off due to cleaning or other water usage within the buildings will be directed to the same foul drainage system in the same manner.

3.4.3.12 Odour Control

An odour control system has been designed to ensure that odour does not give rise to any nuisance beyond the boundary of the RBSF. The system will involve extracting air from within the storage buildings on a continuous basis. Fans located outside, between the storage buildings, will draw air though ducting to an outside odour control unit comprising an organic filer media. The treated air will be emitted to the atmosphere through vertical stacks which will extend to a height of approximately 3 m above the roof level of the storage buildings. Furthermore, each building will be split into two zones, which can be operated independently. This results in a total of four separate stacks. The indicative location of the stacks of shown in drawing Y17702-PL-004, provided in Volume 5, Part B. The assessment of odour at the RBSF is provided in Volume 4, Section 10. In conjunction with the odour control units, separate entrance and exit routes for HGVs are provided in the design of the storage buildings and the doors at these access/egress points will be fitted with fast action doors to minimise the length of time that the doors will be open.

3.4.3.13 Landscape

The most prominent view of the site by the public is from the R135 road along the boundary on the eastern side of the site. Landscaped berms and planting will be provided in the areas between the buildings on the site and the eastern boundary to provide a visual screen. The visual impact of the proposed scheme is assessed in Volume 4, Section 14 of the EIAR.

3.4.4 Construction Phase

3.4.4.1 Programme

It is proposed to transition to the use of the RBSF from the existing storage facility at Thornhill, County Carlow. The initial phase of construction for the RBSF will involve the construction of one storage building in 2020. The construction works are estimated to last 12 months. The second building is likely to be constructed in 2024 to meet requirements at that stage following the transition from the Thornhill facility and will last for approximately 9 months. An indicative programme for the construction works for the initial phase is shown in Figure 3-25.

If necessary, it is expected that both buildings can be constructed in 2020 with little or no extension to the overall construction programme presented in Figure 3-25. However, additional construction staff and resources would be required during the construction period. The assessment of this scenario is

considered in Volume 4 and in particular, in relation to traffic which is discussed in Volume 4, Section 13: Traffic.

Task No.	Task Description	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
1	Mobilisation and Site Set Up												
2	Demolition												
3	Earthworks and Excavation												
4	Roads												
5	Drainage												
6	Storage Building Concrete Foundations												
7	Storage Building Concrete Ground Slab												
8	Storage Building Retaining Walls												
9	Structural Steel and Roof Trusses												
10	Roofing												
11	Cladding												
12	Mechanical and Electrical												
13	Administration and Welfare Building												
14	Landsacping and Planting												
15	Comissioning												

Figure 3-24: RBSF construction works programme - initial phase

3.4.4.2 Construction Activities

Fingal County Council was granted section 175 approval by An Bord Pleanála (Ref. 06F.EL2045) dated 21 April 2006 for a waste recovery facility at the proposed RBSF site. Certain enabling works, including drainage works, internal access roads, boundary fencing, and electricity and telecommunications infrastructure have been carried out at the proposed RBSF site on the basis of that approval. Generally, there are few constraints on the site that will confine access, establishment of site offices and welfare facilities and general construction operations. The design for the RBSF is relatively straightforward. The construction of the RBSF will involve works similar in nature to works for a warehouse or a large storage unit in an industrial estate.

A summary of the main construction activities is summarized as follows:

Mobilisation and Site Set-Up

Mobilisation and site set-up will involve erection of site offices (portacabins), staff welfare and temporary lighting. The site can be accessed at the exiting entrance on the R135. Internal roads are already in place on part of the site.

Demolition Works

The existing structures on the site proposed for demolition are identified on drawing Y17702-PL-003 and include the security/weighbridge kiosk at the site entrance, the weighbridge kiosk near the eastern boundary, an electrical substation (not commissioned) near the site entrance and the existing administration building. These buildings are small relative to the scale of the proposed development at the RBSF site, as shown in Table 3-15. Therefore, the material arising from the demolition works can be processed on site and reused in the proposed works. The demolition work is likely to be carried out by an excavator, using a specialist grab device if required.

Table 3-15: Dimensions of buildings to be demolished

Building	Dimensions (metres)		
	Length	Width	Height
Administration Building	12	7	4.8
Security/Weighbridge Kiosk	6.5	3.5	5
Weighbridge Kiosk	5.5	3.5	5
Electrical Substation	4.8	4.3	3

In addition, approximately 400 m of internal roads will be reconstructed or removed. This will be carried out by pavement milling machines which will grind the road surface and convey the material to a nearby tipper truck. A high proportion of existing road surface and construction sublayers can be reused in the construction of the new roads on the site. If there is a surplus of reclaimed road surfacing material on the RBSF site it can be provided to a pavement contractor and re-used elsewhere.

While the demolition works are shown at the early stage of the programme in Figure 3-25, the contractor may consider using the existing administration building as a temporary site office and sections of the existing roads as temporary construction routes. This would result in the demolition of the building and removal of roads occurring later in the in the programme.

Earthworks and Excavation

Earth moving machinery such as tipper trucks and large excavators will excavate topsoil and high ground. A large proportion of topsoil material can be retained on site for use in landscaping.

A site investigation carried out in 2017 indicates that the ground conditions are relatively stable, and it is expected that this will provide good bearing capacity for construction of the buildings proposed for this project. Foundations for the Storage Buildings will be approximately 1 metre below the finished ground level at the deepest locations. The design of the buildings does not require deep excavations and piling is not expected. At the highest point of the site, the existing ground level is approximately 1.5 metres above the proposed finished ground levels.

The proposed floor levels of the buildings are such that the volumes of excavated and fill material will be generally balanced. Therefore, if the excavated material is suitable it is possible that it could be used on the site as fill material or to form landscaped areas.

Roads

While the design has incorporated as much of the existing roads as is practical, new roads will be constructed around the storage buildings and will link back to the entrance. Excavations to less than 0.5 metre below finished road level will be required in order to build the road foundation and pavement layers. In low areas, suitable fill material obtained from the excavations or imported to the site, if necessary, will be used to build up the roads to an appropriate level. Bulldozers, compaction rollers and paving machines will be required to construct the roads.

Drainage

Sustainable drainage systems such as swales and detention basins to be provided as part of the drainage regime are shallow grass or planted depressions in the ground and do not require deep excavation. The underground attenuation area and the rainwater harvesting storage tank will be

located to the northwest corner of the storage buildings. The construction of both will involve excavations to a depth of approximately 2.5 m and will extend over an area of approximately 1200 m^2.

Storage Building Concrete Foundations, Floor Slab, Retaining Walls

The foundations for the storage buildings will be constructed with a stone aggregate fill and reinforced concrete. The concrete floor slab will be approximately 300 mm deep and increased in depth at the perimeter and internal retaining walls. Aggregate will be delivered to site in tipper trucks and compacted in-situ with compaction rollers. Reinforcement steel is expected to be pre-formed before delivery to site and assembled on site. A small portion will be cut on site using cutting saws. Concrete will be delivered in concrete delivery trucks and poured using concrete pumps or from concrete buckets lifted by a crane.

Retaining walls will be 7 m high and will be constructed from reinforced concrete. Reinforcement steel is expected to be pre-formed before delivery to site but a small portion will be cut on site. Concrete shutters will be assembled on site. Concrete will be delivered in concrete delivery trucks and poured using concrete buckets lifted by a crane.

Structural Steel and Roof Trusses

Structural steel columns will be prefabricated before delivery and installed on top of the concrete retaining walls using a crane. Steel roof trusses are expected to be assembled on site and lifted into location using a crane and assemble using hand-held power tools.

Roofing and Cladding

Prefabricated insulated metal cladding and roof cladding panels will be installed after structural steel assembly and will involve the use of mobile elevated working platforms and hand-held power tools.

Administration and Welfare Building

The Administration and Welfare Building is similar in scale to three-bed domestic bungalow. The construction of the building will involve standard construction techniques for a building of this nature. The external cladding, which is a material similar to the proposed storage buildings, and the curved roof are the most unique features of its design.

Ancillary Works

The electrical substation will be rebuilt at its existing location in accordance with latest ESB specifications. ESB will bring an underground cable across the R135 from a connection point on the opposite side of the road. The cable will cross site boundary and travel a short distance to the proposed substation.

Both weighbridges and the wheel washing system will be proprietary systems that will be supplied and, it is expected, installed by specialist subcontractors.

It is not expected that tower cranes will require to be erected for the RBSF construction. The large footprint of the two buildings and the relatively short programme would make it unsuitable for the erection of tower cranes. Concrete pours, erection of structural steel columns and roof trusses are expected to be achieved by use of mobile cranes. The contractor will be required to consult with the Dublin Airport Authority in relation to the potential height of cranes.

Construction traffic numbers are discussed in Volume 4, Section 13: Traffic. It is worth noting that there is potential concrete supplier (Huntstown Quarry) 1 km to the south of the RBSF site. Concrete delivery vehicles will comprise a large proportion of the peak construction traffic.

3.4.4.3 Construction Environmental Management Plan

An Outline Construction Environmental Management Plan (CEMP) for the RBSF Component of the Proposed Upgrade Project is provided in Volume 4, Appendix 17A. The Outline CEMP is based on the best practice and the latest recommendations of the Construction Industry Research and Information Association (CIRIA) Guidelines. It will be adopted and developed further by the contractor for the construction stage of the works at the RBSF. A community liaison officer will be appointed by the contractor, to whom the public can address queries or concerns.

The whole project team have responsibility for good environmental management and onsite training will be provided for all relevant site staff prior to construction commencement.

3.4.5 Operational Phase

3.4.5.1 Processes

There will be no processes at the RBSF. The main activities will be the delivery, loading/unloading and storage of biosolids all within the storage buildings. There will be no treatment of the biosolids.

3.4.5.2 Biosolids Haulage Traffic

Biosolids will be transported to the RBSF from the Ringsend WwTP (and GDD WwTP if permitted) in articulated trucks with tipping trailers. The trailers each have a capacity of approximately 40 m^3. These haulage vehicles, referred to hereafter as HGVs, are approximately 14 m long and have 6 axles. In transporting biosolids to the RBSF, HGVs will operate throughout the year and the generated traffic volumes will be relatively constant.

The transportation of biosolids from the RBSF to spread lands or local storage facilities will be seasonal. The spread lands currently used for application of biosolids produced at the existing Ringsend WwTP are located in South Leinster and parts of Munster. There is currently no proposal to change the location of the spread lands. The peak periods for traffic will be the spring and autumn. Past records from the existing storage facility show that approximately 80% of the total annual trips to spread lands occur during the months of February, March, August and September. The remaining traffic occurs mainly in January, April, May and October.

The estimated traffic volumes to the RBSF is provided in Volume 4, Section 13.

3.4.5.3 HGV Circulation

The HGVs will enter the site and circulate around the RBSF on a one-way route. HGVs will be weighed at the entrance weighbridge and will travel onwards to the eastern end of one of the storage buildings.

The HGVs will be confined to a central 10m wide corridor within the storage buildings. Storage bays will be located on either side of the corridor. Biosolids will be unloaded and a loader vehicle will move the biosolids to a nearby bay. Conversely, when transporting to spread lands, the loader will move biosolids from a storage bay to a waiting HGV in the central corridor.

The haulage trailers can reach a height of over 10 m when raised up for tipping out materials. The roof level of the buildings is designed to accommodate this requirement.

HGVs will exit the building at the western end and travel on the one-way road to the exit weighbridge to be weighed before leaving site.

3.4.5.4 Odour Control

Odour will be managed through the operation of an odour control system, which will involve extracting air from the storage buildings through an organic filter material. In addition, the following measures will be implemented during the operation phase of the project:

- HGV trailers will be covered until entering the Storage Buildings.
- HGVs will enter the storage buildings through fast-action doors.
- Pedestrian access will be provided through separate self-closing pedestrian doors.
- Implementation of odour monitoring plan in conjunction with Operation Environmental Management Plan (OEMP).

3.4.5.5 Monitoring

The biosolids will be loaded/unloaded and stored within storage buildings. The biosolids material and the atmosphere within the buildings will be monitored by operations staff for levels of odour, heat and dust. Similarly, the environment will be monitored within the boundary of the RBSF site.

Operations staff will also ensure that the conditions of the Certification of Registration issued by the National Waste Collection Permit Office (NWCPO) under the Waste Management (Facility Permit and Registration) Regulations, SI No. 821 of 2007 (as amended) will be adhered to.

The Operation Environmental Management Plan (OEMP) will document the necessary procedures for monitoring to be followed by operations staff.

3.4.5.6 Energy Efficiency

As set out in section 3.3.6.3, Irish Water's commitments, in terms of energy efficiency, are designed to reflect the national target set out in the Public-Sector Energy Efficiency Strategy (DCCAE, 2017). As set out in "*The National Framework for Sustainable Development in Ireland – Our Sustainable Future*" energy efficiency is one of the key areas of opportunity in the transition to an innovative, low carbon and resource efficient society. Irish Water's Energy Policy sets aims to be *"33% more energy efficient in the abstraction, treatment, distribution, collection, treatment and the return to the environment of every cubic meter of water and wastewater against a 2009 baseline"*.

Photovoltaic (PV) technology, commonly referred to as solar panels, is incorporated within the design to generate clean renewable energy to contribute to the power requirement at the RBSF facility. This aligns with the existing energy management regime at Ringsend WwTP. By providing such technology, the project satisfies specific Development Plan objectives of the local authority in terms of a renewable energy contribution to the development.

A feasibility study into the solar contribution potential was carried out by specialists as part of the initial design phase. This study will be re-examined at detailed design stage in order to capture advances in solar technology, thus increasing efficiencies in the power output available from solar panels.

From the initial study, the optimum solution found that a solar panel area of approximately 1,545m² would be required. This arrangement is shown on drawing Y17702-PL-004. The design model predicts an energy yield from such a system of 219,930kWh per annum, which equates to a carbon footprint reduction of 113,704kg of CO_2 per annum. The fans for the odour control units will operate continuously

and so PV technology cannot provide the total energy demand. However, it is estimated the inclusion of PV technology will contribute to in the order of 40% of the sites annual energy demand.

Section 4: Consideration of Alternatives

4.1 Alternatives Overview

This section of the EIAR examines the reasonable alternatives considered for the Proposed Upgrade Project and provides an indication of the main reasons for the final scheme choice, taking into account the effects on the environment. Annex IV, Paragraph 2 of Directive 2014/52/EU on the effects of certain public and private projects on the environment requires the proposer to present:

"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."

Accordingly, this section considers the various alternatives studied by the Applicant, which are relevant to the Proposed Upgrade Project and its specific characteristics with an indication of the main reasons for selecting the chosen option. It includes a comparison of the environmental effects.

ABP granted the 2012 Approval to Dublin City Council to advance the Ringsend WwTP expansion to a capacity of 2.4m PE based on an extension of the existing facility with discharge 9 km out into Dublin Bay via a 5 m diameter tunnelled outfall. In the intervening period, a number of project circumstances have changed as follows:

- Advanced nutrient removal technologies have emerged in the last decade that are capable of treating wastewater to a standard suitable for discharge into estuarial waters (such as the Liffey estuary) at the existing outfall.
- Those technologies have now been proven to be successful in wastewater treatment plants of a similar scale in other countries.
- The 5m diameter tunnelled outfall construction cost estimate has increased significantly due to a detailed consideration of geotechnical data together with construction health and safety risks.
- With the advanced nutrient removal technologies currently available, the requirement for the long sea outfall needed to be re-examined.
- The up-front cost associated with the long sea outfall has been re-examined by Irish Water in the context of competing water services investment demands nationally and its obligations under the Water Services (No. 2) Act, specifically, that projects are provided in an economical and efficient manner.

This section describes the various alternatives which are relevant for the Ringsend WwTP and the RBSF. As these works are located on two different sites, the section is divided accordingly.

4.2 Wastewater Treatment Plant

4.2.1 Do-Nothing Scenario

The loading of the Ringsend WwTP will increase regardless of whether the project is carried out, as a result of the connection to the wastewater treatment network of new development in the Ringsend WwTP catchment. The principal purpose of the Proposed Upgrade Project is to increase the capacity of the existing Ringsend WwTP to accommodate that increased loading. With the Ringsend WwTP

currently already overloaded, doing nothing will not stop the load increasing, further deteriorating the quality of the treated effluent flows from Ringsend WwTP to the receiving waters.

As outlined in section 3, the existing Ringsend WwTP was fully commissioned in 2005 and was designed to treat a loading of 1.64m PE to secondary treatment standards, specifically: 25 mg/l BOD; 125 mg/l COD; 35 mg/l TSS; and 18.75 mg/l Ammonia Nitrogen. It also includes for seasonal disinfection. The average influent loading to the WwTP currently exceeds 1.8m PE. As a result of this overloading the 95th percentile effluent TSS, BOD and Ammonia Nitrogen standards are not being met.

On 19 February 2010, the Minister for the Environment designated the Lower Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon, a sensitive area.[14] Nutrient removal to achieve an annual average of 10 mg/l Total Nitrogen and 1 mg/l Total Phosphorus for continued discharge into the Liffey Estuary is therefore required. The Ringsend WwTP, as currently configured, cannot treat the current loading to the required standards and has limited ability to remove nutrients. The 'Do-Nothing' scenario is therefore not a sustainable option given (i) the current overloading (ii) the projected increase in loading and (iii) the requirement for more stringent nutrient removal standards to comply with the UWWT Directive.

The Proposed Upgrade Project is being advanced in accordance with the recommendations of the GDSDS as outlined in section 3. Accordingly, the major drivers for the Proposed Upgrade Project are the immediate need for additional treatment capacity as well as the increased environmental standards due to more stringent receiving water designations. It follows that the 'Do-Nothing' scenario is not a viable option as IW would be in breach of its statutory obligations under national and EU legislation.

4.2.2 Treatment Location Alternatives

The historical development of Dublin's sewerage systems has been centred on Ringsend as a treatment location, with the commissioning of the first treatment works in 1906. Over the past 110 years, and particularly over the last 45 years, numerous complex sewerage projects have been completed in order to keep pace with the growth of the city and its environs. In particular, a number of complex and challenging engineering linkages to the Ringsend WwTP were completed, each necessitating major capital investment. At the same time, the Ringsend WwTP has been expanded and increased in capacity as stringent European environmental standards evolved. The nature of sewerage infrastructure is such that a long-term view must be taken in order to plan for and protect strategic routes and sites while preserving capacity for future demand growth. Accordingly, all of this sewerage infrastructure, which was developed at significant cost, is specific to the Ringsend WwTP in its current location and would have to be completely replaced or re-configured, with considerable cost and environmental disruption, to facilitate an alternative location. This is not feasible.

A long-term strategy for the development of the Ringsend WwTP has been set out in a number of reports over the last 25 years, which anticipate that Ringsend WwTP will deliver a significant proportion of the increased wastewater treatment capacity required in the Greater Dublin region. The Preliminary Report for the provision of Secondary Treatment at Ringsend was completed in 1993 and recommended that secondary treatment be added in two stages. Stage 1 was to be constructed immediately with a

[14] *Urban Waste Water Treatment (Amendment) Regulations 2010 (SI No 48 of 2010)*

design horizon of 2020 while a 0.8Ha site was to be set aside for a future extension as Stage 2. The GDSDS, published in 2005, was the culmination of a 3-year study of the main drainage needs of the Greater Dublin region for the foreseeable future. This study recommended that Ringsend WwTP should be developed out to a capacity of 2.4m PE in the first instance, utilising the 0.8Ha site reserved for this purpose, and that a new wastewater treatment facility (the GDD) be sited in north Dublin to cater for the additional requirements of the region. The direction of new wastewater loads to the GDD Project was to be achieved by the construction of an orbital sewer which would be used to direct selected sub-catchments away from Ringsend on a phased basis as demand required. Accordingly, the Proposed Upgrade Project and the proposed GDD Project are being advanced by IW under its current capital programme as complementary projects within an overall integrated framework. The GDSDS recommendations were subjected to Strategic Environmental Assessment (SEA) in 2008 and further review by Irish Water in 2017 as outlined in section 3 to ensure the basis for the GDDs conclusions remained valid. These additional studies refined the GDSDS original proposals but continued to recommend the full development of Ringsend WwTP to its capacity of 2.4m PE.

In short, the scale of investment in major infrastructure to date is such that it is not financially feasible abandon the Ringsend WwTP site and relocate its capacity to an alternative location.

4.2.3 Discharge Location Alternatives

The choice of discharge location alternatives comprises continued discharge to the Lower Liffey Estuary via the existing outfall, or to Dublin Bay via a Long Sea Outfall Tunnel (LSOT). Ultimately the consideration of the alternatives relates to the viable wastewater treatment options available.

Retaining the existing Lower Liffey Estuary outfall (Alternative Discharge 1) necessitates additional treatment capacity together with adequate nitrogen and phosphorus removal at the existing facility. As an alternative the discharge point would need to be outside the designated waters in Dublin Bay (Alternative Discharge 2). Both of these alternatives are considered in detail herein and further detailed mathematical modelling is described in Volume 3, Section 4.

4.2.3.1 Alternative Discharge 1 - Existing Discharge to Liffey Estuary

This alternative relates to the existing primary outfall from Ringsend WwTP which discharges into the Liffey Estuary via the ESB cooling water channel, about 1km from Ringsend WwTP. The original 1906 outfall point has been retained as a storm overflow which operates in extreme weather events, as shown in Figure 4-1.

In early 2009, Dublin City Council (DCC) undertook a study into the impact of the existing Ringsend WwTP and storm water overflow on the receiving waters of the Liffey and Tolka estuaries and Dublin Bay. An assessment was undertaken by the Danish Hydraulic Institute (DHI) using a MIKE 3 hydraulic and water quality model which was previously established for the Waste to Energy Plant outfall. The model was also subsequently adapted and used on a pre-feasibility study for a potential system of flood defence barrages in Dublin Bay.

The study provided details of modelling and discussion on the impact of the discharge, and comparison with relevant water quality standards (discharge points are shown in Figure 4-1). Results of the study were contained in “Modelling the Impact of Ringsend Wastewater Treatment Works and Storm Overflow Discharge in the Liffey and Tolka Estuaries and Dublin Bay”, April 2009.

Figure 4-1: Ringsend Wastewater Treatment Plant and storm overflow discharges

Figure 4-2: Picture of outfall diffusers in ESB cooling water channel

Further modelling, following on from this study, has been undertaken in 2016 and 2017 and the results of this work are discussed in detail in Volume 3, Section 4 of this EIAR. This modelling demonstrates that the upgraded 2.4m PE WwTP continuing to discharge at the existing location will achieve the standards required by the UWWTD.

4.2.3.2 Alternative Discharge 2 - Long Sea Outfall to Dublin Bay

Until 2010, the technology to biologically treat wastewater to a standard suitable for discharge directly to the Liffey Estuary had not been tested or proven to any significant scale to merit its consideration for application at Ringsend WwTP. Accordingly, extensive studies were carried out on behalf of Dublin City Council from 2008 to 2012 in order to determine a suitable design for a long sea outfall into Dublin Bay

and outside the sensitive area, obviating the need for nitrogen and phosphorus removal. These studies included:

- Extensive surveys and water quality modelling as described in *Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay* (October, 2009) by CDM/JB Barry
- Environmental Impact of two selected potential outfall locations as described in ''Preliminary Assessment of Long Sea Outfall Locations'' January 2010 by CDM/JB Barry.
- Preliminary Appropriate Assessment screening of the two selected potential outfalls prepared by Natura Consultants.
- Desktop study to identify all known existing constraints on potential discharge locations as described in ''Constraint Mapping of Dublin Bay'' 2010 by CDM.
- Additional water quality modelling as described in ''Ringsend Long Sea Outfall Modelling Results'' January 2011 by CDM/DHI.

The studies facilitated the selection of a preferred sea outfall location from a water quality perspective. A range of marine site investigations were completed in order to determine the underlying geotechnical conditions. As a result of these, it was decided that the outfall would need to be a 5 m diameter tunnel extending 9 km into Dublin Bay with a terminal riser diffuser shaft in marine water depths of 25 m below Lowest Astronomical Tide. An indicative design of the tunnel outfall is shown in Appendix 4A. It indicates a rock tunnel depth of up to 80 m below sea level. In order to construct this tunnel an onshore tunnel inlet shaft up to 110 m deep would be required with a preferred site on ESB lands. A more detailed description of the selection process and the likely construction techniques required is included in Appendix 4A.

4.2.4 Secondary Treatment Alternatives

While there are a wide variety of treatment alternatives, many are compromised because of the limited footprint available, the projected scale of development and the existing site infrastructure. The viable options considered are described hereinafter.

The minimum criteria for identifying an alternative treatment option were as follows:

- Capable of fitting within the available land on the existing Ringsend site.
- Capable of producing a final effluent of appropriate quality, requiring extended nutrient removal, if the discharge is to be within the Liffey Estuary.
- Capable of treating a biological loading of average 2.4 M PE
- Capable of catering for a peak hydraulic load of 13.8 m^3/s.
- Sufficient resilience to accommodate a variation in the daily load of up to twice the average.

The complete list of proposed alternatives which have been identified and assessed for Ringsend consists of:

- Existing sequencing batch reactor (SBR) operation (baseline situation) and capacity upgrade
- Deep Shaft Aeration (DSA)
- Integrated Film Activated Sludge System (IFAS) / Attached Growth Process
- Membrane Bioreactor Process (MBR)
- Aerobic Granular Sludge
- Conventional Activated Sludge Process (CAS)
- Biological Filters (BF)

Each of the identified alternatives is discussed briefly in the following sections and a fuller description is contained in *Ringsend Wastewater Treatment Works Upgrade and Expansion – Outline Design Phase Report* (May, 2015) by TJO'C/JBB/RHDHV. It is noted that, except for the LSOT, all alternatives include extended nutrient removal at the Ringsend WwTP, with effluent discharge within the Liffey Estuary.

In the assessment of each alternative a general description of the technology is followed by a brief description of the implementation at the current Ringsend WwTP and site including a description of the main advantages and disadvantages of the technology in general and more specifically for the Ringsend WwTP and the required effluent quality.

Depending on the options the existing SBR treatment units will be retained and:

- Remain in operation Unchanged (LSOT option, only carbonaceous removal)
- Remain in operation Unchanged, but by applying Chemical Enhanced Primary Treatment (CEPT) the load to the SBR is reduced (DSA)
- Will be converted to utilise an advanced type of technology providing nutrient removal (IFAS, AGS, MBR)

4.2.4.1 Existing SBR Treatment

The current SBR treatment was designed to treat 1.64M PE, allowing for BOD removal and partial nitrification (initial discharge limit 18.75 mg NH_4/l). It can contribute to the total treatment in three ways:

i) Unchanged operation: In summer, partial nitrification/denitrification will take place, while in winter nitrification is periodically limited or even absent. Only in combination with the LSOT is this a viable option. Further, additional secondary treatment capacity of 0.4m PE on the 0.8 Ha footprint is reserved for expansion on the site.
ii) Full Nitrification: Operated to nitrify only and will optimize the time available for aeration. The denitrification can only be achieved using additional filters with carbon dosing. To meet the discharge limit for total N of 10 mg/l, the ammonia removal has to be near complete (i.e. < 5 mg/l). The associated capacity in winter time for full nitrification will be 1.3mPE. The capacity can be improved by 0.3m PE, by applying CEPT to the primary clarifiers;
iii) Enhanced total nitrogen removal: This requires the SBR to partially operate at low or even no aeration. The associated capacity in winter time for enhanced total nitrogen removal will be 0.9m PE. Again, the capacity can be upgraded by approx. 0.3m PE by applying CEPT.

The second and third options clearly do not provide for sufficient capacity even for the current loading. The first option was the previous proposal which was granted permission in 2012.

4.2.4.2 Deep-Shaft Aeration (DSA)

The Deep-Shaft Aeration (DSA) process is an activated-sludge process that uses an in-ground vertical shaft as a reactor to provide biological treatment. The shaft can typically be up to 100 metres deep and 5 metres in diameter. Since the aeration tank is deep, its surface area is small as compared to conventional aeration basins. Due to the processes taking place at great depths (elevated pressure), flotation-type clarifiers are used.

DSA has been applied only in special cases and due to the limited availability of area; Ringsend could constitute such a "special case." DSA is only considered as an "add-on" to the SBR treatment. A complete conversion is considered too complex. The loss of the current SBR capacity during the rebuilt would

cause an unwanted increase of the discharge load into the estuary, with insufficient BOD removal in place for 1 – 2 years. The evaluated option is with the SBR's running in full nitrification mode (1.3 M PE) and applying CEPT (0.3 M PE), the DSA needs to have a capacity of 0.8 M PE. The DSA alternative at Ringsend would necessitate the application of CEPT and additional biological denitrifying filters. Both processes require the dosing of chemicals such as metal salt (CEPT) and a carbon source like methanol (denitrifying filters)

In 2009 DSA was considered a potentially viable alternative, without an extensive evaluation being conducted. From additional research, and concerns outlined in the 2010 Design Review as to full scale applications, it is considered that the process suitability for nutrient removal is questionable. It is concluded that the Deep shaft system as considered in 2010, will not remove nutrients without additional nitrifying and denitrifying technologies such as biological filters. The Capital Costs for a Deep shaft system will substantially increase compared to the 2010 figures. Furthermore, there are no recent full-scale municipal treatment plant references, other than very small plants (<5,000 PE). In 2012, the DSA process was evaluated for the island of Jersey and excluded because of high capital and maintenance costs and perceived problems related to clogging. But most importantly it was expected to be unable to meet the required nitrogen standards.

In addition to the requirement for the construction of deep shafts, the provision of flotation type clarifiers will involve construction of tanks of a similar scale (plan area/two storey) as the SBR's required for other technologies (see AGS technology below). The requirement to provide nitrification and denitrification filters could not then be realistically accommodated on the site. Finally, the drilling and the lining of the Deep Shaft reactors under the prevailing Ringsend geological conditions adds considerably to the DSA risk profile. These conditions are very variable and typically consist of 8m of made ground overlying layers of sand, silt and gravel to 35m BGL before reaching port clay and ultimately bed rock at 80m BGL. Shaft sinking would require specialist geotechnical processes including specific construction techniques such as secant piling, dewatering and ground freezing. Extensive dewatering would likely be required and this can lead to fines migration with resulting settlement of adjacent ground/structures/services.

At closer evaluation the DSA is to be disregarded because of:

- The inherent inability to meet the required effluent quality.
- The substantial negative environmental effects due to the continuous dosing of chemicals (both CEPT and Carbon dosing to the denitrifying filters) on a permanent basis.
- The additional risk of increased settlement on site (both existing and new structures).
- The lack of large scale DSA municipal treatment plant references

4.2.4.3 Attached Growth (IFAS)

Integrated Fixed-film Activated Sludge (IFAS) systems employ a combination of attached growth and suspended growth technology resulting in BOD removal, nitrification and denitrification within the same tank. In such a system part of the biomass will grow onto dedicated carrier material floating in the tank, the remaining biomass is suspended like in conventional treatment such as the current SBR system. BOD removal and denitrification takes place in the suspended growth stage, while nitrification predominantly takes place through the sludge attached to the carriers within the tank.

This carrier material, which requires replacement from time to time, is mixed within the tank by the aeration system. Specially constructed sieves keep the carriers in a designated compartment or zone. The suspended sludge settles in secondary settling tanks.

Several references for sewage treatment application are available, including capacities as large as 1 million PE. The IFAS technology can be applied in existing tanks. However, a pre-condition for SBR tanks, like in Ringsend, would be the conversion into a continuous flow process. In the SBR system both the treatment and the sludge/water separation occur in a single tank, whereas in a continuous system these steps are done in separated tanks, demanding for recirculation flows. Although not directly an environmental issue, the costs and construction risks associated will be substantial and possibly prohibitive for the specific case of Ringsend WwTP.

As well as the expansion with IFAS technology on the 0.8Ha site to achieve the capacity of 2.4 million PE, a possible approach could be to convert the existing Ringsend SBR tanks into an IFAS system. This would be to retrofit 12 of the SBR tanks (one tier) as bioreactors to house the attached and suspended growth and to convert the remaining 12 SBR tanks (other tier) into secondary clarifiers. However, a major challenge would be the phasing of the retrofit. A complete shutdown of the plant would be required to facilitate the retrofit, but would result in discharge of only primary treated sewage for a prolonged period of time (> 9 months). As a minimum it is likely that at least 8 tanks (4 upper and 4 lower) would have to be taken out of operation simultaneously. This will result in a temporary loss of one third of the treatment capacity.

Based on design principles, it is however unlikely that the peak flow could be handled in these 12 secondary clarifiers. A compact additional lamella system would need to be added to handle peak flows.

The IFAS system would also require chemical dosing for Phosphorus removal.

The energy consumption of such an IFAS retrofit is substantial. It is expected to be >30,000 MWh/annum higher compared to the AGS system. The main reasons for this increased energy consumption are:

- All the feed flow, as well as the sludge return flow (typically 50% - 100% of the average feed flow), is required to be pumped to the upper tier tanks, compared to only half the feed flow (and no return flow) in the current SBR configuration, thus increasing the energy requirements for pumping by a factor of 3.
- In part of the IFAS units, less energy efficient coarse bubble aeration is required, further increasing energy consumption.

From this assessment, it can be concluded that IFAS has relatively high risk profiles with regard to process stability, available space for the additional lamella settlers and would result in construction of a complicated (hydraulic) retrofit of the existing SBR tanks. Substantial negative environmental effects are to be expected due to the increased energy consumption and chemical dosing (phosphorus removal and possibly Carbon dosing to aid the denitrification). The construction impacts would be significant in terms of environmental impact on the receiving waters.

4.2.4.4 Membrane Bioreactor (MBR)

A Membrane Bioreactor (MBR) consists of a biological reactor with suspended biomass and solids separation by micro or ultra-filtration membranes with nominal pore sizes ranging from typically 0.1 to 0.4 microns. The MBR process utilises activated sludge technology, but replaces conventional final settlement in large secondary settling tanks with very compact membrane devices that effectively filter the final effluent. The removal of suspended solids in the effluent is near complete.

Further compactness can be achieved by operating the bioreactor itself at higher sludge concentrations up to 8-10 g/l (instead of 3-4 g/l). A precondition for the proper operation of the membrane units is an

extensive pre-treatment of the influent to the MBR units. Besides the existing inlet works screens, additional screening by micro sieves would be required to reduce the risks of fouling and or clogging of the membranes.

The membranes, which are a significant asset (and cost factor) in the MBR alternative, have to be replaced on a regular basis, with an expected lifetime of 7-10 years. The required membrane capacity is directly proportional to the flow to be treated. Application of MBR technology to (diluted) sewage flows is characterised by high investment and energy costs. The energy consumption is expected to be >30,000 MWh/annum higher compared to more energy efficient systems such as the AGS (refer below).

An alternative to full MBR treatment has also been considered, essentially creating a hybrid MBR / SBR process, making the maximum use of existing assets. This hybrid MBR/SBR process would utilise, approximately 12 of the existing 24 SBR tanks, which would have to be converted into MBR aeration tanks and linked to membranes placed in tanks constructed on the open area near the SBRs, including the 0.8Ha site. The remaining 12 SBR's would be operated in the present SBR mode and adjusted to include nutrient removal.

In Ringsend, the Hybrid MBR/SBR would still require complex alterations to be made to the existing structures, which may not be feasible, and also the construction of extensive piping for discharge and recirculation of sludge between the existing tanks and the membrane units.

From an operational and energy consumption perspective, the Hybrid MBR is lower in cost compared to a full MBR retrofit but still significantly higher than for conventional activated sludge processes – typically by a factor 1.5 to 2.

It is noted that the typical lifetime expectancy of the membranes of 7-10 years is not achieved in various full-scale references. Given membrane costs and the scale of Ringsend this introduces significant risks to the annual operating costs.

4.2.4.5 Aerobic Granular Sludge (AGS)

The AGS technology treatment alternative is essentially a biological treatment process, operating in a batch mode comparable to the current SBR operation. However, the key difference is the ability of the process to force the biomass to grow in a granular form rather than as flocs, with a consequential improvement in the solid / liquid separation stage. The essential nutrient removal processes such as nitrification, denitrification and Enhanced Biological P-removal (EBPR) also take place simultaneously within the granules. Due to the granules enhanced settling characteristics, relatively high biomass concentrations (typically 4 times higher than the current SBR system) are feasible within the reactor which, in combination with the short settling times, results in designs with small footprints, relative to the capacity. Additionally, the simultaneous Nitrification/Denitrification and EBPR occurring within the granules reduces the complexity and ancillary equipment required by classical biological nutrient removal activated sludge systems, which subsequently lowers investment and energy consumption, being much lower compared to the other biological nutrient removal systems. The AGS alternative was expected to meet the EU standards with regard to the effluent quality, and research by pilot testing onsite in 2016 and 2017 has proven this.

In 2010, AGS was not evaluated for Ringsend because it was still considered as a developing technology (although on a small scale, units have been in operation since 2006). Now, AGS is in operation in numerous wastewater treatment plants in countries like the United Kingdom, Portugal, South Africa, The Netherlands, Poland and also Ireland. Some of these are hybrid AGS systems running in parallel or

augmentation-linked with a Conventional Activated Sludge system. The AGS technology can achieve the required effluent standards for discharging at the current location within the sensitive area designation. The fact that the technology has matured since 2010 is illustrated by the AGS technology being applied at the Garmerwolde STP, The Netherlands. This plant comprises reactor tanks of comparable size to the existing SBR units in Ringsend and ranks in the list of the world's largest SBR tanks. Besides showing the maturity of the technology at the Garmerwolde site the AGS is operated parallel to a conventional plant showing substantial environmental benefits as follows:

- Less than half the energy consumption
- Improved effluent quality
- Virtually no chemical consumption

The design for this AGS technology for the Ringsend WwTP shows that application of AGS technology within the new treatment tanks being constructed at the 0.8Ha site and the proposed retrofitting of the existing SBRs to include AGS will meet the treatment requirements for 2.4 million PE. Since the basic operation principle for AGS is fundamentally quite similar to an SBR, retrofitting the existing SBR tanks is in principle not difficult, though the requirement to retrofit while maintaining as much treatment capacity as possible makes it complex. It is feasible to retrofit a maximum of 4 tanks together, while the remaining 20 continue to be in operation, together with the CUC system as outlined in Section 3.

The following operational aspects of the AGS process (not necessarily impacting on the environmental benefits of the AGS) have also been considered and the following factors are considered important:

- Granular sludge is formed in the AGS system naturally and as a result of the ongoing treatment, while excess AGS granules need to be periodically removed from the AGS reactors (retrofitted SBR tanks). This again is comparable to the existing SBR operation, with the sludge treatment being also comparable[15]
- At initial start-up, retrofitted SBR's could be seeded with granular sludge from other WwTPs but this would require a significant amount of sludge being imported as well as the associated transportation costs. Alternatively, granular sludge could be grown from Ringsend activated sludge, but this requires several months of transformation time which can complicate the project phasing. Once one or more tanks operate as AGS, excess granular sludge can be used to seed other retrofitted tanks.
- As noted earlier, because of the extensive simultaneous nutrient removal, the technology is characterised by low energy consumption, integrated biological phosphate removal and little or no chemical dosing. This contrasts with classical activated sludge, for example.
- As a result of the sludge processing at Ringsend, the biologically fixed Phosphorus will be released and needs to be re-fixated to meet the P-discharge requirements[16.] Prevention of P-release and re-fixation are integrated in the ongoing sludge-line upgrade. Re-fixation requires the use of chemicals which increases the operating costs, but it also opens up the opportunity to

[15] A number of remedial works to the sludge line will need to be undertaken, but these are not specific to the AGS process and would be required to a large part regardless of the water line configuration utilised (SBR, DSA, MBR or AGS).

[16] The phosphate release is not specific to the AGS sludge. All upgrades applying biological phosphate removal will require P-fixation in the sludge line.

recover a fertilizer product that could contribute to a reduction in operating costs, while recovering the finite phosphorus resource.

4.2.4.6 Conventional Activated Sludge (CAS)

Conventional Activated Sludge (CAS) consists of aeration tanks and separate secondary clarifiers. At Ringsend, CAS processes could be implemented in two ways. One way would be to add secondary clarifiers and to convert the SBRs to aeration tanks. The other way would be as stand-alone activated sludge plant with new aeration tanks and secondary clarifiers. In the Design Review 2010 the CAS process was dropped from further consideration due to capacity limitations as it will not fit on the available foot print.

4.2.4.7 Biological Filters (BF)

Biological filters are able to contain concentrations of biomass four or five times those of activated-sludge processes, thus decreasing the volume of tankage and resultant land area required as compared to conventional suspended-growth processes. Using Biological filters for nitrogen removal processes requires CEPT. Also, chemical dosing of a Carbon Source for denitrification is required. In the Design Review 2010 this alternative was not considered further for this project as a "stand alone technology" due to the capacity limitations, higher capital costs and greater operational complexity. For some of the current options, biological filters are to be applied as a polishing step (i.e. DSA) adding greatly to the complexity. Again, major environmental effects are to be expected due to the chemical consumption.

4.2.5 Analysis of Identified Viable Alternatives

4.2.5.1 Screening of Alternatives

The viable alternatives are presented in terms of the existing outfall with 4 potential treatment options and the existing SBR treatment with the long sea outfall. The available alternatives were screened in accordance with the following criteria:

- Technical
  - Ease of Operation
  - Maintenance
  - Sludge Production
  - Robustness and Reliability
  - Construction Risk
  - Future Proofing
- Environmental
  - Water Quality
  - Power Consumption
  - Chemical Consumption
  - Greenhouse Gases
  - Waste (during construction)
  - Traffic
- Cost
  - Capital
  - Operational
  - Whole Life

As indicated earlier the CAS and Biological filters alternatives are not viable for Ringsend WwTP and are not considered in the detailed analysis. The analysis is visually presented in Table 4.1. All of the options compared are selected to achieve compliance with the requirements of the UWWT Directive and schedule A of the EPA discharge licence.

Table 4-1: Comparison of alternatives

Outfall Options		LSOT	Liffey Estuary			
Treatment Process Options		SBR + CU	DSA (+SBR)	IFAS	MBR	AGS
Technical	Ease of Operation	●	▼	▼	▼	●
	Maintenance	●	▼	▼	▼	●
	Sludge Production	●	▼	●	●	●
	Robustness and Reliability	▼	▼	●	▲	▲
	Construction Risk	▼	▼	▼	▲	●
	Future Proofing	▼	▼	●	▲	▲
Environmental	Water Quality	●	▼	●	●	●
	Power Consumption	●	●	▼	▼	●
	Chemical Consumption	●	▼	▼	▼	●
	Greenhouse Gases	▼	●	▼	▼	▲
	Waste	▼	●	●	▲	▲
	Traffic	▼	●	●	▲	▲
Cost	Capital Cost	▼	●	▼	▼	●
	Operational Cost	●	▼	▼	▼	▲
	Whole Life Cost	▼	▼	▼	▼	▲

Legend: ▲ More Favourable ● Neutral ▼ Less Favourable

The above comparison can be summarised as follows:

- The MBR alternative primarily suffers from high whole life costs, both initial capital and membrane replacement during the project life as well as energy and chemical consumption. The MBR is less favourable at Ringsend for this reason.
- The IFAS option is considered to be more expensive than the AGS option, both initial capital and operating costs, including media replacement and energy consumption. There is a doubt as to whether the IFAS option will fit on the available land and whether the necessary modifications can be made within the existing SBR tank configuration. Finally, the IFAS retrofit would require the largest fraction of the current system to be out of operation during the rebuilt (>2 years). The IFAS option is not favoured over AGS for all these reasons.
- The SBR+CU in conjunction with the LSOT option scores strongly but has the highest capital cost and the greatest construction risk profile.
- The DSA option does not score well in any of the selected criteria when compared to the other available treatment processes. A high-risk profile regarding its suitability or proven track record

for large scale municipal treatment plant applications and question marks regarding meeting the effluent standards makes this option less favourable, if not unrealistic.

- From a sustainability perspective, regarding the energy consumption and chemical consumption, and related (chemical) sludge production, DSA, IFAS and MBR are not favoured.
- The AGS option has significant advantages over the other treatment options considered and is thus strongly recommended as being the preferred solution for continued discharge to the Lower Liffey Estuary, while complying with current legislative requirements.

It is clear from the table that AGS emerged as the favoured option on Technical, Environmental and Cost grounds. Given that the LSOT option was favoured and consented in 2012, in the absence of proven AGS technology, it is important to demonstrate a 'comparison of the environmental effects' as required by Directive 2014/52/EU. This comparison between AGS and LSOT is summarised below.

4.2.5.2 Comparison on environmental effects between AGS and LSOT

Water Quality

The AGS option provides a significantly cleaner and less polluting effluent than the LSOT option but one that it is proposed to continue to discharge to the Lower Liffey Estuary outfall. The water quality of the Lower Liffey Estuary is 'good' for trophic status. However, it is already at 'moderate' status while Dublin Bay is at 'good' status when assessed against Water Framework Directive criteria. Detailed water quality modelling demonstrates that there will be no significant impact on Dublin Bay water quality under the AGS option and that all relevant water quality standards will be complied with. When fully expanded to its maximum capacity of 2.4M PE, the AGS option will discharge significantly less pollutants than the existing plant currently discharges and will comply with UWWT Directive parameters. Notwithstanding this, the discharge of the treated effluent outside Dublin Bay with the LSOT option would have a beneficial effect on the Tolka Estuary in particular. The omission of the LSOT discharge would mean that the 'status quo' remains at the originally proposed diffuser point, 9km out to sea, with no deterioration in water quality at this point.

Criterion Assessment – No significant difference between the AGS and LSOT option.

Power Consumption

The AGS technology results in a significant reduction in power requirements in pure treatment terms, although this is somewhat offset by increased pumping in the Ringsend configuration. However, with regard to the difference in power consumption between the LSOT and AGS options, is considered to be minor when both the liquid and sludge treatment streams are included.

Criterion Assessment – No significant difference between the AGS and LSOT option.

Chemical Consumption

The amount of chemicals used per annum under either option will be extremely low and will be limited to the WwTP's sludge stream processes.

Criterion Assessment – No significant difference between the AGS and LSOT option.

Greenhouse Gases

The energy consumption during operation is expected to be comparable for both options. The LSOT option is likely to have a significantly greater carbon footprint from construction (primarily due to HGV movements for tunnel spoil disposal and embedded carbon in the tunnel segments). The carbon dioxide

emission during construction of the LSOT is expected to be equivalent to two years of operational energy consumption. As such, it can be considered sufficiently significant to distinguish between the options.

Criterion Assessment – The AGS option is to be preferred with regard to greenhouse gas emissions.

Waste

During construction, the LSOT will generate in the order of 850,000 tonnes of spoil during its construction (representing c. 70,000 individual truck movements). All possible options were considered for this spoil in the context of the EU's waste 'hierarchy' and the original project consent provided for the disposal of all tunnel spoil to landfill. The shortage of suitable disposal sites in the Dublin area adds considerably to the disposal cost of this spoil. In terms of the preferred approach from a waste hierarchy perspective, the only realistic way of achieving this is to implement an alternative project approach. While no such alternative was effectively available at the time of the original consent, it is now - in the form of the AGS technology.

During operation, the AGS option will recover most of the phosphorus from the wastewater for beneficial reuse. In comparison, the LSOT option will result in almost four times as much phosphorus (a non-renewable resource) being discharged 9km out to sea at the proposed diffuser location.

Criterion Assessment – The AGS Option is to be preferred from a Waste perspective.

Traffic

The tunnel element of the LSOT represents over 70% of the total HGV movements associated with that option's construction. The removal and disposal of tunnel spoil alone would create 70,000 truck movements over a projected 18-month period. The supply of tunnel segments and other construction materials would add considerably to this number. While the AGS will involve more HGV movements local to the WwTP, arising from the retrofitting of the technology within the plant's existing tanks, these will be spread over a longer timeframe. Overall, the net reduction in traffic impact using AGS (including the elimination of tunnel related trips along the route to the Great South Wall) is considered to be very significant.

In the operation phase, there will be no significant difference between the options during future operations.

Criterion Assessment – The AGS Option is to be preferred from a Traffic perspective.

Summary

The AGS option has significant advantages over the other treatment options considered and is thus strongly recommended as being the preferred solution for continued discharge to the Lower Liffey Estuary, while complying with current legislative requirements. In view of the foregoing, AGS while retaining the existing outfall, is the preferred alternative being adjudged to be more favourable or neutral in comparison to all other viable alternatives

4.2.5.3 AGS Reference Plants

The first Dutch municipal full-scale AGS plant was constructed at Epe WwTP under the trade name Nereda. The Epe WwTP was designed and constructed by Royal HaskoningDHV in 2010-2011 and is operational since September 2011. Prior to design, a pilot trial was carried out for four years and the data was used to design the full-scale plant. Furthermore, relevant information was gathered through two small industrial applications and a demonstration plant in South Africa (Gansbaai). Following the

successful start-up of Epe, more Nereda® plants were designed and successfully put into operation. One of these plants is at Garmerwolde (NL). With two reactors, each 9,500 m^3 in volume, these are comparable to the size of the individual SBR tanks at Ringsend. At Garmerwolde the Nereda was built as an extension to an existing plant. The Nereda extension was designed to treat 41% of the incoming flow at less than 20% of the footprint of the conventional plant.

As shown in the Table 4.2 the AGS units outperformed the conventional plant. A better effluent quality (TN) was achieved with less than 50% of the energy of the conventional plant and very little chemical dosing. With such benefits the operation of the AGS at Garmerwolde is now treating as much as possible (up to 65% of total flow) while still meeting the effluent standard.

Table 4-2: Comparison operational efficiency of AGS and conventional treatment at Garmerwolde

Effluent Parameter	Unit	AGS	Conventional
Total N	mg/l	8	10
Total P	mg/l	<1	<1
Consumables			
Energy	kWh/m^3	0.17	0.38
PAC	m^3/year	0	144
PE – Coagulant	m^3/year	0	39
PW – Flocculant	m^3/year	0	8.4
Carbon-source	m^3/year	0	715
Ferric Chloride	Ton Fe/year	26	120

Following DBO tendering, three other Irish AGS systems have been developed as follows:

- **Clonakilty: -** This was the first Nereda® system to become operational in Ireland. Designed for 21,000 PE with nitrogen and phosphorus removal, it is operational since mid-2015
- **Carrigtohill:** Designed for 30,000 PE with nitrogen and phosphorus removal, this plant has been operational since beginning of 2016
- **Cork Lower Harbour:** Designed for 65,000 PE with nitrogen and phosphorus removal, this project was commissioned in late 2016.

More detailed information about the Irish plants and the other international references is given in Appendix 4B.

4.2.5.4 AGS Process Proving at Ringsend

In order to confirm the application of the AGS process in the Ringsend WwTP and to facilitate optimisation of the application in the existing reactors a “process proving program” was implemented. This program of “De-risking & Confidence Building” at Ringsend WwTP had a two-step approach, presented in Table 4.3.

Table 4-3: Process Proving and Design Optimisation

PPS1: Semi-technical scale; AGS unit	PPS2: Single existing SBR cell scale
Capacity up to 5 m3/day, 2 reactors: height 6 m - diameter 600 mm Process proving - Process optimization - Salinity and Spiking tests	Retrofit of one of the existing SBR tanks with Nereda® internals and Nereda® Control Process optimization - validate retrofit design / procedure

The PPS1 exercise was successfully completed in June 2016. The findings are presented in Appendix 4C, with the main conclusions being:

- The results of PPS1 confirm that the implementation of the AGS technology at the Ringsend WwTP would enable the plant to be expanded to the proposed capacity of 2.4m PE while meeting the effluent requirements schedule A of the EPA discharge licence.
- Throughout the study period the biomass was predominantly granular, stable, and showed consistent biomass growth. The increases observed in PPS1 strongly indicated that 'self-seeding' of future AGS Reactors at the Ringsend WwTP is possible when a certain level of the AGS technology is in place and operating on site. This aspect of the project was further investigated as part of the programme of testing during PPS2.

PPS2, involved the complete retrofit of one SBR tank to an AGS reactor and the construction of buffer tanks in the adjoining SBR cell which will convert this cell to an average of 83,000 PE treatment capacity. The programme of retrofit works was completed in June 2017.

The retrofit AGS cell achieved stable operation in July 2017. The results achieved since then have been within the UWWTD requirements. A full report on Process Proving is included in Appendix 4C. The results clearly indicate that AGS applied in Ringsend WwTP will achieve the UWWTD requirements. Further, the test programme to date confirms that the AGS technology can be readily retrofitted into the existing SBR tanks. The PPS2 testing is continuing and the results will also be used to further optimize the design of the existing SBR units.

4.2.5.5 AGS Construction Impacts

Implementing the AGS process into the existing SBR tanks will require each cell to be temporarily out of operation to allow for the retrofit works to be carried out. This work and subsequent restart could potentially be done through each cell individually. This will reduce the impact on the current capacity but will complicate the building process in terms of cost and time. To speed up the conversion and reduce the costs involved, it is preferred to advance the retrofit in SBR blocks of four surrounding a centre core. This will result in a temporary loss of capacity of nearly 17% for each block of four. In order to maintain at least the current capacity two mitigation measures are available:

- Apply CEPT on a temporary basis to reduce the load to secondary treatment by 15 – 20%
- Endeavour to have the Capacity Upgrade available as early as possible

4.2.5.6 Conclusion

In conclusion, AGS, which was not a proven technology at the time of the 2010 Design Review Report or for the 2012 Planning Application, is now proven and preferred to the other process options due to it being assessed as being a more robust process solution with an ability to ensure effluent complies with UWWT Directive Standards and with a lower expenditure profile. Furthermore, it enables recovery of phosphorus (a nutrient with limited sources available). The AGS option is also preferred, due to its

lower risk profile, as the existing outfall can continue to be used. Furthermore, because of the limited excavation works and compactness of the system, the number of truck movements and mass of rock and spoil to be removed during construction is far less compared to the LSOT, for example. Finally, it is expected to be the option with the lowest greenhouse gas emissions, most notably significantly lower compared to the LSOT option. Accordingly, the AGS option is recommended as being the preferred and proposed scheme for the upgrade and extension of the Ringsend WwTP.

4.2.6 WwTP Procurement Strategy

The existing WwTP was delivered under a Design Build Operate (DBO) contract which expires in 2025. As indicated in section 3, a number of significant works packages have been identified in order to deliver the entire WwTP Component of the project and these will have to be delivered in collaboration with the existing Operator.

In accordance with current Irish Water policy, it is likely that significant elements of this project will be procured by Design and Build (DB) contracts, some with a limited operational periods included. The relevant wastewater treatment infrastructure proposed by the tendering contractors will be required to comply fully with the performance requirements set out in the contract documentation including such development consent approval as may be granted by ABP. A variant of the foregoing may be used for the P-Fixation package where a longer term 'operate' element may be included in order to leverage maximum commercial advantage.

The consideration and assessment of likely significant effects/impacts and the measures envisaged to avoid, reduce and where possible remedy significant adverse effects/impacts (mitigation measures) are based on the preliminary design of the scheme as detailed in this EIAR. The preliminary design and the environmental mitigation measures will be further progressed and refined during the detailed design and procurement of the scheme and incorporating the mitigation measures contained in such approval as may be granted. In this regard, the EIAR sets out the worst-case scenario in terms of likely significant impacts.

The detailed design and procurement will provide for development of the preliminary design in a manner such that there is no material change in terms of significant adverse effect on the environment. Opportunities may be identified to further reduce the significance of adverse effect/impact and, in some cases, improve the residual effect/impact.

4.2.7 Preferred WwTP Option

In accordance with the requirements of the GDSDS, the Ringsend WwTP is to be expanded to a capacity of 2.4m PE. Further, due to the designation of the Lower Liffey Estuary as a nutrient sensitive water body, there is a requirement to either reduce Total Nitrogen and Total Phosphorus to 10mg/l and 1mg/l respectively or create a new outfall some 9 km into Dublin Bay, to discharge outside the designated waters. There are a number of viable wastewater treatment alternatives, each with their own advantages and disadvantages from an environmental effect perspective.

In conclusion, AGS, which was not a proven technology at the time of the 2010 Design Review Report or for the 2012 Planning Application, is now proven and preferred to the other process options due to it being assessed as being a more robust process solution with an ability to ensure effluent complies with UWWT Directive Standards and with a lower expenditure profile. Furthermore, it enables recovery of phosphorus (a nutrient with limited sources available). The AGS option is also preferred, due to its lower risk profile, as the existing outfall can continue to be used. Furthermore, because of the limited

excavation works and compactness of the system, the number of truck movements and mass of rock and spoil to be removed during construction is far less compared to the LSOT, for example. Finally, it is expected to be the option with the lowest greenhouse gas emissions, most notably significantly lower compared to the LSOT option. Accordingly, the AGS option is recommended as being the preferred and proposed scheme for the upgrade and extension of the Ringsend WwTP.

4.3 Regional Biosolids Storage Facility

4.3.1 Do-Nothing Scenario

Biosolids from Ringsend WwTP are currently stored at a facility in Thornhill Co. Carlow. Truck movements from the Ringsend plant are via the port tunnel, along the M50 and south along the M7. The biosolids are then applied to agricultural lands located in South Leinster and parts of Munster. Land spreading occurs mainly during the spring and autumn periods. Land spreading of biosolids is regulated by the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (SI 148 of 1998).

The Thornhill facility has a certificate of registration from Carlow County Council for a maximum annual throughput of 25,000 tonnes of biosolids. While there is theoretically some headroom, this would be insufficient to cater for the current Ringsend WwTP upgrade proposal, and the proposed GDD WwTP.

In September 2016, Irish Water published the National Wastewater Sludge Management Plan (NWSMP) which sets out its strategy to ensure a nationwide standardized approach for the management, treatment, storage and disposal of wastewater sludge over the next 25 years. Following the examination of current practices and disposal alternatives, the NWSMP concluded that the re-use of biosolids as a fertiliser to be spread on agricultural land is the most sustainable disposal route. The Plan considered the requirements for seasonal storage of treated sludge and states that, ''where appropriate, sludge storage facilities will be developed to serve a number of local plants and/or a wider regional need''. It further noted that the upgrade to the Ringsend WwTP and the proposed new GDD WwTP will result in a significant increase from current sludge volumes with a consequent increase in storage requirements. It recommends that a dedicated sludge storage facility should be developed in conjunction with the expansion of Ringsend WwTP to meet its requirements and take account of other future needs in the region.

Having regard to the foregoing, it is evident that the 'Do-Nothing Scenario' is not viable and that alternative plans need to be advanced to cater for future requirements. The Applicant considers that the new proposed RBSF represents a sustainable solution for the seasonal storage of biosolids, arising from the Ringsend WwTP and the proposed GDD WwTP. It is proposed to transition to the use of the RBSF on a phased basis if and when the RBSF is permitted by ABP, constructed and available for use.

4.3.2 Biosolids Disposal Alternatives

The NWSMP examined current international and Irish practices for biosolids use and disposal. It identified a number of disposal routes as follows:

- **Re-use in Agriculture:** Up to 98% of Irish wastewater sludges are beneficially reused in agriculture. This involves the beneficial re-use of biosolids as a fertiliser in agriculture and is considered a favourable environmental option. The Plan examined the available suitable spread-lands and confirmed sufficient availability for the foreseeable future. The use of properly treated wastewater sludge, in accordance with a nutrient management plan under the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (SI 148 of 1998), can avoid

any adverse environmental impact on receiving waters as the quantity of phosphorus is monitored and controlled to match the quantity required by the crop being grown. The use of digested sludge in particular has been shown to improve nitrogen uptake in plants. The organic content and slow release nature of wastewater sludge compared to artificial fertiliser has added benefits in improving the condition of soil and reducing the potential for run-off of nutrients.

- **Re-use in Non-Agricultural Land:** There are options for reuse of wastewater sludge in non-agricultural land. This includes use in energy crops, forestry and land remediation. There are limited ongoing options for both forestry and land remediation. The Plan recommended that this is reviewed on an ongoing basis to identify potential outlets.
- **Thermal Processes:** The main alternative outlet for wastewater sludge internationally is incineration. Other thermal processes, including gasification and pyrolysis, are currently being developed internationally and are expected to be available on a commercial scale in the next 5-10 years. There are significant capital and operating costs associated with all thermal processes and as such they are only likely to become a preferred option if reuse in agriculture or non-agricultural land use are not available.
- **Landfill:** The use of landfill for disposal of wastewater sludge is effectively banned by the Landfill Directive due to the requirement to set limits on the acceptance of biodegradable organic waste. Landfill is no longer considered to be a sustainable outlet for wastewater sludge and will only be considered as a short-term emergency outlet where reuse options are not available.
- **Other:** Other options are available, include use in energy crops, silviculture and land remediation. However, development of these outlets has been limited both in Ireland and internationally.

The draft NWSMP was subject to full Appropriate Assessment (AA) and Strategic Environmental Assessment (SEA). The final published NWSMP incorporates the recommendations and mitigation measures arising therefrom. In view of the foregoing, it is Irish Water's policy to continue with beneficial re-use in agriculture as the favoured route for the disposal of biosolids in accordance with the NWSMP. Land spreading of biosolids is discussed in Volume 4, Section 19: Cumulative Impacts.

4.3.3 Alternative RBSF Sites

Before arriving at its preferred approach to meeting sludge storage needs, the Applicant considered the findings of the NWSMP and considered further options as follows:

- **Provision of off-site storage facilities serving individual wastewater treatment plants**: This approach would go against the principle of the NWSMP of developing strategic facilities that serve a number of plants. It would contradict the principle of increasing operational efficiency as a number of individual facilities would require more investment and more resources. The management and control of facilities to the highest standards is best achieved through a small number of strategic regional, highly controlled facilities rather than a large number of smaller facilities.
- **Provision of off-site storage facilities serving groups of wastewater treatment plants (located close to the spread-lands):** This option does not provide flexibility for changes to the spread-lands location or for changes to the future disposal outlet.
- **Provision of off-site storage facilities serving groups of wastewater treatment plants (located close to the source):** This is the preferred approach as it achieves greater capital and operational efficiencies, facilitates high standards of management and control and restricts the number of developments required in various locations. This approach also allows for flexibility in the future to changes in the location of the spread-lands or to the changes to the disposal route.

Having reviewed the foregoing, the decision was taken to locate a single RBSF site with sufficient area to cater for the biosolids arising from a projected 3.6m PE from the GDSDS region by 2050. However, planning would be advanced based on a 3m PE requirement to cater for the arisings from Ringsend and the proposed GDD to 2040. A generic design of the proposed RBSF required a site area of approximately 5.5 hectares. As it was quite unlikely that such an 'ideally' sized perfectly rectangular site would be located, and to provide layout flexibility and buffering to minimise potential environmental impacts (particularly on sensitive receptors), it was proposed for site selection purposes to seek site locations where a minimum usable area of 8 hectares was available. Further, it was decided to look for suitable sites within the GDSDS region using the following broad criteria:

- **Suitably Zoned Lands**: The GDSDS boundary includes the administrative area of seven local authorities, including Dublin City Council, Fingal County Council, South Dublin County Council and Dun Laoghaire Rathdown County Council (the four Dublin Authorities) together with parts of counties Meath, Kildare and Wicklow. The development plans of all seven authorities were examined to determine where such a facility may be acceptable from a zoning perspective. This was followed with consultations with the Planning departments from each local authority. A detailed analysis of planning policies, objectives and standards together with environmental, economic and social and community considerations was completed to further refine the selection process. All the authorities directed the Applicant to Industrial zoned land.
- **Colocation of the storage facility with other waste facilities**: As per the objectives of the Eastern and Midlands Regional Waste Management Plan (EMRWMP), this option was considered where there are existing waste facilities within the GDSDS area.
- **Irish Water and Ervia owned lands**: Ervia and Irish Water landbanks within the GDSDS area were considered to determine if there are any potential suitable locations for the proposed facility.
- **On-Site Storage at WwTPs**: The Ringsend WwTP could not accommodate additional storage facilities on the scale required. Colocation with other wastewater treatment plants within the GDSDS was also considered.

A three-stage site selection process was completed in order to identify the preferred site. At each stage, a detailed report was published and stakeholder observations sought. All feedback was duly considered and used to inform the decision-making process. The site selection process is shown graphically as a Project Development Roadmap in Figure 4-3 while all relevant reports are included in Appendices 4D, 4E and 4F. The process is summarized hereinafter.

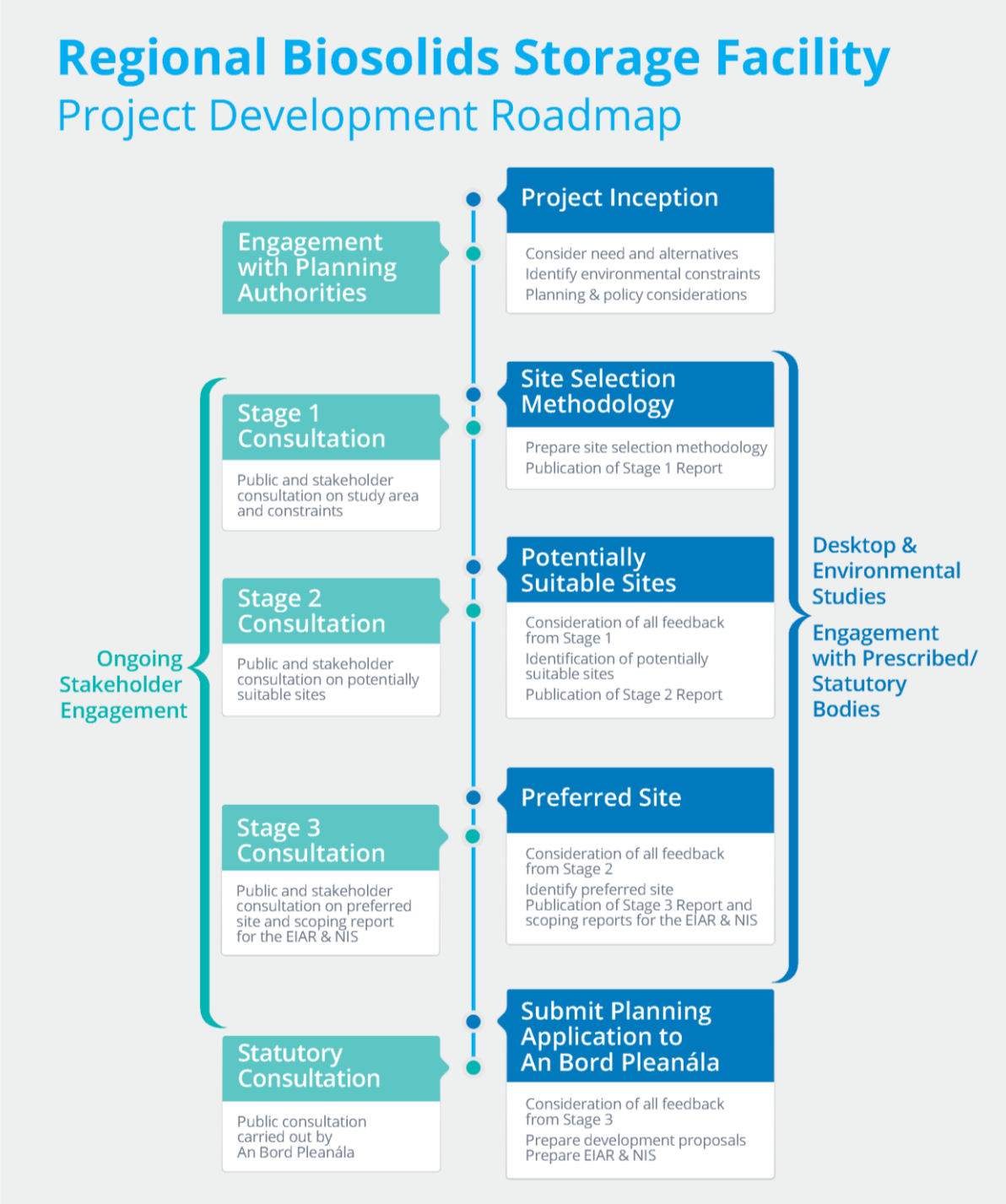

Figure 4-3: Project development roadmap

A Stage 1 non-statutory consultation on the proposed RBSF site selection methodology was conducted from 2 February 2017 to 2 March 2017. This coincided with the publication of *Stage 1 Report – Site Selection Methodology*. A total of 64 submissions were received from public bodies and the public generally. Observations were made on the appropriate zoning for sites, biosolids re-use including environmental concerns regarding land spreading, risk of odours and alternative approaches to biosolids reuse in agriculture. All these were considered in the next stage of the process.

A *Stage 2 Report – Identification of Preferred Sites* was published on 11 May 2017. This report outlined an eight-stage shortlisting phase whereby five potential sites were shortlisted. These sites are shown in Figure 4-4 together with the various sites considered in the site selection process.

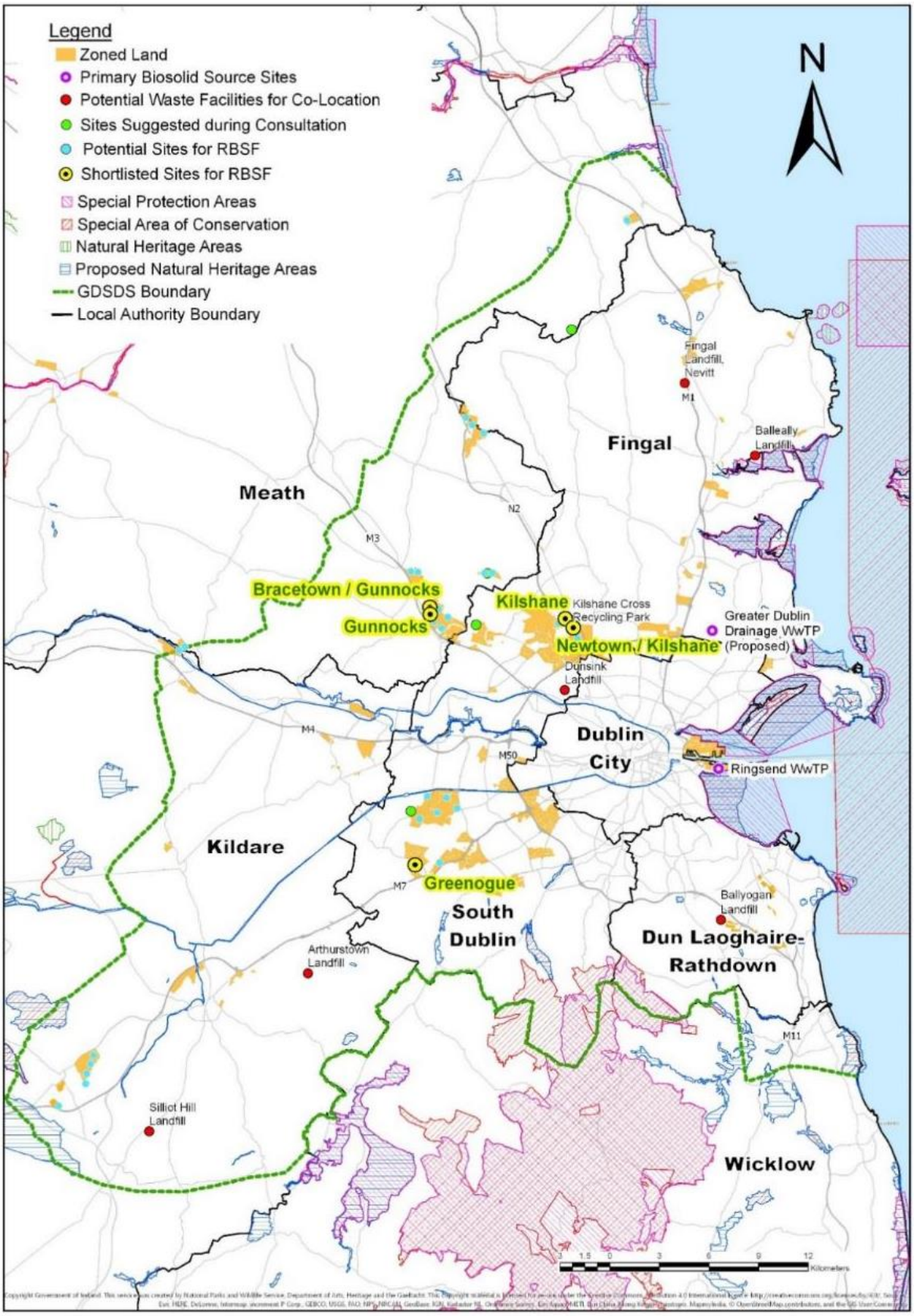

Figure 4-4: Potential site locations

The 5 shortlisted sites were as follows:

- Bracetown/Gunnocks, Co Meath: This is a 12.5 ha site located to the north of Dunboyne and easily accessible from the M3 Motorway.
- Gunnocks, Co Meath: This is a 14.5 ha site located north of Dunboyne, directly south of the previous site. It is likewise easily accessible from the M3 Motorway.
- Greenogue, County Dublin: This is a 12.5ha site located off the M7 Motorway, west of Rathcoole in South Dublin.
- Newtown/Kilshane, Dublin 11: This is a 11.0 ha site located off the N2/M2 Motorway near Kilshane Cross in Fingal. This site has been previously partially developed as a waste management/recycling facility.
- Kilshane, Dublin 11: This is a 11.3 ha site located just north of the previous site. It is likewise accessible from the N2 Motorway.

Irish Water undertook a Stage 2 non-statutory consultation over a 5-week period from 11 May 2017 to 15 June 2017. The consultation phase included 3 open days at venues located close to the potential sites. A total of 499 stakeholders and organisations participated by attending the open days or making submissions. Observations were made on the appropriate zoning for the sites, biosolids re-use including environmental concerns regarding land spreading, site selection methodology, risk of odours, public health concerns, traffic concerns in the vicinity of the sites and alternative approaches to biosolids re-use in agriculture. These observations were considered as part of the final site selection process.

Under the *Stage 3 Report – Identification of Preferred Site*, the 5 potential sites proceeded to a detailed assessment phase in accordance with Environmental, Economic & Engineering, Planning and Social & Community criteria with a view to identifying a preferred site. The 5 sites were duly compared under 21 criteria. For each criterion, a qualitative approach was adopted and therefore, expert judgement was applied with the following classification adopted to compare the specific sites relative to each other as shown in Figure 4-4.

The selection of the final preferred site was based on a cumulative consideration of the classifications. From this assessment, the preferred site was selected as the Newtown/Kilshane[17] site, the site now proposed for the RBSF Component of the Proposed Upgrade Project. The advantages of the site were summarized as follows:

- The proposed development would be considered as Permitted in Principle in the Fingal County Development Plan.
- The site has been partially developed for what was intended to be a waste facility for construction and demolition waste, wastewater sludge treatment, biological waste treatment and waste transfer for municipal waste.
- There are existing roads, site services and fencing from this past development, some of which can be incorporated into the proposed development of the RBSF.
- The separate routes to and from the site provides advantages in relation to traffic management and traffic safety.

[17] *'Newtown/Kilshane' is the name attributed during the site selection process to the site in Newtown, Dublin 11, which is now the proposed location for the RBSF Component of the Proposed Upgrade Project.*

- The site is located in an existing industrial and infrastructural setting, which includes a quarry and electricity power station. This is the landscape backdrop when the site is viewed from the N2. Nevertheless, the site presents a good opportunity for incorporation of landscape measures for mitigation.
- The population within 500m of the site is estimated to be less than 30 and the nearest schools are more than 2km to the east of the site. There are no hospitals near the site.

Table 4-4: Assessment criteria and corresponding assessment classifications

Criteria	Site	Bracetown / Gunnocks (Meath)	Gunnocks (Meath)	Greenogue (South Dublin)	Newtown / Kilshane (Dublin 11)	Kilshane (Dublin 11)
Environmental	Air Quality	●	●	●	●	●
	Odour	▼	▼	▼	●	●
	Noise	●	●	▼	▲	●
	Landscape & Visual	●	▼	●	▲	▼
	Geology & Hydrogeology	●	●	●	●	●
	Hydrology	●	●	▼	▲	▲
	Ecology	●	▼	●	▲	●
	Archaeology, Cultural & Architectural Heritage	●	▼	▼	▲	▼
Economic & Engineering	Traffic	●	●	▼	●	▼
	Road Safety	●	●	●	▲	▼
	Service & Utility Connections	▼	▼	●	▲	▼
	Geotechnical	●	●	●	▼	●
	Distance from Biosolids Source	●	●	●	▲	▲
	Capital & Operating Costs	●	▼	●	▲	●
Planning	Land Use Zoning	●	●	▲	▲	▲
	Planning Policies & Objectives	▼	▼	●	▲	●
	Planning History & Current Usage	●	●	●	▲	●
	Population & Sensitive Receptors	●	●	▼	●	●
	Adjacent Land Use	●	●	●	●	▲
Social & Community	Material Assets	●	●	●	●	▼
	Neighbourhood Character	●	●	●	●	●

Legend: ▲ **More Favourable** ● **Neutral** ▼ **Less Favourable**

The selected site was the subject to a 6 week Stage 3 non-statutory consultation period from 29th August 2017 to 10th October 2017, which sought the views of stakeholders on the contents of the Stage 3 report. A Scoping Report for the Environmental Impact Assessment Report and the Natura Impact Statement for the site was also published and observations sought as an integral part of the Stage 3

consultation process. An open day was held on 12 September 2017 at the White House Hotel, Co Dublin. A total of 90 individuals and organisations participated by attending the open day or making written submissions. Concerns were expressed concerning traffic, odour control, visual appearance and community gain. A Stage 3 Consultation Report on these submissions is included Appendix 2E. The feedback received is reflected in the facility design and the environmental mitigation proposed.

4.3.4 Design and Site Layout Alternatives

There are a number of constraints which limit the options for the siting of the individual buildings on the site. The preferred site has been partially developed as a waste recycling facility and significant site development works were completed in 2009 prior to the project being abandoned. Because of the similarity between the proposed use and the previous plans, it is proposed to salvage and re-use as much of the installed infrastructure as possible. This includes utility services, roads, site entrance, etc. Some of the other infrastructure, such as small buildings, will require demolition. An over-riding requirement is to provide for adequate transport vehicle circulation within the site while removing the risk of queuing onto the public road. Additional site constraints include the proximity to one dwelling and overhead high voltage electricity cables traversing the site. The proposal to capture solar energy as a sustainable way to operate the facility means that the buildings are best configured in an east west orientation in order to maximise photo voltaic cell efficiency. A final constraint relates to the need to provide for phased development to match the storage needs while future proofing the site to provide for possible future expansion, subject to planning approval.

Having regard to the foregoing, there is limited scope in terms of site layout alternatives. However, the following alternatives were considered:

- **Storage building in a North South configuration**: Considered to have negative landscape implications, did not suit solar energy capture and did not easily facilitate staging.
- **Storage buildings in a chevron formation**: Poor site circulation, less re-use of existing infrastructure and sub-optimal from a solar energy perspective.
- **Storage buildings in an East West configuration**: The chosen site layout.

The selected site layout was considered to be the best overall fit having regard to the various site constraints.

4.3.5 Conclusion

The requirement for biosolids storage arises primarily from the statutory restriction on land spreading between 12 October and 15 January. Further, the principal re-use in agriculture is as a fertiliser for feed grain crops. Accordingly, spreading occurs in the spring and autumn sowing seasons which indicates a requirement for 4 months storage capacity. Limitations on the existing storage facility for biosolids from the Ringsend WwTP coupled with the requirements of the NWSMP lead to the requirement to locate a RBSF in the GDSDS region. Accordingly, Irish Water undertook a 9 month three stage site selection process to identify a preferred site. This incorporated a robust consultation process whereby the feedback from each stage was used to inform and shape the next stage. The preferred site was accordingly identified as an 11Ha site at Newtown, Dublin 11. This site is in the ownership of Fingal County Council and had previously been partially developed as a waste recycling facility. The proposed repurposing of the site as an RBSF is compatible with the current Fingal Development Plan zoning, waste management policies and the NWSMP. The site is particularly suitable from a transportation perspective in catering for biosolids from both the Ringsend WwTP and the proposed GDD WwTP.

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TJ O'CONNOR & ASSOCIATES
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consulting engineers

Royal HaskoningDHV
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