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UISCE ÉIREANN : IRISH WATER

Arklow Wastewater Treatment Plant Project

Environmental Impact Assessment Report

Volume 2: Main text (Book 1 of 3)

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Glossary and Abbreviations

AA	Appropriate Assessment – An assessment of the potential adverse effects of a plan or project (in combination with other plans or projects) on the Natura 2000 network of European designated sites for biodiversity as defined by the Habitats Directive
AADT	Annual Average Daily Traffic – The total volume of vehicle traffic of a motorway or road for a year divided by 365 days.
ACM	Asbestos Containing Material
AHU	Air Handling Unit
The Alps	The vacant land (approximately 2.9ha) located to the west of River Walk at Upper Main Street, between Parade Ground to the south and Avoca River to the north. This area is as defined as the Alps Opportunity Site in the Arklow LAP.
AQS	Air Quality Standards
Aquatic ecology	The topic that deals with all aspects of ecology in the River Thames up to and including the flood defence walls. This includes fish, invertebrates, marine mammals and aquatic plants using the River Thames and its foreshore areas. Wintering birds which use the foreshore are not included in the aquatic ecology section (Refer to terrestrial ecology)
Archaeological Heritage	the term ‘archaeological heritage’ is applied to objects, monuments, buildings or landscapes of an (assumed) age typically older than AD 1700 (and recorded as archaeological sites within the Record of Monuments and Places)
Architectural Heritage	The term ‘architectural heritage’ is applied to structures, buildings, their contents and settings of an (assumed) age typically younger than AD 1700 For the purposed of this report the terms ‘architectural heritage’ and ‘built heritage’ have the same intended meaning and are used interchangeably.
Area of Archaeological Potential	An area with known potential for significant archaeological remains as identified in the Wicklow County Development Plan 2016 -2022
Arklow Bridge	The 19 arch bridge over the Avoca River in between Arklow town (to the south) and Ferrybank (to the north).
Arklow LAP	Arklow Local Area Plan 2018 - 2024
As	Arsenic
Assessment area	Study area considered in the environmental assessment for a given topic
Baseline	Refers to existing conditions as represented by latest available survey and other data

Benthic	A description for animals, plants and habitats associated with the river or seabed
BGL	Below Ground Level
Birds Directive	Council Directive 79/409/EEC as amended by Council Directive 2009/147/EC on the conservation of wild birds
BOD	Biological Oxygen Demand – The amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period
BSI	British Standards Institution
Caisson	A foundation formed by constructing a shaft, often supported by precast concrete segments in rings, and then filled with concrete
CCTV	Closed-circuit television
Cd	Cadmium
CDWMP	Construction and Demolition Waste Management Plan
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
COD	Chemical Oxygen Demand – The amount of oxygen consumed by reactors in a measured solution (that can be used to quantify organics in water)
Cofferdam	A temporary watertight structure to enclose an area underwater that is pumped dry to allow construction work to be carried out
COMAH	Control of Major Accidents Hazards involving Dangerous Substances
CoRTN	Calculation of Road Traffic Noise
County Development Plan	Wicklow County Development Plan 2018 - 2024
CPO	Compulsory Purchase Order
Cultural Heritage	'Cultural Heritage' where used generically, is an over-arching term applied to describe any combination of archaeological, architectural and cultural heritage features. The term 'cultural heritage', where used specifically, is applied to other (often less tangible) aspects of the landscape such as historical event, folklore memories and cultural associations. This designation can also accompany an archaeological or architectural designation or describe features that have a more recent origin, but retain cultural heritage significance.
CSM	Conceptual Site Model
CSO	Central Statistics Office
Cu	Copper

Cumulative effect	Likely significant effects arising from a cumulation of effects associated with the proposed development and other projects in the local area of relevance
DaS	Dumping at Sea
DBO	Design Build and Operate – A form of contract where the contractor is responsible for the design and construction of a facility, and has a long term responsibility for operation
DCCAE	Department of Communications, Climate Action and Environment
DCHG	Department of Culture, Heritage and the Gaeltacht
Decibel (dB)	The ratio of sound pressures, which we can hear, is a ratio of 106 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.
DIN	Dissolved inorganic nitrogen
DMRB	Design Manual for Roads and Bridges
DO	Dissolved oxygen
DoEHLG	Department of the Environment Heritage and Local Government
DSA	Detailed Site Assessment
DWF	Dry Weather Flow
ECJ	Court of Justice of the European Union
ED	Electoral Division
EIA	Environmental impact assessment
EIAR	Environmental Impact Assessment Report
The EIA Directive	Council Directive 2014/52/EU on the assessment of certain public and private projects on the environment
EIS	Environmental Impact Statement
ELV	Emission limit value
EPA	Environmental Protection Agency
ETS	Emissions Trading Scheme
EU	European Union
European designated site	The Natura 2000 site network, i.e. Special Areas of Conservation - (including candidate SACs) protected under the provisions of the Habitats Directive and Special Protection Area - (including proposed SPAs) protected under the provisions of the Birds Directive
FFT	Full flow to treatment
Fluvial	Relating to a river, i.e. fluvial flow is the flow of freshwater

Foreshore	The area of a shore that lies between the mean high water and mean low water mark
FOG	Fat, Oil and Grease (removal)
FSR	Flood Studies Report
GDA	Greater Dublin Area
GDSDS	Greater Dublin Strategic Drainage Study
GE	General Electric
GHG	Greenhouse Gas
GI	Ground Investigations
GNI	Gas Networks Ireland
GSI	Geological Survey of Ireland
ha	Hectare
Habitat	An area or natural environment formed of physical factors such as soil and moisture that reside in a defined topographical area in which organisms (fauna and flora) normally live.
Habitats Directive	Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HGV	Heavy goods vehicle
HIA	Health Impact Assessment
HSE	Health Services Executive
HVAC	Heating, Ventilation and Air Conditioning
IAQM	Institute of Air Quality Management
ICE	Institute of Civil Engineers
ICPSS	Irish Coastal Protection Strategy Study
IE	Industrial Emissions Licence
IE	Intestinal enterococci
IED	Industrial Emissions Directive
IEMA	Institute of Environmental Management
IGI	Institute of Geologists Ireland
Interactive Effects	Likely significant effects arising from the interaction of different environmental factors that give rise to multiple effects on a single receptor
Intertidal	The area of shore that is exposed to the air at low tide and underwater at the high tide
IPPC	Integrated Pollution and Prevention Control

IROPI	Imperative Reasons for Overriding Public Interest
ISO	International Standards Organisation
$L_{Aeq\ T}$	The equivalent continuous sound level. It is an average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).
$L_{Ar\ T}$	The rated noise level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound.
Lg	Local sand and gravel aquifer
LI	Local Zones
Lidar	A remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light
m	metres
mOD	metres Above Ordnance Datum
MAND	Major Accidents and Natural disasters
MBR	Membrane Bioreactors
MEICA	Mechanical, Electrical, Instrumentation, Controls and Automation
MHWS	Mean High Water Springs – The highest level that spring tides reach on the average over a period of time
Mitigation	This is defined as measures which avoid or reduce environmental effects which are not included in the design of the proposed development or otherwise included 'up front' in the scheme description (such as the CoCP)
MMO	Marine Management Observer
Mt	Million tonnes
NDP	National Development Plan
NHA	National Heritage Area – An area considered by the NPWS important for the habitats present or which holds species of plants and animals whose habitat needs protection
Ni	Nickel
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement
NO_2	Nitrogen Dioxide
NTS	Non-technical summary
NPWS	National Parks and Wildlife Service
NPF	National Planning Framework
NRA	National Roads Authority
NSAI	National Standards Authority of Ireland

NSS	National Soil Survey
NVMP	Noise and Vibration Management Plan
NWSMP	National Wastewater Sludge Management Plan
OCU	Odour Control Unit
OD	Ordnance Datum
OPW	Office of Public Works
OHSAS	Occupational Health and Safety Assessment Series
OHSS	Occupational Hygiene and Safety Series
OS	Ordnance Survey
PCBs	Polychlorinated biphenyls
PCU	Passenger car units – One car is considered as a single passenger car unit (1 PCU), a motorcycle is considered as half a car unit (0.5 PCU). Buses and trucks (due to their large size) is considered equivalent to 3 cars (3 PCUs).
PE	Population Equivalent
PFRA	Preliminary Flood Risk Assessment
PID	Photo-ionisation detector
Pier	A column supporting the superstructure of a bridge
Planning boundary	The boundary for planning purposes of the project in question, i.e. the red line boundary as shown in Figure 1.1
PM	Particulate Matter
pNHA	Proposed Natural Heritage Area – An area identified by the NPWS on a non-statutory basis as sites of significance for wildlife and habitats
PO4	Orthophosphate
PPV	Peak particle velocity
Proposed development	The proposed Wastewater Treatment Plant and associated infrastructure including the interceptor sewer network, marine outfalls, upgrade to the revetment, Alps combined sewer overflow and stormwater storage tank.
Proposed Arklow Flood Relief Scheme	It is understood that Wicklow County Council funded by The Office of Public Works intends to undertake engineering works along the Avoca River to mitigate the risk of flooding in the Arklow and Ferrybank area in County Wicklow.
PSA	Preliminary Site Assessment
PSES	Public Sector Energy Efficiency Strategy
PV	Photovoltaics
RBC	Rotating Biological Contractors
RBMP	River Basin Management Plan
RDAS	Refurbishment / Demolition Asbestos Survey

Receptor	Something that could be adversely affected by the proposed development, such as people, an ecological system, property, water body or social infrastructure.
Rip-rap	Rock pieces 10-30 cm diameter used for scour protection of in-river works
RMP	Records of Monuments and Places
RPS	Records of Protected Structures
RQD	Rock Quality Description
RSES	Regional Assembly Spatial and Economic Strategy
SAC	Special Areas of Conservation - (including candidate SACs) protected under the provisions of the Habitats Directive
SBR	Sequencing Batch Reactor
Scour	Erosion of the riverbed due to water flows
SEA	Strategic Environmental Assessment
SI	Site investigation
SID	Strategic Infrastructure Development – Classified as such under the Seventh Schedule of the Planning and Development Act 2000, as amended including by the Planning and Development (Strategic Infrastructure) Act 2006.
Site	The entire area within the planning boundary for the proposed development
SMR	Sites and Monuments Record
Spring tide	The exceptionally high and low tides that occur at the time of the new moon or full moon when the sun, moon and earth are approximately aligned
SPA	Special Protection Area - (including proposed SPAs) protected under the provisions of the Birds Directive
SWO	Stormwater overflow – Relief valves within the network that allow excess combined storm water to be released to the storm water network, or directly to receiving waters (including rivers, lakes, estuarine or coastal waters).
T	Tonnes
TA	Total ammonia
TBM	Tunnel Boring Machine
TD	Téachta Dála – A TD is a member of Dáil Éireann, the lower house of the Oireachtas. It is the equivalent of terms such as ‘Member of Parliament’ or ‘Member of Congress’ used in other countries.
TDS	Total Dissolved Solids
TII	Transport Infrastructure Ireland
TSS	Total Suspended Solids

UMASW	Underwater Multichannel Analysis of Surface Waters
UPS	Uninterruptable power supply
UWWT Directive	Urban Wastewater Treatment Directive - Council Directive 91/271/EEC concerning urban waste-water treatment
WFD	Water Framework Directive – Council Directive 2000/60/EC establishing a framework for Community action in the field of water policy
WHO	World Health Organisation
WWDA	Wastewater Discharge Authorisation – Application made to and authorisation received from the EPA to discharge to aquatic environment as defined under Regulation 5 of the Waste Water Discharge Regulations 2007 (i.e. for an agglomeration with a population equivalent of more than 10,000 in the case of the proposed development)
WwTP	The proposed wastewater treatment plant that would be located at the Old Wallboard site, Ferrybank
WwTP site	The Old Wallboard site at Ferrybank where the proposed development would be constructed
WZ	Water-front Zone – Arklow's Waterfront' comprises the port, marinas, harbour, quays, north and south beaches and adjoining lands. The 'Waterfront Zone' is made of two district areas north and south of the river that have seen different development pressures and levels of activity over the year, but both sharing the common characteristics of water frontage onto the river and/or the sea and the presence of industrial lands / buildings, a large proportion of which is currently underutilised and vacant.

1 Introduction

1.1 Introduction

Irish Water intends to develop the Arklow Wastewater Treatment Plant Project (refer to **Figure 1.1 in Volume 3**), hereafter referred to as the proposed development.

The proposed development will comprise a new Wastewater Treatment Plant (WwTP), associated infrastructure including the interceptor sewer network and marine outfalls as well as an upgrade to the existing coastal revetment. There are currently no wastewater treatment facilities in Arklow town. As a result, untreated wastewater is being discharged directly into the Avoca River. To rectify this problem and to facilitate future development in the town, which is currently constrained by the lack of adequate wastewater treatment, the proposed development is being advanced by Irish Water.

The proposed development exceeds the thresholds specified in legislation for which an Environmental Impact Assessment (EIA) is required. This EIA Report (EIAR) has therefore been prepared in accordance with Article 5 of Council Directive 2011/92/EU as amended by Directive 2014/52/EU on the assessment of effects of certain public and private projects on the environment ('The EIA Directive').

1.2 Overview of the Proposed Development

The proposed development will comprise of the following elements:

- A new WwTP of 36,000 population equivalent (PE) and associated infrastructure for the WwTP including an inlet pumping station, a storm water storage tank, treatment, sludge thickening and dewatering facilities, a pump sump and tank to discharge excess stormwater flows as well as site administration facilities and associated landscaping (all located at the Old Wallboard site at Ferrybank);
- Interceptor sewers along River Walk, North Quay, South Quay and under the Avoca River (including associated manholes and vent stacks) that will tie in with the existing waste water collection network and bring the untreated wastewater to the WwTP;
- A stormwater overflow (SWO) and stormwater storage tank to the west of River Walk on a vacant site referred to as 'the Alps'[1];
- A SWO) to discharge excess stormwater flows to the Irish Sea;

[1] Note -The Alps refer to the Alps Opportunity Site as defined in the Arklow and Environs Local Area Plan 2018 – 2024. Aspects of the proposed development, i.e. the SWO and stormwater storage tank are within this site.

- A long sea outfall pipe (approximately 955m in length) to discharge the treated wastewater effluent to the Irish Sea;
- An upgrade to the existing revetment on the coastal side of the Old Wallboard site at Ferrybank; and
- All associated and ancillary development works comprising or relating to permanent and temporary construction and excavation, abandonment of short sections of existing sewers (and infilling with concrete), site boundaries and landscape reinstatement works as well as all ancillary connections to electricity, telecommunications and water supply networks and site drainage.

The proposed development is likely to be procured by means of a Design and Build type contract, with the contractor responsible for the detailed design and construction. A specimen design has been prepared for the purposes of the EIAR, which allows the reasonable worst case to be assessed.

Further information on the proposed development is included in **Chapters 4 and 5** of this report. All aspects of the proposed development will be provided within the planning boundary as illustrated in **Figure 1.1 in Volume 3**.

1.3 Overview of the Planning Process

The Planning and Development Act 2000, as amended, provides the statutory framework in Ireland for planning consents and the control of development. The Planning and Development Act 2000, as amended (including by the Planning and Development (Strategic Infrastructure) Act 2006) categorises development which is of strategic economic or social importance (i.e. 'Strategic Infrastructure Development') under its Seventh Schedule. The Seventh Schedule of the Planning and Development Act 2000, as amended, includes the following class of development, under the heading 'Environmental Infrastructure'.

"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".

For development coming under the Seventh Schedule (including the proposed development), An Bord Pleanála must consider whether the development meets the criteria listed in Section 37A(2) of the Planning and Development Act, 2000, as amended, and must determine, following consultations under Section 37(B) of the said Act, whether or not the proposed development is deemed to be Strategic Infrastructure Development (SID).

It was determined by An Bord Pleanála on 23 May 2018 that the proposed development is considered 'Strategic Infrastructure Development' in accordance with Section 37 of the Planning and Development Act 2000, as amended. Section 37E(1) of the said Act states in this regard:

"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."

Consequently, the consent application for the proposed development will be made to An Bord Pleanála, under Section 37E of the Planning and Development Act, 2000, as amended and will be accompanied by an Environmental Impact Assessment Report.

A number of other relevant documents and licence applications, including a Natura Impact Statement (which includes the Report for Screening for Appropriate Assessment in a single report), Compulsory Purchase Order (CPO) application, application(s) for consent under the Foreshore Act, 1933 to 2014 as amended, an application for a Wastewater Discharge Authorisation (WWDA) and bat derogation license have also been prepared as described in detail in **Section 4.5 of Chapter 4**.

1.4 Approach to the EIA

1.4.1 Definition of EIA

EIA supports the decision-making process as it is integrated into consenting processes for new development projects. This helps to ensure that consent decisions are made in the knowledge of the environmental consequences of the project. Article 1(2)(g) of the 2014 EIA Directive states that:

"environmental impact assessment" means a process consisting of:

(i) the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);

(ii) the carrying out of consultations as referred to in Article 6 and, where relevant, Article 7;

(iii) 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;

(iv) the reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and

(v) the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a."

For the purpose of this EIAR, Irish Water is the 'developer' of the proposed development and An Bord Pleanála is the 'competent authority' responsible for undertaking the EIA and integrating its reasoned conclusion in this regard into the consent decision for the proposed development.

1.4.2 Legislative Context

1.4.2.1 Statutory Requirement for EIA

A European Directive for EIA has been in force since 1985 since the adoption of Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

The EIA Directive of 1985 has been amended three times by Council Directives 97/11/EC, 2003/35/EC and 2009/31/EC. It was ultimately codified and repealed by Council Directive 2011/92/EU on 13 December 2011. This Directive was further amended in 2014 by Council Directive 2014/52/EU which sets out the current requirements for member states on the assessment of the effects of certain public and private projects on the environment.

The EIA Directive, requires the competent authority to consider and take account of the EIAR for certain public and private projects that are likely to have significant effects on the environment as part of the consent decision making process. In Ireland, the requirements for EIA in relation to planning consents are specified in Part X of the Planning and Development Act, 2000, as amended and in Part 10 of the Planning and Development Regulations, 2001, as amended.

The proposed development requires an EIA, under the provisions of the Planning and Development Act, 2000, as amended (as outlined in **Sections 1.1 and 1.3**) and this EIA will be undertaken by the competent authority for the planning consent (An Bord Pleanála).

This EIAR has adhered to the requirements of the EIA Directive and transposing European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (SI No. 296 of 2018) which came into force on 1 September 2018 as well as associated guidance as described in **Section 1.4.3.**

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 transpose the requirements of Directive 2014/52/EU, amending previous Directive 2011/52/EU, on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) into planning law with effect from 1 September 2018. Where reference is made to the EIA Directive throughout this EIAR, it should be understood that the transposing European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 also apply.

Notwithstanding, regard has also been had to the provisions of the Planning and Development Act 2000 (as amended), and the Planning and Development Regulations 2001 (as amended) as they apply now.

This EIAR therefore fully complies with all European law and EIA Directive requirements in respect of EIARs and also all Irish law and requirements under the Planning Act and Planning Regulations in respect of Environmental Impact Statements (EISs).

Throughout this document, where reference is made to EIS, it should also be understood to mean EIAR. Likewise, where reference is made to EIAR, it should be understood to mean EIS.

1.4.2.2 Other Relevant Legislation

Water Framework Directive

Council Directive 2000/60/EC (the Water Framework Directive [WFD]) on establishing a framework for community action in the field of water policy was adopted by all member states in October 2000. The WFD is the legislative framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife and habitats across Europe.

The proposed development meets the objectives of the WFD as it will eliminate in so far as possible, the discharge of untreated wastewater to the Avoca River, therefore protecting the water environment and enhancing water quality in the Avoca River.

Urban Wastewater Treatment Directive

Council Directive 91/271/EEC (UWWT Directive) concerning urban waste water treatment was adopted in May 1997 by all member states. The UWWT Directive is the legislative framework to protect the water environment from the adverse effects of discharges of urban waste water and from certain industries in urban agglomerations.

Article 3(1) of the UWWT Directive identifies the need for urban agglomerations to be provided with collecting systems for wastewater that satisfy those requirements outlined in Annex 1(A). Further, Article 4(1) provides that:

"Member States shall ensure that urban wastewater entering collecting systems shall before discharge be subject to secondary treatment or an equivalent treatment."

Commission Decision 2014/413/EU (which replaces Decision 93/481/EEC) defines the information that member states should provide (to the European Commission) when reporting on the state of implementation of the UWWT Directive. Article 17 of the UWWT Directive aims at collecting information on planning processes for the implementation of the UWWT Directive, beyond the information on the status of compliance for agglomerations and treatment plants.

The proposed development aligns with the objectives of the UWWT Directive as it will provide appropriately designed infrastructure that prevents the discharge of untreated wastewater to the Avoca River, thereby protecting the water environment in this urban location and ensuring compliance with the objectives of the UWWT Directive.

Habitats and Birds Directives

EU member states are required to establish a network of Natura 2000 sites under the obligations of Council Directive 92/43/EEC (Habitats Directive) and Council Directive 79/409/EEC (Birds Directive), as amended and codified in Council Directive 2009/147/EC. The Natura 2000 network comprises designated sites selected to protect important biodiversity including rare and threatened habitats and species including:

- Special Areas of Conservation (SACs, including candidate SACs) protected under the provisions of the Habitats Directive; and
- Special Protection Areas (SPAs, including proposed SPAs) protected under the provisions of the Birds Directive.

The Habitat and Birds Directives require that the likely significant effects of any plan or project, alone, or in combination with, other plans or projects, on the Natura 2000 site network (i.e. European designated sites), should be assessed before any decision is made to allow that plan or project to proceed. This process is known as Appropriate Assessment (AA), which starts with Stage 1 AA Screening and if likely significant effects cannot be ruled out, must progress to Stage 2 AA (i.e. preparation of a Natura Impact Statement).

There are a number of steps and tests in place that should be undertaken sequentially and documented by competent authorities in order to make decisions on the approval or refusal of a plan or project that may impact on European designated sites). Part XAB of the Planning Acts, which transposes the Birds and Habitats Directive requires the following to be undertaken:

- Stage 1 – Screening for Appropriate Assessment: To assess, in view of best scientific knowledge, if a development, individually or in combination with another plan or project is likely to have a significant effect on any European designated site.
- Stage 2 – Appropriate Assessment: This is required if it cannot be excluded, on the basis of objective information, that the development, individually or in combination with other plans or projects, is likely to have a significant effect on a European designated site. The appropriate assessment must include a final determination by the competent authority as to whether or not a proposed development would adversely affect the integrity of a European designated site. In order to reach a final determination, the consenting authority must undertake examination, analysis and evaluation, followed by findings, conclusions and a final determination. The appropriate assessment must contain complete, precise and definitive findings and conclusions, and may not have lacunae or gaps.
- Stage 3 – Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European designated sites.

- Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain: An assessment where no alternative solutions exist and where adverse impacts remain – an assessment of compensatory measures where, in light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

A Natura Impact Statement (NIS) including the information for Screening for Appropriate Assessment (AA) has been prepared in a single report to accompany the SID application to An Bord Pleanála. This report contains the necessary information required for the competent authority to undertake the AA of the proposed development. The NIS concluded that, in the opinion of the lead ecologist (Eleanor Mayes) on the basis of objective information, the proposed development, individually or in combination with other plans or projects, will not have a significant effect on any European sites.

It is considered that further stages of AA are not necessary for the proposed development, however the competent authority, An Bord Pleanála, will make the final determination in this regard.

1.4.3 Guidance

This EIAR has been prepared with due regard to the following overarching guidance on EIA:

- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;
- Department of the Environment, Community and Local Government (2013) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);
- Department of the Environment, Heritage and Local Government (2003) Environmental Effect Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development;
- Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems; and
- Department of Housing, Planning, Community and Local Government (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): Advice on the Administrative Provisions in Advance of Transposition;

- Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment; and
- Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017).

Additional topic-specific guidance used to undertake assessments is identified in **Chapters 7 - 19** as appropriate.

1.4.4 Structure of the EIAR

This EIAR has been prepared in four volumes as follows:

- Volume 1 provides the non-technical summary. This summarises the findings of the EIAR in a clear, accessible format that uses non-technical language and supporting graphics. The non-technical summary describes the proposed development, existing environment, effects and mitigation measures and relevant aspects of the EIAR in a manner that can be easily understood by the general public;
- Volume 2 encompasses the main EIAR including introductory chapters in addition to 'assessment' chapters for each environmental aspect in accordance with Article IV of the EIA Directive. The front end chapters (**Chapters 1 – 6**) provide the relevant project context whilst the assessment chapters (**Chapters 7 -19**) provide a description of the relevant environmental aspects and likely significant effects with summary chapters provided thereafter (**Chapters 20 and 21)**;
- Volume 3 includes the figures to support Volume 2; and
- Volume 4 provides the technical appendices that support and are cross-referenced with Volume 2. This may include other relevant drawings, modelling outputs, background reports and/or supporting documents.

1.4.5 Project Team

This section provides an overview of the project team that has been appointed by Irish Water and has contributed to design development of the proposed development to date as well as the preparation of the SID consent application.

1.4.5.1 Design Team

The design has been developed on behalf of Irish Water by a multi-disciplinary design team led by Arup (lead consultants) and their sub-consultants Byrne Looby & Partners (design engineers) and Clancy Moore Architects.

1.4.5.2 EIAR Team

This EIAR has been prepared on behalf of Irish Water by a multi-disciplinary consultancy team of competent experts led by Arup with input from specialist sub-consultants.

Arup has been awarded an EIA Quality Mark by the Institute of Environmental Management and Assessment in recognition of its excellence in EIA activities. Further, all technical leads are deemed to be qualified and competent experts in their fields in accordance with Article 5(3) of the EIA Directive, given their academic qualifications, professional affiliations and professional experience on other EIAs for major infrastructure projects. Refer to **Appendix 1.1** for further detail on the competent experts that have prepared this EIAR.

1.5 Consultation undertaken

1.5.1 Overview

Extensive consultation has been undertaken with a range of stakeholders during the development of the EIAR and statutory consent application in order to:

- Provide information on the proposed development;
- Ascertain and understand the views of stakeholders; and
- Seek input from stakeholders on the design, construction and assessment aspects of the proposed development.

It should be noted that this section describes project-wide consultation that has been undertaken. Where appropriate, **Chapters 7 – 19** identify specific consultation that has been undertaken to support individual assessments and assessment chapters.

1.5.2 Statutory Consultation

1.5.2.1 Pre-Application Consultation with An Bord Pleanála

Extensive consultation has been undertaken with An Bord Pleanála (the consenting authority) as part of the formal pre-application consultation process for the proposed development.

Irish Water submitted a letter to An Bord Pleanála on 24 July 2015 requesting to enter into pre-application consultation to determine if the proposed development is ‘Strategic Infrastructure Development’ in accordance with the Seventh Schedule of the Planning and Development Act, 2000, as amended. An Bord Pleanála was also required, as part of the pre-application consultation process, to give advice on procedural matters involved in making an application and to advise on matters relating to proper planning and sustainable development or the environment, which may have a bearing on its determination.

An Bord Pleanála was also able to engage with and/or ask Irish Water to engage with relevant persons or organisations which may have information in relation to the proposed development.

Seven pre-application consultation meetings were subsequently held with An Bord Pleanála on the following dates:

- 27 August 2015;
- 30 November 2015;
- 11 February 2016;
- 6 May 2016;
- 9 November 2016;
- 28 September 2017; and
- 6 March 2018.

The records of each of these meetings are available on the An Bord Pleanála website[2]. Generally, these meetings enabled the design team to discuss and refine aspects during the iterative design development process, consult on the planning framework and review matters raised during the public consultation process.

Following these meetings, on 23 May 2018 An Bord Pleanála confirmed[3] that the proposed development is 'Strategic Infrastructure Development' in accordance with the Seventh Schedule of the Planning and Development Act, 2000, as amended.

1.5.3 Non-Statutory Consultation

1.5.3.1 Public Consultation

Three periods of non-statutory public consultation were undertaken by Irish Water to engage with relevant stakeholders in relation to the proposed development. These public consultation periods occurred on the following dates:

- 15 Oct 2014 – 12 Dec 2014;
- 15 May 2015 – 10 July 2015; and
- 11 Oct 2017 – 15 Nov 2017.

The purpose was to invite feedback from statutory bodies, interested parties and the general public on the proposed development. A suite of material providing up-to-date information on the proposed development was created for each consultation period and made available on the project website throughout the consultation period and thereafter.

[2] An Bord Pleanála webpage (Case PC0202): Available from http://www.pleanála.ie/casenum/PC0202.htm [Accessed 21 June 2018]
[3] An Bord Pleanála (2018) Board Direction: Available from: http://www.pleanála.ie/documents/directions/PC0/SPC0202.pdf [Accessed 23 June 2018]

Additionally, drop-in information events were held in Arklow Town during each consultation period and press releases were also issued through the local media in order to raise awareness of the consultation process.

Summary reports were prepared following each consultation period and were published by Irish Water[4]. Throughout the public consultation process, the project team aimed to ensure that all engagement with stakeholders:

- Was open and transparent;
- Demonstrated the current level of understanding on the proposed development;
- Ensured the stakeholders were made aware of the issues that were open for consultation during this phase (in accordance with the relevant feedback topics); and
- Detailed how public participation would be facilitated and how stakeholder feedback would be managed and utilised during the design development.

The first period of non-statutory public consultation (October – December 2014) sought public views on the process and constraints used in identifying potential locations for the WwTP, interceptor sewers and outfalls. This period of public consultation provided the opportunity for members of the public to participate and share their knowledge of the area and local information with the project team. The 130 submissions received helped refine a number of emerging preferred sites for the WwTP as described in detail in **Section 3.3.2 of Chapter 3**.

Four key questions were posed in respect of the proposed development as detailed below, with the responses generally positive:

1. What do you think of the process and constraints used in identifying the three potential locations?
2. What do you think of the three potential locations chosen?
3. What do you think should be considered in choosing the final location?
4. How would you like to be communicated with as the project progresses?

Some issues were raised, particularly the exclusion of the Shelton Abbey/IFI site and the exclusion of the potential for an outfall to the Avoca River. These issues were considered fully (Refer to **Chapter 3** for further detail) and this consultation phase resulted in a number of changes to the Phase 1 site selection as a result of submissions received.

The second period of non-statutory public consultation (May – July 2015) sought the public's view on the emerging preferred site for the WwTP, the interceptor sewer routes and the location of the marine outfall. This period of consultation allowed members of the public to provide further information on the emerging preferred site (at the Old Wallboard site at Ferrybank) and to raise any issues or comments on the preferred site.

[4] Irish Water webpage (Arklow: Public participation: Available from: https://www.water.ie/projects-plans/arklow-wwtp/environment-planning/ [Accessed 23 June 2018]

The 27 submissions received assisted the project team with the design development as described in detail in **Section 3.3.2 of Chapter 3**.

As with the Phase 1 consultation, the Phase 2 consultation posed a number of questions on which submissions were sought, as follows:

5. What are your views on the Emerging Preferred Site at Ferrybank (Old Wallboard Site), route pipeline and outfall location?
6. What are your views on the process for selecting the Emerging Preferred Site, route pipeline and outfall location?
7. Do you have any comments on the alternative sites, route pipeline and outfall locations?

Generally, the comments were relatively positive and illustrated the local interest and understanding of the public that the proposed development is urgently needed. There was general acceptance that the emerging preferred site was a suitable site for the WwTP, however some general concerns were raised, as follows:

- Close to residents and commercial businesses
- Proper screening would be required
- Care must be taken in the design so that the treatment plant does not make noise
- Property values/land values in the local community may be affected negatively having a WwTP in the vicinity
- Negative impact of site works during the construction phase of the development
- Daily impacts of the actual operating site associated with air, odour, noise and vibration
- Potential impact of a major incident at such a plant close to a residential area
- Impact on the quality of life of residents
- Landscape and visual impacts of a WwTP in the town
- Health and safety impacts with regards to airborne pollutants and contaminants

These concerns have been addressed in the design of the proposed development and are further dealt with in the relevant sections of the EIAR.

The third period of non-statutory public consultation (October – November 2017) sought feedback on the preferred design for the proposed development and responses to the Scoping Report as detailed in **Section 1.5.3.6**. The 41 submissions received ultimately fed into the iterative design development for the proposed development as described in detail in **Sections 3.3 – 3.7 of Chapter 3**.

During the third public consultation period, the project team asked stakeholders to provide feedback based on the following statements:

1. This new plant will change how the area looks. We are currently finalising the design of the plant; and
2. We are currently developing the Environmental Impact Assessment Report (EIAR).

A community update brochure was also prepared for this phase of non-statutory public consultation containing information about the proposed development. Copies of the brochure were made available in Wicklow County Council offices in Arklow town throughout the period and were made available at each drop-in information event. Copies of the brochure were also distributed to approximately 6,000 homes through an insert in the Wicklow Times. A copy of the brochure was also made available on the Irish Water website[5].

The majority of feedback received relates to the potential impact of the proposed development on the surrounding environment (Refer to Table 1.1). These issues have been addressed, as appropriate, in the development of the project design and in this EIAR where appropriate.

Table 1.1: Issues raised during the third phase of non-statutory public consultation

Key Aspects	
Air Quality, Odour and Climate	Raised as a primary concern by most stakeholders, particularly in relation to the potential for odours from the WwTP. This has been addressed in **Chapter 9**.
Aquatic Ecology and the Aquatic Environment	A number of stakeholders stated that there will be a positive impact on aquatic ecology and the fishing industry. Two stakeholders expressed concern that South Beach and other beaches in the area may become polluted due to marine outfall. This has been addressed in **Chapters 11 and 15**.
Community and Socio-Economic Impacts	The majority of stakeholders stated that the proposed development will benefit the local community in the long term and was 'much needed'. Suggestions were made on behalf of the Tidy Towns to provide opportunities to host local groups for educational events, which has been incorporated as described in **Section 4.4 of Chapter 4**. Some concerns were raised as to the impact of the works, particularly at construction stage, on the local community. These concerns are addressed in **Chapter 17.**
Construction	Construction related concerns primarily centred around construction timelines, disturbance to residents in terms of traffic, safety, noise and access. These are addressed in **Chapters 7 – 19**.
Consultation	The majority of stakeholders were happy with the consultation process and methods of communication. One stakeholder did state that the consultation process was 'ageist' as email was 'not a sufficient method of communication for the elderly.
Flooding and Storm Events	Concerns were raised by several stakeholders in relation to the likelihood and impact of large volumes of rainfall, storm events and flooding, in terms of the location of the WwTP, the flooding analysis/modelling undertaken and the potential for surcharge in the sewers and the likelihood or otherwise of the Flood Relief Scheme going ahead. These issues are addressed in **Chapter 15**.

[5] Irish Water (2017) Arklow WWTP webpage: Public Participation. Available from: https://www.water.ie/projects-plans/arklow-wwtp/public-participation/Arklow-Brochure_-Public-Consultation-Oct-2017_web.pdf [Accessed 28 June 2018]

Key Aspects	
Health and Safety	A number of stakeholders were concerned with health and safety throughout the construction and operation of the proposed development, with concern also raised with regard to the revetment and safety of residents during road works. This is addressed in **Chapters 17 and 19.**
Landscape and Visual Impact	Many residents understood the reason behind the proposed scale of the WwTP and were positive about the design and visual appearance. A number of stakeholders raised concerns that the WwTP may be visually obtrusive due to its proposed size. Further, suggestions were made on behalf of the Tidy Towns to provide landscaping with native planting, which has been incorporated as described in **Chapter 4**. There were also a number of submissions regarding the proposed landscaping of the site. These issues are further considered in **Chapter 13.**
Noise and Vibration	The potential for noise and vibration impacts during both construction and operation were raised by a number of stakeholders with respect to both the WwTP and the sewer network. These issues are addressed in **Chapter 10.**
Planning and Development	A number of submissions raised aspects of the planning process, including other developments planned in the vicinity and any impacts associated with this and the fact that the proposed development may support future development in the town.
Population and Human Health	Most submissions were positive with regard to population and human health aspects of the proposed development. The design of the proposed development has addressed these issues where appropriate, as detailed in **Chapter 17**.
Project Need and Benefits	The majority of stakeholders acknowledged the need for the proposed development, with a number stating it could be a very positive development for Arklow. A number of stakeholders were very positive about the proposed development overall, particularly in relation to its 'positive contribution to the urban realm' and that they can 'only see positives for Arklow from it'.
Proposed Development	Many stakeholders raised concerns regarding the size, design and capacity of the WwTP buildings, with concerns around the adequacy of treatment, the design life of materials, renewable energy potential and the boundary treatment. A number of stakeholders also raised issues regarding the location of the interceptor sewers (one suggesting that the sewers should be laid in the river). The design of the proposed development has addressed these issues where appropriate, as detailed in **Chapters 3 and 4**.
Outfall	Concerns were raised with regard to the marine outfall, particularly with regard to any potential impacts on water quality and beaches. The outfall design has taken these issues into account, as detailed in **Section 3.3.4 of Chapter 3 and Chapters 11 and 15**.
Recreation and Amenity	A number of stakeholders queried whether a public walkway or footpath could be provided through and around the site (particularly along the seafront) and whether public parking could be provided on site. **Section 3.5.2.3 of Chapter 3, Chapter 6 and Chapter 7** address these points.
Site Selection	While some stakeholders were positive about the site selected, others had queries and concerns about why the Old Wallboard site at Ferrybank was chosen and was it the most appropriate, as well as raising concerns about potential flooding on the site, the proximity of residential areas and whether all alternatives were considered. The site selection process is explained in detail in **Section 3.3.2 of Chapter 3**. A flood risk assessment has also been prepared to support **Chapter 15** and is included in **Appendix 15.4 and Appendix 15.6**.

Key Aspects	
Sludge Management	Some queries arose with regard to the management of sludge produced at the proposed development, particularly on the disposal route for this sludge and the associated traffic movements. These issues are addressed in **Section 4.6.2.1 of Chapter 4 and Chapter 7**.
Tourism and Local Business	Irish Water received submissions stating that the proposed development will have positive impacts on tourism through improved water quality in the Avoca River. A number of concerns were raised with regard to the potential impact of the proposed development on tourism and local businesses such as the sailing club, with one submission noting that the site may have been better utilised for tourism amenity. These issues are addressed in **Chapter 17**.
Traffic and Transportation	Increased traffic in the area was a concern for many stakeholders, including in particular, the Marina Village Road, North Quay/Aldi entrance, Marina Corner and South Quay. These concerns related primarily to the construction stage. These issues are addressed in **Chapter 7**.

1.5.3.2 Elected Members Engagement

Irish Water undertook non-statutory engagement with local TDs, Ministers, Councillors and elected representatives in the Arklow and wider Wicklow area throughout the design development. Project updates were issued to elected representatives throughout, with specific briefings provided to Elected Representatives on the following dates:

- 15 October 2014;
- 13 May 2015; and
- 17 October 2017.

Further, a meeting was held with Deputy John Brady TD on 29 May 2017 upon request, to provide an update on the proposed development.

1.5.3.3 Consultation Meetings with Other Interested Parties

Following on from the public consultation process outlined above, further meetings were requested by particular interested parties to discuss specific issues. The following meetings were held between members of the project team and individual parties during the design development to discuss these issues:

- Three meetings were held with the management of Marina Village apartments on 16 June 2016, 25 October 2016, 29 June 2017 as well as consultation as part of the open day on 26 October 2017 to discuss design development and provide an update on the proposed development.

1.5.3.4 Wicklow County Council

There was extensive consultation with Wicklow County Council as part of the overall consultation process outlined in **Section 1.5.3.1**.

Further, a number of specific meetings and discussions took place between members of the project team and Wicklow County Council to discuss specific issues during the design development. In particular, members of the design team met with Wicklow County Council Planning and Roads Departments to discuss the design development. These meetings led to high level agreements in relation to specific design elements including:

- Selection of routes for construction traffic and diversions around working areas during construction (Refer to **Section 5.7 of Chapter 5** for further information);
- Refinement of the massing and form of the WwTP buildings (Refer to **Section 3.5.1 of Chapter 3** for further information); and
- Refinement of the interceptor sewer network to accommodate local drainage and potential flood risk concerns (Refer to **Section 3.5.2 of Chapter 3** for further information).

1.5.3.5 Wicklow County Council and Office of Public Works

In addition to the above, meetings were held with Wicklow County Council and the Office of Public Works in relation to the proposed Arklow Flood Relief Scheme. As described in detail in **Section 2.6.7 of Chapter 2**, Wicklow County Council, funded by the Office of Public Works, proposes to develop a Flood Relief Scheme that will physically overlap with the proposed development (refer to **Section 2.6 of Chapter 2** and **Chapter 20** for further detail).

The proponents of both projects recognised at an early stage, the importance of liaising throughout the design development. Iterative consultation and numerous meetings occurred throughout 2016, 2017 and 2018 between the proponents and their design teams to optimise the design, minimise nuisance for local residents, consider any health and safety issues and where practicable, to maximise cost efficiencies associated with specific 'plug-in' elements to facilitate the proposed Arklow Flood Relief Scheme (such as installing sheet piling to construct the interceptor sewer that was designed to support the flood defence wall).

1.5.3.6 EIA Scoping Consultation

An informal EIA scoping exercise was undertaken and an EIA Scoping Report was prepared and circulated to relevant stakeholders in October 2017. The Scoping Report described the key elements of the proposed development and outlined the level of detail and information to be included in the EIAR.

The Scoping Report was published on the project website[6] as part of the third-round of non-statutory consultation during 11 October 2017 – 15 November 2017 and circulated to relevant stakeholders for their consideration.

[6] Irish Water (2017) Arklow Wastewater Treatment Project: EIA scoping Report. Available from: https://www.water.ie/projects-plans/arklow-wwtp/public-participation/Arklow-EIA-Scoping-Report-ISSUE_18.10.2017.pdf [Accessed 6 February 2018]

Feedback was sought from the following stakeholders to further inform the content and scope of the EIAR:

- Department of Housing, Planning and Local Government;
- Department of Communications, Climate Action and Environment;
- Department of Transport, Tourism and Sport;
- Department of Culture, Heritage and the Gaeltacht (including the Development Applications Unit, National Parks and Wildlife Service and the National Monuments Service);
- Department of Agriculture, Food and the Marine;
- Health and Safety Authority;
- Health and Safety Executive;
- Transport Infrastructure Ireland;
- National Transport Authority;
- Mid-East Regional Authority;
- Eastern and Midland Regional Assembly
- An Chomhairle Ealaíon (The Arts Council);
- Fáilte Ireland;
- An Taisce;
- The Heritage Council;
- Environmental Protection Agency;
- Inland Fisheries Ireland;
- Wicklow County Council;
- Office of Public Works;
- Arklow and District Chamber of Commerce; and
- Arklow Harbour Authority / Harbour Commissioners.

Submissions were received in response to the Scoping Report from a number of stakeholders. Points raised and associated action taken by the EIA team is provided in **Appendix 1.2**.

1.6 Difficulties Encountered During the Assessment

The primary difficulty encountered during the preparation of the EIA was associated with the Old Wallboard site at Ferrybank (i.e. the WWTP site). The buildings on the site are in a poor state of repair (including the asbestos cement cladding which envelops the main building). This limited access to the site, from a health and safety perspective, particularly during the Site Investigation (SI).

No other difficulties were encountered during the preparation of this EIAR. The difficulties which arose are not considered to have a material impact on the baseline data collection for this EIAR.

1.7 References

European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report.

An Bord Pleanála webpage (2018) *(Case PC0202):* Available from http://www.pleanála.ie/casenum/PC0202.htm [Accessed 21 June 2018]

An Bord Pleanála (2018) *Board Direction*: Available from: http://www.pleanála.ie/documents/directions/PC0/SPC0202.pdf [Accessed 23 June 2018]

Department of the Environment, Heritage and Local Government (2003) *Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development;*

Department of the Environment, Community and Local Government (2013) *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;*

Department of Housing, Planning, Community and Local Government (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): Advice on the Administrative Provisions in Advance of Transposition*.

Department of Housing, Planning, Community and Local Government (2017) *Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems*

Environmental Protection Agency (2017) *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);*

Irish Water webpage (2018) *Arklow: Public participation*: Available from: https://www.water.ie/projects-plans/arklow-wwtp/environment-planning/ [Accessed 23 June 2018]

Irish Water (2017) *Arklow Wastewater Treatment Project: EIA scoping Report.* Available from: https://www.water.ie/projects-plans/arklow-wwtp/public-participation/Arklow-EIA-Scoping-Report-ISSUE_18.10.2017.pdf [Accessed 6 February 2018]

2 Background

2.1 Introduction

This chapter provides a summary of the background to the proposed development and site. This includes a description of the proponent, history, objectives and need for the proposed development as well as an overview of the existing site layout and neighbouring land uses in the surrounding area.

2.2 Irish Water

Irish Water is the national water utility responsible for providing water and wastewater services throughout Ireland. Irish Water is a subsidiary of the Ervia Group (formerly Bord Gáis Éireann), which was formed as a company under the Water Services Act 2013 and incorporated under the Companies Acts.

Irish Water took responsibility for almost all functions for the delivery of water and wastewater assets and services that were previously managed by the 31 local authorities in January 2014. Irish Water is now responsible for the operation of all public water and wastewater services in Ireland including:

- Management of national water and wastewater assets;
- Maintenance of the water and wastewater system;
- Investment and planning;
- Managing capital projects; and
- Customer care and billing.

Irish Water is also responsible for the capital investment decisions and implementation of the capital programme delivery across the country. As outlined in its business plan, Irish Water's mission is:

"All of our customers should receive a safe and reliable supply of drinking water and have their wastewater collected and safely returned to the environment. We will protect the environment in all our activities and support Ireland's social and economic growth through appropriate investment in Water Services."

2.3 Need for the Proposed Development

2.3.1 Overview

Wastewater in Arklow town is currently collected by means of a mixture of separate, partially separate and combined sewers. The latter are generally the older sewers that date back to the 1930s and 1940s. The older sewers carry a mixture of wastewater and stormwater flows whilst the more modern sewers are separate (i.e. have different pipelines to carry the wastewater and stormwater flows).

The existing network discharges untreated wastewater from homes and businesses through 19 discrete outfalls to the Avoca River which runs directly through Arklow town.

As noted in **Section 1.4.2.2 of Chapter 1**, the practice of discharging untreated wastewater to the Avoca River is not compliant with obligations of the UWWT Directive. An infringement case has been brought to the European Court of Justice against the State over the discharge of untreated wastewater into rivers and the sea at various locations in Ireland and Arklow is one such location that is failing to meet the requirements of the UWWT Directive.

The proposed development is intended to resolve this problem by providing an effective wastewater collection network, treatment capacity and suitable outfalls that can provide for Arklow town now and into the future. The proposed development will comply with European and national legislation as well as planning policy by providing appropriate wastewater treatment facilities and supporting network for Arklow town.

Moreover, the proposed development will improve water quality in the Avoca River and bring benefits in terms of health, environmental integrity and facilitate economic and social development for Arklow town and its surrounds.

2.3.2 Protecting the Environment and Health

Wastewater treatment for Arklow is a requirement under both the UWWT Directive (as described in **Section 1.4.2.2 of Chapter 1**) and national legislation. The Urban Waste Water Treatment Regulations 2001 as amended, require relevant authorities to provide appropriate wastewater collection systems and treatment for agglomerations such as Arklow town.

The proposed development will ensure compliance with these statutory requirements and obligations. The proposed development will ensure that the water quality standards set down by regulatory bodies will be achieved, therefore safeguarding the quality of the aquatic environment.

The proposed development will bring benefits in terms of public health, integrity of the environment and improved water quality for Arklow town. Effective wastewater treatment will eliminate in so far as possible, the ongoing discharge of untreated wastewater directly into the Avoca River and thus mitigate the risk of polluting receiving waters. Cleaner water will enhance Arklow's amenity value and could act as a platform for social and economic development. The proposed development also includes the capacity for future population growth in the area as the design has been undertaken to accommodate forecasted population growth (as outlined in the relevant planning policy and described in detail in **Chapter 6**).

2.4 Objectives of the Proposed Development

The objectives of the proposed development are as follows:

- To stop the current practice of discharging untreated wastewater to the Avoca River;
- To provide a wastewater treatment facility that will comply with all relevant legislative requirements and will service the population of Arklow into the future; and
- To improve water quality in the Avoca River.

2.5 Planning History

2.5.1 Overview

A number of historical planning applications have been made for various design iterations and individual infrastructure elements to provide wastewater treatment for Arklow town and the surrounding area. Over time, the location and design of the proposed development has evolved, with most of the previous permissions no longer valid.

Section 2.5.2 briefly summarises the historical planning permissions and consents for wastewater treatment infrastructure in Arklow town.

2.5.2 History of the proposed Development

The need for wastewater treatment in Arklow town and environs has been well understood and documented. In 1993 PH Mc Carthy and Partners[1] completed a study to identify drainage infrastructure requirements. Design work was subsequently undertaken and the initial application for wastewater treatment in Arklow town was submitted in the same year. The initial consent was granted by Wicklow County Council (Reference 93/280) and confirmed, on appeal, by An Bord Pleanála (Reference PL27.092119) to Arklow Urban District Council in March 1994.

A further application was made by Arklow Urban District Council to Wicklow County Council in July 1999 (Reference 23/99), which was granted permission and this decision was subsequently upheld by An Bord Pleanála (Reference PL27.112569) in January 2005. Subsequently, this consent was the subject of judicial review through the High Court and Supreme Court with a ruling in July 2011 upholding the consent to progress this scheme.

When Wicklow County Council sought to progress with the consented development after the Supreme Court decision, further legal challenges were brought against the Compulsory Purchase Order.

[1] PH McCarthy and Partners (1993) The Arklow Main Drainage Supplementary Report

Irish Water assumed responsibility for bringing the water and wastewater services of the local authorities under one national service provider on 1 January 2014, during which time the legal challenges against the Compulsory Purchase Order were ongoing.

Irish Water reviewed the status of the extant consent and the ongoing challenges to it and concluded that it would not be feasible to advance to construction before the planning permission expired in April 2015.

Irish Water therefore made the decision to commence a new planning process, the first step being to carry out a new site selection process in 2014. As outlined in **Section 3.3.2 of Chapter 3**, a number of locations were considered and the site selection process identified Ferrybank (i.e. the site of the proposed development) as a suitable site. Further detail on the subsequent design development is provided in **Chapters 3 and 4**.

Other planning consents and approvals of relevance to the proposed development are briefly outlined below:

- In October 2003, a Part 8 application was approved for the North Quay Pumping Station under Part 8 of the Planning and Development Regulations, 2001, as amended. This infrastructure is no longer required as the proposed development supersedes the need for this pumping station;
- A planning application for a 2.91ha mixed use development, referred to locally as 'the Alps' was made in 2008 (Reference 08/610058) to Arklow Town Council. On 13 August 2010, An Bord Pleanála granted consent on appeal (Reference PL33.231008). It is assumed that this permission has expired, however there is precedent for such a development in the future, subject to appropriate approvals.
- Separately, on 3 December 2013 Arklow Town Council approved an upgrade under Part 8 of the Planning and Development Regulations, as amended (Reference 13/610038) for infrastructure including the upgrade of the existing sewer, provision of a combined sewer overflow (CSO) and associated site works (including additional pipework, an underground storage tank and emergency overflow). This scheme is no longer required as the proposed development supersedes the consented infrastructure and relevant elements have been incorporated into the proposed development (Refer to **Section 4.3.2 of Chapter 4**).

2.6 Site and Surrounds

2.6.1 Overview

The site of the proposed development, as illustrated on the scheme drawings in **Volume 3** (**Drawing No.'s 247825-00-C-IS-004** and **247825-00-C-IS-005**) includes the footprint of terrestrial, riverine and marine lands within the planning boundary. The planning boundary of the proposed development is located in Arklow town, entirely within the administrative boundary of Wicklow County Council.

Arklow town is a key hub of economic activity, shopping, education, recreation and administration for south-east Wicklow therefore the site of the proposed development is predominantly urban in character.

The proposed development is concentrated around the waterfront area of Arklow, with the proposed interceptor sewers located along the northern and southern banks of the river channel and the WwTP located at the Old Wallboard site at Ferrybank. The WwTP site is bounded to the east by the Irish Sea and to the south by the Avoca River. The WwTP site is therefore in a prominent location on the waterfront at the mouth of the estuary that currently accommodates a vacant site with disused buildings.

2.6.2 Wicklow County Council Vision

The Arklow and Environs Local Area Plan 2018-2024 (Arklow LAP) and the Wicklow County Development Plan 2016 - 2022 (County Development Plan) set out a vision for Arklow town that would see significant growth in the town in the coming years as discussed in detail in **Chapter 6**. Specifically, the land zoned as 'Waterfront', which comprises the port, marinas, harbour, quays and adjoining land (including the WwTP site at the Old Wallboard site at Ferrybank) has been identified in the Arklow LAP as a:

"*key location to provide significant residential development while also facilitating the existing port activities and further tourism, community, recreational and maritime uses*."

In particular, the vision for the Waterfront zone outlined in the Arklow LAP is to:

"*promote and facilitate the in-depth development of the waterfront zone, for mixed-use development with a high concentration of residential use subject to a high standard of design, layout and finish'*. Further, the vision is for the area to '*continue to sustainably develop as an active port alongside the development of its recreational potential and to encourage the redevelopment of the waterfront as a residential and mixed use extension of the existing town. It is important for the town centre to connect with the waterfront to exploit each other's assets without compromising their historical and environmental amenity*."

Further detail with regard to relevant planning policy and land use zoning is provided in **Chapter 6.**

2.6.3 Site Layout

The most upstream, south-western segment of the site, within the Alps, is vacant land that has been subject to a number of previous planning applications as outlined in **Section 2.5.2**. The area is mostly grassed with some shrubs, trees and rock outcrops adjoining the steep verges (as illustrated in Figure 2.1). There are a number of existing trees throughout this segment of the site and to the north, there is a promenade that is regularly used by pedestrians walking along the riverfront (Refer to Figure 2.2).

Figure 2.1: Alps segment of the site (viewed from River Walk)

Figure 2.2: Riverfront promenade adjoining the Alps segment of the site (viewed from the river channel)

The River Walk segment of the site comprises existing footpaths and roads (including on street parking and adjoining open space) that traverse the south bank of the Avoca River upstream of Arklow Bridge as illustrated in Figure 2.3. This area is regularly used by the local community as it includes car parking, a number of cafes and a riverfront walkway as well as connecting roads that link with Main Street which lies to the south. There are a number of existing trees throughout this segment of the site.

Figure 2.3: River Walk (viewed from the river channel)

Arklow Bridge lies between River Walk and South Quay and crosses the Avoca River to join North Quay to the north of the river channel as illustrated in Figure 2.4. Arklow Bridge is on the National Inventory of Architectural Heritage, with the baseline conditions associated with Arklow Bridge described in detail in **Section 12.3 of Chapter 12**.

Figure 2.4: Arklow Bridge (viewed from downstream on North Quay)

The South Quay segment of the site comprises a narrow road and in some areas has a footpath that traverses the south bank of the Avoca River downstream of Arklow Bridge as illustrated in Figure 2.5. The road is particularly narrow just downstream of Arklow Bridge, while there is open space and car parking in front of the properties further downstream. There are a number of existing trees throughout this segment of the site.

Residential development along South Quay fronts onto the roadway and Avoca River (Refer to Figure 2.5). There is an area of green space separating the houses from the riverside downstream on South Quay (between South Green and Anchor Mews). Further downstream, directly opposite the WwTP site (i.e. to the west of the Harbour Road – South Quay junction), there is industrial development that loops around Arklow Harbour which is located at the downstream end of South Quay.

Figure 2.5: South Quay (viewed from the river channel)

The segment of the site adjacent to South Quay at Arklow Harbour within the planning boundary is currently a vacant, industrial yard that contains some empty buildings, containers and storage areas. The site has been used as a construction compound for other development proposals in Arklow town in recent years and there is a track that connects directly to the boat ramp in Arklow Harbour.

The Avoca River segment of the site (as illustrated in Figure 2.6) incorporates the area around the three southernmost piers of Arklow Bridge (between River Walk and South Quay) in addition to the footprint of the river crossing between South Quay and North Quay. The baseline conditions in the Avoca River are described in detail in **Section 11.3 of Chapter 11** and **Section 15.3 of Chapter 15**. It should be noted that the riverine environment upstream of Arklow Bridge is contained within the boundary of the proposed Natural Heritage Area (pNHA) of Arklow Town Marsh.

Figure 2.6: Avoca River through Arklow town and the Old Wallboard site at Ferrybank (viewed from the harbour mouth)

The North Quay segment of the site typically comprises existing footpaths and roads. This segment of the site also extends slightly upstream of the Arklow Bridge from the demolished property at 1 Ferrybank into the Arklow Town Marsh pNHA. North Quay is subject to high pedestrian and vehicular traffic accessing the Bridgewater Shopping Centre, Aldi and local commercial properties including the Blessings Clinic, Arklow Sailing Club and some local businesses (as illustrated in Figure 2.7). The eastern end of North Quay and Mill Road is less well used by the local community as there are few industrial/commercial properties and no residential properties to the east of Marina Village.

Figure 2.7: Bridgewater Shopping Centre and Aldi on North Quay (viewed from the Arklow Bridge)

The Old Wallboard site at Ferrybank (i.e. WwTP site) is located near the mouth of the Avoca River and is bounded to the north-east by the Irish Sea as illustrated in Figure 2.8. The WwTP site is located within the waterfront, on the northern bank of the Avoca River, adjacent to the Irish Sea and at the eastern end of the town. The WwTP site is bounded by North Quay on its southern extent.

The WwTP site contains an abandoned gypsum factory, formally Arklow Gypsum Ltd. which closed down in the early 1980s. The WwTP site is currently derelict comprising a number of disused buildings as illustrated in Figure 2.8.

At present, access to the immediate vicinity of the WwTP site for pedestrians is poor, with little connectivity between the coast and the river, or indeed from the public walkways along the coast down to the marina or river. The WwTP site itself is secured and public access is restricted.

Figure 2.8: Old Wallboard site at Ferrybank (viewed from the harbour mouth)

Along the coastal (north-eastern) boundary of the WwTP site, there is an existing revetment, which extends further north-east beyond the boundary of the WwTP site, as illustrated in Figure 2.9. The extent of the revetment along the WwTP site is proposed to be upgraded. The existing revetment was originally constructed in 1972 and improvements were undertaken in 1990. The crest of the revetment is approximately 5.5mOD and displacement of the rock armour stones indicate that the revetment is coming to the end of its design life.

The aquatic environment is described in further detail in **Section 11.3 of Chapter 11** and **Section 15.3 of Chapter 15**.

Figure 2.9: Irish Sea and existing revetment adjoining the Old Wallboard site (viewed from the existing revetment to the west of the site)

To the north-west of the WwTP site and the revetment, the area within the planning boundary incorporates green space adjacent to the running track, skate park and walkway between Seaview Avenue and Mill Road. This area is regularly used by the local community for recreation.

2.6.4 Neighbouring Land Uses

The Alps site is identified as an Opportunity Site in the Arklow LAP for potential redevelopment and as discussed in **Section 2.5.2**, where previous permission (now assumed expired given the lapse in time) was granted for a mixed use development. The Avoca River lies to the north, with a number of residential properties to the south-east on Parade Ground and Upper Main Street with the Dublin – Rosslare railway line and the remains of Arklow Castle present to the south-west.

The location of the proposed interceptor sewers along River Walk and South Quay are bounded by the Avoca River to the north and a number of residential and commercial properties to the south. There are also a number of roads that connect River Walk and South Quay with the wider road network in Arklow town. Arklow Harbour and the commercial properties located therein are located at the eastern end of South Quay.

The section of interceptor sewer to be laid within the Avoca River is bounded by River Walk and the Arklow Town Marsh pNHA (upstream of the Arklow Bridge) as well as South Quay and North Quay (downstream of the Arklow Bridge). To the south of the river crossing there are a number of residential properties whilst vacant or derelict land as well as local businesses are present to the north of the river crossing.

The section of the interceptor sewer on North Quay (upstream of Arklow Bridge) is bounded by the Arklow Town Marsh pNHA and there are a number of residential properties along the R772 in Ferrybank.

The section of the interceptor sewer on North Quay (downstream of Arklow Bridge) is bounded to the north-west by commercial properties including the Bridgewater Shopping Centre as well as a range of neighbouring commercial and residential properties including the Blessings Clinic, Arklow Sailing Club, the Marina Village residences whilst Arklow Shipping Limited and Arklow Marine Services are located on Mill Road.

This part of the town has a history of industrial development, with maritime development still thriving, as evidenced by the adjacent boat building premises and the marina. Further to the north-west, the Bridgewater Shopping Centre and the Marina Village residential development, have evolved the development type in this area, which is intended to evolve further to incorporate high quality, mixed use development, in line with the vision for the waterfront area outlined in the Arklow LAP.

The WwTP site adjoins a derelict industrial site to the south containing disused industrial tanks and buildings. Planning permission has previously been granted (Reference 05/610072) to demolish the existing derelict structures and develop an apartment block. There are other industrial properties along Mill Road including boat building/repairs at Arklow Marine Services and there is a long history of industrial activities in this part of Ferrybank.

To the north of the WwTP site, there is an existing walkway located on the seafront which extends alongside the existing revetment to the edge of the Ferrybank site and connects with the existing revetment that extends further north to Arklow North Beach.

Further information on the existing conditions in and around the site and more generally in Arklow town is provided in **Chapters 6 – 19**.

2.6.5 Sensitive Receptors

Sensitive receptors are those existing properties and local features that are particularly susceptible to change and environmental effects. Topic-specific sensitive receptors of relevance to each of the assessments are described in detail in **Chapters 6 – 19**, however an overview of sensitive receptors for the proposed development is provided in **Sections 2.6.5.1 - 2.6.5.5**.

2.6.5.1 Residential Receptors

Residential receptors comprise those properties that are owned and inhabited in Arklow town. The residential receptors of relevance to the proposed development include:

- Dwellings on Upper Main Street are 20m from the planning boundary (at its nearest point) at the Alps segment of the site;

- Dwellings along River Walk are within 10m of the planning boundary (at its nearest point) at this segment of the site;
- Dwellings along South Quay are within 10m of the planning boundary (at its nearest point) at this segment of the site;
- Dwellings on Ferrybank (to the north of the Arklow Bridge roundabout) are 15m from the planning boundary (at its nearest point) at this segment of the site;
- Dwelling on North Quay are within 10m of the planning boundary (at its nearest point) at this segment of the site; and
- Dwellings in Marina Village (on North Quay) are within 10m of the planning boundary (at its nearest point) at this segment of the site and approximately 140m from the WwTP site.

Further information on residential properties in the vicinity of the proposed development is provided in **Sections 8.3 of Chapter 8, 9.3 of Chapter 9, 10.3 of Chapter 10 and 17.3 of Chapter 17**.

2.6.5.2 Social Infrastructure

Social infrastructure comprises facilities that provide recreational, cultural, educational, healthcare and general infrastructure that support the local community. The social infrastructure receptors of relevance to the proposed development include:

- The running track to the east of the Bridgewater Shopping Centre within the planning boundary;
- Coral Leisure on Seaview Avenue;
- Blessings Clinic on North Quay adjacent to the planning boundary;
- Harbour Surgery on Harbour Road;
- Dr Ian Bothwell on Upper Main Street;
- Kavanagh Dental Clinic on Bridge Street;
- Arklow Physiotherapy Clinic to the north of Arklow Bridge roundabout on Ferrybank; and
- The Animal Health Clinic to the north of Arklow Bridge roundabout on Ferrybank.

Further information on baseline social infrastructure is provided in **Section 17.3 of Chapter 17**.

2.6.5.3 Ecological Receptors

Ecological receptors comprise those areas with statutory and non-statutory biodiversity designations that contain notable flora, fauna, habitats and/communities with intrinsic biodiversity values. The ecological receptors of relevance to the proposed development include:

- Arklow Town Marsh pNHA (which also extends into the Avoca River);
- Various areas of bat activity including the trees along River Walk, Arklow Bridge as it is being used as a roost site for bats;
- Atlantic Salmon, River Lamprey and the European Eel have been found to migrate through the Avoca River Estuary;
- Presence of listed marine mammals including Harbour Porpoise (Common Porpoise), Bottle-nosed Dolphin, Grey Seal and Harbour (Common) Seal;
- Evidence of Otter activity upstream of the planning boundary; and
- Kingfisher were recorded flying around the Avoca River indicating that they may be breeding in the local area.

It should be noted that the area has been highly modified by human activities and development and biodiversity has been impacted in aquatic and terrestrial environments. There are no European sites within 4km of the planning boundary.

Further information on the baseline biodiversity is provided in **Section 11.3 of Chapter 11**.

2.6.5.4 Water Receptors

Water receptors comprise those aquatic environments, including groundwater, surface and marine water bodies that may be particularly sensitive to the proposed development. The water receptors of relevance to the proposed development include:

- The Avoca Estuary is an at risk transitional water body of moderate status (as defined under the WFD);
- Large sections of Arklow town, including the majority of the site are identified as flood risk zones;
- Avoca River;
- Arklow Town Marsh;
- Irish Sea; and
- Underlying aquifer of local importance with relatively shallow water table.

Further information on the baseline water is available in **Section 14.3 of Chapter 14** (groundwater and hydrogeology) and **Section 15.3 of Chapter 15** (all other water elements).

2.6.5.5 Other Receptors

The geological conditions typically comprise made ground, alluvial deposits underlain by Ordovician Slate and Sandstones known as the Kilmacrae formation. Further information on the baseline land and soils is available in **Section 15.3 of Chapter 15**.

Some of Arklow town is considered to be an Area of Archaeological Potential and the Arklow Bridge is listed on the National Inventory of Architectural Heritage. Further information on the baseline archaeology and heritage is available in **Section 12.3 of Chapter 12**.

As noted in **Section 2.6.2**, Arklow town is an urban area with relatively high levels of economic activity and significant population growth anticipated.

This has given rise to a well-developed road network within the planning boundary and around Arklow town. Local businesses are relatively concentrated around well serviced parts of Arklow town including Main Street, Arklow Harbour and in the vicinity of the Bridgewater Shopping Centre on North Quay.

2.6.6 Other Schemes proposed to be developed

2.6.6.1 Overview

A cumulative assessment has been undertaken in accordance with Part 5 of Annex IV of the EIA Directive:

"e) a 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;"

The assessment specifically considers whether any of the proposed and/or recently approved schemes in the local area have a potential to exacerbate (i.e. alter the significance of) effects associated with the proposed development.

Cumulative effects are changes to the environment that are caused by an action in combination with other actions. They can arise from and this EIAR (and the accompanying) NIS will look at:

- the interaction between all of the different permitted and planned projects in the same area in combination with this proposed development; and
- the interaction between the various impacts within this proposed development.

Cumulative impacts will consider whether the addition of many minor or significant effects of the proposed development itself or the cumulation of effects of other permitted or planned projects have the potential to result in larger, more significant effects when combined with the effects of the proposed development. Interactions will consider the interaction between the various environmental aspects, for example the interaction between noise and ecology.

Further information on the cumulative assessment is provided in **Chapter 20**.

2.6.6.2 Approach

A qualitative assessment has been undertaken (Refer to **Chapters 7 -20**) to identify cumulative effects based on information available in August 2018. Wicklow County Council provided information in relation to the proposed schemes in the local area.

Eight developments that have been consented and/or recently submitted and recorded in the planning system since 2008 were identified as described in Table 2.1. The proposed schemes are illustrated in **Figure 2.1 of Volume 3** and all lie within 100m of the planning boundary. There are no further developments consented under the provisions of the Foreshore Act 1933 to 2014, as amended of relevance to the proposed development.

2.6.7 Future Land Uses and potential Receptors

Where it is known that land use is likely to change and/or additional development is forthcoming that may introduce additional sensitive land uses, these future receptors have been assumed for the purposes of the in-combination assessment.

The following potential future receptors of relevance to the proposed development have been identified:

- Proposed Arklow Flood Relief Scheme; and
- Potential future residential receptors associated with land use zoning outlined in the Arklow and Environs Local Area Plan 2018 - 2024.

2.6.7.1 Proposed Arklow Flood Relief Scheme

Overview

Wicklow County Council funded by The Office of Public Works intends to undertake engineering works along the Avoca River to mitigate the risk of flooding in the Arklow and Ferrybank area in County Wicklow. The application for consent of the proposed Arklow Flood Relief Scheme is anticipated to be lodged to An Bord Pleanála at a later date. There is the potential for physical and temporal overlap between the proposed development and the proposed Arklow Flood Relief Scheme.

Table 2.1: Schedule of developments considered for cumulative effects

Planning Reference	Name	Address	Relevance	Description	Status	Decision Date
18/316	Mill Sea Ltd	North Quay, Arklow	Located on Mill Road adjacent to the planning boundary	Demolition of existing disused industrial buildings including gas bottle filling plant, warehouse, administration offices, site office, security office and store of total floor area 2035m^2.	Grant	22 May 2018
18/289	F and S Duffy	7 and 8 Bridge Street, Arklow	Located on Bridge Street approximately 50m from the planning boundary (at its nearest point)	Demolition of two buildings and erection of a retail and commercial building of 160.2m^2 and associated site works	Application received	No decision at time of writing
18/251	Gas Networks Ireland	Belarnine Plaza District, Bridgewater Centre	Located on North Quay adjacent to the planning boundary for the proposed development	3m high 'lamp post' style relief vent stack servicing the existing above ground district regulating installation with all ancillary services and associated site works	Grant	7 May 2018
15/857	Joby Developments	North Quay, Arklow	Located on Mill Road adjacent to the planning boundary	Demolition of existing structures and construction of two 5 storey blocks comprising of eight retail units, 50 residential units, an on-site wastewater treatment facility, ancillary parking and all associated site works	Grant	11 October 2015
10/610009	Arklow Sailing Club	North Quay, Arklow	Located on North Quay adjacent to the planning boundary	Alterations & additions to existing clubhouse comprising the construction of a new single storey extension of 50.4m^2, the provision of a new entrance porch, notice board and patio area all to the front, and the construction of a single storey extension	Grant	17 May 2010
08/610068	T and J Dowling	2/3 Lower Main Street, Arklow	Located on Lower Main street approximately 90m from the planning boundary (at its nearest point)	Demolish existing buildings on site and erect a mixed use development comprising two retail units and four apartment to connect to the existing services	Grant	1 October 2008
13/610028					Extension to original permission	26 September 2013
09/610054	J and B Lambert	Innisfail, South Quay, Arklow	Located on South Quay adjacent to the planning boundary	Two storey dwelling (112m^2) with all ancillary site works to include connection to mains services	Grant	16 January 2010
86/10038	K O'Brien	5 Doyle's Lane, Arklow	Located on Doyle's Lane approximately 20m from	The demolition of 11.5m² existing single storey study, construction of 76.4m² 2 storey extension with balcony and alterations to existing 78m² 2	Grant	17 July 2008

Planning Reference	Name	Address	Relevance	Description	Status	Decision Date
			the planning boundary (at its nearest point)	storey house. Demolition of southern and western boundaries and the re-building of same and associated works		

Scheme Overview

It is understood that the proposed Arklow Flood Relief Scheme would comprise the provision of direct flood defences as well as conveyance improvements in the Avoca River. The proposed works would assist in alleviating future flooding in Arklow town by providing the following:

- Flood defence walls, embankments and gates would be constructed within Arklow town to improve resilience to flooding. Flood containment structures would be in the form of sheet pile walls and concrete walls along River Walk and South Quay on the southern riverbank. A flood embankment and flood defence wall would also be provided on the north side of the channel upstream of the Arklow Bridge (on the eastern side of the Arklow Town Marsh (which is a proposed Natural Heritage Area [pNHA]) whilst flood gates/barriers would be provided in discrete locations around the harbour;
- Arklow Bridge would be underpinned (at the bridge piers and abutments) and re-pointed to improve structural integrity and the floor of the bridge would be lowered by approximately one metre;
- Scour protection would be provided at Arklow Bridge to prevent any impacts on the riverbed due to the force of water;
- The river channel would be altered on South Quay (downstream of the Arklow Bridge);
- Dredging of the river channel would be undertaken upstream and downstream of Arklow Bridge to improve conveyance in the river channel;
- Construction of a debris trap upstream of Arklow Bridge to reduce the risk of blockage of the bridge during flood events;
- Construction of a gravel trap in an accessible location upstream of the proposed debris trap to reduce the requirement for maintenance dredging; and
- Public realm design improvement would be implemented along River Walk and South Quay.

Scheme Integration

It was apparent from the early stages of the design development that there was also a proposal for a flood relief scheme in the local area as flooding has been identified as a long-standing issue in Arklow town. The proponents of each of these schemes, have therefore considered the other proposals during their respective design development.

The proposed development and the proposed Arklow Flood Relief Scheme have therefore been designed having regard to the existence of the other scheme and the potential for interaction. During the design development, it became evident that there will be a physical overlap between the schemes. It was therefore recognised that a number of efficiencies and/or benefits could be achieved from delivering the design and construction of the overlapping elements of each of the schemes in an integrated manner in so far as possible.

On the basis of the above, a number of meetings were held between the design teams and proponents of both schemes to optimise the design development (as described in **Section 1.5.3.4**). This particularly focused around Arklow Bridge and South Quay where there will be a physical overlap between both schemes.

2.6.7.2 Land Use Zoning

Waterfront Zone

Under the Arklow and Environs Local Area Plan 2018 – 2024 (Arklow LAP) the port, marinas, harbour, quays, north and south beaches and adjoining lands are all zoned as part of the 'Waterfront Zone' (refer to **Section 6.4.2** for further detail). This land-use zoning specifically incorporates South Quay, North Quay and the WwTP site. This land use zoning therefore creates the potential for additional future receptors (in this case residential) in close proximity to the proposed development.

The Waterfront Zone (WZ) in the Arklow LAP includes the following in the zoning matrix for this area:

'*to facilitate the provision of a new Waste Water Treatment Plant with an appropriate high quality architectural design/appearance'*.

Town Centre Zone

As outlined in **Section 2.5.2**, the proposed SWO and stormwater storage site at the Alps is zoned for 'Town Centre' development in the Arklow LAP.

Further, the Alps has been identified as an Opportunity Site that should be developed to accommodate a mix of uses including significant commercial and residential development at a high density, see Objective OP1 in the Arklow LAP.

Further, between Main Street and River Walk there is another Opportunity Site in proximity to the proposed development identified by Objective OP2 in the Arklow LAP. This site which includes the former 'Morgan Doyle' site, the former 'Marine Hotel' site and the former '56 Bar' has been identified as suitable for retail, commercial and residential development at a high density. The proposed development will facilitate the development of these opportunity sites.

2.7 References

PH McCarthy and Partners (1993) The Arklow Main Drainage Supplementary Report

Wicklow County Council (2018) Online Planning: Find a Planning Application by Map. Available from: http://wicklow.maps.arcgis.com/apps/webappviewer/index.html?id=57b22c27e7c049fbac54117da1a20f60 [Accessed 1 May 2018]

3 Alternatives

3.1 Introduction

This chapter describes the alternatives considered by Irish Water during the design process for the proposed development and outlines the main reasons for choosing the proposed development.

This chapter of the EIAR has been prepared in accordance with Part 2 of Annex IV of the EIA Directive which identifies that the following is required in the EIAR:

"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, taking into account including a comparison of the environmental effects."

This chapter has therefore been structured to describe the following reasonable alternatives that have been considered:

- The do-nothing scenario;
- Alternative locations for the proposed development;
- Alternative processes (technologies) for treating wastewater; and
- Alternative designs (including scale, layouts and specific characteristics) for the proposed development.

It should be noted that this chapter describes the reasonable alternatives considered by Irish Water only and does not consider historic proposals for wastewater treatment put forward by other proponents (i.e. Arklow Town Council and Wicklow County Council). Further information on historic design iterations is provided in **Section 2.5 of Chapter 2**.

3.2 Do-nothing

The do-nothing scenario refers to what would happen if the proposed development was not implemented and appropriate wastewater treatment was not provided in Arklow town.

As outlined in **Sections 1.4.2.2 of Chapter 1** and **Chapter 6**, the need for wastewater treatment provision in Arklow town has been well documented in national, regional and local policy as well as legal cases.

The UWWT Directive and the transposing Urban Wastewater Treatment Regulations, 2001, as amended sets standards to be met in the collection and treatment of wastewater as well as the monitoring requirements for wastewater discharges from urban areas. The UWWT Directive and the associated Regulations require that secondary or equivalent treatment is provided for wastewater generated in urban areas such as Arklow.

Furthermore, the Water Framework Directive (WFD) sets objectives to reduce the discharge of pollutants to waters, to prevent deterioration in water quality and achieve 'Good Status' in all waters over time.

The European Commission is currently taking a case against Ireland at the Court of Justice of the European Union for its failure to ensure that urban wastewater in 38 agglomerations (of which Arklow is one such named agglomeration) is adequately collected and treated to prevent serious risks to human health and the environment. Indeed, the referral decision also raises additional concerns about the failure to ensure that a correct operating licence has been issued for the treatment plants serving the agglomeration of Arklow.

It is clear therefore, that from a legislative perspective alone, the 'do-nothing' scenario is not a reasonable alternative in the context of the proposed development.

Notwithstanding the legislative requirements, the provision of appropriate treatment of wastewater in Arklow is required to improve water quality in the Avoca River and enable further development in Arklow town, which is currently constrained by the absence of treatment.

For those reasons, the 'do-nothing' scenario was not considered further.

3.3 WwTP Site and Sewer Route Selection

3.3.1 Background and Scheme Objectives

The background to the proposed development and the historical context is provided in **Section 2.5 of Chapter 2**.

In 2014, following its formation under the Water Services Act 2013, Irish Water commenced a new site selection process for the proposed WwTP and associated infrastructure. In commencing this site selection process, the objectives for the proposed development were set out to ensure the selection of a suitable solution in accordance with these objectives (Refer to **Section 2.4 of Chapter 2** for further detail on the objectives of the proposed development).

3.3.2 WwTP Site Selection

A site selection process was undertaken to evaluate various sites for the WwTP in and around Arklow town. The principal aims of the site selection process was to:

- Review all suitable sites for the proposed WwTP in the environs of Arklow town;
- Review suitable locations for the treated effluent discharge point from the WwTP; and
- review suitable corridors for the proposed connecting pipelines (interceptor sewers) from the existing drainage networks to the proposed WwTP.

The consultation process and timeline for the site selection process is summarised in the schematic below:

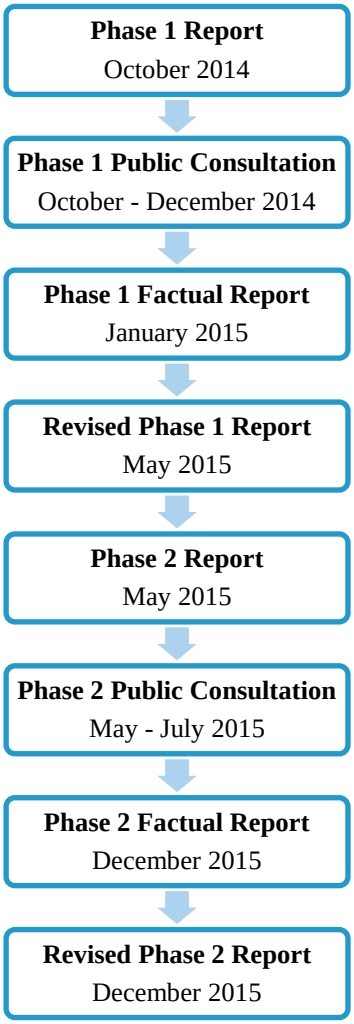

Figure 3.1: Consultation process and timeline for the site selection process

3.3.2.1 Phase 1 Site Selection Report

Overview

In October 2014, the Phase 1 Site Selection Report was prepared by Byrne Looby PH McCarthy[1]. The extent of the study area for this report was the administrative boundary for Arklow town and environs as set out in the Arklow Town and Environs Development Plan 2011 - 2017.

[1] Byrne Looby PH McCarthy (2014) Site Assessment Report – Phase 1 for the Arklow Wastewater Treatment Works. Available from: https://www.water.ie/projects-plans/arklow-wwtp/SA-Report_Arklow_WwTP.pdf [Accessed 21 August 2018]

Consideration was given to relevant best practice including EPA guidance[2,3] and planning policy[4,5]:

The site selection process was predicated on a WwTP with an ultimate capacity of 36,000PE, which, from previous studies, was considered to provide adequate capacity for Arklow over the design horizon. This scale of plant was considered to require a site of at least 2 hectares (ha) to provide:

- Flexibility in the final selection of the treatment process to be utilised;
- Sufficient space to adequately construct and screen the site; and
- To ensure flexibility regarding purchase of the required land.

Assessment of environmental constraints

To identify suitable land parcels within the study area, a desk-based assessment of environmental constraints was undertaken in the first instance to screen out unsuitable sites from further consideration. The following environmental constraints were identified:

- **Biodiversity** – Areas designated for nature conservation interest under European and national legislation in the study area were mapped (such as Natural Heritage Areas (NHAs), proposed Natural Heritage Areas (pNHAs), Ramsar sites as well as Special Areas of Conservation (SACs), candidate SACs and Special Protection Areas (SPAs) designated under the Birds Directive or Habitats Directive). Any sites that overlapped with these designated areas were not considered further. Other protected areas of ecological value were also avoided, such as designated shellfish waters, nature reserves, Refuge for Fauna, Tree Preservation Orders, Flora Protection Orders and Parks Biodiversity Buffer Designations/Nature Development Area.
- **Cultural Heritage** – Areas designated for heritage and archaeology, such as National Monuments, archaeological sites as identified in the Record of Monuments and Places (RMP), structures listed in the Record of Protected Structures (RPS) and Architectural Conservation Areas were also mapped. Any sites that overlapped with these designated areas were not considered further.
- **Geology** – Any sites that overlapped with Geological Heritage Sites identified by the Geological Survey of Ireland were mapped. Any sites that overlapped with these designated areas were not considered further.
- **Water** – Sensitive water bodies including Salmonid waters, designated biodiversity sites, recreational waters, designated bathing waters, designated nutrient sensitive waters, designated shellfish waters and aquifers designated as extremely vulnerable were mapped. Any sites that overlapped with these designated areas were not considered further.

[2] EPA (2006) Landfill Manuals: Manual on Site Selection (Draft for Consultation)
[3] EPA (1999) Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels
[4] Wicklow County Development Plan 2010 – 2016
[5] Arklow Town and Environs Development Plan 2011 – 2017

Areas at risk from fluvial and tidal flooding (i.e. for the 1 in 100 year storm event that were mapped as part of the Arklow Flood Feasibility Study), as well as storm events north of the M11 bridge (identified from the OPW CFRAM study) were also screened out and not considered further.

- **Landscape** – Areas designated as 'Highly Sensitive Landscapes' as defined within the Wicklow County Development Plan 2010 – 2016 were mapped. Any sites that overlapped with these designated areas were not considered further.
- **Sensitive receptors** – In the absence of recommended buffer zones in the relevant planning policy, a 100m buffer zone around known residential receptors was applied and a 50m buffer zone was applied around known commercial receptors (as agreed with Wicklow County Council during Phase 1 of the site selection process)[6]. Appropriate buffers were also applied to roads and railway lines identified in the Wicklow County Development Plan 2010 – 2016. Any sites that overlapped with these buffers were not considered further.

Once all of these constraints were identified and mapped, an examination of the remaining land areas in the study area was undertaken to identify suitable sites (of at least 2ha in size). On this basis, a total of 11 land parcels were identified by this screening assessment.

Assessment of extant permissions

A planning search was subsequently undertaken to identify any planning applications and/or extant permissions that may further constrain any of the 11 identified land parcels. As a result, one of the 11 sites (at Ballynattin) was excluded. Ballynattin was excluded on the basis that when the buffer zones for sensitive receptors were applied, the size of the available land parcel became such that it was now of insufficient size to accommodate the proposed WwTP.

At the end of this screening assessment, ten land parcels (identified by their townland names), were identified for further consideration as outlined below and illustrated in Figure 3.2:

- Lamberton and Ballyraine;
- Kilbride (ED Kilbride);
- Bogland and Kish;
- Killiniskyduff;
- Money Big;
- Ballymoney (ED Kilbride);
- Tinahask Upper;

[6] Note - The Phase 2 Public Consultation identified that a site, proximate to the Old Wallboard site at Ferrybank, had an extant planning permission (since expired) for construction of residential and retail units which had not been identified. The buffer zone applied for the existing business (at the time) on this site, means that this new information did not alter the outcome of the Phase 1 or 2 assessment.

- Seabank;
- Old Wallboard site at Ferrybank; and
- IFI/Shelton Abbey.

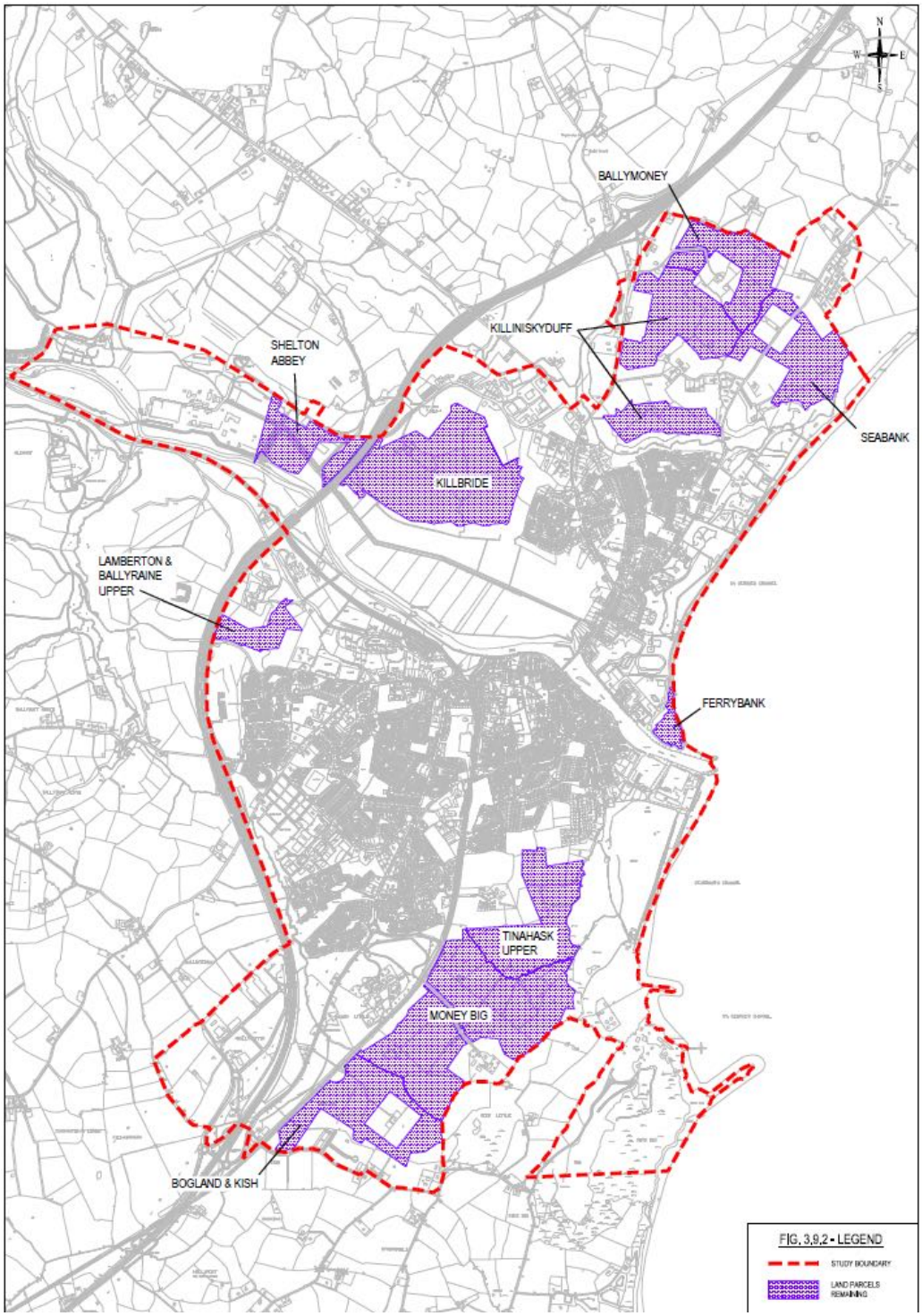

Figure 3.2: Location of ten shortlisted land parcels

Assessment of site suitability

Having identified ten land parcels through the initial screening assessment, the next step was to assess these parcels in terms of their proximity and accessibility to the identified load centre in Arklow town as well as an evaluation of the feasible outfall locations.

Load Centre

The load centre was identified as the point to which all flow gravitates, from the wastewater network in Arklow town. At the time of this assessment, the load centre was identified as the midway point of the planned sewer crossing at the Avoca River (towards the mouth of the Avoca River).

The proximity of this load centre to the ten sites and the associated energy requirements (if pumping was required) was an important consideration to minimise the need for additional infrastructure, associated capital and operational costs, energy demand, carbon emissions and environmental impacts of pumping flows from the load centre to the preferred site.

Outfall Locations

It should be noted that a river outfall was not considered during this stage of the site selection process, on the basis that a single point discharge into the Avoca River would not provide sufficient dilution of the effluent (Note - this principle had been established through previous surveys as discussed in detail in **Section 3.3.4**). Furthermore, the existing high levels of naturally deposited material in the river channel (which has required regular maintenance through dredging) and the pNHA designation of a large section of the Avoca River, meant that only marine outfalls discharging to the Irish Sea were considered at this stage.

Comparable coastal WwTPs along the eastern seaboard were also examined, in terms of the type of outfall structures and associated Emission Limit Values (ELVs). This examination demonstrated that the selection of marine outfalls was the preferred option, with standard 25:35:125 limits (BOD:COD:TSS) typical for comparable WwTPs. The proximity of each of the ten sites to the coastline was equally a factor in minimising the need for additional infrastructure, carbon emissions and associated environmental impacts.

Other

It was also necessary to consider other aspects of the ten sites in relation to high level engineering constraints. In the context of site selection, constraints examined included accessibility, proximity to existing services, site topography and existing land use.

Outcome

When these constraints were considered in terms of site suitability, sites with a greater combined distance from both the load centre and from a coastal location (for a possible marine outfall) were excluded from further consideration.

The phase 1 site selection process therefore determined that three sites were to be taken forward for detailed technical and environmental consideration in the Phase 2 site selection report. These sites were:

- Old Wallboard site at Ferrybank;
- Seabank; and
- Tinahask Upper.

Consultation

As noted in **Section 1.5.3 of Chapter 1**, non-statutory public consultation on the Phase 1 site selection process was undertaken by Irish Water over a period of 8 weeks (15 October 2014 - 12 December 2014) and a copy of the Phase 1 Consultation Report was published thereafter[7].

This public consultation period generated a large number of submissions from interested parties and the general public. Specifically, two issues arose which required further consideration:

- Additional lands at the IFI/Shelton Abbey land parcel (i.e. the adjacent old IFI plant site closed in 2000) would be available for a WwTP if required, hence no longer classifying these lands as a 'sensitive receptor' (Note that the IFI site was originally identified as commercial development and hence had the 50m buffer applied); and
- Irish Water should consider discharging treated wastewater into the Avoca River as well as considering a marine outfall.

These two issues were then considered further by the design team, as detailed below.

In respect of the IFI/Shelton Abbey land parcel, the size and shape of the revised land parcel made it more suitable for the location of a WwTP. Further work was also undertaken in respect of flood risk at the IFI/Shelton Abbey site[8]. This study concluded that an adequate area of land was available within this site for the proposed WwTP and that, while portions of this land are within flood zones A or B, they are well protected by an existing flood defence embankment.

Further modelling was undertaken in April 2015[9] in order to inform the feasibility of a river outfall. This exercise concluded that a river outfall was a feasible option, albeit that a higher standard of effluent discharge would be required than for a marine outfall.

[7] Byrne Looby PH McCarthy (2015) Arklow Wastewater Treatment Plant – Phase 1 Site Selection Report. Available from: https://www.water.ie/projects-plans/arklow-wwtp/Phase-1-Consultation-Report.pdf [Accessed 21 August 2018]
[8] Byrne Looby PHMcCarthy (2015) Flood Risk Assessment and Management Report
[9] Irish Hydrodata (2015) Preliminary Report: Arklow WWTP Investigation of the Impact of Treated Wastewater Discharges To Avoca River and Irish Sea. Available from: https://www.water.ie/docs/App-A.pdf [Accessed 22 August 2018]

The Phase 1 site selection assessment was therefore revisited due to this additional information. It was determined that the IFI/Shelton Abbey site should be taken forward for further assessment, given its location in proximity to the Avoca River, and the submissions received during the public consultation process in relation to the size of the land parcel.

Updated Phase 1 Site Selection Report

An updated Phase 1 Site Selection Report was prepared in May 2015[10], taking account of the public consultation submissions received and further information as described above. This report re-evaluated the ten shortlisted sites again with regard to this updated information. On this basis, it concluded that:

- Should a river discharge be a viable option (based primarily on the combined distance from both the load centre and nearest river or coastal outfall location), the following land parcels would be taken forward for detailed technical and environmental consideration in the Phase 2 site selection report:
    - Old Wallboard site at Ferrybank;
    - Kilbride; and
    - IFI/Shelton Abbey
- Should a marine discharge be required, i.e. river discharge is not a viable option (based primarily on the combined distance from both the load centre and a coastal discharge location only), the following land parcels would be taken forward for detailed technical and environmental consideration in the Phase 2 site selection report:
    - Old Wallboard site at Ferrybank;
    - Seabank; and
    - Tinahask Upper.

On the basis of the additional modelling, which confirmed that a river outfall was a viable option, the updated Phase 1 Site Selection Report recommended that the following land parcels were brought forward for further consideration against a range of environmental, technical and economic criteria under a Phase 2 Site Assessment:

- Old Wallboard site at Ferrybank;
- Kilbride; and
- IFI/Shelton Abbey.

[10] Byrne Looby PH McCarthy (2015) Arklow Wastewater Treatment Plant: Site Assessment Report – Revised Phase 1. Available from: https://www.water.ie/docs/1-Main-Body.pdf [Accessed 21 August 2018]

3.3.2.2 Phase 2 Site Selection Report

Overview

The Phase 2 site selection assessment (Refer to **Appendix 3.1**), prepared in May 2015, brought forward these three shortlisted sites for further assessment. Figure 3.3 shows each of the sites as well as the location of associated sewers and outfalls.

The Old Wallboard site at Ferrybank site is located within the townland of Ferrybank to the north of the Avoca River. This site is bounded to the south by the North Quay and the Avoca River, the Irish Sea to the east and the Mill Road to the west. The site is currently comprised of an abandoned factory building, associated outbuildings and structures and the land parcel is partially overgrown. The site area is approximately 2.83ha.

The Kilbride site is located approximately 870m north of Arklow town centre to the north of the Avoca River. The site comprises all or part of approximately five undeveloped green fields surrounding Kilbride House, to the immediate south of the M11.

The IFI/Shelton Abbey site is located approximately 1.4km north-west of Arklow town centre on the northern banks of the Avoca River. The site comprises three undeveloped green fields and two previously developed plots on the northern banks of the Avoca River, to the immediate west of the M11.

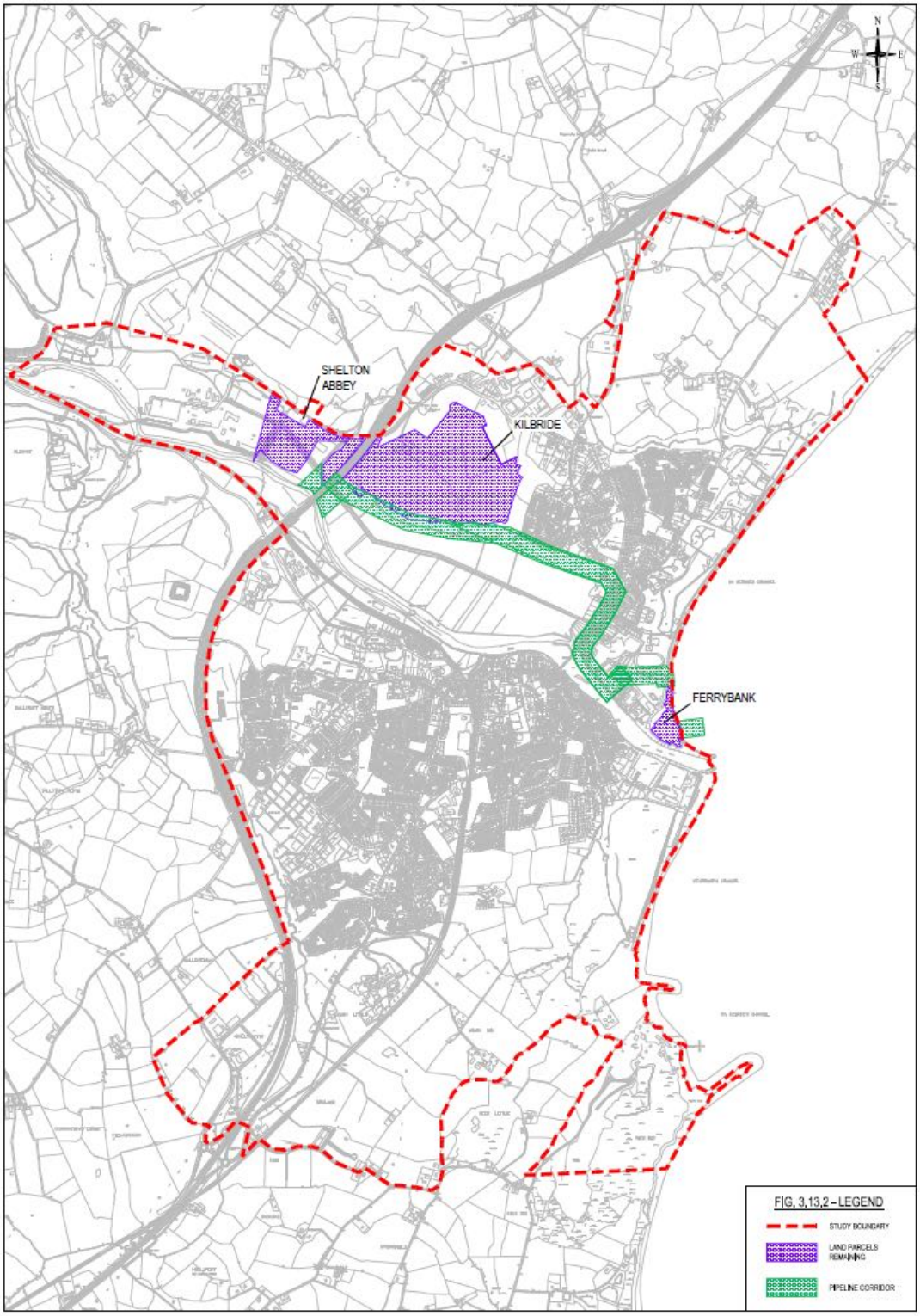

Figure 3.3: Location of three shortlisted sites

Multi-criteria assessment

The Phase 2 site selection process comprised a multi-criteria assessment of the three shortlisted sites and the associated corridors for the sewers and outfalls. The multi-criteria assessment considered a range of technical, economic and environmental criteria as detailed in Table 3.1.

Specifically, the environmental criteria utilised for the Phase 2 site selection assessment, whilst not exhaustive, broadly reflect the environmental factors that would be typically considered relevant during the EIA scoping process for a WwTP of this nature and scale.

Table 3.1: Technical, economic and environmental criteria considered during the Phase 2 site selection assessment

Environmental Criteria	**Technical/Economic Criteria**
Ecology	Safety
Cultural Heritage	Planning Policy
Landscape & Visual	Engineering & Design
Hydrology & Hydrogeology	Capital and Operational Costs (including annual energy costs)
Soils & Geology (including contamination)	Land Valuation
Traffic	
Air Quality & Odour	
Agriculture & Agronomy	
Noise & Vibration	
People & Communities	

To support this assessment, a number of additional specialist surveys were undertaken including:

- Ground investigation works at the shortlisted brownfield land parcels, where possible;
- Ecological surveys;
- Archaeological surveys; and
- Asbestos surveys.

The Phase 2 site selection assessment was based on a qualitative assessment, whereby competent specialists assessed the three sites under each of the relevant criteria in Table 3.1.

This included data collection (based on desktop assessment) and, in some cases, site surveys and invasive site investigation works as well as site visits and 'windshield surveys'.

The sites were then assessed against each criterion (and sub-criterion) to categorise potential impacts across a five point scale between 'imperceptible' and 'profound' based on the EPA[11] and the NRA[12] guidance.

Technical aspects of the sites were assessed in a manner that allowed the most and least favourable site options to be identified.

[11] EPA (2002) Guidelines for the Information to be contained in Environmental Impact Statements
[12] NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide

In respect of technical considerations, the location of the site, with respect to a corridor for the potential sewer and outfall locations were also considered, to ensure that the WwTP site was not selected in isolation.

On this basis, the assessment was conducted in accordance with the following methodology, with each criterion or sub-criterion given equal weight:

- **Step 1** – Mapping of impacts for the three sites by the environmental and technical specialists based on desktop assessment and in some cases visual inspections to produce individual matrices;
- **Step 2** – Identification of the best positioned 2ha site within each of the three sites based on relative technical and environmental constraints;
- **Step 3** – Update individual matrices to reflect the focus from the overall site to the individual 2ha site within those land parcels;
- **Step 4** – Combination of the individual matrices into one overall primary matrix;
- **Step 5** – Identify cells that are most favourable across the sub-criteria (Shade these cells green);
- **Step 6** – Identify the cells which are the least favourable (Shade these cells amber). This process was continued for subsequent iterations;
- **Step 7** – Review the completed matrix to determine whether any sites with 'least favourable' classifications can be omitted (Note – this resulted in the omission of IFI/Shelton Abbey); and
- **Step 8** – Review each sub-criterion to determine whether there are any differentiating levels of impact remaining across the two site options (Note – this resulted in the conclusion that Kilbride was less favourable than the Old Wallboard site at Ferrybank).

As outlined above, detailed matrices were prepared for each site to consider each of the criteria and sub-criteria that were assessed (i.e. across the technical, economic and environmental criteria).

At Step 7, both the Kilbride site and the Old Wallboard site at Ferrybank were assessed as being 'more favourable' across a greater number of criteria, therefore resulting in the omission of the IFI/Shelton Abbey site from further consideration.

At Step 8, the Old Wallboard site at Ferrybank was assessed as being 'more favourable' across a greater number of criteria assessed, therefore resulting in the identification of the Old Wallboard site at Ferrybank site as the preferred site for the WwTP.

In comparison to the Kilbride and IFI/Shelton Abbey sites, the Old Wallboard site at Ferrybank was considered more favourable under the following criteria:

- Cultural heritage;
- Landscape and visual;
- Ecology;

- Hydrology;
- Hydrogeology;
- Agronomy and land use;
- Traffic; and
- Engineering and design (including carbon emissions, power and maintenance requirements).

Public consultation

As noted in **Section 1.5.3 of Chapter 1**, the second public consultation phase took place over an eight week period (15 May 2015 - 10 July 2015), with an updated Phase 2 Site Assessment Report[13] following thereafter based on the submissions received.

In general, the feedback on the outcomes of the Phase 2 site selection assessment was positive, with many seeing the Old Wallboard site at Ferrybank as a suitable site for locating the WwTP. Some concern was expressed with regard to the proximity of the Old Wallboard site at Ferrybank to nearby lands which have development potential (i.e. within the 'Waterfront' land use zoning) and its prominent position on the waterfront.

Prior to finalising the site selection report, Irish Water also met with An Bord Pleanála as part of the pre-application consultation process as described in detail in **Section 1.5.2 of Chapter 1**. An Bord Pleanála identified that planning policy was considered too narrowly in the site selection report, as it did not consider the potential for each of the sites to support the realisation of the Core Strategy targets in the Wicklow County Development Plan 2010- 2016 or the potential to realise some of the specific land use zoning objectives contained in the Arklow Town and Environs Development Plan 2011-2017. On foot of that meeting Irish Water undertook further consultation with Wicklow County Council Planning Department and the EPA regarding the proposed development.

The Phase 2 Site Selection Report (Refer to **Appendix 3.1** - **Section 4.11** and the assessment matrix in particular) was reviewed on this basis and the analysis was revisited to take into account the specific concerns of An Bord Pleanála. However it is important to note this did not affect the conclusion i.e. the Old Wallboard site at Ferrybank remained as the preferred site as discussed in further detail below.

Consultation with An Bord Pleanála, Wicklow County Council and Environmental Protection Agency

Prior to finalising the site selection report, Irish Water met with An Bord Pleanála as part of the pre-application consultation on the Strategic Infrastructure Development process.

[13] Byrne Looby PH McCarthy (2015) Arklow Wastewater Treatment Plant: Site Assessment Report – Phase 2. Available from: https://www.water.ie/projects-plans/arklow-wwtp/Phase-2-Site-Assessment-Report-December-2015.pdf [Accessed 21 August 2018]

On foot of the meeting, Irish Water was asked to further consult with Wicklow County Council Planning Department and the EPA regarding the proposed development.

One of the topics discussed with An Bord Pleanála and Wicklow County Council was the scope of the site selection process with regard to planning policy objectives for Arklow, particularly the Core Strategy targets of the three sites and the potential to realise some of the specific objectives of the Arklow Town and Environs Plan 2011 – 2017. As a result, the site selection was revisited and updated, to take account of changes to planning policy.

Specifically in relation to the Old Wallboard site at Ferrybank, following consultation with Wicklow County Council, it was considered that the development of a WwTP on lands zoned WZ 'Water-front Zone: to promote and provide for mix-use development' would not be inconsistent with the objective to realise housing targets set out in the Wicklow County Development Plan 2010-2016 and the Arklow Town and Environs Plan 2011 – 2017 and would not impede the delivery of the Core Strategy.

The need to meet the specific objectives for the waterfront zoning was recognised by Irish Water and it was acknowledged that the WwTP would need to be:

"*designed to a high architectural standard and quality, such that it becomes an anchor for the area, contributes to the public realm surrounding the site by providing improved access to the shore, adjacent to the plant and potentially links to the adjacent sports ground and ensures that the potential to redevelop adjoining lands is not undermined by the siting of a WwTP at this location*." [14]

Outcome

The outcome of the Phase 2 site selection assessment (that was communicated during the associated consultation period – Refer to Appendix 3.1) is that Irish Water indicated its intent to proceed with the emerging preferred site (i.e. Old Wallboard site at Ferrybank). This site was deemed to represent a suitable site in terms of technical and environmental considerations for those reasons outlined above and detailed in the Phase 2 Site Selection Report[13].

3.3.2.3 Planning Policy

The site selection reports were prepared with cognisance of the Wicklow County Development Plan 2010 – 2016 and the Arklow Town and Environs Plan 2011 – 2017. Since the publication of these reports, the Wicklow County Development Plan 2016 – 2022 (i.e. the County Development Plan) and the Arklow and Environs Local Area Plan 2018 – 2024 (i.e. the Arklow LAP) have both been adopted by Wicklow County Council (Refer to **Chapter 6** for further information on planning policy).

[14]Byrne Looby PH McCarthy (2015) Arklow Wastewater Treatment Plant - Phase 2 Consultation Report Final. Available from: https://www.water.ie/projects-plans/arklow-wwtp/Phase-2-Consultation-Report.pdf [Accessed 21 August 2018]

The current County Development Plan and the Arklow LAP have been considered with regard to land use planning objectives of relevance to the site selection process, particularly for the three shortlisted sites.

As discussed in detail in **Section 6.4 of Chapter 6**, the land use zoning objectives support the provision of a WwTP at the Old Wallboard site at Ferrybank. This site is within the Waterfront Zone (WZ) in the Arklow LAP, and the following is included in the zoning matrix for this area:

'*to facilitate the provision of a new Waste Water Treatment Plant with an appropriate high quality architectural design/appearance'*.

The land use zoning at the Kilbride and IFI/Shelton Abbey sites does not accommodate the provision of a WwTP, with the IFI/Shelton Abbey site being outside the administrative boundary of Arklow Town and the Kilbride site being zoned as an 'action area' for employment opportunity.

It is clear from the most recent planning policy and land use zoning and associated objectives identified therein that the Old Wallboard site at Ferrybank, is now firmly supported through the land use planning framework. On this basis, the Old Wallboard site at Ferrybank remains the most suitable site for the proposed development.

3.3.3 Sewer Route Selection

3.3.3.1 General

The purpose of the proposed interceptor sewers is to collect untreated wastewater flows currently discharging directly to the Avoca River and to transport these flows to the proposed WwTP. Given the topography of Arklow and the termination of all existing outfalls at the river, the areas along the north and south banks of the Avoca River are considered the only viable locations for the proposed interceptor sewers.

A detailed report, Interceptor Sewer Route Options Report was undertaken (Refer to **Appendix 3.2**) and documents the options for the alignment of the sewer within the sections illustrated in Figure 3.4.

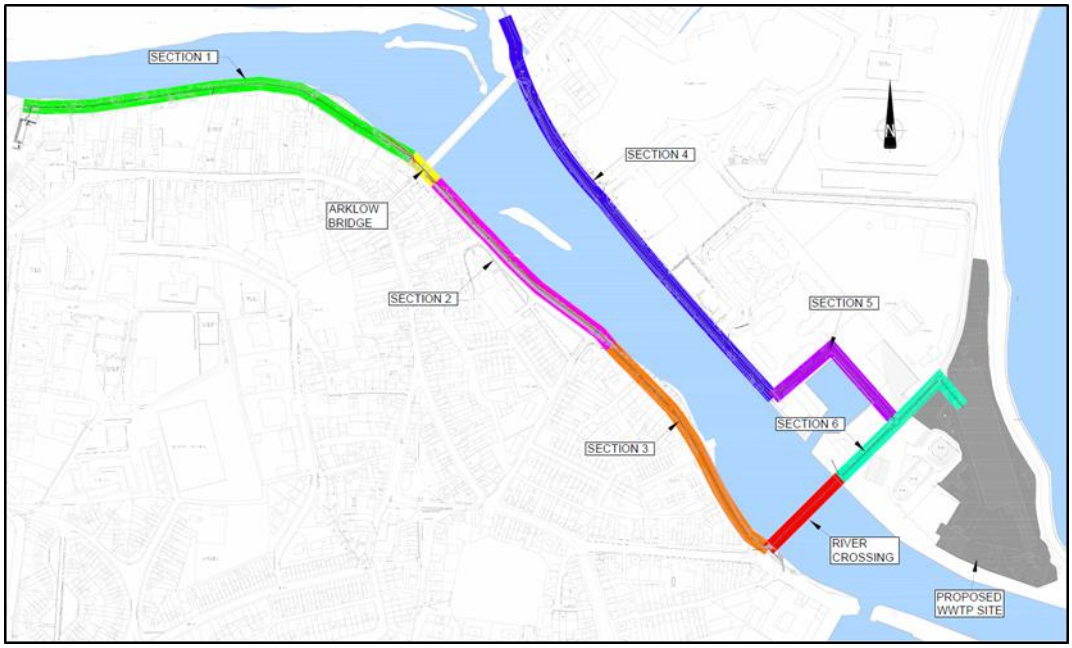

Figure 3.4: Location of sewer alignments considered (Source: Byrne Looby – Refer to Appendix 3.2 for further detail).

3.3.3.2 Avoca River Crossing

Arklow has developed on both sides of the Avoca River and therefore a river crossing to transfer wastewater to a single WwTP would be required as part of the proposed development. Several alternatives were considered for locating this sewer crossing as described below.

A sewer crossing upstream of Arklow Bridge was ruled out early in the design development process because it would require works in the Arklow Town Marsh pNHA. Further, a crossing upstream of Arklow Bridge would also require deeper sewer excavations due to its upstream location and distance from the WwTP site. On the basis of these two constraints, a crossing upstream of Arklow Bridge was ruled out from further consideration.

A sewer crossing downstream of Arklow Bridge was therefore assessed based on two main criteria, namely the shortest length to cross the river and proximity to the preferred WwTP site. These two criteria have a significant bearing on overall impacts including the duration of construction duration and energy use during operation. Two locations were identified for further assessment on this basis (Refer to Figure 3.5):

- Location 1: Shortest river crossing (approximately 80m): this is located at a narrow point approximately halfway between Harbour Rd and South Green on the south side, and runs to a location in front of the Marina Village development on the north side.
- Location 2: a crossing (approximately 120m) between Harbour Road and Mill Road with the sewer continuing up Mill Road to enter the WwTP site.

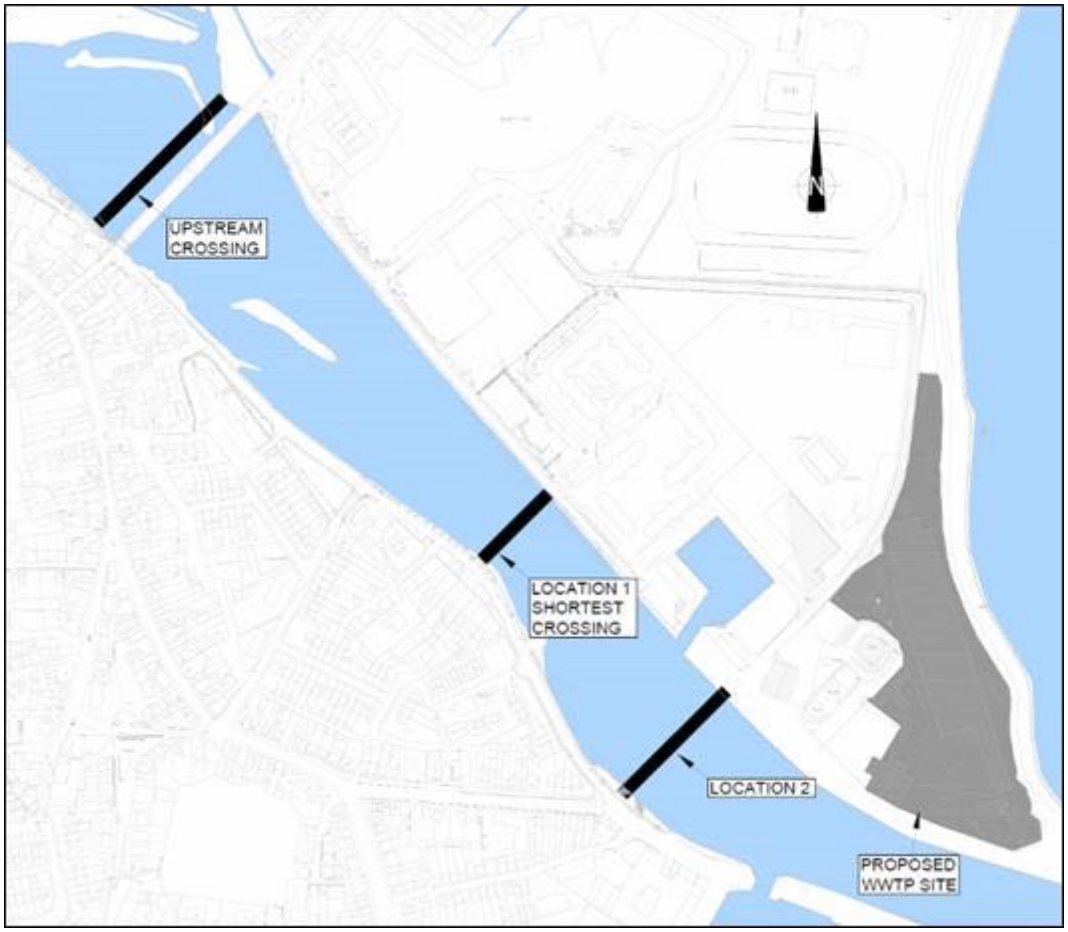

Figure 3.5: Location of the river crossings considered (Source: Byrne Looby – Refer to Appendix 3.2 for further detail)

The final selection of the river crossing point location was based on three main considerations:

- Extent of sheet piled quay walls;
- Impact of the proposed Arklow Flood Relief Scheme; and
- Length of crossing.

Investigation revealed that sheet piles are present at both of the proposed crossing points to a depth of 12m, hence neither location was considered more favourable in this regard.

The proposed Arklow Flood Relief Scheme proposes various measures to prevent future flooding in Arklow, including a proposal to widen the river at its narrowest point. As this is coincident with Location 1, there is potential for design and construction conflicts between the two schemes as there is a physical overlap of development proposals, particularly where the sewer would cross the proposed re-aligned sheetpiled river wall on the widened section.

Location 1 particularly where the sewer would cross the proposed re-aligned sheetpiled river wall on the widened section.

Location 2 held a further advantage because it minimised the length of deep tunnelling required to the WwTP. Hence it was decided that Location 2, despite being the longer river crossing by approximately 40m, was the preferred location for the crossing.

3.3.4 Outfalls

3.3.4.1 Overview

An outfall is required to discharge the treated effluent to receiving waters. As outlined in **Section 3.3.2.1**, both marine and river outfall options were considered as part of the site selection process (i.e. a marine outfall for the Old Wallboard site at Ferrybank, river outfall for IFI/Shelton Abbey and both for Kilbride – Refer to Figure 3.3).

Hydrodynamic and water quality models were prepared[9] to simulate the impacts of the proposed discharges from the long sea outfall to allow comparisons to be made and suitable discharge standards to be set.

Three offshore discharge locations (at approximately 400, 650 and 900m from the shoreline), together with a river discharge location (the harbour mouth chosen for assessment purposes) were considered. The modelling demonstrated that the discharge standards required for a river outfall would be much more onerous than that of a marine outfall. For that reason, the river outfall was not considered further.

The main regulatory constraints that apply to the discharges are:
Urban Wastewater Treatment Regulations 2001 (SI 254/2001);

- European Communities (Water Policy) Regulations (SI 722/2003);
- European Communities Environmental Objectives (Surface Waters) Regs 2009 (SI 272/2009);
- European Communities (Birds and Natural Habitats) Regs(SI 477/2011);
- Bathing Water Quality Regulations 2008 (SI 79/2008);
- European Communities (Quality of Salmonid Waters) Regulations 1988 (SI 293/1988).

3.3.4.2 Long Sea Outfall

The location of the long sea outfall has been determined by the layout and position of the treatment units on the WwTP site. Treated effluent from the WwTP will be discharged from the final process units to the initial section of the pipeline which therefore determined the beginning of the pipeline route.

The route, length and position of the discharge point were also informed by hydrodynamic modelling to ensure adequate dispersion of the effluent to ensure compliance with regulatory requirements.

The initial outfall route selection process took account of flow currents in Arklow Bay as well as the proximity to beaches and other sensitive sites (such as European sites and the beaches at Brittas Bay and Clogga which are designated bathing waters.

The modelling (Refer to **Appendix 15.2**) demonstrated that bacterial concentrations were the critical parameter for the marine outfall options and that a 900m outfall could ensure compliance with the bathing water 'excellent' category during calm and windy conditions. The modelling also considered tidal and marine currents. A marine outfall, of approximately 900m in length was therefore selected to ensure compliance.

In addition to the hydrodynamic modelling, a marine site investigation was carried out to inform the outfall route selection and design process. This investigation indicated that ground conditions are sand and gravel over clay, over sand and gravel, over bedrock as discussed in detail in **Chapter 14**. The marine site investigation also included an underwater archaeological investigation, to identify any archaeological constraints associated with the outfall route options.

The location of the existing General Electric (GE) sub-sea electricity cable from the Arklow Bank Offshore Wind Park also formed a significant constraint in the location and route of the marine outfall.

The final route of the marine outfall was chosen with consideration of these constraints. The size and hydraulic profile of the outfall have been chosen based on the requirements for gravity discharge and the flow volumes to be discharged. The outfall will discharge at the seabed, through a diffuser (which ensures adequate mixing and dispersion) as described in detail in **Section 4.3.5 of Chapter 4**. The depth and spacing of the diffusers has been selected to provide the dilution considered necessary to eliminate any localised surface sheens, slicks or odours.

3.3.4.3 Storm Water Overflow (SWO) at WwTP

A storm water overflow (SWO) is required at the WwTP to discharge excess stormwater flows, when the capacity of the WwTP and the stormwater storage tank is exceeded, in accordance with standard practice for WwTP design. The SWO is also required to provide an emergency relief for excess flows in the sewered catchment during extreme rainfall events and during extended power outages. The excess stormwater will be discharged through the SWO, to the Irish Sea.

This SWO needs to discharge flows at a level of -3.9 m OD, just below the Mean Low Water Springs level, meaning that the SWO will terminate at the toe of the proposed revetment in order to ensure compliance with Irish Water standards[15].

The positioning and route of this SWO took into consideration the proposed location of the long sea outfall (which was chosen following a dispersion modelling exercise), the location of the existing GE power cable from the Arklow Bank Wind Park and the location of the relevant infrastructure within the WwTP (including stormwater storage, inlet works sump and SWO pump sump). This largely dictated the route of the SWO pipeline.

The flow that needs to be discharged under design conditions and the required hydraulic profile of the SWO, determine the size of the pipe required. The outcome of the hydraulic modelling has identified the requirements in this regard.

3.3.4.4 Storm Water Overflows (SWO)

To alleviate flooding in the network system in the event of power failure, pump failure / blockage at the WwTP or the combination of extreme rainfall events and high tide levels, it was considered necessary to provide SWOs within the interceptor sewer network at appropriate locations.

During rainfall events, SWOs act as relief valves within the network, allowing excess storm flows and heavily diluted wastewater to be discharged directly to receiving waters. This helps protect properties from flooding and prevents wastewater backing up into streets and homes during heavy storm events. New SWOs are therefore proposed at the following locations:

- A SWO at the head of the proposed interceptor sewer on the southern side of the river channel adjacent to The Alps. This SWO would intercept wastewater (including significant volumes of combined flows) in this area and provide appropriate storage with excess storm flows (screened) discharging through an existing outfall to the Avoca River;
- A SWO at South Quay-Harbour road on the interceptor sewer (at tunnel shaft TSS1) discharging (screened) stormwater through a new outfall to the Avoca River; and
- A SWO at the inlet pumping station at the WWTP (as described under **Section 3.3.4.3**).

The SWOs act as emergency overflows for excess storm flows and their location and design has been chosen with a view to optimising the hydraulic design of the system and in particular to reduce the need to pump stormwater at the WwTP.

The alternative of omitting these overflows or storage volumes would result in increased pipe size, unacceptable flooding risk in the event of pump outage at the WwTP and also the requirement to pump large volumes of stormwater for exceptional rainfall events that coincide with high tide levels. Accordingly, it is considered that there are no reasonable alternative to providing the proposed SWOs.

3.4 Treatment Processes

The proposed development will be procured as a Design and Build project, as detailed in **Chapter 4** and **Chapter 5**, with the appointed contractor responsible for the final detailed design of the proposed development. A number of alternatives were considered in the selection of the specimen design for the WwTP which will be used for the purposes of the assessment in this EIAR.

3.4.1 Approach to Process Selection

An exercise was undertaken to identify a preferred specimen design for the treatment processes included in the proposed development. This exercise:

- Identified the design parameters and constraints to be considered in the design;
- Identified acceptable process options for the level of treatment required;
- Provided preliminary sizing of the various structural and MEICA elements of the treatment process;
- Considered layout arrangements for the proposed major process units;
- Provided an overview of capital and operational expenditure for the preferred options; and
- Described the selection of the most appropriate option for the WwTP.

The process selection formed the foundation on which both the engineering and architectural design of the proposed development could progress.

In terms of WwTP design and selection the key design criterion is the anticipated Emission Limit Values (ELVs) likely to be enforced through the Waste Water Discharge Authorisation (WWDA) by the EPA (which is the consenting authority in this regard). It should be noted that the EPA will not issue the WWDA until the statutory consent is in place, therefore it was assumed that the ELVs imposed would be similar to other eastern seaboard plants with marine discharges, with ELVs of 25:35:125 (BOD:COD:TSS) considered.

The assessment also examined the impact on the major process units of requiring nutrient removal, should more stringent limits be stipulated by the EPA. The proposed treatment solution is flexible enough such that it can be adapted within the existing configuration of the SBR tanks in the Process building by provision of variants to the specimen design and degassing options for denitrification. The level of the major process units could be adjusted either above or below ground to accommodate greater treatment capacity should the EPA impose more onerous ELVs that require nutrient removal. In addition, provision has been made in the specimen design to provide phosphorus removal as a simple retrofit solution.

In formulating the various treatment process options, the following considerations were taken into account during the design development of the treatment processes in the WwTP:

- Relevant legislation, best practice and industry design standards for wastewater treatment;
- Information obtained as part of the consultation process;
- ELVs likely to be applied;
- Design of the collector sewer network;
- Raw water characterisation e.g. determine if alkalinity addition required;

- Plant sizing and loading;
- Site size, configuration and any planning considerations;
- Storm water volumes to be managed;
- Oxygen demand required;
- Sludge production, treatment and disposal;
- Environmental emissions i.e. effluent, odour and noise; and
- Regulatory requirements and technical specifications.

The scope of the proposed development is to design a treatment process capable of treating an ultimate population equivalent of 36,000PE (albeit that the process capacity would be installed on a phased basis). The key objectives are to ensure that the site is adequate for the preferred treatment option up to 36,000PE and that the technology provided is capable of meeting the anticipated ELVs.

3.4.2 Process Treatment Options

The first part of the process treatment options assessment looked at treatment options that could meet the expected ELVs. Table 3.2 provides a summary of the industry standard appropriate technologies vis a vis the requirements of the proposed development. This high level assessment allowed each technology to be awarded a point score where the required criteria (10 in total) were met or were considered relevant.

Table 3.2: Industry standard appropriate technologies and their relevance in this application for Arklow WwTP

Appropriate Technology System Assessment															
	Arklow WWTP	Primary & Secondary Settlement					Biofilm (Attached Growth) Systems					Suspended Growth Systems			Advanced
No.	Technology Description	Conventional Primary Settlers	Septic Tanks	Imhoff Tanks	Upward flow secondary settlement tanks	Horizontal flow secondary settlement tanks	Constructed Wetlands	Intermittent Aerobic Filters	Percolating Filters	Rotating Biological Contactors (RBC)	Submerged Filters	Extended Aeration Activated Sludge	Oxidation Ditch	Sequencing Batch Reactor (SBR)	Membrane Bioreactors
1	Ability of the process to achieve the secondary level of treatment in the WWDA ELVs compared to the 25 / 35 standard in the UWWTD	x	x	x	x	x	√	√	√	√	√	√	√	√	√
2	Flexibility of process to allow for an upgrade from UWWTD standard to WWDA ELVs	Processes cannot achieved the required discharge standards and are not evaluated further									√	√	√	√	√
3	Suitability of process to meet the initial design load of 24,000 PE and future increase to the ultimate design load of 36,000 PE.										√	√	√	√	√
4	Land acquisition considerations							√	√	√	√	√	√	√	√
5	Planning / Environmental considerations										√	√	√	√	√
6	Cost of construction						√	√	√	√	√	√	√	√	√
7	Cost of O&M						√	√	√	√	√	√	√	√	
8	Anticipated Design Life and Capital Replacement						√	√	√	√	√	√	√	√	√
9	Impact and ability of the process to cope with flooding / high surface water volumes.										√	√	√	√	√
10	Respnse to shock loading from the network (organic)											√		√	√
	Points Score						**4**	**5**	**5**	**5**	**9**	**10**	**9**	**10**	**9**

Using this approach, many of the available technologies were discounted on the basis of ability to achieve the required discharge standards, or the ability to be modified to achieve any potential ELVs that may be required for the WWDA.

The outcome from this preliminary assessment illustrated that the most suitable treatment technology was the suspended growth type system, which combines both attached and suspended growth processes.

Each of the suspended growth type systems was then considered in more detail. Two technologies were discounted early on in the evaluation as follows:

- Rotating Biological Contactors (RBCs) – RBCs are an attached growth process and while reliable they can cause operational problems when required to handle increasing and fluctuating loads. The treatment capacity is limited to the media area provided which is fixed and long term high organic loading can cause anaerobic conditions, resulting in odour and poor treatment performance, which considering the site location in this instance, is considered a risk. For RBCs, wastewater concentration and flow rate influence the systems efficiency, with removal rates of organics ranging from 40% - 85%. For plants of 36,000PE to ensure adequate performance is achieved, multiple stage units may be required. In addition to offline contingency requirements, this process is not the most efficient use of available space – activated sludge process are more flexible in treating ranges of flows and loads, have removal efficiencies up to 95% and occupy significantly less area to achieve comparable effluent standards.
- Membrane Bioreactors (MBRs) – on the basis that while this treatment technology can achieve very stringent emissions standards and have a small footprint in comparison to other technologies, MBRs are a more advanced treatment technology that typically have relatively high capital and operating costs (including membrane cleaning and replacement), high energy costs (can be up to 30% higher than non-membrane technologies) and may require chemical additives (depending on the consistency of the influent to the works). MBRs require significant upstream preliminary processes which from experience can cause higher than normal cleaning and maintenance requirements. The technology was therefore considered overly complex and operationally risky with regards to the proposed development.

On the basis of the above, two technologies were carried forward for more detailed evaluation:

- Conventional activated sludge process;
    - Conventional aeration process including primary treatment; and
    - Extended aeration process.
- Sequencing batch reactor process.

A summary of these processes and the relevant considerations in the final process selection is provided in Sections 3.4.2.1 - 3.4.2.4.

3.4.2.1 Continuous Flow Processes

Overview

Two continuous flow processes were examined as potential treatment options namely, 'Conventional treatment' with a primary treatment stage and 'Extended aeration'.

Continuous flow refers to a system in which each process has a dedicated function and each function is carried out on a continuous, sequential basis. Figure 3.6 illustrates the basic configuration of a conventional wastewater treatment process.

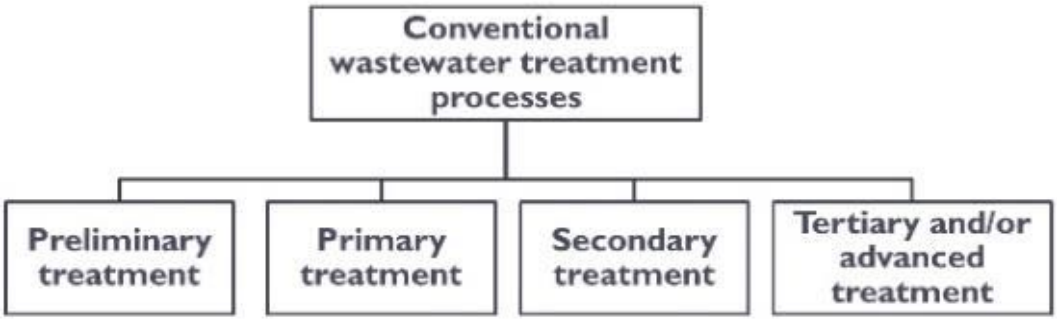

Figure 3.6: Basic configuration of a conventional wastewater treatment process

The preliminary treatment stage is to remove large residuals from the process (as described in **Section 3.4.3**). This stage typically includes screening and grit removal.

The primary settlement stage is used to reduce the organic and solids loads passed forward for biological treatment. This process produces a primary sludge, which has high microbial activity, is malodorous and requires thickening and stabilisation prior to disposal.

Conventional treatment with a primary treatment

The conventional activated sludge process is in effect a plug flow system where the primary effluent from the previous stage enters the aeration tank and travels through the tank at a constant rate to the point of discharge. The wastewater is aerated in the tank, in which micro-organisms metabolise the suspended and soluble organic matter. In the aeration stage, primary effluent mixes with return sludge from the secondary settlement stage providing a medium to reduce the organic load by up to 95%.

The treated wastewater then goes forward to final settlement. The final effluent is separated from the secondary sludge during final settlement with the secondary sludge being thickened and dewatered prior to being disposed off-site and the treated effluent going to tertiary treatment (if required) or discharged to the receiving waters.

The primary sludge (conventional) configuration was considered for the proposed development as this treatment is required in the event that anaerobic digestion (AD) be used as the sludge treatment process. AD uses primary and secondary sludges as feed for an anaerobic reactor, in turn generating a methane based biogas which can provide an energy source for the plant.

Given the proximal location of the WwTP to potential commercial and residential areas, the risk of odour generation from both treatment and transport of primary based sludges was considered high for this particular site and for this reason and from a cost perspective, this treatment option was not considered further.

Extended aeration

The extended aeration process similarly, is a continuous flow process with units dedicated to perform a specific function. One sludge type is produced by the extended aeration process, namely waste activated or secondary sludge. There is no primary settlement or primary sludge producing stage in the extended process.

Due to the specific functionality of each process unit additional structures and footprint are required when compared to the batching process which is reviewed in **Section 3.4.2.2**.

3.4.2.2 Sequencing Batch Reactor

A sequencing batch reactor (SBR) provides a comparable activated sludge process to the continuous flow options with an alternative configuration. SBRs gained popularity as a result of the lower footprint requirements when compared to continuous flow and conventional systems, therefore improving the effective capacity of a given area. SBRs perform all of the same functions as a continuous flow system with the following distinct differences:

- Tanks are used for multiple functions including filling, aeration and settlement avoiding the need to construct and operate multiple stages;
- There is generally no primary treatment stage; and
- There is no return pumping stage which reduces power demand for pumping.

The SBR is a fill and draw type reactor system that involves a single complete mix reactor in which all steps of the activated sludge process occur. For municipal wastewater treatment with a batch flow process, a minimum of 2 basins are required to allow one unit to be available for fill mode while the other goes through the react, settling and decanting sequences.

The SBR process provides a basic structure which can be developed into a number of innovative variants depending on specific site and treatment requirements. A number of innovative variations to the SBR process which are currently in use and may be further evaluated by the contractor during the detailed design stage include the Granular Sludge SBR (Nereda®), the Mixed Liquor Vacuum Degassing (MLVD) and the MBBR HYBAS™.

3.4.2.3 Process Selection

Of the two processes reviewed, SBR was selected as the preferred option for the proposed development. One of the main criteria used to determine the preferred solution is the treatment and handling of the sludges produced by both processes. In this regard, the SBR process is the preferred option producing only waste activated sludge which can be thickened and dewatered to 20% TDS as a minimum prior to transport.

In contrast, the conventional continuous flow process requires the removal of BOD and TSS in a primary settlement stage. Primary sludge requires a separate thickening process and cannot be dewatered without blending or digestion. In addition, the odours associated with the production of primary sludge constitute a risk in relation to compliance with contract performance specifications for environmental emissions. Given the location of the proposed site and proximity to receptors, it is preferable to provide a solution that does not generate primary sludge on site.

Furthermore, selection of the SBR process presents the following benefits:

- Smaller footprint in comparison to conventional activated sludge process;
- High degree of operational flexibility with respect to effluent quality and dissolved oxygen control;
- Greater offline flexibility with respect to effluent quality and dissolved oxygen control;
- Effluent quality meets anticipated nitrogen requirements for marine discharge;
- No primary treatment stage required;
- No separate final clarification or return aerated sludge stage required;
- Proven treatment process capacity upgrades do not require significant modification or interruption to the existing process;
- High degree of automation which reduces operational staff requirements;
- Lower initial capital cost; and
- Lower power consumption per capita than conventional process.

The main disadvantage of selecting an SBR process is the level of complexity of the process control automation. Specific training will be required for operators to ensure that the functionality and limitations of the process is understood. However, the procurement strategy will ensure that only suitably experienced and trained personnel will operate the plant.

Following selection of the secondary treatment process, the other key treatment processes were considered as outlined in Sections 3.4.2.4.

3.4.2.4 Inlet Works (Preliminary Treatment)

Irish Water stipulates the accepted inlet works arrangement for treatment works in excess of 25,000PE (Refer to Figure 3.7).

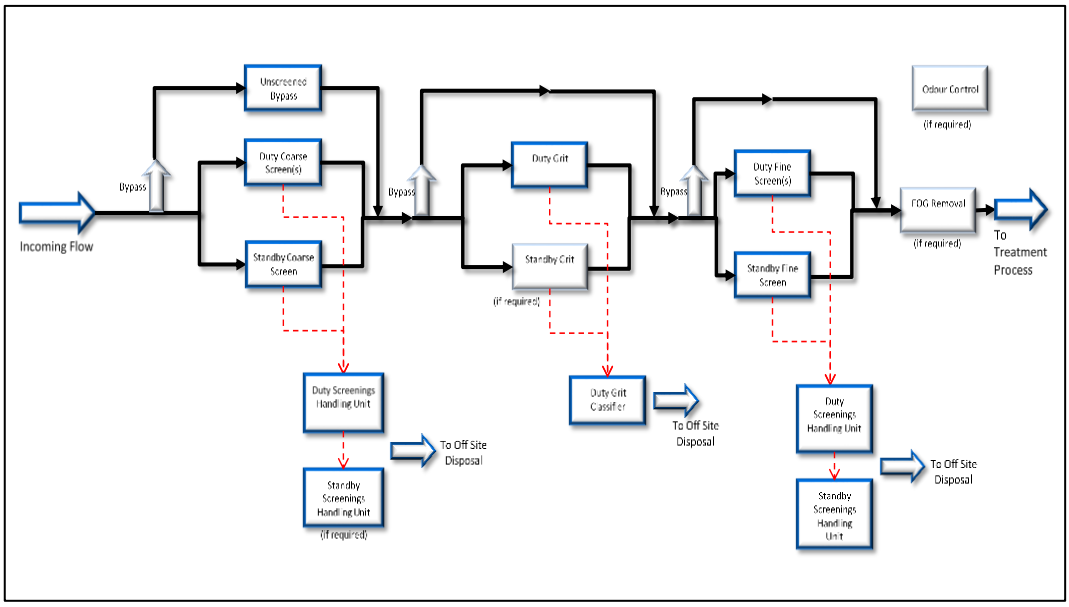

Figure 3.7: 25,000+ PE Inlet Works Arrangement (Source: Irish Water[15])

At a minimum, all process units identified in Figure 3.7 are required for the proposed development. The inlet works therefore, must include:

- Screenings channels – coarse (25mm) and fine (6mm) screens; and
- Aerated grit chamber.

The contractor will have some flexibility to consider the most appropriate configuration and equipment choices to meet the required Irish Water specifications.

3.4.3 Storm Water Management

Irish Water design standards[15] require that, for plants >25000PE the design basis for the management of storm flows shall be for two hours retention for low significance discharges to coastal/transitional waters. The design of the stormwater management system was on this basis and therefore there are no reasonable alternatives in this regard.

A storm tank will be provided with two operational cells. The storm tank cells will receive screened wastewater from the inlet works. The first operational cell will act as a first flush cell, capturing heavy solids. The function of the second operational cell is to capture flows from a sustained rainfall event. Following the rainfall event, the contents of the stormwater tanks will be returned for full treatment through the WwTP. If the capacity of the stormwater tanks is exceeded, excess flows will discharge by gravity through the SWO to the Irish Sea.

[15] Irish Water (2016) Technical Standard: Inlet Works & Stormwater Treatment (Wastewater). Document No: IW-TEC-700-99-02. Revision 1.0 (March 2016)

3.4.4 Odour Control and Vent Stack

The existing stack on the WwTP site was considered at an early stage for re-use in the proposed development. However, its current location did not facilitate its use. It was therefore decided to proceed with the design of new stacks for the odour control/ventilation of the buildings.

The location of the vent stack at the Inlet Works building was chosen based on the location of the OCU to keep duct lengths to a minimum and to reduce the visibility of the vent stack structure from the surrounding area. The location of the vent stack at the Process building was chosen to conceal the stack from view from the surrounding lands.

The height of the vent stacks at the WwTP were chosen to be 1m above the building height to allow for effective dispersion of emissions and to minimise the effect of building downwash.

3.5 Options considered during Design Development

3.5.1 Architectural Design Alternatives

3.5.1.1 WwTP Site Layout

An iterative process was undertaken to evaluate and establish the proposed layout on the Old Wallboard site at Ferrybank. The site and its physical characteristics as well as the local planning policy context were considered during the evaluation of various strategies for the site layout and how this would inform the architecture.

The site, between the rock revetment adjoining the Irish Sea and the Avoca River, has long been associated with industry in Arklow. Further, the existing structures (i.e. the remains of the Old Wallboard factory – a tall and long structure) are highly visible in the broader landscape of Arklow town. This context of maritime industry has reduced in recent years but remains a strong presence in the materiality and forms of surrounding buildings.

The legislative context is set out in both the current Arklow LAP and the preceding Arklow Town and Environs Development Plan 2011 – 2017 (which was in place at the commencement of the design development process). Both of these documents define the land use zoning of the WwTP site as ‘WZ – Waterfront’. This zoning establishes a clear aspiration for the area to diversify to mixed use development including residential, commercial and amenity uses and states a desire for a denser configuration of built structures – with a minimum of 3-4 stories indicated for developments in this area. The current plan (2018-2024) also specifically states the objective:

“To facilitate the provision of a new Waste Water Treatment Plant with an appropriate high quality architectural design/appearance.”

During the design development four approaches were considered in terms of the potential layout of the WwTP and these are described in the following sections.

Distributed Design

The distributed design involves laying out the plant in a conventional approach that is regularly adopted for WwTP's of this nature. As illustrated in **Figure 3.1 in Volume 3**, all operational aspects of the plant would be located in discrete single storey structures, with yards and roads between the structures. A summary of the advantages and disadvantages of the distributed design option is provided in Table 3.3.

Table 3.3: Advantages and disadvantages of the distributed design option

Advantages	**Disadvantages**
Low Capital Cost	The low lying and distributed pattern of discrete structures would reinforce the existing pattern of ad hoc industrial structures which forms the immediate context. This strategy would not comply with Wicklow County Council's aspirations to transition to a more urban location, incorporating mixed use developments of some scale on adjacent sites, and their specific requirement for a 'high quality architectural approach'. These issues were highlighted and emphasised during pre-planning meetings with Wicklow County Council.
Low lying buildings would not be visible from the wider context	The distributed approach would present a landscape of tanks, pipe runs and yards which would not positively contribute to the visual environment and landscape character
Easy to access for maintenance and adjustment, replacement and/or upgrades	This approach maximises the footprint of the building structures, therefore the entirety of the site would be required with minimal opportunity for landscaping or for any areas being handed over to the public as amenity use. This would limit opportunities for community gain.
	The distributed approach would result in a greater need for pumping leading to higher operational costs as each stage of the treatment process would be on the same level.
	This approach is not considered to comply with the zoning objective of the Waste Water Treatment Plant having 'an appropriate high quality architectural design/appearance.'

Advantages	Disadvantages
	The distributed approach would result in a landscape of tanks, pipe runs and yards around the buildings that would not positively contribute to the visual environment and landscape character. In particular this would be visible from adjoining sites were they to be developed, curtailing residential development.

The distributed design option for site layout was therefore considered as being inappropriate to the site due to its inability to respond to the legal context as set out in the Arklow LAPs. In particular this approach would present a maximum footprint with minimal opportunity for landscaping, amenity uses or a high quality design approach. It would also present a risk of not complying with the desired land use planning objectives (including on surrounding lands), and thereby restricting the development of this part of the town in the medium to long term.

Stacked Design

The stacked design is the opposite of the distributed approach. As illustrated in **Figure 3.2 in Volume 3**, all the relevant functions would be consolidated into a single structure, in effect placing all the operational parts of the WwTP into a building, the façade of which would then be modelled to present a strong architectural presence to the surrounding area. A summary of the advantages and disadvantages of the stacked design option is provided in Table 3.4.

Table 3.4: Advantages and disadvantages of the stacked design option

Advantages	Disadvantages
Consolidating the plant into a single building would present the WwTP as an urban structure rather than a distributed industrial process and would free up areas of the site that could be used for public amenity.	Once all aspects of the plant were accurately sized the WwTP structure would be up to 26m tall, i.e. the equivalent of 7 stories.
A more compact structure would present greater potential for the extent of landscaping on site	There were high capital costs associated with this option
Reduced pumping requirement between each stage of treatment processes due to use of gravity.	Operational difficulties associated with access for maintenance and adjustment, replacement and/or upgrades
	The building mass would mean that a hard landscaping (for operational traffic etc.) would need to surround the structure on all four sides, thus making this area difficult to screen

Advantages	Disadvantages
	Height and bulk of the form and massing of the building structures would be inappropriate in scale to the context of Arklow's townscape

The stacked design option was therefore considered as being inappropriate to the site due to the excessive height and increased visibility of the structure. However, the idea of treating the plant as a building, not as an industrial process alone was considered worthy of incorporating into any future approach if possible.

Linear Design

The linear design approach would see the various operational aspects of the WwTP being placed in a single long structure (refer to **Figure 3.3 in Volume 3**). This option is similar to the distributed design option but it would provide a more compact form and similar to the stacked design as the linear form is thought of as a discrete structure, with a façade that would screen all relevant aspects of the WwTP.

A summary of the advantages and disadvantages of the linear design option is provided in Table 3.5.

Table 3.5: Advantages and disadvantages of the linear design option

Advantages	Disadvantages
Low Capital Cost (for architectural aspects)	The low lying and distributed pattern of discrete structures would reinforce the existing pattern of ad hoc industrial structures which forms the immediate context. This strategy would not comply with Wicklow County Council's aspirations to transition to a more urban location, incorporating mixed use developments of some scale on adjacent sites, and their specific requirement for a 'high quality architectural approach'.
Low lying buildings would not be visible from the wider context	The linear form would not allow yard areas to be concealed by the building mass
Easy to access for maintenance and adjustment, replacement and/or upgrades	During the design development, it was established that the linear form would not fit on the WwTP site

The linear design option was therefore considered as being inappropriate to the site as it produced a treatment process design that could not be contained on the WwTP site.

Stacked and Linear

The stacked and linear approach seeks to combine the best aspects of the other reasonable alternatives that were considered, (refer to **Figure 3.4 in Volume 3**). In this approach the inlet works would be stacked over the stormwater storage tanks. SBR functions, electrical areas, workshops and a PV solar farm would be located on a separate discrete structure, as would the sludge tanks and odour units. The three building structures would be placed so that they mask the primary operational yard from view in the surrounding area. Ancillary structures including the administration building would also be placed as a gate lodge and control point on Mill Road. A summary of the advantages and disadvantages of the stacked and linear design option is provided in Table 3.6.

Table 3.6: Advantages and disadvantages of the stacked and linear design option

Advantages	**Disadvantages**
The Inlet Works and Process building structures present the WwTP as an urban structure rather than a distributed industrial process. These will be less visible on the site than the existing wallboard plant, but will still present the plant as a piece of civic infrastructure.	This option carries a higher capital cost than other options
Easy to access for maintenance and adjustment, replacement and/or upgrades	
A more compact footprint would accommodate provision for a landscaped area that could be handed over to Wicklow County Council and for much of the edges of the site itself to be landscaped.	
Building forms can mask operational yards from view.	
Stacked approach to the inlet works structure would reduce pumping requirements between prelminary and secondary treatment processes (located in the Inlet Works and Process buildings).	

On consideration, the stacked and linear design option was identified as the most advantageous option for the site layout. It presents a strong response to the land use zoning objectives of the Arklow LAPs, while also facilitating a more sustainable design for operation of the plant once constructed. This design option has been adopted during the design development and is described in further detail in **Chapter 4.**

3.5.1.2 Landscape

The landscape strategy was developed as part of the design development. The approach to landscaping that has been taken was governed by the ambient conditions at the WwTP site, including the level of contamination in the soil (refer to **Section 14.3** for further detail) and the associated requirement to seal the underlying contamination and provide planting with minimal root depth.

The design for landscaping was therefore selected on the basis of current information on contamination at the WwTP as described in **Chapters 7 - 19**. This context limits the range of possible options as regards landscaping. During the design development two options were explored:

- Not providing any landscaping; and
- Providing landscaping.

No Landscaping

In this approach, the areas surrounding the building would not be landscaped and no planting would be undertaken at the WwTP site. Hard standing would surround the structures and the site would be secured with palisade fencing. A summary of the advantages and disadvantages of not landscaping is provided in Table 3.7.

Table 3.7: Advantages and disadvantages of not landscaping

Advantages	**Disadvantages**
Lower capital cost	No softening of the interface between the built structures and the surrounding public realm.
Low maintenance	No contribution to the public realm.
	The need for landscaping, integrated with the design was emphasised in pre-planning meetings with Wicklow County Council

On consideration, this option would not comply with the land use zoning objectives as outlined in the Arklow LAPs. It was therefore decided that an integrated landscape design would be developed as part of the proposed development.

Integrated landscaping (including planting)

This approach extends to planting, hard landscaping details and the making of boundaries. This more holistic approach was developed iteratively throughout the design development process.

Specifically, this approach included consultation with the lead ecologist to determine an appropriate selection of planting for the WwTP site.

The selection of planting is based on what native species are already doing well on the Old Wallboard site at Ferrybank (in spite of the ambient conditions) and developing an approach to landscaping on this basis. Where appropriate, species selection was undertaken to protect, and where practicable enhance, biodiversity in accordance with objective NH12 of the Wicklow County Development Plan.

Given the proposed stacked and linear arrangement, landscaping around the four buildings would follow a basic grid, derived from the primary geometries of the site. This grid would include hard landscaping between the buildings in addition to soft landscaping that would be planted around the site perimeter. A summary of the advantages and disadvantages of integrated landscaping is provided in Table 3.8.

Table 3.8: Advantages and disadvantages of integrated landscaping (including native planting)

Advantages	**Disadvantages**
Uses planting species which are already growing well on the site.	Higher capital costs
Low maintenance	
Makes a strong contribution to the public realm in line with LAP and desires expressed by Wicklow CoCo in preplanning meetings.	
Extends habitats	

This approach was adopted as the preferred strategy for the site as it complies with the land use zoning objectives in the Arklow LAP and the biodiversity objectives of the Wicklow County Development Plan. This design option has been adopted during the design development and is described in further detail in **Chapter 4**.

3.5.1.3 WwTP Façade

Once the site layout was established, a further iterative process was undertaken to identify, and determine the appropriate façades for the WwTP buildings.

Early in the process, particularly with regard to the Inlet Works building it became evident that significant numbers of loading bays, hoist locations and areas for pipework transfer would be required. In thinking about how to make a high quality architectural response, it was evident that there was little scope for design treatments beyond that determined by process and off the shelf responses.

In thinking about this through the iterative design process, it was determined that the façade would be kept away from the operational skin of the building structure, so that there was a gap between the façade and the actual operational skin behind.

This meant that loading bays, craneage points, fire escapes and localised pipe runs would be masked and not visible from the surrounding area. The outer façade would also be off the ground so that it forms a canopy to trucks making deliveries and/or removing skips from the WwTP.

Further, consideration was given to the assumption that the WwTP may evolve to become a civic structure and positive part of the local landscape, therefore cognisance has been given to approaches rooted in the constructional logics of the plant, the site and its history.

During the design development four façade typologies were considered and these are described in the following sections.

In-situ concrete

An in-situ concrete façade would provide a large, cantilevering structure of concrete cast in situ. A summary of the advantages and disadvantages of the in-situ concrete façade is provided in Table 3.9.

Table 3.9: Advantages and disadvantages of the in-situ concrete facade

Advantages	**Disadvantages**
Concrete is a common material in maritime industrial settings, and weathers well with minimal maintenance.	High Capital Cost
Robust, resilient material that is difficult to damage.	Difficult to guarantee quality of concrete in a design build and operate context
In-situ concrete is an expected part of the construction methodology elsewhere.	Concrete surface is scaleless and abstract when viewed in the distance and up close
	Difficult to construct
	Relatively high embodied energy / carbon

The in-situ concrete option was therefore considered as being inappropriate due to the complexities involved in its construction, its inability to respond to human scale and its higher carbon content. However, the aspiration for a robust, low maintenance material was carried forward through the design development.

Pre-cast concrete

The pre-cast concrete façade would provide a frame in steel or concrete, with a screen made of precast concrete slats. This façade would be porous to light and air. A summary of the advantages and disadvantages of the pre-cast concrete façade is provided in Table 3.10.

Table 3.10: Advantages and disadvantages of the pre-cast concrete facade

Advantages	**Disadvantages**
Concrete is a common material in maritime industrial settings, and weathers well with minimal maintenance	Simple orthogonal form does not work well when viewed at a distance
Robust, resilient material that is difficult to damage	High weight façade
Pre-cast concrete is an expected part of the construction methodology elsewhere	
Porous nature of the façade means that the façade would glow at night time with a diffused light from within	
Modular approach means that the façade would present a rhythm and scale which would respond to proximity	
Modular approach is easier to construct than in situ concrete	

Given the high weight of this façade and the fact that it does not work well when viewed at a distance, the pre-cast concrete façade was considered as being inappropriate. However, the quality of the finish whereby the façade would have a different quality at night was considered as an aspiration that should be carried forward throughout the design development.

Timber

The timber façade would provide a frame of timber and steel surrounded by a façade of solid oak that would be allowed to weather naturally. This would be detailed such that it is made in vertical lifts which step out to protect the layer below. A summary of the advantages and disadvantages of the timber façade is provided in Table 3.11.

Table 3.11: Advantages and disadvantages of the timber façade

Advantages	**Disadvantages**
Modular approach is easier to construct.	Large quantity of timber required – difficult to ensure quality and consistency in a DBO context.
Modular approach means that the façade would present a rhythm and scale which would respond to proximity.	Leaving the oak to weather naturally will present a degree of risk in the perception of the building to locals – this can be read as being a finish which has not been maintained. It was decided that this was not appropriate to such a potentially significant element of the civic realm.
Low maintenance as oak performs well in saline environments.	Specialist tradespeople not ordinarily involved in the construction process would be required

For the reasons stated above, the timber façade was considered as being inappropriate as the building needed to form a role as a piece of civic infrastructure, and therefore the land use objective of the Arklow LAP around high quality architectural design would not be achieved. However, the quality of this approach whereby the façade would have a different quality in rain than when dry was considered as an aspiration that should be carried forward throughout the design development.

Fibre Cement

The fibre cement façade would provide a frame in steel and aluminium with a series of oversized fibre cement louvres that would project out from the building. The gaps in between would be permeable to light and air whilst the louvres would be scaled to present a strong silhouette to the building when viewed from a distance, and the scale of each lift means that it responds to human scale when viewed close to. A summary of the advantages of the fibre cement façade is provided in Table 3.12.

Table 3.12: Advantages and disadvantages of the fibre cement façade

Advantages	**Disadvantages**
Modular approach is easier to construct.	The approach uses a relatively standard material and achieves its aesthetic qualities through a very precise level of detail and specification. This would therefore require precise detailing and construction.
Modular approach means that the façade would present a rhythm and scale which would respond to proximity.	
Layering of each panel would mean that the façade would present a different appearance in rain than when dry – the wet area would not collect on the upper level of each panel, but would on the lower giving a rich quality to the building responding to the weather.	
Porous nature of the façade means that the façade would glow at night time with a diffused light from within.	
Robust, and difficult to damage.	
Lightweight and constructed with easily sourced and specified materials offering a large degree of control for maintenance purposes.	
Fibre cement is appropriate to an industrial context, and references the previous structures on the site. At the same time the pronounced horizontal lines generated by the louvres work well with the series of horizontal lines presented by the maritime context (river, quay side, revetment, horizon)	
Presents a subtle but clear silhouette when viewed at a distance allowing the structure become a clear civic structure in the broader landscape.	

On balance, this approach was considered the most appropriate as it complied with the land use objectives of the Arklow LAP and the aspiration to make the plant a piece of civic infrastructure. In order to counteract the disadvantage regarding the precise detailing, the following steps have been taken:

- The design details have been developed in detail with structural engineers and other consultant inputs to prove its detailing and buildability;
- The design drawings indicate detailed façade sections at 1:33 and a detailed model at 1:50 has been developed giving a precise description of the façade and thus certainty as to the eventual appearance of this element; and
- This element will not be subject to the design / build element of the eventual tender documentation and will be retained under the control of the client and their design representatives to ensure that the precise details are carried through.

The fibre cement façade was considered the most advantageous façade and this design option has been adopted during the design development and is described in further detail in **Chapter 4**.

Design development of preferred option and resolution.

The approach to the architectural design went through detailed design development including multiple iterations and adjustments to arrive at the proposed development as described in **Chapter 4**. These iterations were explored in physical model, drawing and renderings, and where appropriate inputs were sought from Wicklow County Council, An Bord Pleanála, and the local community during the consultation exercises as described in **Section 1.5 of Chapter 1.**

Consultation throughout the design development resulted in further updates including:

- Making the panels more pronounced such that the special nature of the building can be more clearly articulated;
- Adjustments to how the façade terminates against the sky to make a cornice which gives a clear shadow at this point; and
- Adjustments to the scale, rhythm and modulation of the façade.

The finished design therefore presents a robust approach that is grounded in the logics of the WwTP, the historical context of the Old Wallboard site at Ferrybank and future growth as described in planning policy. The architectural design represents a new civic structure that could set the tone for the future evolution of this part of Arklow town and will facilitate future developments on adjoining lands.

3.5.2 Infrastructure Design Alternatives

3.5.2.1 Sewers

General

The overall design for the proposed network is a gravity sewer discharging directly to the WwTP at the Old Wallboard site at Ferrybank. This solution avoids the need for any intermediate pumping at a separate 'main-lift' pumping station with associated transfer pipelines and additional capital and operational costs (including in particular associated energy costs).

The pipe sizing for the sewers is based on hydraulic modelling of the sewer network using Infoworks CS. The hydraulic model has been run for the preferred solution and models both the current state of the network and the expected network for a 50 year design horizon including all anticipated upgrades and extensions.

The sizing is based on restricting the number of overflow events at the SWOs whilst providing appropriate stormwater storage at the Alps and WwTP in conjunction with online storage in the network pipes.

Interceptor Sewer under Arklow Bridge

The proposed interceptor sewer is required to cross Arklow Bridge on the south side in an area with limited working space and with a large number of services present, most significantly a 355mm diameter gas main.

Three design options were considered:

- Option 1 - lay the pipe on land between the bridge abutment and the existing buildings.
- Option 2 - lay the pipe within the river through the existing arch with the channel edge moved out to accommodate the pipe.
- Option 3 - tunnel at sufficient depth to pass under all obstacles.

<u>Option 1</u>

Option 1 involves laying the pipe by open cut methods from a manhole upstream of the bridge to a manhole in South Quay downstream of the bridge. The pipe would be c. 750mm diameter and depths would vary from approximately 2m to approximately 4m. Diversion of the existing gas main is not expected to be feasible, hence the sewer would need to be laid with adequate clearance from this gas main.

Additionally, given that Arklow Bridge provides the only river crossing in Arklow town, a full road closure of Bridge Street is not expected to be feasible because of the absence of alternative access routes. Even partial road closures are likely only to be permitted at night given the potential negative impacts on local residents that night working would bring. A summary of the advantages and disadvantages for Option 1 is available in Table 3.13.

Table 3.13: Advantages and disadvantages of Option 1 for the sewers

Advantages	**Disadvantages**
No impact on river flows	Maximum traffic impact
No impact on upstream and downstream works	Maximum impact on residents as night working likely
	Maximum risk of structural damage to buildings
	H&S risk associated with gas main
	Risk to other services
	Requires access to private property
	Difficult to build

Option 2

Option 2 involves creating a new river wall to outside the existing wall through the bridge arch and laying the pipe in the section thus created.

The design will also necessitate working within the river channel with associated temporary works required. Depending on the exact details of the abutment foundation, some underpinning or other protection may be required.

Due to the restricted clearances under the bridge, the use of normal sheet piling techniques to create the new channel wall, as proposed in other sections, would not be possible and a specific design solution is required. There is a moderate risk of damage to the bridge itself but this should be avoidable with suitable design and construction techniques. A summary of the advantages and disadvantages for Option 2 is available in Table 3.14.

Table 3.14: Advantages and disadvantages of Option 2 for the sewers

Advantages	**Disadvantages**
Minimum traffic impact	Possible impact on river flow and flood defence scheme
Minimum impact on residents as night working unlikely	Agreement required with OPW
Minimum risk of structural damage to buildings	Foreshore consent likely required

Minimum H&S risk associated with gas main	
Minimum risk to other services	
No access to private property required	
No impact on upstream and downstream works	

Option 3

Option 3 is the laying of the pipe in a tunnel from a shaft upstream of the bridge to a shaft downstream. This would require the construction of a c. 5m diameter shaft either outside the existing quay walls or breaching the quay wall. To avoid the existing gas main, the downstream shaft would have to be located outside the existing quay wall.

The main disadvantage of this option is the impact on channel flow capacity, both during construction and thereafter. Permanent intrusion into the river channel would be required or the pipe would have to be positioned low enough to allow a side access below channel level.

To allow tunnelling, the pipe would also need to be lower than the expected channel depth for the proposed Arklow Flood Relief Scheme with a consequent knock on effect on downstream levels. It should be noted that there are also five existing sewers at high level to be intercepted between the Arklow Bridge and South Green, over a distance of approximately 250m.

Tunnelling under the bridge abutment is not expected to be permissible due to the need to avoid damage to it and the lack of information about the abutment and its foundations. Tunnelling generally can pose a small risk to surrounding buildings due to subsidence above the tunnel but this is expected to be minimal for all structures other than Arklow Bridge, with a moderate risk for the bridge abutment with suitable design and construction techniques.

A summary of the advantages and disadvantages for Option 3 is available in Table 3.15.

Table 3.15: Advantages and disadvantages of Option 3 for the sewers

Advantages	**Disadvantages**
Minimum traffic impact	Significant impact on downstream levels
Minimum impact on residents as night working unlikely	Some impact on river channel
Minimum risk of structural damage to buildings	

Advantages	Disadvantages
Minimum H&S risk associated with gas main	
Minimum risk to other services	
No access to private property required	

Conclusion

Option 3 was considered to offer limited advantages over Option 2 and significant disadvantages in terms of requiring the levels downstream to be lowered. On this basis Option 3 was disregarded.

Option 1 was considered to pose a number of issues around buildability and would have the most significant impact on traffic, local residents and the highest risk of damage to existing buildings and services. Option 2 minimises these risks, hence is preferred to Option 1.

Option 2 (i.e. laying the pipe through the bridge) was therefore selected as the preferred option for this section of the sewer.

River Crossing

Three design options for the river crossing were considered:

- Gravity;
- Inverted siphon; and
- Pumped.

Pumped crossing

The pumped crossing was ruled out as it offered no benefits and would be more expensive to construct and operate in comparison to the other two options.

Inverted siphon

The inverted siphon offered an advantage over the gravity crossing in that its outlet would be at a higher level than the siphon's lowest point, thus reducing excavation depths on sections of the sewer from the outlet to the WwTP.

However, inverted siphons require ongoing maintenance and are often associated with odour problems. The latter was considered particularly problematic, given that the area is zoned as a Waterfront Development zone and can be expected to contain residential and commercial development in the future. In addition, the siphon would act as a potential restriction on sewer flow, necessitating protective measures upstream to prevent surcharging.

Gravity

It was concluded that the advantages offered by the crossing operating under gravity outweighed the disadvantages, hence the gravity design was chosen as the preferred option.

The sizing of the river crossing was determined on the basis of modelling that has shown that for a gravity sewer, a c. 1500mm diameter pipeline will be required for a single pipe. A twin pipe solution was rejected as it would result in higher construction costs for a relatively small reduction in excavation depth.

To provide a minimum 3m clearance which is required below the dredge level at the crossing point, shaft depths of approximately 12m each side of the river will be required to facilitate construction.

The length of the river crossing is approximately 120m. The flows from the southern interceptor sewer will flow through the river crossing by gravity, joining the northern inceptor sewer and being discharged to the proposed WwTP at the Old Wallboard site at Ferrybank.

3.5.2.2 Long Sea Outfall and SWO at WwTP

The design requirements of the long sea outfall and SWO has been dictated by the hydraulic profile of the proposed development through the collection network and the WwTP, as well as the design specifications required by Irish Water in terms of treatment throughput, stormwater storage and network design requirements in addition to required discharge design standards.

The size and vertical profile of the long sea outfall and SWO has therefore been dictated by the process levels on the WwTP site, ground levels, the revetment and sea levels.

3.5.2.3 Revetment

The existing revetment in the vicinity of the Old Wallboard site at Ferrybank was examined in the context of the proposed development. It was deemed that the height of the revetment was not adequate to provide the required protection to the WwTP and it was also clear that the revetment was not in good condition, having been damaged by previous storm events. It was therefore considered necessary to rebuild and raise the height of the revetment, in the vicinity of the WwTP site.

Initially, the provision of a walkway along the crest of the revetment was considered as an opportunity to provide community gain as part of the proposed development. During the design development however, the provision of this walkway was omitted for health and safety considerations. This decision was based on the recommendations in industry guidance[16,17] with regard to tolerable overtopping with respect to pedestrians using the walkway.

[16] EurOtop (2016) Manual on wave overtopping of sea defences and related structures Second Edition, Pre-release.
[17] USACE (2011) Coastal Engineering Manual, Chapter 5, Part VI, September 2011.

Specifically, EurOtop[16] outlines safe overtopping volume limits for pedestrians behind a sea defence structure and states that:

"A few general conclusions can be made on tolerable overtopping with respect to people. If the wave height exceeds about 3m it may be dangerous to allow people on any structure during wave overtopping."

The predicted wave height from the modelling undertaken in May 2018 was 3m for the 1 in 500-year event. Whilst the wave height aligns with the allowable overtopping limit (i.e. wave height of 3m), the walkway was still deemed a health and safety risk for the following reasons:

- This estimated overtopping volume is for the area behind the revetment rather than at the crest of the revetment, therefore it is not a true indication of the safety of a walkway on top of the revetment. Due to the space restrictions between the revetment and the WwTP buildings, the placement of a walkway behind the revetment was not deemed a viable option.
- The tie-in sections of the revetment are not up to design standards[16,18]. Given that there is no existing walkway at these locations, a new walkway would be required at these locations. However, the revetment outside of the planning boundary does not meet design standards[16,18] and therefore, there is a risk that overtopping above the recommended limit may occur and pedestrian safety could not be guaranteed at these locations.
- During the design development damage to the existing walkway occurred along Arklow North Beach during Storm Ophelia in October 2017 (Refer to Figure 3.8). An entire stretch of pavement was dislodged by the force of wave action which highlights the risk associated with such walkways.

[18] ICE (2007) The Rock Manual - The use of rock in hydraulic engineering (2nd edition).

Figure 3.8: Dislodgement of pavement observed near the site after Storm Ophelia in 2017

3.5.2.4 Civil Structures and Site Remediation

The following considerations were taken into account during the design development of the civil structures for the buildings at the WwTP site.

Foundation type

The foundation type adopted for each of the buildings has been determined by considering the geotechnical load carrying capacity of the soil on site and minimising the extent of contaminated land to be excavated.

Two viable foundation schemes were identified for the proposed development:

- A shallow foundation scheme whereby isolated pads would be located below columns with ground bearing slab for the Inlet works and raft foundation provided for the Process building and Sludge tank enclosure; and
- A system of piles, pile caps and ground beams was investigated for the structures to minimise the extent of contaminated land to be excavated.

The piled system would reduce the extent of contaminated material to be excavated. However, from a preliminary assessment it appears that the potential saving in excavation would not outweigh the additional cost and complexity required for a piled foundation solution.

A piled foundation system is something that may be explored by the contractor during the detailed design. The EIAR has considered and detailed both options in **Chapter 4**, to ensure the reasonable worst case is assessed herein.

Choice of structural material

Steel and concrete have been considered as alternative materials for the structural frame for the Inlet Works and Process buildings. The structural grid system is dependent on the process layout which required relatively long spans between support locations.

Steel generally provides greater efficiency achieving larger spans with reduced structural depth in comparison to concrete. Further, an equivalent concrete framed building would likely be heavier, resulting in bigger foundations and potentially deeper excavations. Hence, a steel frame was selected for the structural frame for the proposed buildings.

Nonetheless, a concrete framed structure may provide other financial, programme related or operational (maintenance) benefits that the Contractor might wish to explore during their development of the detailed design and both have been considered in this EIAR.

3.5.2.5 MEP

A number of options for mechanical, electrical and plumbing design in the WwTP have been considered with cognisance of energy demand and efficiency.

PV Installation

The following alternatives were considered in relation to the installation of PV panels:

- ‘Do-nothing’, i.e. do not install PV panels.
- PV installation on roof of Inlet Works Building; and
- PV installation on the roof of the Process building.

The WwTP would have significant continuous usage of electrical energy, therefore omission of the PV panels was not considered to be a feasible option from an energy efficiency perspective. The inclusion of the PV installation would reduce annual energy usage from the national electricity grid, reduce operational energy costs and improve energy efficiency of the proposed development.

The roof of the Inlet Works building was initially selected to install PV panels, however this was rejected as the PV panels would increase the height of the Inlet Works building which would then exceed the maximum desired building height defined by Wicklow County Council during consultation.

The roof of the Process building was therefore chosen as the location of the PV installation because the roof of the building would remain within the allowable height limits with the inclusion of the PV installation thereon. This is discussed in further detail in **Chapter 4.**

Standby Power

The following alternatives were considered:

- 'Do-nothing', i.e. no backup power.
- Uninterruptable Power System (UPS) power supply; and
- Diesel generator.

The continued operation of the WwTP is of high importance and the exclusion of an alternative power supply would render the WwTP non-operational in the event of a power outage. The loss of power would prevent and disrupt pumping activities and thus overall operability. This was deemed not feasible on this basis.

UPS provide power supply for a pre-defined period before being required to be recharged. The UPS power supply would therefore not be suitable for providing long term backup power at this scale, hence an alternative technology is required.

For this reason, a diesel generator has been proposed as an alternative power supply to be used in the event of a loss in utility supply. Diesel generators have been proven to be a reliable backup power source for various types of facilities and for various lengths of time, from hours to days and are therefore provided as part of the proposed development as described in **Chapter 4**.

HVAC Installations

Overview

The requirement to either naturally ventilate or mechanically ventilate the buildings on the WwTP site was reviewed against their functional and operational use on a building by building basis and on a space by space basis. Consideration was specifically given to the expected activities and occupation within each building to determine their classification as buildings or otherwise with respect to their compliance with the Building Regulations (TGD Part L Amendment) Regulations 2011. Given the regulatory requirements, there were no reasonable alternatives and on this basis, the finalised HVAC strategy for the proposed development has been determined as described in the following sections.

Inlet Works building

The Inlet Works building (which also houses the sludge thickening and dewatering equipment, polymer makeup units, sludge and solids residuals skips and stormwater storage tanks) has been determined to be a building that is not designed to be heated to temperatures for human occupancy. The Inlet Works building would be used solely to enable the inspection, repair and maintenance of the equipment installed therein. Thus, any heating provision would only be for maintaining a temperature within relevant spaces such that the formation of condensation and frost inside the building is prevented.

Any foul air generated by the initial stages of the treatment process itself or within some of the spaces associated with these initial stages of the treatment process would be extracted by an Odour Control (OC) system and discharged to atmosphere via the vent stack.

On this basis general ventilation only, as required, would be provided via an Air Handling Unit and / or external louvres to provide makeup air as necessary to these spaces.

Process building

The Process building has been determined to be a building that is not designed to be heated to temperatures for human occupancy. Similarly, the Process building would be used solely to enable the inspection, repair and maintenance of the equipment installed therein. Thus, any heating provision would only be for maintaining a temperature within relevant spaces such that the formation of condensation and frost inside the building is prevented.

Mechanical ventilation would be provided to expel the stale air above the Process tanks. This air would be discharged to atmosphere via an extract fan installation and the associated vent stack. External louvres would be provided for the provision of the required make-up air should the extent of air infiltration into the building be deemed insufficient.

Administration building

The Administration building has been determined to be a building that requires mechanically ventilation and thus would be provided by a dedicated Air Handling Unit for this purpose along with a sanitary accommodation extract fan system.

The administration building would therefore be a fully air-conditioned environment in order to provide a secure and comfortable working environment for operational staff.

Sludge Tank Enclosure

The Sludge Tank Enclosure will have no roof and thus will be a naturally ventilated structure rather than an enclosed building with a roof structure, with the sludge tanks therein sealed and connected to the odour control system. Thus, there is no need for any HVAC installations.

3.6 Integrated Scheme

The Office of Public Works is responsible for flood relief schemes and, together with Wicklow County Council is proposing a flood relief scheme for Arklow town (as described in **Section 2.6.7 in Chapter 2**). As outlined in **Section 1.5.3 in Chapter 1**, Irish Water has liaised with the Office of Public Works and Wicklow County Council to finalise how the design and construction of both projects along the Avoca River can work together and how the two schemes can be integrated as much as possible, in an effort to ensure that disruption to Arklow town is minimised.

Based on the current best available information, it would appear that the programme for the proposed Arklow Flood Relief Scheme is running behind that of the proposed development and consequently the detailed design of the proposed Arklow Flood Relief Scheme has not progressed to a stage that would allow reasonable alternatives to the level of integration currently proposed and described in **Chapter 4**.

On the basis of the currently available information on the design of the proposed Arklow Flood Relief Scheme, it is anticipated that integration works will be confined to providing new sheet piled river walls for an area on the River Walk / South Quay commencing at Arklow Bridge and extending some 375m downstream (as described in **Chapter 4**).

There is no reasonable alternative given the confined area (as undertaking of works separately would require further construction activities at the same physical locations). In this way through the integration of works, the two schemes are ensuring that the impacts in this area are minimised and the need to come back to the same location at a later date and install the walls for the flood relief scheme (below existing ground level) is avoided.

3.7 Construction Methods

3.7.1.1 Sewers

A detailed report, Interceptor Sewer Route Options Report has been prepared and is included at **Appendix 3.2**. This report documents the preferred construction methods for the proposed interceptor sewer within the sections illustrated in Figure 3.4 and **Section 3.3.3.1**.

Generally, the construction techniques available for below ground sewer construction falls into two main categories:

- ‘Open Cut Excavation’; or
- ‘Trenchless’, also commonly described simply as ‘Tunnelling’ techniques.

In urban areas, tunnelling (where feasible) minimises excavation, spoil removal, disruption at ground level, above ground utility diversion and road reinstatement requirements. This is particularly the case for large diameter deep sewers such as those required as part of the proposed development. A summary of the preferred construction methods is indicated in Table 3.16 and further detail is provided in **Appendix 3.2**.

Table 3.16: Summary of construction options for proposed interceptor sewers

Sewer Location	Preferred methodology	Main reasons for preferred option
Avoca River	Tunnelling	Open cut considered impractical for Avoca River and would likely have significant environmental impact
River Walk	Open cut excavation	Tunnelling is not considered practical (insufficient cover depth) for the smaller diameters and shallow depths at this location
Avoca River at southernmost bridge arch	Open cut excavation	Open cut preferred through bridge arch as tunnelling would require increased sewer depths and likely increase risk to Arklow Bridge
Avoca River adjacent to South Quay	Open cut	Open cut is preferred at this location given the need for the new sheetpiled quay wall (to support the proposed Arklow Flood Relief Scheme) to minimise cumulative effects
South Quay	Tunnelling	Open Cut considered impractical given sewer depths required. This would likely have greater environmental impacts
Private land/ North Quay	Tunnelling	Open Cut considered impractical given sewer depths required. This would likely have greater environmental impacts
North Quay	Tunnelling	Open Cut considered impractical given sewer depths required. This would likely have greater environmental impacts
Mill Road	Tunnelling	Open Cut considered impractical given sewer depths required. This would likely have greater environmental impacts

3.7.1.2 Long Sea Outfall

There are several methods by which the outfall can be constructed. The options considered, based on current best practice and site restraints/characteristics, include:

- Horizontal directional drilling (HDD);
- Float and flood method; and
- Bottom pull method.

It is proposed to allow flexibility for the contractor to select the most appropriate construction method, which will be influenced by their available plant and equipment as well as their previous experience in laying marine outfalls. The contractor will therefore be responsible for determining which method is most appropriate The EIAR has considered and detailed these options in **Chapter 5** to ensure the reasonable worst case is assessed herein.

3.8 References

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4 The Proposed Development

4.1 Introduction

This chapter describes the proposed development for which Irish Water is seeking consent in Arklow town (Refer to **Volume 3** for the relevant scheme drawings of the proposed development). Specifically, this section describes the design, operation and decommissioning elements of the proposed development whilst the construction aspects of the proposed development are described separately in **Chapter 5**.

This chapter of the EIAR has been prepared in accordance with Part 1 of Annex IV of the EIA Directive. This chapter has been structured to describe the following:

- The strategy for procurement of the proposed development and how it will influence the detailed design;
- The design of the proposed development;
- Associated aspects of the proposed development of relevance including community gain and separate consents required;
- The operation of the proposed development; and
- The decommissioning of the proposed development.

4.2 Procurement Strategy

Irish Water intends to procure the detailed design and construction of the proposed development using a Design and Build type contract. This form of contract has the benefit of encouraging innovation and value engineering, particularly for a project of this nature and scale, by giving the contractor ownership of both the detailed design and construction of the development. Design and Build contracts traditionally also lead to shorter construction programmes. Under this type of contract, the successful contractor will ultimately be responsible for the final detailed design of the proposed development, within the constraints as outlined herein.

The contractor is required to comply with all of the performance requirements set out in the tender documentation including the statutory consent approvals and any associated conditions that may be granted by An Bord Pleanála, Department of Housing, Planning and Local Government, EPA and other statutory stakeholders.

Irish Water has developed a detailed specimen design of the proposed development for assessment within this EIAR. This EIAR has considered the likely significant effects on the environment associated with our detailed specimen design. The contractor will develop this design further, in accordance with the proposed mitigation measures, and any conditions that may be prescribed as part of the consent for the proposed development, ensuring that there is no material change in terms of significant effects on the environment.

As such, the assessment herein is considered to be the 'reasonable worst-case scenario' in terms of significant environmental effects with regard to the overall planning boundary of the proposed development. The detailed design by the contractor should seek to identify opportunities for reducing further any significant adverse environmental effects where practicable.

4.3 Design of the Proposed Development

4.3.1 Introduction

4.3.1.1 Overview

Wastewater in Arklow is currently collected and discharged (untreated), through 19 existing discrete storm water overflows (SWOs) and/or outfalls to the Avoca River. To ensure compliance with the UWWT Directive, it is necessary to appropriately treat wastewater from agglomerations such as Arklow, prior to discharge to water bodies. The proposed development is designed to address this deficiency and provide appropriate wastewater treatment for Arklow town.

The proposed development will improve water quality in the Avoca River and provide adequate treatment capacity to support further development in Arklow town. All existing SWOs and/or outfalls that currently discharge to the Avoca River will be captured by the proposed interceptor sewers that will be provided to the north and south of the river channel. The interceptor sewers will convey wastewater to the WwTP for treatment and eliminate in so far as possible the current practice of discharging untreated wastewater to the Avoca River.

The proposed infrastructure at the head of the southern interceptor sewer, i.e. the Alps SWO and storage tank, will intercept wastewater flows in this part of the catchment, provide appropriate storage as well as pipework and a new overflow to allow storm flows, in excess of this storage capacity, to discharge to the Avoca River. The SWO and stormwater tank is designed to pass forward minimum Formula A flows[1] and to limit spills to the river to no more than seven times per bathing season in accordance with the requirements of the Wastewater Discharge (Authorisation) Regulations 2007, as amended and the guidance[2].

The proposed interceptor sewers will convey wastewater by gravity to the proposed WwTP that will be located at the Old Wallboard Site at Ferrybank. The interceptor sewers will be provided along the northern and southern quays and a river crossing will be provided between south Quay and Mill Road.

[1] Formula A flows are the industry standard for design that considers the Dry Weather Flow (DWF) plus allowance for storm flows as a factor of population (i.e. Formula A = DWF +1.36P + 2E where DWF = PG + I +E; Where 'P' is the population served and 'G' is the average per capita water consumption, 'E' is the average industrial effluent and 'I' is the rate of infiltration) as per HMSO (1970) *Report of the Technical Committee on Storm Overflows and the Disposal of Storm Sewage*

[2] Department of the Environment (1993) *Procedures and Criteria in relation to Storm Water Overflows*. Available from: http://www.epa.ie/pubs/forms/lic/wwda/uwwtdirective91271eecprocedurescriteriairtstormwateroverflows.html [Accessed 22 May 2018]

Two further SWOs will be provided on the network, one at the junction of South Quay -Harbour Road (discharging from the southern bank of the Avoca River) and one at the proposed WwTP site (discharging from the toe of the revetment into the Irish Sea). These SWOs will act as an emergency relief for excess storm flows in the sewered catchment during extreme rainfall events or during extended power outages at the WwTP. All flows through the SWOs will be screened prior to discharge.

The WwTP will provide both preliminary and secondary treatment of the wastewater, in a bespoke, architect designed WwTP. The WwTP will have an ultimate capacity of 36,000PE with an initial treatment capacity of 24,000PE installed in the first instance. As outlined in **Chapter 1**, Irish Water are seeking consent for the 36,000PE WwTP and the effects of such have been assessed in this EIAR.

It has been assumed (for the specimen design) that a sequencing batch reactor (SBR) treatment technology will be provided for the secondary treatment in the Process building. Following treatment, the treated effluent will discharge to the Irish Sea through the long sea outfall.

Excess storm flows in the WwTP will, in the first instance, be diverted to a stormwater holding tank in the Inlet Works building, particularly during significant rainfall events. These excess storm flows will discharge to the Irish Sea through the proposed SWO located at the WwTP site, which also operates as an emergency relief for excess flows in the sewered catchment as described above.

A new, upgraded coastal revetment will also be installed on the shoreline adjoining the WwTP site to replace the existing rock armour revetment. The crest of the existing revetment will be raised by approximately 2m and rock armour will be installed to achieve the relevant design standard. This revetment upgrade will improve flood resilience by providing protection to the WwTP from the wave and tidal action of the Irish Sea.

In summary, the key design aspects of the proposed development are:

- Alps SWO and Stormwater Storage Tank (approximately 400m^3);
- Interceptor Sewers;
    - Northern interceptor sewer along North Quay (approximately 800m);
    - Southern interceptor sewer along River Walk and South Quay (Approximately 1.1km) of which approximately 300m will be constructed in the Avoca River;
    - Underpinning works on the two southernmost arches of Arklow Bridge;
    - Tunnelled crossing under the Avoca River (approximately 120m) between South Quay and Mill Road and SWO for excess storm flows; and
    - Associated manholes and vent stacks along the alignment of the proposed interceptor sewer network.

- WwTP
  - Demolition and site clearance of existing structures on the Old Wallboard site;
  - 36,000PE WwTP providing preliminary and secondary treatment (Sequencing Batch Reactor process) in four buildings, two of which will have vent stacks;
  - SWO to discharge excess storm flows from a storage tank (approximately 3,150m^3); and
  - Ancillary site infrastructure development and landscaping.
- Outfalls
  - Long sea outfall (approximately 930m long) to discharge treated effluent terminating with a diffuser; and
  - SWO as outlined above.
- Upgrade of the existing rock armour revetment on shoreline adjacent to the WwTP site.

Design drawings illustrating the proposed development are available in **Volume 3** (full set of scheme drawings provided therein).

4.3.1.2 Land Requirements

Lands for the proposed development will be acquired pursuant to the following legislation:

- Form of Compulsory Purchase Order under Section 76 of, and the Third Schedule to, the Housing Act, 1966, as extended by Section 10 of the Local Government (No.2) Act, 1960 and amended by the Planning and Development Act, 2000, as amended
- Local Government (No.2) Act, 1960
- Section 10 of the Local Government Ireland Act, 1898, as amended by Section 11 of the Local Government (No.2) Act, 1960 and Section 213 of the Planning and Development Act, 2000, as amended, as applied by Section 93 of the Water Services Act, 2007
- Water Services (No.2) Act, 2013

The Compulsory Purchase Order (CPO) includes under the CPO Schedule the extent of the following:

- Lands to be acquired (purchased);
- Permanent wayleaves;
- Temporary working areas;
- Permanent rights of way.

The land requirements identified in the CPO are necessary to construct, operate and maintain the proposed development.

As part of the CPO process, supporting documentation is provided in the form of an Engineer's Report, CPO drawings and land schedules.

The Engineer's Report outlines the following:

- The Community Need underlying the proposed development covering:
  - The existing situation and the need for the proposed development;
  - Description of the proposed development and public interest;
  - History of proposed development and statutory processes; and
  - The need for the identified lands and the need to acquire them compulsorily.
- Planning considerations; and
- Resources and alternatives considered.

The CPO drawings and schedules clearly identify the land plots required for the CPO process including ownership/reputed ownership/occupiers and the associated area (size) necessary to facilitate the proposed development.

4.3.2 Alps SWO and Stormwater Storage Tank

4.3.2.1 Overview

The existing SWO, located in the north-east corner of the Alps, will be upgraded and associated site works undertaken to link with the existing network and provide storm water storage at this location. The scope of works for this portion of the proposed development includes:

- Provision of a new online enclosed storage tank structure (approximately 400m^3 storage volume) that would consist of reinforced concrete base, walls and roof;
- Installation of a non-powered static overflow screen inside the storage tank and provision of access covers in the roof structure (included at ground level);
- Raising of existing ground profile by approximately 1m to accommodate the tank structure – with appropriate landscaping provided in the form of grassing above the tank and tarmac surfacing to provide vehicular access;
- Provision of gabion retaining wall (approximately 40m in length and up to 1.8m in height to the toe of existing embankment) in the area between the tank and access gate;
- Diversion of existing foul sewer via two new manholes (MHA1 and MHA2) to enable construction of the proposed storage tank. The smaller approximately 225mm diameter pipeline would be permanently diverted to connect to the larger (approximately 1200mm diameter) pipeline[3];

[3] The existing sewer would be maintained from this point until the proposed development is commissioned. On completion, flows would be diverted to the proposed SWO and storage tank from the same manhole.

- Provision of a new manhole (MHA3) to divert upstream flows in the approximately 1200mm diameter pipeline into the storage tank;
- Provision of three manholes (MHA5, MHA6 and MHA7) and approximately 300mm diameter pipeline to collect downstream flows from the storage tank (including additional interceptor sewers to divert the existing sewers to the manhole [MHA7]);
- Upgrade of existing manhole (MH1) to divert existing flows to the proposed interceptor sewer (via MHA7);
- Connection of overflow pipework (via a new approximately 900mm diameter pipeline) to the existing 1200mm diameter sewer, manhole (MHA4) and existing box culvert which discharges to the Avoca River;
- Installation of fence (up to approximately 2.4m high) to secure the storage tank and facilitate ongoing maintenance and operation;
- Provision of a gate suitable for vehicular access (required for maintenance);
- Provision of power supply/control panel to enable monitoring of tank levels and overflow events;
- Installation of water supply hose reel (in kiosk) to allow wash down of overflow screen/chamber floor within the storage tank; and
- Abandonment of up to approximately 130m of sewer in this area of which approximately 80m will be left in situ and approximately 50m will be removed.

4.3.2.2 Design details

SWO and Storage Tank

The upgraded SWO has been designed for return periods in excess of 5 years, i.e. any flows up to a 5-year storm return period could be contained within the storage tank. The storage tank will have a storage volume of approximately 400m^3.

The SWO has been designed to pass forward minimum Formula A flows and to limit spills to the river to no more than seven times per bathing season as noted in **Section 4.3.1.1**. All excess storm flows discharged to the Avoca River will be screened to ensure that all particles greater than 6mm in diameter will be retained by the screen in the storage tank.

Structure

The SWO structure and storage tank will comprise a reinforced concrete base and walls to a depth of approximately 4m below existing ground level. The tank itself will be enclosed by a reinforced concrete slab roof with access covers provided in the roof to facilitate maintenance during operation. The access covers will be appropriately vandal proofed at the ground level and secured by means of perimeter fencing.

The SWO and storage tank will be contained in a structure that will protrude above existing ground level and require the raising of existing ground levels by approximately 1m in this area. Perimeter fencing will be erected and a gate will be provided at the northern end for vehicular access (to facilitate operational maintenance). Soft landscaping will be incorporated in the form of wildflower grass and perimeter hedging except where vehicular access is required (i.e. tarmac hardstanding would be installed to the north). A footpath will also be provided around the tank where access is required to inspect manholes.

Sewer connections and diversions

The existing foul sewer (225mm diameter pipeline) will be diverted at a new manhole (MHA1). This pipeline diversion will connect to another new manhole (MHA2) that will be provided on the line of the existing sewer (1200mm diameter pipeline).

The existing foul sewer currently discharges untreated wastewater directly to the Avoca River via a concrete box culvert. This culvert will be maintained to facilitate discharge of overflow (i.e. excess storm flows) during flood events. Excess storm flows will be passed from the storage tank via an approximately 900mm diameter pipeline that will connect to the culvert and this discharge of storm flows, during rainfall events, will continue to the Avoca River.

Once operational, flows will be diverted from MHA2 into the SWO and storage tank via another manhole (MHA3) and into an approximately 1200mm diameter pipeline that will connect to the structure. The flows through the tank will be via an open channel reducing in size from approximately 1200mm diameter inlet to approximately 300mm diameter at the outlet. The outlet will divert flows into a new approximately 300mm diameter pipeline via three manholes (MHA5, MHA6 and MHA7).

At this point, flows from the tank will be combined with an existing 225mm diameter pipeline (flowing from the west). At MH7, the pipeline will increase to approximately 450mm diameter and flows will be conveyed to the head of the new interceptor sewer at MHS1. The proposed interceptor sewer between MHA7 and MHS1 will cross under the existing box culvert.

Functionality

The proposed development will intercept the existing combined and storm sewers that currently conveys wastewater. Flows will therefore be passed through the SWO once operational with the wastewater conveyed to the interceptor sewers whilst the storm flows will be passed to and stored in the proposed online storage tank.

The storage tank will provide capacity for holding storm flows. Modelling has been undertaken to ensure that the storm water tank is sized to provide sufficient storage (up to approximately 400m^3). This will ensure that the SWO will discharge to the Avoca River no more than seven times per bathing season in accordance with requirements in the guidance[2] and in the Wastewater Discharge Authorisation Regulations 2007, as amended (Refer to **Section 4.5** for further detail on the relevant licenses and consents).

During significant rainfall events where storm flows exceed the tank storage capacity, excess flows will spill via the SWO to the Avoca River (entering the river channel via the existing culvert). These spills will be screened through a static upward flow screen to ensure particles of more than 6mm in diameter are retained within the tank.

As noted in **Section 4.3.2.2**, access covers will be provided in the roof of the structure. Primary covers will be located over the static screen and a hose reel in a kiosk (approximately 1m x 1m x 1.5m) will be installed adjacent to assist with screen cleaning required to support regular maintenance. Whilst, the tank is designed to be self-cleansing through suitable gradient, benching and a dry weather channel, regular maintenance may be required to facilitate inspections of the tank inlet and outlet pipes.

A small control kiosk is also required to provide power and control signals for instrumentation installed in the stormwater storage tank. The instruments record the level of stormwater and monitor the number of overflow spills to the river.

4.3.2.3 Abandonment of sewers

On diversion of all flows through the SWO and storage tank, there will be no flows from MHA2 to MHA4. This section of 1200mm sewer will be abandoned, though remaining in place. The existing wastewater network pipes that are redundant will typically be pumped with concrete to form a plug at either end of the line.

MHA2 and MHA4 inlet and outlet pipework will be modified to suit flow diversion and abandonment.

Approximately 130m of sewer will be abandoned in this area and approximately 80m will be left in situ. This will include the following as illustrated in **Drawing No.'s 247825-00-C-IS-801 to 247825-00-C-IS-806 in Volume 3**:

- Foul sewer currently collecting between the proposed manholes MHA2 and MHA4;
- Some of the foul sewers currently collecting between the proposed SWO and storage tank and the Avoca River;
- Foul sewer currently collecting under the proposed SWO and storage tank; and
- Foul sewer discharging to the Arklow Bridge.

4.3.3 Interceptor Sewers

4.3.3.1 Overview

Interceptor sewers will be provided to the north and south of the river channel. A sewer will also be provided from the south quay to the north quay under the Avoca River (i.e. the 'river crossing').

The proposed sewers will intercept the existing foul network (that currently discharges untreated wastewater to the Avoca River). The interceptor sewers will join on Mill Road (to the north of the river channel) in order to convey untreated wastewater to the WwTP for appropriate treatment and eliminate in so far as possible, the discharge of untreated wastewater into the Avoca River.

The scope of works for this portion of the proposed development includes:

- Provision of approximately 1.1km of sewer on the southern side of the Avoca River between River Walk and South Quay (of which approximately 300m will be in the river channel).
- Underpinning works to abutments and adjacent bridge pier at South Quay end of Arklow Bridge (a protected structure: RPS A26) to facilitate interceptor sewer construction through southernmost bridge arch;
- Lowering of the river bed under a second bridge arch at South Quay end of Arklow Bridge (a protected structure: RPS A26) by approximately 1m;
- Provision of a SWO located at a new manhole chamber adjacent to South Quay -Harbour Road junction with a discharge point to the Avoca River;
- Provision of approximately 120m of tunnelled sewer crossing under the Avoca River from the South Quay to Mill Road;
- Provision of approximately 800m of tunnelled sewer on the northern side of the Avoca River along North Quay and extending as far as the Inlet Works building in the WwTP;
- Diversion of flows from the existing sewer network along both the southern and northern sides of the river channel on commissioning of the new WwTP;
- Provision of manholes and service shafts along the route of the proposed interceptor sewers;
- Provision of 12 vent stacks along the length of the northern and southern interceptor sewers for ventilation at each of the tunnel shafts;
- Abandonment of approximately 590m of existing sewer network on completion of diversion of flows to the new interceptor sewer.

It should be noted that, as described in detail in **Section 5.6 of Chapter 5**, the interceptor sewers will be installed off line, therefore allowing existing network flows to be maintained until the completion and commissioning of the WwTP.

4.3.3.2 River Walk / South Quay

Overview

The interceptor sewer on River Walk will commence adjacent to the proposed Alps SWO and storage tank (at MHS1) and continue east along River Walk to Arklow Bridge. Immediately upstream of Arklow Bridge, which is a protected structure (RPS: A26), the sewer will enter the Avoca River (i.e. it will be within the river channel) and pass under the most southerly arch of Arklow Bridge to just downstream of South Green.

The sewer will exit the river channel adjacent to the South Quay – South Green junction, pass through the existing quay wall and be on the landside and continue east to the proposed river crossing at Harbour Road. The sewer will traverse under the existing roadway and green space along this section of South Quay to Harbour Road. Approximately 30m of sewer will be installed to the east of the river crossing to collect flows from the existing foul sewer network in this area.

The interceptor sewer network has been designed to tie in with the existing watewater network.

Design details

River Walk

At MHS1 flows from the SWO will be passed into the proposed approximately 450mm diameter pipeline and flow east along the promenade to River Walk and onwards to the proposed WwTP. The sewer will increase to approximately 525mm in diameter after MHS4 and subsequently to approximately 750mm in diameter after MHS5. The proposed and existing sewers will interface at a number of locations along this section.

The proposed sewers will therefore be installed at depth (up to c. 3.5m below ground level) to allow the existing foul sewer network to operate as normal until the proposed development is commissioned. There are four locations along this section where flows will be transferred from the existing foul sewer network to the proposed sewer upon operation, therefore the following will be provided:

- c. 150mm diameter spur pipeline at MHS2 to connect to the existing foul sewer and proposed manhole (MHS2A);
- c. 150mm diameter spur pipeline at MHS3 to connect to the existing foul sewer and proposed manhole (MHS3A);
- c. 150mm diameter spur pipeline at MHS4 to connect to the existing foul sewer and proposed manhole (MHS4A); and
- c. 300mm diameter spur pipeline to the south of MHS5 to connect to the existing foul sewer.

The 750mm diameter pipeline (approximately) between MHS6 and MHS9 will pass under River Walk at a depth of up to approximately 4m below ground level. There are four locations along this section where flows will be transferred from the existing foul sewer network to the proposed sewer upon operation, therefore the following will be provided:

- c. 375mm diameter spur pipeline at MHS7 to connect to the two existing foul sewers;
- c. 300mm diameter spur pipeline at MHS8 to connect to the existing foul sewer; and
- c. 300mm diameter spur pipeline at MHS9 to connect to the existing foul sewer.

Arklow River / Arklow Bridge

At MHS9 the approximately 750mm diameter pipeline will enter the river channel at a depth of approximately 2m below the river bed. The pipeline will be protected with mass concrete and the river bed will be reinstated to its current condition upon completion of construction.

The pipeline will pass under the most southern arch of Arklow Bridge. It should be noted that significant land constraints and the presence of a range of existing utilities, services and infrastructure at the southern end of Arklow Bridge mean that the interceptor sewer cannot be accommodated on the landside portion of this area as discussed in detail in **Chapter 3**.

A small area of land (approximately 40m^2) on River Walk (i.e. upstream of Arklow Bridge around MHS9) will be reclaimed from the river channel to accommodate the proposed manhole and sewer. At this location, the quay wall will be moved further north, by approximately 4m, into the river channel.

The sewer will exit the river channel approximately 15m downstream of Arklow Bridge and connect to MHS10 within another section of reclaimed land on South Quay as described below.

South Quay

An area of approximately 1,650m^2 on South Quay (downstream of Arklow Bridge around MHS10) will be reclaimed from the river channel. At this location, the quay wall will be moved further north, by approximately 6m, into the river channel over distance of approximately 275m.

Sheet piling will be installed outside the area of reclaimed land and the sewer will be laid within the section of reclaimed land. This permanent sheet piling will be capable of accommodating the flood defence walls proposed as part of the forthcoming Arklow Flood Relief Scheme (Refer to **Section 2.6.7 of Chapter 2** for further detail). The sheet pile walls will be capped to match the existing road level on South Quay whilst the reclaimed land will be brought up to ground level (approximately 1.25mAOD) with suitable material, topsoil and seeded. A cross section of the sewer in this area is illustrated in Figure 4.1.

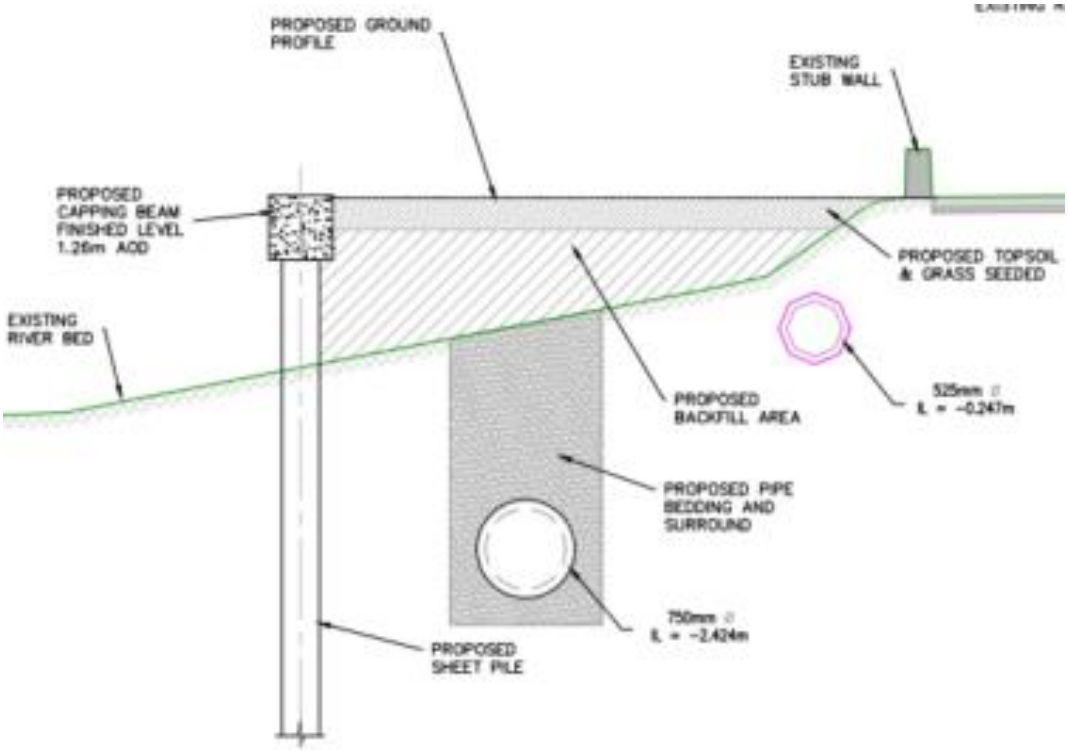

Figure 4.1: In-river section of the interceptor sewer

The existing outfalls along this sewer section will be extended to meet the proposed interceptor sewer in this area and therefore will transfer flows into the proposed interceptor sewer upon operation. The following will therefore be provided:

- c. 600mm diameter spur pipeline at MHS10 to connect to the existing foul sewers;
- c. 150mm diameter spur pipeline at MHS11 to connect to the existing foul sewer;
- c. 600mm diameter spur pipeline at MHS12 to connect to the existing foul sewers;
- c. 300mm diameter spur pipeline at MHS13 to connect to the existing foul sewer;
- c. 225mm diameter spur pipeline at MHS14 to connect to the existing foul sewer; and
- c. 900mm diameter spur pipeline at MHS15 to connect to the existing foul and surface water sewers.

At TSS1 the sewer will leave the existing river channel and be approximately 5.5m below ground level on the existing landside of the quay wall. From TSS1, the approximately 1500mm diameter pipeline will run under South Quay as far as the river crossing at TSS3. Flows will be transferred from the existing sewer (running along South Quay between Doyle's Lane and South Green) to the proposed sewer upon operation, therefore the following will be provided:

- c. 900mm diameter spur pipeline at TSS1 to connect to the existing foul sewer; and
- c. 525mm diameter spur pipeline at TSS3 to connect to the existing foul sewer.

To the east of TSS3, approximately 30m of approximately 1050mm diameter pipeline will be installed between the junction of the South Quay – Harbour Road sewer/river crossing and Rockview Terrace. This pipeline will connect to the existing sewer (at MHS17).

A SWO will be provided in the easternmost tunnel shaft on South Quay (TSS3). This SWO will provide emergency relief for excess storm flows in the sewered catchment and during extended power outages at the proposed WwTP. Hydraulic modelling has been undertaken and the results of spill frequency analysis (of the future system with a 10 year time series rainfall event) indicated that the proposed SWO will spill on average less than once per bathing season which is well below the permitted 7 spills per bathing season that is documented in the guidance[2] and in the Wastewater Discharge Authorisation Regulations 2007, as amended.

An approximately 1200mm diameter pipeline will be installed from the tunnel shaft through the existing river sheet pile wall. The SWO will have a flap valve to prevent water ingress. All spills through the SWO will be screened to ensure that all particles greater than 10mm are retained by the screen.

Abandonment of sewer

Approximately 460m of sewer will be abandoned along River Walk and South Quay and left in situ. The existing foul sewer network pipes that are redundant will typically be pumped concrete to form a plug at either end of the line. This will include the following:

- Foul sewer currently collecting and discharging to Avoca River via the box culvert adjacent to the Alps;
- Some of the foul sewers collecting along the western end of River Walk and associated outfalls;
- Foul sewer adjoining the southern end of Arklow Bridge;
- Foul sewer along South Quay between Doyle's Lane and South Green;
- Foul sewer and outfall between Harbour Road and the Avoca River; and
- Foul sewer and outfall between Rockview Terrace and the Avoca River.

4.3.3.3 River Crossing

The river crossing will be approximately 1500mm diameter pipeline tunnelled 4m beneath the river bed for approximately 120m between the South Quay - Harbour Road junction (on the southern side of the river) and Mill Road (on the northern side of the river). A tunnel shaft will be provided to the north and south of the river channel (TSS3 and TSN6 respectively) and an SWO (as described above) will be constructed at this location to facilitate discharge of excess storm flows.

The 1500mm diameter pipeline will continue along Mill Road to meet the proposed interceptor sewer from North Quay (Refer to **Section 4.3.3.4**). These sewers would ultimately join to convey foul flows and enter the WwTP at the pumping station located at the Inlet Works building (which as described in **Section 4.3.4.4** is 17m below ground level).

There are two locations along this section (to the north of the river channel) where flows will be transferred from the existing foul sewer network to the proposed sewer upon operation, therefore the following would be provided:

- c. 525mm diameter spur pipeline at TSS3 to connect to the existing foul sewer; and
- c. 150mm diameter spur pipeline at TSN6 (which decreases to c. 100mm in diameter) to connect to the existing foul sewers.

4.3.3.4 North Quay

Design details

To the north of the river channel, an approximately 525mm diameter pipeline will be provided upstream of Arklow Bridge to collect from the existing foul sewer to the west of the Arklow Town Marsh. This pipeline will be approximately 2m below ground level. Flows from the existing sewer (that runs along the rear of properties to the west of Ferrybank, i.e. the R772) will be intercepted at a new manhole (MHN1). This approximately 525mm diameter pipeline will connect to the existing sewer and continue east to TSN1 which is located at 1 Ferrybank (i.e. on the site of a demolished property).

At TSN1, the approximately pipeline will increase to approximately 1200mm in diameter in order to provide capacity to accommodate population growth and anticipated future network improvements in Ferrybank and north Arklow.

This approximately 1200mm diameter pipeline will cross under the roundabout to the north of Arklow Bridge before traversing along North Quay following the alignment of the road around Arklow Harbour until it joins the proposed river crossing on Mill Road (as described in **Section 4.3.3.3**). The pipeline will be approximately 1200mm in diameter all along North Quay and it will be entirely tunnelled, typically up to approximately 3-4m below ground level.

At TSN7 on Mill Road, the pipeline will meet the proposed river crossing (Refer to **Section 4.3.3.3**). These sewers will convey wastewater and enter the WwTP at the pumping station located at the Inlet Works building (which as described in **Section 4.3.4.4**, this building is up to 17m below ground level (with an additional 1m for the base slab). The invert level of the incoming sewer is up to approximately 11m below ground level.

There are seven locations along this section where flows will be transferred from the existing foul sewer network to the proposed sewer upon operation, therefore the following will be provided:

- c 525mm diameter spur pipeline to the west of TSN1 to connect to the existing foul sewer;

- c. 300mm diameter spur pipeline and manhole (MHN3A) at MHN3 to connect to the existing foul sewer;
- c. 600mm diameter spur pipeline and manhole (MHN4A) at MHN4 to connect to the existing foul sewer;
- c. 300mm diameter spur pipeline at TSN2 to connect to the existing foul sewer;
- c. 400mm diameter spur pipeline and manhole (MHN5) at TSN3 to connect to the existing foul sewer;
- c. 450mm diameter spur pipeline and manholes (MHN6, MHN7 and MHN8) to connect to the existing foul sewers; and
- c. 300mm diameter spur pipeline at MHN9 to connect to the existing foul and surface water sewers.

Abandonment of sewers

Approximately 130m of sewer will be abandoned along North Quay and left in situ. The existing wastewater network pipes that are redundant will typically be pumped with concrete to form a plug at either end of the line. This will include the following:

- Foul sewer currently crossing the eastern side of the roundabout (to the north of Arklow Bridge) and discharging to the Avoca River via the culvert approximately 50m downstream of Arklow Bridge; and
- Foul sewers and associated outfalls that would be intercepted by the sewer along North Quay.

4.3.3.5 Vent Stacks

12 vent stacks will be provided along the length of the interceptor sewers for ventilation at each of the tunnel shafts (Refer to **Drawing No.'s 247825-00-C-IS-700 to 247825-00-C-IS-716 in Volume 3**). Dispersion into the atmosphere will be via these vent stacks (approximately 300mm in diameter) extending to a height of approximately 7.6m above ground level to provide effective dispersion under all meteorological conditions.

The vent stacks will be provided with appropriate sampling and access points. At ground level, the vent stacks will be designed to resemble lighting columns.

4.3.4 WwTP

The proposed wastewater treatment plant at the Old Wallboard site will comprise: demolition and site clearance and the development of a wastewater treatment plant to provide for 36,000PE wastewater treatment capacity, with preliminary and secondary treatment processes. The main elements of the proposed WwTP are described below.

4.3.4.1 Demolition and Site Clearance

As described in **Section 2.6 of Chapter 2**, the WwTP will be located on the Old Wallboard Site at Ferrybank. There are a number of buildings and structures on this site, that are be required to be demolished and the site will require clearance, prior to the commencement of construction (as described in detail in **Section 5.5 of Chapter 5**).

The existing Old Wallboard factory building is in a poor structural condition and has significant asbestos panel cladding that will require specialist removal prior to the commencement of construction. As outlined in **Section 5.5 of Chapter 5**, this will precede all other work on the WwTP site and a specialist contractor will ensure that the demolition and site clearance works are done in full accordance with health and safety and waste legislation, with all hazardous materials transferred to an authorised facility in respect of which a waste permit or a waste licence is granted.

Once the buildings have been demolished, further site investigations will be undertaken under the footprint of the buildings, to provide further detail of the underlying ground conditions and levels of site contamination (Refer to **Section 5.5 of Chapter 5** for further detail).

4.3.4.2 Proposed WwTP site layout

Overview of WwTP site layout

There are four buildings proposed as part of the WwTP (Illustrated in Figure 4.2) including:

- The Inlet Works building to the north;
- The Process building to the south-east;
- The Sludge Tank Enclosure to the east (located between the Inlet Works and Process buildings); and
- The Administration Building to the south (adjacent to the site entrance at Mill Road).

Figure 4.2: Proposed site layout

Treatment processes at the WwTP would take place within the buildings that have been designed to maximise gravity flows and minimise pumping where possible. The buildings would be stand-alone structures, however the Inlet Works and Process buildings would be connected by an underground services tunnel.

Incoming wastewater will enter the WwTP from the interceptor sewer network via the inlet works pumping station, located below the Inlet Works building. From here, the wastewater will be pumped to the inlet works (within the Inlet Works building) where it would undergo preliminary treatment before gravitating to secondary treatment in the Process building, as outlined in Figure 4.6. The treated effluent and excess storm flows will be discharged via the long sea outfall and SWO respectively, to the Irish Sea. Excess sludge from the treatment processes will be dewatered on site and transported off site for further treatment and appropriate disposal. Further detail on the treatment processes is provided in **Section 4.3.4.4**.

Vehicular and pedestrian access to the WwTP site will be via the entrance on Mill Road. This entrance will be normally closed by a security gate for safety and security control and access will be restricted to employees and contractors accessing the WwTP (i.e. the site will not generally be accessible to the public). The following infrastructure will be provided to serve the WwTP:

- 20 car parking spaces;
- loading bays
- Internal circulation roads and associated hard standing;

- Site lighting;
- all ancillary connections to electricity, telecommunications and water supply networks and site drainage.

4.3.4.3 Architecture

Design Concept

The Old Wallboard site at Ferrybank (i.e. the WwTP site) has a long history as an industrial site, and the existing structures that have stood on the site have formed a key part of the urban memory and character of Arklow town. This part of the town is currently characterised by the remnants of this industrial history - sheds, tanks and silos which stand apart from one another on the site, separated by yards and scrub.

Its setting, between the river and the sea, and close to the new developments along the banks of the Avoca River mean that this area could accommodate larger, more urban structures offering places to live and to work in the future. This potential is expressly set out in the waterfront zoning of this area in the Arklow LAP (as discussed in detail in **Section 6.4.2 of Chapter 6**) – a zoning that encompasses a wide range of uses that requires:

"Any new developments in the Waterfront Zone to meet a high standard of design that respects the unique historical, environmental, visual and recreational amenities of the area".

In understanding this context, the proposed development may be thought of as more than just necessary infrastructure as it presents an opportunity to make a civic structure that will positively contribute to the visual environment in Arklow town whilst delivering those environmental and social benefits associated with providing wastewater treatment to the local community.

As set out in **Chapter 3**, the architectural approach has informed the shaping of the massing and appearance of each of the buildings. The design team has collaborated throughout and the result has been an integrated approach in which operational aspects and architectural approaches have been united throughout the design development. There is a clear lineage (from Victorian times to today) of infrastructure which perform as civic structures, and it is in this tradition that Clancy Moore Architects has iteratively designed the proposed development based on comments received during the public consultation and meetings with stakeholders including Wicklow County Council and An Bord Pleanála.

Clancy Moore Architects have sought to design the WwTP to acknowledge this industrial history whilst emphasising the transition of the site to support the future development of Arklow and form a part of the town's growing civic landscape. An iterative, critical and robust design process has resulted in the design which acknowledges this hybrid connection and is therefore rooted in the logics of the plant function and with cognisance of its role as civic infrastructure.

The site layout and landscaping (as described in **Section 4.3.4.1**) is cognisant of those concepts and the customary approach for arranging the site into disaggregated sheds and tanks was not applied to the proposed development. The approach has been to stack and arrange the elements of the WwTP into stand-alone compact structures. The design of the buildings presents a more coherent form and scale that allows the proposed development to set the tone for other future developments in Arklow town. The buildings are more responsive to human scale than elements of the existing site (i.e. the conventional industrial structures). The buildings are arranged so that they will conceal the car parking areas between them and to facilitate soft landscaping around the entire perimeter so that this can form a further positive contribution to the broader landscape character in Arklow town.

Form and Massing

The architecture of the proposed development is anticipated to become an important part of Arklow's visual character given the prominent location between the Avoca River and the Irish Sea. The form and massing of each of the buildings will be as described in Table 4.1.

Table 4.1: Building dimensions for the WwTP

Building	Approximate maximum height (above ground level)	Approximate maximum depth (below ground level)	Approximate plan area
Inlet Works building	16.5m[4]	18m	63.6m x 38.5m
Process building	14.5m[4]	3.5m	66m x 39m
Sludge tank enclosure	8.5m	0m	54.3m x 16m
Administration building	10.1m	0m	18.5m x 9.4m

The Inlet Works building is the tallest of the proposed buildings, however at approximately. 16.5m above ground level, it is about 13m lower than the highest point of the existing building structures. A vent stack will be incorporated on the Inlet Works building and on the Process building each extending approximately 1m higher than the building structures.

The massing of the Inlet Works building has been designed to maintain a shoulder which reinforces the planning objectives that this area is to be developed at a greater density and urban form. Further, this massing echoes the presence of the tall flank of the existing wallboard factory building, close to Mill Road, although the structure will be set back. In the lee of this structure the hard landscaping will be screened from view from the surrounding areas. To the north-eastern end, the longer, lower form of the Process building will accommodate photovoltaic (PV) panels on its roof as described in detail in **Section 4.3.4.6**. The administration building, located to the south of the site will adjoin the entry roadway and will therefore mark the transition to the entrance to the WwTP from Mill Road.

[4] Note – Vent stack extends 1m above the maximum height of the building

The boundary to Mill Road will be set back along the entire frontage by approximately 5m. This will provide passive provision for a future pavement that may be provided by others at some point in the future (i.e. this is not part of the proposed development, however there is no restriction on this being provided in the future by other developers). The site boundary fronting onto Mill Road will comprise a timber fence with low level planting to the pavement edge.

Façade

The façade design takes its cues from the site's history and the nature of this infrastructure. The Inlet Works and Process buildings have an inner, operational façade and an outer façade which allows them to address the civic nature in response to human scale. This external façade will act to screen loading bays, cranes, pipe runs, and internal lighting. This façade will also run above the top of the structures to shield the roofs, including the PV panels on the Process building. The sludge tank enclosure will be screened by a permeable steel and aluminium framework. The façade of the administration building will echo the Inlet Works and Process buildings and would be clad in fibre cement panels.

The external façade will be made with industrial materials (including fibre cement panels, aluminium flashings and aluminium supports surrounded by a steel frame), modulated and serrated into oversized louvred planes so that it has a presence in silhouette when viewed from a distance and responds to human scale when closer to the structure. The serration refers both to the maritime context and the building form.

The horizontal striation produced by the overlapping planes will allow for the buildings masses to respond to the horizon as the primary context of river and sea horizons. Further, the angles of the planes will provide differing levels of shelter at different areas and this will therefore allow the building to subtly change its character depending on the ambient light conditions and rain - inflecting the architecture to its climatic context as illustrated in Figure 4.3 and Figure 4.4.

Figure 4.3: Illustration of the indicative façade on the WwTP from Mill Road

Figure 4.4: Illustration of the horizontal emphasis in façade detailing allows the buildings to respond to the sites riverine and maritime context.

Landscaping Strategy

Landscaping around the four buildings will follow a basic grid, derived from the primary geometries of the site. This grid will include hard landscaping between the buildings in addition to soft landscaping planted around the site perimeter. Soft landscaping is likely to be native plant shrub, grass and tree species found locally such as gorse, grasses, birch and pine trees. The selection of plant species has been undertaken in consultation with the lead ecologist for the proposed development and is proposed as a consolidation and extension of existing biodiversity on the site.

Hard landscaping between the buildings will include concrete and gravel finishes with marked areas for workers on foot to navigate between the buildings. Parking will be provided on site for up to approximately 20 vehicles (including two electric car charging points), approximately four bays for fork lifts and standby areas will be provided for approximately two trucks collecting sludge.

A landscaped area that with additional native planting will be provided to the north-west of the site on the seaward side of Mill Road. This area is outside the boundary of the WwTP site between the road and the upgraded revetment. Upon commissioning, this landscaped area will be handed over to Wicklow County Council as a continuation and contribution to the public realm of the area (Refer to **Section 4.4** for further detail).

External lighting will be installed around the WwTP for the safety and security of staff on the site. Lighting for traffic and pedestrian movements will be low level and discrete.

Flood lighting for operational areas close to the building will be integrated into and shielded behind the architectural façade (Refer to Figure 4.5). Flood lighting to the main yard will not be regularly required and so this lighting (also integrated into the building facades) will only be switched on when required. Flood lighting will not be required to any other areas of the WwTP site.

Figure 4.5: Illustration of the indicative façade and lighting contained therein

4.3.4.4 Treatment Processes

Overview

An overview of the wastewater treatment processes is provided in Figure 4.6. The basis of the specimen design for treatment processes is to ensure that the wastewater is treated in accordance with best practice and legislative requirements and that the effluent discharged from the WwTP will not impact on the receiving waters. The specimen design, which will be developed further by the contractor appointed under the Design and Build contract, will be fully compliant with the requirements of the WFD, UWWT Directive and Urban Wastewater Treatment Regulations, 2001, as amended.

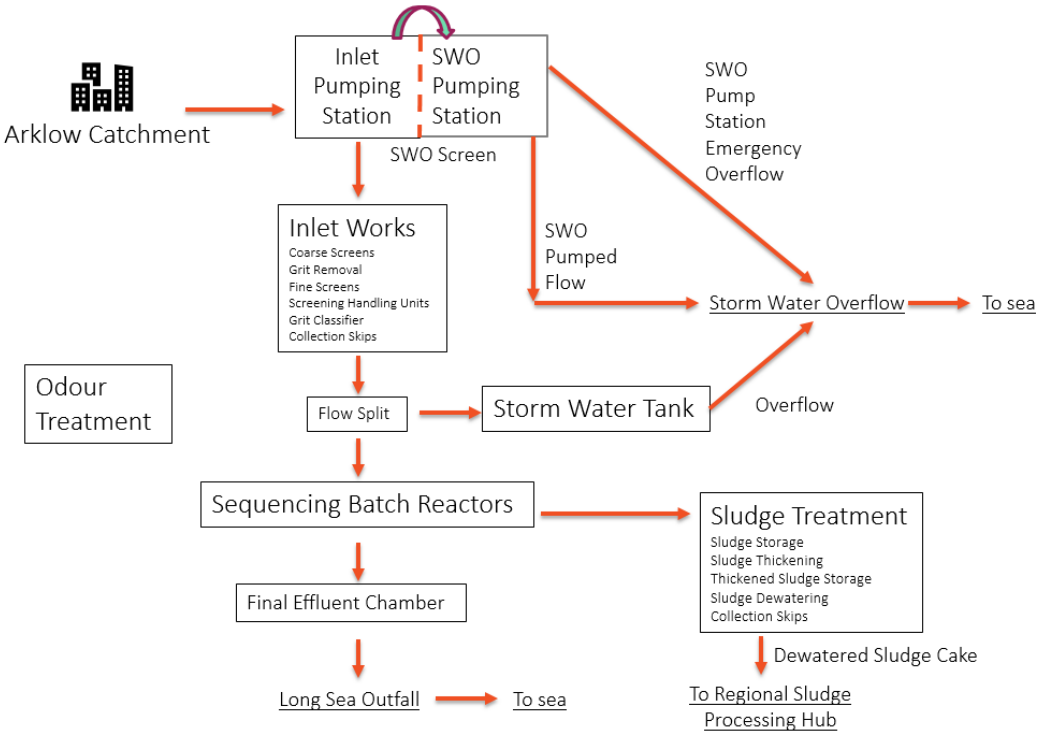

Figure 4.6: Treatment processes in the WwTP

Plant Sizing and Loading

The WwTP will be sized for an ultimate loading of 36,000PE. While the installation of process equipment may be phased, it is proposed that the civil and structural works for the full 36,000PE capacity will be completed during the construction of the proposed development (as described in detail in **Chapter 5)**. The process equipment for an initial capacity of 24,000PE will be installed in the first instance and in this way, the process capability can be scaled up within the proposed buildings as required to accommodate the future growth in Arklow town, to the ultimate capacity of 36,000PE.

The plant sizing and loading has therefore been designed to serve an ultimate capacity of 36,000PE. Specifically, the loading has been estimated based on per-capita contributions for 36,000PE during the specimen design as outlined in Table 4.2.

Table 4.2: Average daily loading of the plant considered in the specimen design

Design criteria	**36,000PE WwTP**	
Average daily organic loads[5]		
Biological Oxygen Demand (BOD)	2,293kg/day	
Total Suspended Solids (TSS)	3,033kd/day	
Chemical Oxygen Demand (COD)	4,986kg/day	
Total Nitrogen (TN)	4452kg/day	
Hydraulic loads[6] (exclusive of return flows)		
Dry Weather Flow (DWF)	8,100m^3/day	94l/s
Formula A flows	61,891 m^3/day	716 l/s
Average Flow (AWF)	10,125m^3/day	117l/s
Full Flow to Treatment (FFT)	24,300m^3/day	281l/s

Effluent Standards

In designing the WwTP, the effluent standards to be achieved have dictated the treatment processes required (Refer to **Section 3.4 of Chapter 3** for further detail). The EPA will ultimately dictate the Emission Limit Values to be achieved in its Waste Water Discharge Authorisation (Refer to **Section 4.5.3** for further detail). However the specimen design for the WwTP has been undertaken on the basis that any discharge from the WwTP (i.e. effluent) will be treated to achieve those standards (i.e. Design Emission Limit Values) outlined in Table 4.3.

Table 4.3: Effluent Emission Limit Values (Source: Urban Wastewater Treatment Regulations 2001, as amended)

Parameter	**Design Emission Limit Values**
BOD	25mg/l
TSS	35mg/l
COD	125mg/l
TN	15mg/l

[5] Average daily loads have been based on per-capita contributions of 60 g BOD/c/d, 75 g TSS/c/d., 120g COD/c/d and 12g TN/c/d

[6] Hydraulic loads have been based on per-capita contributions of 225l/c/d for Dry Weather Flow in line with industry practice

Specifically, the specimen design for treatment processes has been undertaken to ensure that the effluent from the WwTP will achieve these Emission Limit Values to guarantee compliance with the requirements of the UWWT Directive. The proposed treatment processes will therefore meet all regulatory requirements and significantly improve the quality of effluent being discharged in Arklow town.

Approach to Treatment Processes

The criteria outlined in Table 4.2 and Table 4.3 were used as the basis of design for determining and designing the treatment processes incorporated into the WwTP. On the basis of the above, the WwTP will provide preliminary and secondary level of treatment and the processes included therein can be categorised into the following:

a) Inlet works;

b) Storm water management;

c) Activated sludge processes, (Carbonaceous Biochemical Oxygen Demand (cBOD) removal; and

d) Sludge treatment and disposal.

Inlet Works

Wastewater from Arklow town (collected via the proposed interceptor sewer network) will be conveyed to the Inlet Works building at the WwTP. Wastewater will be passed by gravity via a c. 1500mm diameter pipeline into the inlet works sump, from where it will be lifted to the head of the inlet works.

The inlet works sump is up to approximately 18m below ground level (including 1m allowance for the base slab), to allow all wastewater from Arklow to flow by gravity to the WwTP. The pumps in the inlet works sump will convey Formula A flows (see Table 4.2) to the inlet works (i.e. preliminary treatment) located on the first floor of the Inlet Works building. Formula A flows, for context equate to approximately 7 -8 times dry weather flow (DWF). All flows up to Formula A will receive preliminary treatment. The inlet works sump will also include an overflow for flows in excess of Formula A. These excess flows, which may occur from time to time during significant rainfall events, will be passed to the pump sump for discharge through the proposed SWO.

The inlet pumps will lift the wastewater for preliminary treatment in the upper level of the inlet works building. This lift will facilitate a gravity flow through the remaining downstream units. Preliminary treatment will comprise screening and grit removal, as well as stormwater management (as described above). These processes will be contained entirely within the Inlet Works building (as described in detail in **Section 4.3.4.3**).

Flows will be passed through 25mm coarse screening channels which would remove large objects to protect pumps, valves and pipelines from ragging. This is followed by an aerated grit tank and 6mm fine screens to remove smaller particles in the incoming wastewater.

The aerated grit tank, located on the upper floor of the Inlet Works building will be configured into two chambers. Each of the chambers will have blowers for aeration to support settlement. Once the grit has settled, it will be passed via a grit clarifier into nearby skips for removal.

Fats, oils and greases (FOG) removal will also be provided at the Inlet Works building. This will be provided in accordance with Irish Water design specifications and best practice.

Skips will be located within the building and it is anticipated that approximately 1.62m^3 of screenings will be typically produced per day. Once the c. 8m^3 grit skip is filled, the grit will be collected by a suitably permitted contractor and transferred to an authorised facility in respect of which a waste permit or a waste licence is granted. It is anticipated that the grit in the grit skips on the ground floor of the Inlet Works building will be removed approximately twice per week.

Stormwater Management

As outlined in **Section 4.3.2**, other than the proposed SWOs at the Alps and on South Quay, it is not proposed to discharge any wastewater to the Avoca River (in normal conditions). Provision to cater for excess surface water flows, during and/or following significant rainfall events would be provided at the WwTP at an additional SWO that will discharge to the Irish Sea.

Following preliminary treatment, the Formula A flows would enter a storm flow splitter chamber that would separate flows into the full flow to treatment (FFT) and stormwater (the balance of the Formula A flows) channels.

A c. 3,150 m^3 stormwater holding tank will be provided in the Inlet Works building to provide stormwater storage for flows between 3DWF and Formula A flows (with 2 hours storage provided therein) in accordance with the Irish Water standards for Inlet Works and Stormwater Management. Once the inlet flows have reduced to below the FFT flow rate, the contents of the stormwater holding tank will be returned in a gradual manner to a location downstream of the inlet works, to proceed through the WwTP (receiving secondary treatment). Return flows will be controlled by a flow meter on the FFT line. The return pumps will be capable of returning the full volume of the stormwater holding tank in a 12-hour period.

The stormwater holding tank will also be fitted with an emergency overflow, to allow discharge of flows in excess of the tank capacity through the SWO that will discharge to the Irish Sea. This SWO will also provide emergency relief for excess storm flows in the sewered catchment during extreme rainfall events and during extended power outages at the WwTP. The purpose of the SWO storm pumps is the prevent surcharge of the network during wet weather.

The storm flows will be screened at this location. The screenings will not pass into the SWO chamber, they will remain in the Inlet chamber for pumping to the inlet works The pumps in this SWO have been sized to cater for a 1 in 30-year storm event. The pumps will lift excess storm flows to a chamber which will allow discharge under gravity, through the SWO pipeline, discharging through the toe of the upgraded revetment to the Irish Sea). Appropriate non-return valves will be fitted to the pipeline to ensure against sea ingress to the SWO.

The stormwater holding tank will be located on the ground floor of the Inlet Works building and will be covered. A dry weather flow channel will be provided to achieve self-cleansing during normal flow conditions whilst any overflow from the flow control chamber will pass to the storm tank.

The storm tank would be equipped with an automatic cleaning system (re-using final effluent as washwater) to wash the tank following use.

Activated Sludge Process, cBOD removal and nitrification

From the inlet works, wastewater will then be conveyed to the secondary treatment process in the Process building via a pipeline in the underground services tunnel. Secondary treatment will comprise an activated sludge process (i.e. biological process). The basis of design has assumed a sequencing batch reactor (SBR) activated sludge process, however the final detailed design will be selected by the appointed contractor.

The treatment process will include a number of SBR tanks that will treat the wastewater to the appropriate standard for discharge. This treatment process will also produce sludge that can be subsequently thickened and dewatered (on site) prior to removal off site.

The SBR is a fill and draw type reactor system, in which all the steps of the activated sludge process occur within a single reactor. The SBR goes through a number of cycles per day with a typical sequence as follows:

- Fill - 3 hours in duration
- Aerate - 2 hours
- Settle - 0.5 hours
- Decant - 0.5 hours

An idle stage can also be included to provide flexibility during high flow events. Six SBR tanks will be provided in the Process building to provide the ultimate capacity for 36,000PE. At least one SBR tank will be available for fill at any moment, while the other tanks can go through the react, settling and decanting sequences. Mixed liquor will remain in the SBR tank at all times to provide the biomass for the cBOD removal processes.

Wastewater will enter the SBR tank from the Inlet Works building via the inlet valve during the filling stage. Once filled, aeration will be accomplished by fine bubble diffused air which encourages biomass to multiply and reduces organic matter by consuming nutrients. One air blower will be provided in each SBR with a standby air blower also provided for contingency.

Following aeration, sludge biomass will be allowed to settle to the bottom of the SBR tank. The sludge will be periodically removed, and stored in a local sludge tank. As described in detail below, the sludge will then be thickened and stored as thickened sludge before dewatering. Dewatering will be the final step converting liquid sludge to dry cake for export off site (i.e. for removal to the sludge hub centre).

From the SBR tanks, the effluent will be discharged to the final effluent tank and thereafter conveyed by gravity to the Irish Sea via the long sea outfall, as described in detail in **Section 4.3.5**.

Sludge Treatment and Disposal

Sludge generated from the activated sludge process in the SBR tanks (i.e. secondary sludge) will be transferred, via progressive cavity pumps to two secondary sludge buffer tanks in the Sludge Tank Enclosure (Refer to **Drawing No. 247825-00-STE-001 in Volume 3**). Based on the 36,000PE ultimate capacity, it is estimated that an excess sludge volume of approximately 400 m^3 per day, at a dry solids content of approximately 0.67% will be produced. The secondary sludge buffer tanks have been designed to provide up to approximately 4 days storage. The sludge buffer tanks will also provide contingency when excess sludge is produced and/or where the dewatering equipment is temporarily out of service or overloaded. The sludge buffer tanks will be equipped with a high-level overflow to the supernatant sump (return liquor sump).

Sludge drum thickeners will be provided to thicken the secondary sludge to approximately 5.5% dry solids. The specimen design is based on the drum thickeners operating 7 hours per day over a 4-day week. The thickened sludge volume produced on this basis will be approximately 47 m^3 per day. Thickening polymer will be added to the sludge to assist with the thickening process.

The thickening process will also produce a filtrate, at a rate of approximately 415 m^3 per day, which will discharge to the supernatant sump.

The thickened sludge will then transferred to the thickened sludge storage tank, where c.18 days storage will be provided in the sludge tank enclosure. From the thickened sludge storage tank, sludge will be fed by progressive cavity pumps to a duty/standby dewatering unit (belt press or centrifuge) which will dewater the sludge to a minimum of 18% total dry solids. The dewatering process units will be located in the Inlet Works building (Refer to **Drawing No.'s 247825-00-INL-001 to 247825-00-INL-D-003 in Volume 3**).

Dewatering polymer will be added to assist with the dewatering process and the design of each of the dewatering units has been sized to operate over a five-day week. The anticipated volume of dewatered sludge cake produced will be up to approximately 14 m^3 per day.

The dewatered sludge will subsequently be transferred to one of three covered skips contained in the Inlet Works building. This sludge will then be removed from the site by the operators' collection vehicles and transported for disposal to a regional sludge hub as described in **Section 4.6.2.1**.

Return liquors/supernatant from the following areas, will be collected and pumped back to downstream of the inlet works, to re-join the treatment stream:

- Filtrate from the sludge drum thickeners;
- Filtrate or Centrate from the sludge dewatering units;
- Emergency overflow from each sludge tanks;

  - Two sludge storage tanks;
  - A thickened sludge storage tank;
- Contaminated site drainage (sludge wash-down areas);
- Screenings handling dirty water from Inlet Works (dewatering of screenings);
- Analyser/instrument waste water;
- Drainage from Inlet Works building and Process Building;
- Odour control wastewater; and
- Wash Water Filter waste water.

As described in detail in **Section 4.3.4.3**, the Sludge Tank Enclosure will be open and naturally ventilated, however the tanks will be covered and an Odour Treatment Unit (OTU) would be provided for this enclosed space, as described below.

Odour Treatment

A centralised OTU has been designed for the WwTP, with an odour concentration of 183 odour units (OU)/m^3 and an emission rate of approximately 1,592 OU/sec. The OTU will comprise biological and carbon filters and the treated air will discharge through a 600 mm, 17.5 m high vent stack, in the Inlet Works building (i.e. 1m above the roof).

Air from the following areas would be treated in the OTU:

- Inlet pump sump;
- Stormwater holding tanks;
- Inlet works – screenings and grit disposal skips;
- Sludge holding tanks;
- Sludge thickeners;
- Sludge dewatering;
- Dewatered sludge skips; and
- Supernatant sump.

No odour treatment will be provided in the Process building as it will be sealed and mechanically ventilated. The design odour concentration for the Process building is 1,323 OU/m^3 with an emission rate of 1,890 OU/sec. The Process building will be vented via a 600mm diameter vent stack at 15.5m height (i.e. 1m above the roof).

The odour control system for the WwTP has been designed to comply with an odour limit of 3OU/m^3 at the WwTP site boundary. As outlined in **Section 9.2.2 of Chapter 9,** Irish Water has recommended an odour limit value of 3OU/m^3 of the 98th percentile of 1-hour value at the site boundary for the proposed development. This limit value has been determined by Irish Water's odour specialist in cognisance of the forthcoming Irish Water Odour Management Plan.

Monitoring and Flow Measurement

As a minimum, flow measurement will be provided for the following aspects of the WwTP:

- Inlet pumping station on the rising main upstream of the inlet works;
- Full flow to treatment (FFT) downstream of the flow splitter chamber;
- Stormwater return rising main;
- Stormwater holding tank – on the emergency overflow;
- SBR feed – upstream of the flow distribution chambers;
- Final effluent discharge;
- Waste activated sludge; and
- Return liquors rising main.

As a minimum, it is also proposed to sample the following:

- Raw water time composite (24 hour) automated sampler, to be located downstream of the Inlet Works fine screens and upstream of the return liquors and stormwater return; and
- Flow proportional composite automatic sampler to be located downstream of the final effluent tank.

It is anticipated that some testing of sludge and/or effluent may be required within a laboratory contained within the Administration building for quality control. Such operations will be subject to detailed design and operational procedures employed by the contractor. The contractor will be responsible for specifying and getting the appropriate consents prior to operation.

4.3.4.5 Structural and Civil Structures

Inlet works

The inlet works is likely to be a steel framed building supported by reinforced concrete shear walls/cores extending to roof level, however the contractor may use a concrete framed structure.

The façade will be supported on a steel frame connected back to the primary building structure. In-plane bracing will be provided at intermediate bays to prevent “racking” of frames due to lateral loads.

The Inlet Works building will cover the dry well of the inlet and pump station.

Process Building

The Process building frame will be a two-span duo-pitch roof supported by rafter beams, columns and bracing in the walls. An alternative braced frame roof structure will also be a possibility that may be explored by the contractor.

The reinforced concrete tanks within the Process building will be founded on a reinforced concrete raft slab at ground level that will extend locally to support the building columns.

The service area enclosed by the Process building to the north of the tanks will have pad foundations below columns and strip foundations below walls. The internal slab will be ground bearing.

Sludge Tank Enclosure

The Sludge Tank Enclosure will be a steel frame trellis type structure fully open on top. Stability of the columns will be achieved through moment connections onto their pad foundations. Alternative framing arrangements may also be explored by the contractor.

Administration Building

The Administration building will be a two-storey building constructed using domestic scale type construction with load bearing masonry founded on strip foundations.

4.3.4.6 Mechanical Electrical and Plumbing

Mechanical Services

The mechanical services scope will comprise heating, ventilation and cooling (HVAC) systems, water services installations, drainage services installations, fire-fighting installations and a building management systems (BMS) installation.

HVAC Services

Foul air generated by the initial stages of the treatment process within the WwTP will be extracted by an Odour Control (OC) system and discharged to atmosphere via the vent stacks. A combination of natural ventilation and mechanical ventilation will be provided to service the remaining areas of the WwTP including within the Inlet Works Building, and the Process building. Mechanical ventilation will be provided either by internal Air Handling Units (AHUs) or by extract fan systems installations. The Sludge Tank Eenclosure will be naturally ventilated, therefore mechanical ventilation will not be required therein.

The WwTP will be mostly unoccupied, therefore a minimum level of heating would be incorporated in the Inlet Works and Process buildings to prevent the formation of condensation and frost. Electrical energy will be used directly for this purpose (i.e. for heater batteries in AHUs, localised panel heaters, etc.), therefore a full heating system installation is not proposed.

The Administration building will be provided with a full air conditioning installation and a mechanical ventilation installation for the supply of fresh air. An extract fan system will also be provided for the sanitary accommodation and a fume cabinet is envisaged for installation within the testing laboratory.

Water Services and Drainage

A dedicated watermain, connected to the public water supply will be provided as part of the overall infrastructure at the WwTP site. This incoming water main will be metered upon entry after which it will be distributed below ground to serve each of the individual buildings.

A complete water services installation including for the provision, as required, of mains, cold and hot water to each building. The mains water will feed a number of mains water break tanks within the Inlet Works and Process buildings which will in turn service the respective cold water service requirements such as safety showers, wash-down hose reels, process equipment etc. The mains water will also feed a 24hr cold water storage tank which will in turn service the cold water service requirements of the Administration building. Point of use type electric water heaters will be provided to service any hot water service requirements of areas such as the sanitary accommodation.

An above ground soil and waste drainage installation will be provided for all buildings including the provision of, as required, drainage from all equipment, from all sanitary accommodation and from all items of equipment within ancillary spaces including workshop, laboratory, canteen etc. Condensate drainage will also be provided as necessary from any HVAC equipment installations.

Rainwater collection from the roofs of the various buildings will be discharged directly to drain.

Fire Suppression / Firefighting Installations

Fire suppression systems will not be installed within any spaces in the buildings other than possibly within the main communications room. There is no requirement for a sprinkler system, dry risers, or wet risers to be provided within any of the buildings, however portable fire extinguishers will be provided in the Administration building in accordance with the standard[7]. An industrial purpose fire hose reel will be installed to service both the Inlet Works Building and the Process Building in accordance with the standard[8].

Electrical services

The electrical services will comprise low voltage reticulation inside the buildings, small power distribution, lighting design, fire alarm, security (CCTV and access control), lightning protection systems, renewable energy generation (PV), bulk power supply to process equipment and other specialist services.

A passenger lift will be provided within the Administration building. Electric vehicle charging stations will be provided as part of the car parking provided at the WwTP site.

[7] NSAI (2015) *IS291:2015 Selection, commissioning, installation, inspection and maintenance of portable fire extinguishers.*
[8] NSAI (2012) IS EN 671-1:2012: Fixed firefighting systems. Hose systems. Hose reels with semi-rigid hose

Electrical reticulation

The proposed development will be connected to the existing ESB distribution network via a new 10kV connection at the WwTP site boundary on Mill Road (adjacent to the administration building). The maximum demand for the WwTP is currently estimated at 900kVA. The new 10kV connection will require a dedicated ESB substation room in the Process building. This substation room will house all ESB equipment and access would be restricted to ESB personnel only.

A 10/0.4kV, 1,250kVA cast resin stepdown transformer will be provided in the Process building. The transformer will be located in a dedicated room adjacent to the ESB substation. The use of a dry-type transformer is preferable as oil is not required for cooling of the transformer.

ICA (instrumentation, control and automation) equipment and panels will also be provided to monitor and control the treatment processes and be housed in the WwTP buildings, as shown on the **Drawing No. 247825-00-MP-001 in Volume 3**.

Generator Supply

The WwTP will have an emergency power supply from a standby diesel generator located in the Process building that will provide up to 24 hours' backup supply. The intention is that this generator will operate in the event of power outages. Preliminary estimates suggest a generator set of approximately 1,250kVA.

The generator room will be acoustically treated, to ensure that noise levels (outside of the generator room) do not exceed 80dB(A) at 1m from the exhaust.

There will be up to approximately 6,200l of diesel stored on site to supply the generator for 24 hours before refuelling is required. The diesel will be stored in a separate room, adjacent to the generator room in a bunded area to ensure containment and prevent spillages of fuel.

PV Installation

Photovoltaic (PV) panels will be installed on the roof of the Process building to provide an onsite source of renewable energy. The PV installation will tie-into the low voltage electrical installation at the main distribution board.

The PV installation will consist of around 450 PV panels appropriately mounted on the roof of the Process building. There will be 15 rows of panels (30 panels in each row), with approximately 1m separation distance between every panel to allow for maintenance access and to prevent shading. The PVs will be 0.5 – 0.8m in height above the proposed building and it is anticipated that they will be shielded from view by the façade of the Process building as described in **Section 4.3.4.3.**

The PV installation will connect into the main distribution board of the facility and assist in reducing the daytime power requirement from the national grid. The anticipated energy yield for the first year is 110MWh.

4.3.5 Long Sea Outfall and SWO

A long sea outfall and SWO will be provided as part of the proposed development. The long sea outfall will discharge treated effluent and the SWO to the north of the long sea outfall, will discharge excess stormwater flows from the WwTP and will also act (in parallel with the proposed SWOs at South Quay and the Alps), as an emergency relief for excess flows in the sewered catchment during extreme rainfall events and extended power outages. Both the long sea outfall and the SWO will cross under the upgraded revetment and discharge into the Irish Sea.

The long sea outfall and SWO as illustrated in **Drawing No.'s 247825-00-M-O-1001 to 247825-00-M-O-4101 in Volume 3** will be perpendicular to the shoreline. A 100m wide pipe corridor (i.e. 50m either side of the long sea outfall) is included in the consent application, to allow flexibility for construction activities required within this corridor.

The SWO (located to the north) will terminate at the toe of the upgraded revetment and likely comprise concrete material. It will have an internal diameter of approximately 2000mm. A precast culvert concrete structure will be installed through the revetment to accommodate the SWO pipeline. Flows through the SWO will discharge below Mean Low Water Spring levels. The SWO pipeline will be fitted with a non-return value.

The long sea outfall (located to the south) will be approximately 955m in length (i.e. approximately 900m from shoreline) and will likely comprise high density polyethene (HDPE). It will have an internal diameter of approximately 630mm.

The specimen design provides for up to approximately 6 elastomeric variable orifice check valves as part of a subsurface diffuser located at the end of the long sea outfall. The riser valves would be vertical, therefore aiding the dispersion of treated effluent in the water column. Each diffuser will be equipped with a non-return flex valve and marker buoys would be provided to mark the location of the end of the outfalls therefore ensuring that boats are aware of their presence.

Flow through the long sea outfall will be via gravity and sufficient capacity will be provided to allow for high velocity pumped flush, therefore avoiding any blockages in the outfall during continuous periods of low rainfall.

4.3.6 Revetment

The existing rock armour revetment adjoining the site will be upgraded as part of the proposed development. The existing rock armour will be removed and subsequently replaced over a distance of approximately 360m along the coastal side of the WwTP site boundary as illustrated in **Drawing No.'s 247825-00-M-R-1001 to 247825-00-M-R-2003 in Volume 3.**

The alignment of the revetment will follow the existing shoreline on its northern and southern ends. The curve of the central part of the existing revetment will be slightly softened to provide additional space between the Inlet Works building and the revetment.

It should be noted that there is an existing cable (owned by GE Energy) that runs under the existing revetment. The proposed development will encroach within the existing 50m cable buffer zone for this cable, however as agreed with GE, a 10m buffer zone around the cable would be adhered to and thus the proposed development would not extend within this zone.

The revetment would consist of a double layer of rock armour of approximately 6-10 tonnes (T) on an underlayer of approximately 0.3 to 1T. The thickness of the armour layer and underlayer will be approximately 2.9m and approximately 1.3m respectively. The revetment will be finished at approximately 7.5mOD (i.e. approximately 1 to 3m above the level of the existing revetment crest) with a crest width of approximately 9 – 10m.

The total width of the upgraded revetment at its base will be approximately 50m (including the toe of the revetment that is to be buried under the seabed), however this will be subject to local minor variations due to changes in ground and seabed levels. Fill material will form the foundation of the revetment and a geotextile layer will be placed between the underlayer and the fill material to provide an adequate interface.

4.3.7 Energy Efficiency

The need to transition to a low carbon economy is well recognised and acknowledged in the Irish context. The National Planning Framework[9] reiterates that:

"The Government is committed to a long term climate policy based on the adoption of a series of national plans over the period to 2050, informed by UN and EU policy. This is being progressed through the National Mitigation Plan and the National Climate Change Adaptation Framework."

It also states that in addition to legally binding targets that:

"It is a national objective for Ireland to transition to be a competitive low carbon economy by the year 2050."

As a public-sector body, Irish Water is required to meet targets set by the Public Sector Energy Efficiency Strategy[10] (PSES) throughout, which fulfils the commitments made in Ireland's third National Energy Efficiency Action Plan[11],

[9] Project Ireland 2040 – National Planning Framework, Government of Ireland, 2018, http://www.npf.ie
[10] Public Sector Energy Efficiency Strategy, Department of Communications, Climate Action and Environment, 2017 https://www.dccae.gov.ie/documents/Public%20Sector%20Energy%20Efficiency%20Strategy.pdf
[11] National Energy Efficiency Action Plan, 2014, Department of Communications, Energy and Natural Resources, https://www.dccae.gov.ie/documents/NEEAP%203.pdf

the Energy Policy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015 – 30[12] and the Programme for a Partnership Government 2016[13].

The PSES requires public bodies such as Irish Water to improve its energy efficiency by 33% when measured against the base year of 2009. It requires the public sector to:

"*Employ an action focussed and results driven approach to public sector reform and cost efficient energy management*', which will '*foster a cleaner and healthier environment now and for future generations.*"

Irish Water recognises the need for energy efficient design of its assets, as set out in its Water Services Strategic Plan[14] (Strategic Plan) which includes its vision that:

"*…through responsible stewardship, efficient management and strong partnerships, Ireland has a world class water infrastructure that ensures secure and sustainable water services, essential for our health, our communities, the economy and the environment.*"

The Strategic Plan includes key objectives with regard to the protection and enhancement of the environment, including:

"*ensure that Irish Water services are delivered in a sustainable manner which contributes to the protection of the environment…*

mitigating our climate impact by reducing our carbon footprint…

Supporting the objectives of the National Energy Efficiency Action Plan through targeted investments and adapting asset operations."

Irish Water is committed to designing, building and operating assets to be as energy efficient as possible. Irish Water's energy policy sets out the following specific commitments:

- 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; and
- Measuring energy performance indicators.

[12] Ireland's Transition to a Low Carbon Energy Future 2015 – 2030, Department of Communications, Energy and Natural Resources, https://www.dccae.gov.ie/documents/Energy%20White%20Paper%20-%20Dec%202015.pdf
[13] A Programme for a Partnership Government, May 2016, https://merrionstreet.ie/MerrionStreet/en/ImageLibrary/Programme_for_Partnership_Government.pdf
[14] Water Services Strategic Plan, 2015, Irish Water, https://www.water.ie/docs/WSSP_Final.pdf

Energy efficiency has therefore been fully integrated into the design of the proposed development from the outset. All design proposals have been challenged to ensure that maximum efficiency can be delivered throughout the life cycle. Key energy and resource efficiency measures incorporated as part of the proposed development include:

- The WwTP has been located as close as possible to the load centre in Arklow town;
- The WwTP is adjacent to the Irish Sea (i.e. the target location for final discharge of effluent) and all discharge will be conveyed to the long sea outfall via gravity flow to minimise pumping requirements (and thus associated energy use);
- All foul flows in the interceptor sewer network will be conveyed by gravity to the WwTP to minimise pumping requirements (and thus associated energy use);
- Wastewater in the WwTP will be mostly conveyed by gravity flows (with the exception of the initial inlet works pump station lift) to minimise pumping requirements (and thus associated energy use);
- Soft start pumps/efficient pump selection will be utilised throughout;
- On-site renewable energy in the form of PV panels that use solar energy have been incorporated into the plant design (As described in detail in **Section 4.3.2**) to optimise the generation and use of renewable energy at the WwTP;
- The plant design has incorporated energy efficient design throughout, considering whole life cycle cost and measures to minimise energy use, in accordance with Irish Waters Energy Efficient Design Standard;
- Energy efficient lighting technologies will be used throughout the proposed development (to minimise associated energy use);
- Provision has been made for two electric car charging points at the WwTP site;
- The buildings on the WwTP site will be naturally ventilated where possible, with heating limited to mitigate the effects of frost and condensation in the Inlet Works and Process buildings only. Occupied spaces will have heat recovery ventilation systems. The combination of these HVAC elements will minimise associated energy use in the building during operation;
- Re-use of final effluent for washing of units, the provision of grey water collection, storage and re-use; and
- The production of sludge for use of the regional Sludge Hub centre to support opportunities for energy recovery and reuse of sludge where possible (in accordance with the National Sludge Management Plan).

4.4 Community Gain

Irish Water recognises the importance of ensuring that the development and operation of its assets is undertaken with minimum impact and indeed to the benefit of the local community. A number of community gain initiatives are included as part of the proposed development, as outlined below.

- The primary community gain benefit is the proposed development itself, i.e. the provision of the WwTP, which will provide appropriate treatment of wastewater for the people of Arklow now, and into the future.
- The provision of the WwTP will also result in significant environmental improvements in Arklow, particularly with regard to water quality. The existing outfalls discharging untreated wastewater into the Avoca River will be discontinued, with a long marine outfall, discharging treated effluent, replacing the existing outfalls. This will result in a significant improvement in water quality in the Avoca River.
- At the WwTP, the site boundary has been pulled back from the existing road line, by 5m, to further accommodate pedestrian traffic along Mill Road and to provide passive provision for additional public realm in this area.
- As described in **Section 4.3.4.3**, a landscaped area with additional native planting will be provided to the north-west of the WwTP site. Upon commissioning, this landscaped area will be handed over to the Wicklow County Council as a continuation and contribution to the public realm of the area.
- Facilities will be provided within the signature WwTP building for use by schools.
- Irish Water is also committed to making all relevant environmental data it gathers as part of the EIA process and during operation, available to stakeholders.
- The provision of wastewater treatment in Arklow town aligns with the County Development Plan as it will help create a safe and healthy environment whilst assisting in the protection of its natural resources as well facilitating the achievement of the population and employments targets set out for Arklow.
- The proposed development will meet the land use zoning outlined in the Arklow LAP by providing a high standard of design that respects the local area and providing the required wastewater treatment in the appropriately zoned area in Arklow town.

4.5 Separate Consents

4.5.1 Overview

This section provides an overview of the relevant consents, licences, authorisations and permits that would be required in addition to the consent for the proposed development from An Bord Pleanála (Refer to **Section 1.3 of Chapter 1** for further information on the planning process).

4.5.2 Foreshore License/Lease

Under the provisions of the Foreshore Act 1933 to 2014, as amended, a lease or licence must be obtained from the Minister for Housing, Planning and Local Government for development works on the State-owned foreshore. A lease is generally issued for a development that requires exclusive occupation of the foreshore whilst a licence is generally issued for a development that does not require exclusive occupation of the foreshore.

Foreshore consent applications would therefore be required for specific elements of the proposed development including the following:

- The underpinning of Arklow Bridge;
- Construction works in the Avoca River to construct the interceptor sewer and sheet pile walls;
- The tunnelling of the interceptor sewer under the Avoca River from the South Quay to Mill Road;
- Construction works to construct the long sea outfall in the Irish Sea; and
- Construction works for the SWO and upgraded revetment at the WwTP site.

Foreshore consent application(s) for the above works are being submitted to the Department of Housing, Planning and Local Government in parallel to the application for consent that is being submitted to An Bord Pleanála. A pre-application consultation meeting was held with the Foreshore Unit in the Department of Housing, Planning and Local Government on 20 June 2018.

4.5.3 Waste Water Discharge Authorisation

Water Services Authorities are required to apply for a Waste Water Discharge Authorisation (WWDA) for any agglomeration with a population equivalent of over 500. Specifically, under Regulation 5 of the Waste Water Discharge Regulations 2007 as amended, the proposed development will require a WWDA from the EPA to discharge treated effluent to the Irish Sea and discharge storm overflows to the Avoca River and the Irish Sea.

Prior to the commencement of operations, Irish Water will apply to the EPA for the waste water discharge licence or certificate of authorisation for the proposed development (including the discharge of storm overflows and treated effluent).

It is anticipated that Irish Water will amend the previous application for a WWDA for Arklow and Environs that was submitted in December 2007[15]. On 14 April 2014, Irish Water confirmed[16] with the EPA that the intention is to submit a revised WWDA licence application to the EPA on completion of the planning process and receipt of consent for the proposed development.

4.5.4 Building Certification

The Building Control Act 1990 and the Building Control (Amendment) Regulations 2014, provide an enforcement framework to ensure improved quality of buildings. A Code of Practice has been issued by the Department of Environment, Community and Local Government[17] outlining the steps required to ensure compliance with the applicable legislation.

On this basis, suitably competent parties will be appointed by Irish Water, to certify that all buildings are fully compliant with the relevant legislation. This will include undertaking the construction in accordance with the plans and specifications, provision of a competent person to oversee the works, obtaining relevant certificates including the Fire Safety Certificate, Disability Access Certificate and maintenance of all relevant records as required.

4.5.5 Other Licences/Consents required

Any other relevant consents, authorisations and/or licences required for the proposed development are described in detail as appropriate in **Chapters 7 – 19**. A summary of likely requirements is provided below:

- Derogation licence from the National Parks and Wildlife Service (in accordance with the Habitats Directive and under the European Communities Birds and Natural Habitats) Regulations 2011, as amended) to undertake construction works that may disturb individual bats and their breeding and resting places;
- Licence for archaeological excavation from the National Monuments Service (Under Section 26 of the National Monuments Act 1930 to 2014) for any intrusive works that would require archaeological excavation and/or monitoring;
- Licence for a dive survey from the National Monuments Service (under Section 3(5) of the National Monuments Act 1987) for any underwater archaeological activities;

[15] EPA (2018) License Details: D0006-01. Available from: http://www.epa.ie/terminalfour/wwda/wwda-view.jsp?regno=D0006-01 [Accessed 25 June 2018].
[16] EPA (2018) Correspondence re license D0006-01: Available from: http://www.epa.ie/licences/lic_eDMS/090151b2805318eb.pdf [Accessed 25 June 2018]
[17] Department of Housing, Planning, Community and the Local Government (2016) Code of Practice for Inspecting and Certifying Buildings and Works: Building Control Regulations 2007 to 2015. Avialable from: http://www.housing.gov.ie/sites/default/files/publications/files/2016-10-21_code_of_practice_for_inspecting_and_certifying_buildings_and_works_final_version.pdf [Accessed 21 June 2018]

- Section 50 Consent from the Office of Public Works (in accordance with the Arterial Drainage Acts 1945 and 1995 and The European Communities (Assessment and Management of Flood Risks) Regulations 2010 and 2015) to undertake any works to Arklow Bridge that may impact on flood risk;
- Trade Effluent Licence from Wicklow County Council (in accordance with Section 4 of the Local Government (Water Pollution) Acts 1977 to 2007) to discharge to a surface waterbody such as the Avoca River and/or Irish Sea during the construction of the proposed development;
- Relevant licences under the Roads Acts 1993 to 2016 from Wicklow County Council to undertake temporary road closures and diversions during the construction period;
- Relevant waste permits from the EPA (in accordance with the Waste Management Acts 1996 to 2011) to ensure compliance during the removal, transfer and disposal of waste; and
- Certificate of Planning Compliance from Wicklow County Council (in accordance with Part VII of the Planning and Development Act 2000, as amended) to certify that supervision and construction has been undertaken in compliance with relevant building and planning legislative obligations. The Certificate of Planning Compliance (Certificate of Compliance on Completion) is required to be validated by Wicklow County Council under Part IIIC of the Building Control Regulations 1997, as amended.

4.6 Operation of the Proposed Development

4.6.1 Overview

This section describes the likely operational activities of relevance to this EIAR. It should be noted that as outlined in **Section 4.2**, the contractor will be responsible for the initial operations during the early years of the proposed development.

4.6.2 Management

4.6.2.1 Maintenance and Monitoring

Maintenance activities will typically include the following:

- General maintenance on a daily basis;
- Preventative maintenance as scheduled by the operator;
- Inspections of equipment including the SWOs on a weekly basis;
- Inspection of chambers on pipelines on an annual basis; and
- Inspection of diffusers via dive survey on an annual basis.

Monitoring activities will be undertaken in accordance with the WWDA and will typically include:

- Quality and quantities of influent and treated effluent discharge;
- Individual elements of the treatment processes in the WwTP;
- Individual elements of the pumping station;
- Flows in the interceptor sewers, SWOs and long sea outfall; and
- Air, noise and odour emissions.

4.6.2.2 Sludge

The sludge generated by the WwTP will be produced in accordance with the National Wastewater Sludge Management Plan (Refer to **Section 6.2.7 of Chapter 6** for further detail) which requires dewatering to a minimum 18% dry solids for treatment plants in excess of 10,000PE.

The dewatered sludge will be placed in one of three skips, with the skips removed by licensed contractors once filled. The dewatered sludge will be transported to a sludge hub centre for further treatment and appropriate disposal in accordance with the National Wastewater Sludge Management Plan.

As outlined in **Section 4.3.4.4**, It is anticipated that approximately 14 m^3 of dewatered sludge will be typically generated per day under normal conditions. It is therefore estimated that removal of dewatered sludge from the skip may be required every day (worst case scenario).

The vehicles required for this purpose will travel down Mill Road and South Quay to the Arklow Bridge junction where they will travel onwards to the relevant sludge hub centres (Refer to **Section 4.6.2.4** and **Chapter 7** for further information).

4.6.2.3 Site Deliveries/Exports

There will be a number of deliveries of the necessary equipment and materials to the WwTP site once operational, e.g. polymer will be regularly required to support the activated sludge process and deliveries may be required to the Administration building including chemicals, office consumables etc.

Further, a number of vehicles will regularly come to the WwTP site to remove waste such as the grit produced in the Inlet Works building and municipal waste generated from the Administration building.

It is anticipated that these vehicular movements would be minimal in the context of existing traffic levels in the local area (Refer to **Section 4.6.2.4** and **Chapter 7** for further information).

4.6.2.4 Access

The above ground structures of the proposed development (i.e. the Alps SWO and Stormwater Storage Tank and the WwTP) will be located in sites secured by perimeter fencing with controlled access gates and appropriate security measures in place. This will restrict site access and ensure that only relevant personnel can access these assets during the operation of the proposed development.

As outlined in **Section 4.3.2**, the Alps SWO and Stormwater Storage Tank will be accessed via River Walk.

As outlined in **Section 4.6.2.1**, it is anticipated that up to 10 vehicles will be required to enter and exit the WwTP per day (i.e. 10 - 20 additional trips per day) which will be minimal in the context of existing traffic levels and prevailing traffic conditions in the local area. It is anticipated that parking for all vehicles accessing the WwTP can be accommodated on site.

4.6.2.5 Environmental, Health and Safety Management

In accordance with the Irish Water procurement procedures, the operator will be required to have 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 proposed development.

In accordance with the typical requirements of a WWDA, procedures will be established and put in place to notify the EPA of emergencies, exceedance of licence conditions and where environmental pollution has, or may have, taken place.

4.6.3 Employment

When completed and fully operational, the proposed development is likely to employ approximately 3 - 5 personnel, some of whom would work in shifts as the facility will be operational 24 hours per day.

4.7 Decommissioning

This section describes the relevant assumptions that have been made with regard to the decommissioning of the proposed development. It should be noted that the design life for the proposed development is 50 years and Irish Water considers the proposed development to be a key strategic asset in its portfolio.

As such, it is anticipated that the proposed development will be maintained and upgraded by Irish Water as required in line with all their other strategic assets. In the event of decommissioning, the following measures will be undertaken by Irish Water to ensure that there will be no likely significant effects associated with the decommissioning of the proposed development:

- All raw materials, chemicals, oils, fuel etc. on site at the time of closure will be returned to the supplier, or collected and recycled or disposed of by an authorised waste contractor, as appropriate;
- All WwTP buildings and process equipment will be decontaminated and decommissioned in an appropriate manner;
- Infrastructure and underground pipelines are not anticipated to be removed. Generally, specialist equipment will be sold for reuse, where possible, or disposed of off-site;
- All buildings, structures and pipelines will be decommissioned;
- Roads, hard-standing and site fencing will be retained; and
- When operations have ceased, it is expected that there will be no requirement for long-term aftercare management at the site.

The decommissioning measures are required to be implemented to the satisfaction of the competent authority and any relevant licenses and discharges will be surrendered in accordance with the relevant requirements.

4.8 References

Department of Communications, Climate Action and Environment (2017) *Public Sector Energy Efficiency Strategy*

Department of Communications, Energy and Natural Resources (2015) *Ireland's Transition to a Low Carbon Energy Future 2015-2030*

Department of Communications, Energy and Natural Resources (2014) *National Energy Efficiency Plan*

Department of the Environment (1993) *Procedures and Criteria in relation to Storm Water Overflows*. Available from: http://www.epa.ie/pubs/forms/lic/wwda/uwwtdirective91271eecproceduresrcriteriairtstormwateroverflows.html [Accessed 22 May 2018]

Department of Housing, Planning, Community and the Local Government (2016) *Code of Practice for Inspecting and Certifying Buildings and Works: Building Control Regulations 2007 to 2015*.

EPA (2018) Correspondence re license D0006-01: Available from: http://www.epa.ie/licences/lic_eDMS/090151b2805318eb.pdf [Accessed 25 June 2018]

EPA (2018) License Details: D0006-01. Available from: http://www.epa.ie/terminalfour/wwda/wwda-view.jsp?regno=D0006-01 [Accessed 25 June 2018].

Government of Ireland (2018) *Project Ireland 2040 – National Planning Framework*

HMSO (1970) *Report of the Technical Committee on Storm Overflows and the Disposal of Storm Sewage*

Irish Water (2015) *Water Services Strategic Plan.* Available from: https://www.water.ie/projects-plans/our-plans/water-services-strategic-plan/ [Accessed 20 June 2018]

NSAI (2012) *IS EN 671-1:2012: Fixed firefighting systems. Hose systems. Hose reels with semi-rigid hose*

NSAI (2015) *IS291:2015 Selection, commissioning, installation, inspection and maintenance of portable fire extinguishers.*

A Programme for a Partnership Government, May 2016, https://merrionstreet.ie/MerrionStreet/en/ImageLibrary/Programme_for_Partnership_Government.pdf

5 Construction Strategy

5.1 Introduction

This chapter describes the strategy to construct the proposed development. The design, operation and decommissioning elements of the proposed development are described separately in **Chapter 4**.

This chapter has been prepared in accordance with Part 1 of Annex IV of the EIA Directive. This chapter has therefore been structured to describe the following:

- Indicative duration and phasing during the construction period;
- Land use requirements to support the construction of the proposed development;
- Likely activities required to prepare the site and undertake the enabling works to support the construction of the proposed development;
- Methodologies to undertake demolition and construction activities;
- An overview of anticipated construction traffic, relevant diversions, access points and haulage routes that are likely to be used during construction;
- An overview of employment and typical site management measures associated with the construction of the proposed development; and
- An overview of the Outline Construction Environmental Management Plan to provide minimum requirements that the Contractor(s) will be required to implement (Refer to Appendix 5.1 for the Outline CEMP).

5.2 Approach

The approach to construction which has been assumed for the purpose of this EIAR is illustrated in **Sections 5.3 - 5.9** herein. This information describes the main construction activities that are relevant for the assessment of likely significant environmental effects.

It should be noted that Irish Water proposes to procure the construction works by means of a Design and Build type contract. This type of contract has the benefit of encouraging innovation and value engineering, particularly for a project of this nature and scale, by giving the contractor ownership of the detailed design and construction. Under this type of contract the successful contractor will ultimately be responsible for the final detailed design and determination of appropriate construction activities required for the proposed development.

Notwithstanding, the approach to construction outlined in **Sections 5.3 - 5.9** herein is considered to be the reasonable worst case scenario, given the existing site constraints, the adjacent land uses and the various construction methodologies which could be considered by the contractor. The construction of the proposed development will require a combination of marine, riverine and land-based works.

It will be the responsibility of the contractor (under the obligations of the Design and Build type contract) to ensure compliance with those measures that have been outlined in this EIAR to avoid and/or reduce significant adverse effects that have been identified. Where the contractor proposes from the methodologies and working areas outlined herein and defined in the granted planning consent, it will be the responsibility of the contractor to ensure compliance with or obtain the relevant licenses, permits and consents for such changes.

5.3 Indicative Duration and Phasing

5.3.1 Overview

The construction of the proposed development is estimated at between 3.5 and 4 years, based on the reasonable worst case assessed herein. The programme is divided into two main elements:

- Construction of the interceptor sewer pipe network; and
- Works associated with the WwTP and surrounding site.

Refer to **Appendix 5.2** for the estimated construction programme that has been outlined for the proposed development.

5.3.2 Sequencing

5.3.2.1 Interceptor Sewers

Overview

Upon award of the contract, the contractor is likely to require an initial approximately 6 month period to undertake site investigations and detailed design of the interceptor sewer network. Following this period, the contractor will mobilise onsite to undertake the enabling works described in **Section 5.5** (i.e. to setup compounds and initiate the diversion of existing utilities to facilitate the installation of new pipelines, manholes, tunnels and shafts associated with the sewers).

The sewers will be constructed using tunnelling and open cut methods. The first element of work that the contractor will undertake, is the tunnelling of the sewer.

Tunnelling

Approximately 1,250m of the sewer will be constructed by tunnelling methods using a series of tunnel shafts and a tunnel boring machine (TBM) for those segments of the sewer downstream on South Quay, the river crossing and along North Quay (Refer to **Section 5.6.3.4** for further detail).

Once the necessary utilities have been diverted, the vertical tunnel shafts will be constructed (ranging in depth from approximately 7m to approximately 16m below ground level).

The eight tunnel shafts to the north of the river channel will be constructed first, commencing adjacent to the WwTP site (at TSN8) and proceed upstream along North Quay (to TSN1). Upon completion of the tunnel shafts on North Quay, the works will then transfer to the remaining four shafts to the south of the river channel. The tunnel shafts to the south of the river channel will commence downstream (at TSS3) and proceed upstream (to TSS1).

The working areas provided for each tunnel shaft have been selected and sequenced to take account of traffic flows, ensuring that access around the working areas is maintained at all times throughout the construction of the tunnel shafts and the tunnel construction itself (Refer to **Section 5.7** for further detail).

Once the required number of tunnel shafts have been constructed in a given working area, the excavation and tunnelling will commence. The working areas around the launch and reception shafts (i.e. at each end of the pipeline) will be used while tunnelling is taking place. Tunnelling will occur 24-hours a day, seven days per week. Typically works at each shaft location will take approximately 3 months. Shafts that are mid tunnel length (i.e. where the TBM approaches the shaft from one direction and then continues on to the next shaft), will be operational for approximately 3 months as the TBM approaches and also a further 3 months until the TBM reaches the subsequent shaft down the tunnel line and the fit-out of the shaft as a permanent chamber has been completed. On completion of a section of tunnelling and fitout of the permanent manhole chambers, the working areas around the launch and reception shafts will be reinstated and reopened.

Two sizes of sewer (Approximately 1200mm and 1500mm diameter pipelines) will be tunnelled as part of the proposed development.

Open Cut

The remaining approximately 865m of sewer will be constructed using open cut methods. This open cut method will require excavations (approximately 4m in depth) and the subsequent installation of the pipelines.

Open cut installation of the sewer to the north of the river channel will be over a length of approximately 46m to the west of 1 Ferrybank (i.e. between TSN1 to MHN1). Open cut installation of the sewer to the south of the river channel will be over a length of approximately 746m between MHS1 (adjacent to the Alps SWO and tank) and TSS1 (located on South Quay). These works will commence downstream (at TSS1) and proceed upstream (to MHS1). It is anticipated that the Alps SWO and stormwater storage tank will be constructed in parallel with the installation of the adjacent sewer between River Lane East and Chateaudune Promenade (i.e. the sewer between MHS1 - MHS5).

5.3.2.2 WwTP

Overview

The demolition of the structures on the WwTP site and construction of the WwTP will require a longer time period to construct than the interceptor sewers.

Whilst the final sequencing and phasing of the works will be for the contractor to determine, we have considered the various likely options in this regard and have set out below, a likely sequence of works that will enable the assessment of the reasonable worst case to be considered herein.

Given that the WwTP construction is likely to take longer to construct than the interceptor sewers, it is envisaged that the contractor will mobilise on the WwTP site and set up a compound immediately after contract award. Following completion of bat surveys in the existing buildings, a three month period (approximately) will be allocated for the diversion or termination of existing utilities within the WwTP site (Refer to **Section 5.5.2**). This will be followed by the sequential activities as outlined below (Refer to **Drawing No.'s 247825-00-C-P-1001 to 247825-00-C-P-1006 in Volume 3** for further detail):

- Asbestos removal;
- Demolition of existing structures;
- Excavation, remediation and dewatering where appropriate;
- Upgrade to Section A of the revetment and installation of the cofferdam for the SWO;
- Deep excavation works for WwTP buildings;
- Construction of building foundations, subsurface structures and installation of the SWO;
- Construction of above ground structures, installation of the long sea outfall and upgrade to Section B of the revetment;
- Finishing and fitout of buildings and site-wide landscaping;
- Testing and commissioning of buildings; and
- Connection to the sewers and commissioning of the proposed development.

Stripout and demolition of existing structures

The first phase of work to be undertaken within the WwTP site will be the removal of asbestos containing materials and then stripping out of the existing structures on the WwTP site (as described in detail in **Section 5.5.5.2**). Once this task is complete, the demolition of structures across the WwTP site will commence (as described in detail in **Section 5.5.5.3**).

Following site clearance and demolition of all structures to ground level, site investigations works will be undertaken to confirm the ground conditions and characterise the extent of any contaminated material beneath the footprint of the existing Old Wallboard factory building.

A remediation strategy will then be finalised (based on the information gathered during the site investigation) in advance of the commencement of any excavation works.

Exacavation and removal of contaminated material, upgrade of Section A revetment and SWO cofferdam installation

Contaminated soil within the footprint of the proposed WwTP buildings will be excavated out and disposed of off site (i.e. transferred to an authorised facility in respect of which a waste permit or a waste licence is granted) as described in **Section 5.5.5.4**. In parallel with the excavation of contaminated material, a temporary sheetpile cofferdam will be constructed in the area of the existing revetment to facilitate the excavation and construction of the SWO through the revetment. Upgrade to the first half of the revetment (as described in detail in **Section 5.6.6**) will also commence at this stage.

It is preferable to upgrade the revetment outside of the winter months in order to reduce the likelihood of delays due to weather constraints. The upgrade of the revetment will generally proceed from north to south, with the exception of the area required to construct the SWO (until works in the cofferdam have been completed).

Deep excavation works

Deep excavation will be required to accommodate sumps, tanks, service corridor and foundations beneath the WwTP buildings (as described in detail in **Section 5.6.4.2**). Excavation within the cofferdam for the SWO will also be completed during this phase. Further, the trenching of the long sea outfall would occur (if this is the chosen construction methodology).

Deep excavation would range from approximately 1.2m to 18.5m below ground level. The excavations will require robust temporary support systems including sheet piles and secant piles and dewatering systems will also be employed to facilitate dry excavation areas (as described in detail in **Section 5.6.4.2**).

Construction of subsurface structures

Once the deep excavations have been completed to the required depths, the subsurface elements of the WwTP will be constructed. As described in **Section 5.6.4.2**, this will involve piling and construction of large reinforced concrete structures for the inlet sump, stormwater storage tank in the Inlet Works building, the service corridor and building foundations.

The SWO and long sea outfall (using open cut methods as appropriate) will also be constructed at this stage, backfilled and the temporary cofferdam removed, allowing for completion of the upgrade to the revetment.

On completion of the foundation and floor slab for the Process building, it is envisaged that the long sea outfall will be constructed (using one of the three construction methods described herein). The foundations for the Process building will be completed prior to the more complex below ground structures to provide a suitable time period to accommodate the construction of the long sea outfall.

For the 'flood and float' or 'bottom pull' method of construction, a temporary sheet pile cofferdam will be required to facilitate the outfall installation through the existing revetment. If the horizontal directional drilling method is selected, a large working platform, on the floor slab of the Process building will be required to accommodate the drilling equipment.

Construction of above-ground structures and upgrade to Section B of the revetment

On completion of below ground structures, the SWO and the long sea outfall, the above ground construction works for the WwTP will commence. These structures will likely be primarily constructed of steel and concrete and be constructed using conventional methods (Refer to **Section 5.6.4.2** for further information). In parallel with these works, the remaining section of the revetment will be upgraded, again preferably occurring outside of the winter months.

External finishing and internal fitout

On completion of all structures, the external hard standing (i.e. roads and car parking) as well as the soft landscaping (i.e. planting, landscaping etc.) will be installed (Refer to **Section 5.6.4.4** for further detail). This will be followed by finishing works including the erection of on-site security lighting, provision of markings on the roadway etc.

In parallel, the installation of all process, mechanical and electrical equipment will take place in the buildings (Refer to **Section 5.6.4.3** for further detail).

Commissioning and Connection of Existing Outfalls to New Sewer Network

Once construction works are complete, the testing and commissioning phase will commence (Refer to **Section 5.6.4.5** for further detail).

Once the WwTP is commissioned and ready for initial wastewater reception, the existing outfalls will be connected to the proposed interceptor sewer with flows diverted to the WwTP. This will involve returning to working areas along North Quay and River Walk - South Quay to install the connections manholes along the interceptor sewer network (as described detail in in Seciton 5.6.3.8).

5.3.3 Duration and Phasing

In summary, the estimated construction programme is anticipated to take approximately 3.5 – 4 years (refer to **Appendix 5.2**). It is anticipated that the following would occur :

- Detailed design by the contractor would take approximately 8 months;
- Establishment of the site compound and enabling works for the interceptor sewer would take approximately 8 months;
- Installation of the temporary causeway would occur during the summer of 2020;
- Installation of the tunnel shafts would take approximately 15 months, (i.e. up to approximately 35 days per shaft);

- Tunnelling of the interceptor sewer would take approximately one year;
- Open cut construction of the interceptor sewer would take approximately 9 months;
- Removal of the temporary causeway would occur during the summer of 2021;
- Civil works (to construct the subsurface and above ground structures, as well as the SWO, long sea outfall and the revetment) for the WwTP would take approximately 22 months;
- Installation of process, mechanical and electrical equipment as well as site landscaping at the WwTP site would take approximately one year; and
- Testing and commissioning would take approximately 7 months.

Some of the above activities will overlap as described in detail in **Section 5.3.2**. It should be noted that some of the construction activities could be subject to seasonality restrictions, e.g. the construction and removal of the temporary causeway may only be undertaken during the Inland Fisheries Ireland season (July to September inclusive), unless the consent of Inland Fisheries Ireland is obtained. Any delays to the consent and/or appointment of the contractor will need to be cognisant of these seasonality restrictions and the construction programme will be required to be revised accordingly.

5.3.4 Interaction with Proposed Arklow Flood Relief Scheme

Wicklow County Council, on behalf of Office of Public Works intends to proceed with the proposed Arklow Flood Relief Scheme in the near future as described in **Section 2.6.7 of Chapter 2.** As currently proposed, the proposed Arklow Flood Relief Scheme works will overlap with the proposed development, both in terms of geographical location and possibly construction programme. It is understood that the construction of the proposed Arklow Flood Relief Scheme will be undertaken in a particular sequence in order to mitigate against any increased flood risk.

The commencement of construction for the proposed Arklow Flood Relief Scheme will be subject to the timely submission, consents and appropriate procurement. At the time of writing, the outline programme that has been provided by the design team shows a commencement date of early 2019, with the following key work sequencing:

- Bridge underpinning (Phase 1) in 2019;
- Bridge underpinning (Phase 2) in 2020;
- The flood defences works on the South Quays being undertaken over approximately 12 months following on from the end of the bridge underpinning (Phase 1);
- The dredging being carried out in the river in 2021; and
- The flood embankment adjacent to Arklow Town Marsh being undertaken following the dredging works, in late 2021/early 2022.

If the proposed Arklow Flood Relief Scheme proceeds in accordance with this outline programme, it is likely that construction works may overlap with the proposed development.

All works on Arklow Bridge, in particular, those requiring traffic management and out of hours works, will be coordinated with the proposed Arklow Flood Relief Scheme wherever possible, to ensure that disruptions to the public are minimised. It is envisaged that collaborative working practices will also be required for works on South Quay and River Walk, in an effort to minimise disruption to businesses and local residents. It is not foreseen that works between the two schemes will significantly overlap in other areas, however both project teams and the contractors will collaborate on management plans (including environmental and construction traffic management) prior to implementation and commencement of the works.

Irish Water and Wicklow County Council will continue to endeavour to minimise in combination effects of both schemes. This potential for cumulative effects has been addressed in **Chapters 7 – 20** (Refer to **Chapter 20** for a summary of cumulative effects), with the reasonable worst case considered in terms of such effects for each environmental aspect. This is based on the currently available information available from the proposed Arklow Flood Relief Scheme and the outline programme provided by the design team.

5.4 Land Use Requirements

5.4.1 Overview

Construction of the proposed development will require temporary land take to accommodate construction activities in addition to the permanent land take required to accommodate specific above ground elements of the proposed development (as described in detail in **Section 4.3.1 in Chapter 4**).

Land will be temporarily required to accommodate construction compounds and temporary on-site activities as illustrated in Figure 5.1. Refer to **Drawing No.'s 247825-00-C-IS-001-004 and 247825-00-C-IS-005 and Drawing No.'s 247825-00-C-IS-1500 to 247825-00-C-IS-1516 of Volume 3** for detailed drawings of the land to be acquired temporarily during construction, hereafter referred to as the 'working areas'.

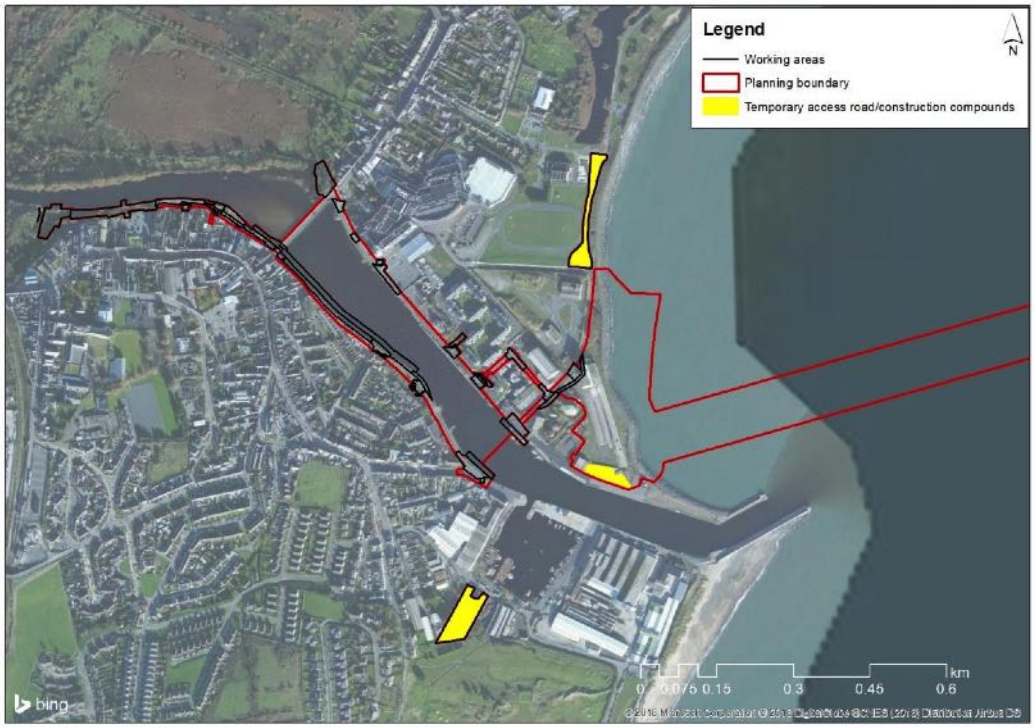

Figure 5.1: Overview of working areas required for the proposed development

5.4.2 Construction Compounds and Working Areas

Construction compounds have been, as far as possible, located close to the working areas. Two construction compounds have been identified and are considered to be capable of accommodating the construction activities. The construction compounds and working areas have been included in the planning boundary for the proposed development as illustratred in Figure 5.1 above and **Drawing No. 247825-00-C-IS-1400 of Volume 3.**

The main construction compound will be located on the WwTP site and will provide site offices and welfare facilities for construction employees, as well as providing an area for material storage. This compound will facilitate the construction of the WwTP, long sea outfall, SWO, revetment and associated infrastructure works on site, as well as slong North Quay.

A second construction compound, to service River Walk/South Quay (Working Area S19) will be established, predominantly for material storage. Material storage will also be permitted at another working area (Working Area S1) adjacent to the Alps SWO and Stormwater tank.

The construction of the interceptor sewers is linear in nature, requiring a number of working areas (that have been identified within the planning boundary) to accommodate the construction compounds and relevant activities on a temporary basis (as illustrated on **Drawing No.'s 247825-00-C-IS-1500 to 247825-00-C-IS-1516 of Volume 3**).

The working areas will be made available to the contractor for use during the construction period. The working areas will be secured and will not be accessible to the public for the duration of the construction works in the relevant areas.

5.5 Enabling Works

Enabling works are required for various aspects of the proposed development, in order to prepare the working areas identified and the WwTP site for construction activities. A description of the enabling works required is provided in **Sections 5.5.2 - 5.5.5**.

5.5.1 Overview

Enabling works will be required to prepare the various working areas for construction. The following will typically be required at each of the working areas, with certain site specific enabling works set out in **Section 5.5.4** for specific working areas and **Section 5.5.5** for the WwTP site:

- Establish and get appropriate approvals for construction traffic management requirements for diversions and haulage routes (refer to **Section 5.7** for further details);
- Establish and implement appropriate surface water management procedures in accordance with the requirements set out in the Outline CEMP in **Appendix 5.1**;
- Construct temporary site access from the existing road network and install trafficable surfaces where required (Refer to **Section 5.7** for further details);
- Install secure hoarding and fencing (2.4m in height as a minimum) that will remain in-situ for the duration of the construction works (Refer to **Section 5.8.3** for further details);
- Install vehicle set down and material storage areas (typically by laying down harcore to a depth of approximately 300mm) in relevant working areas;
- Undertake vegetation removal and stripping of topsoil as required in relevant working areas;
- Install the main construction compound to accommodate site offices and welfare facilities at WwTP site (Refer to **Section 5.6.4** for further details);
- Install a further construction compound on South Quay (as described in **Section 5.4.2**) predominantly for material storage; and
- Undertake all required utility and services diversions and provide a connection to the local sewerage network, water distribution and electrical networks as required.

5.5.2 Utilities and Services

Due to the urban nature of the location of the proposed development there are a large number of utilities and services located in the public road and footpaths along River Walk, South Quay and North Quay.

These existing utilities and services include gas mains, watermains, surface water drainage, telecommunications, public lighting and electricity supplies servicing both domestic and commercial customers.

Generally, the areas most affected by diversions will be the tunnel shafts where all services that run directly under the location of the tunnel shafts will be required to be re-routed locally around the shaft.

It should be noted that the Contractor will be responsible for agreeing all connections to existing utilities that are required in advance of the commencement of any works. The specific details of all permanent diversion works will be set out and agreed by the contractor in advance with the utility provider and any likely significant effects are considered herein in **Chapter 18**. No significant disruption to service is anticipated.

5.5.3 Site Investigation

It is anticipated that the contractor may undertake further site investigation works within the planning boundary to confirm the existing information on the land and soils (as described in detail in **Section 14.3 of Chapter 14**). At this stage, it is possible that further site investigation may be required along the alignment of the interceptor sewer and within the WwTP site under the footprint of the existing buildings. The specification of such works will be developed by the contractor during the detailed design.

5.5.4 Enabling Works for Alps SWO and Stormwater Storage Tank and Interceptor Sewers

5.5.4.1 Working Areas

Enabling works that will be specifically required at individual working areas are detailed in the following sections. Further detail on the specific methodologies and activities during construction at each of these working areas is available in **Section 5.6**.

Working Areas S1, S2 and S3

Working Areas S1, S2 and S3 (as illustrated on **Drawing No.'s 247825-00-C-IS-1501 and 247825-00-C-IS-1502 in Volume 3**) are located adjacent to the Alps development site and on the western side of River Walk. These working areas will support the construction of the Alps SWO and storage tank as well as the interceptor sewer on River Walk.

These working areas will be subject to typical enabling works as outlined in Section 5.5.1.

Working Area S4

Working Area S4 is located on River Walk (as illustrated in **Drawing No. 247825-00-C-IS-1502 in Volume 3**) and will support the construction of the interceptor sewer on River Walk.

An existing wall to the north-east of Working Area S4 (fronting onto River Walk) will require demolition to facilitate traffic movements around Working Area S3. A temporary trafficable surface will also be installed as part of the enabling works.

Working Areas S5 and S6

Working Areas S5 and S6 (as illustrated in **Drawing No. 247825-00-C-IS-1503 in Volume 3**) are located on River Walk and will support the construction of the interceptor sewer on River Walk.

These working areas will be subject to typical enabling works as outlined in Section 5.5.1. Working Area S6 will also require the removal of a timber fence from the corner property to the west of the Condren's Lane Upper and River Walk junction and removal of the footpath to the east of the junction .

Working Area S7, S8 and S11

Working Areas S7, S8 and S11 are located on River Walk (as illustrated in **Drawing No. 247825-00-C-IS-1503 of Volume 3**). These working areas will support the construction of the interceptor sewer on River Walk.

These working areas will be required to facilitate traffic movements around the adjoining working areas on the landside of River Walk (i.e. Working Areas S5, S6 and S9). A temporary trafficable surface will be installed as part of the enabling works.

Working Areas S9 and S10

Working Areas S9 and S10 are located on River Walk (as illustrated in **Drawing No. 247825-00-C-IS-1503 of Volume 3**) and will support the construction of the interceptor sewer on River Walk. Working Area S10 will extend into the river channel.

These working areas will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area S11

Working Area S11 is located on River Walk (as illustrated in **Drawing No. 247825-00-C-IS-1503 in Volume 3**) and will support the construction of the interceptor sewer on River Walk.

This working area will be required to facilitate traffic movements around the adjoining working areas on the landside of River Walk (i.e. Working Areas S5, S6 and S9). A temporary trafficable surface will be installed as part of the enabling works.

Working Areas S12 and S13

Working Areas S12 and S13 are located on South Quay and extend into the river channel (as illustrated in **Drawing No.'s 247825-00-C-IS-1504 and 247825-00-C-IS-1505 of Volume 3**).

These working areas will support the construction of the interceptor sewer on South Quay including the construction of the tunnel shaft (TSS1).

These working areas will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area S14

Working Area S14 is located on South Quay and extends into the river channel (as illustrated in **Drawing No. 247825-00-C-IS-1506 of Volume 3**). This working area will support the construction of the tunnel shaft (TSS1) and interceptor sewer on South Quay.

Working Area S14 will be required to provide access and parking for local residents, therefore a temporary pedestrian walkway and two temporary on street parking spaces will be provided as part of the enabling works.

Working Areas S15A & S15B

Working Areas S15A and S15B are located on South Quay (as illustrated in **Drawing No. 247825-00-C-IS-1506 of Volume 3**) and will support the construction of the tunnel shaft (TSS2) and interceptor sewer on South Quay.

Working Areas 15A and 15B will be required to provide a shared temporary trafficable access road (in each working area) while works are ongoing at the adjoining working area (Working Area S16). Each access road will serve two properties and there will be a requirement to create an access through the dividing garden wall as part of the enabling works.

Working Area S16

Working Area S16 is located on South Quay (as illustrated in **Drawing No. 247825-00-C-IS-1506 of Volume 3**) and will support the construction of the tunnel shaft (TSS2) and interceptor sewer on South Quay.

This working area will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area S17

Working Area S17 is located on South Quay (as illustrated in **Drawing No. 247825-00-C-IS-1506 of Volume 3**) and will support the construction of the tunnel shaft (TSS2) and interceptor sewer on South Quay.

This working area will be required to facilitate traffic movements around the adjoining working area S16. A temporary trafficable surface will be installed as part of the enabling works.

Working Area S18 and S20

Working Areas S18 and S20 are located on South Quay (as illustrated in **Drawing No. 247825-00-C-IS-1507 of Volume 3**) and will support the construction of the tunnel shafts (TSS2A and TSS3) and interceptor sewer on South Quay.

These working areas will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area S19

Working Area S19 is located on South Quay, south of the harbour (as illustrated in **Drawing No. 247825-00-C-IS-1508 of Volume 3**). This working area will be a construction compound to support the construction of the interceptor sewer on River Walk/South Quay. Further details are provided in **Section 5.4.2**.

River Working Area S1

River Working Area S1 is located in the river channel, extending from upstream of Arklow Bridge to just upstream of the tunnel shaft (TSS2) on South Quay (as illustrated in **Drawing No.'s 247825-00-C-IS-1503 to 247825-00-C-IS-1506 of Volume 3**).

This working area will support the construction of the interceptor sewer directly upstream of Arklow Bridge (adjacent to River Walk), the works at Arklow Bridge and the construction of the river based interceptor sewer from manhole (MHS9) to tunnel shaft (TSS1). A temporary causeway would be constructed in this working area to facilitate the construction of the proposed interceptor sewer as discussed in detail in **Section 5.6.3.3**.

River Working Area S2

River Working Area S2 is located in the river channel, in the vicinity of the proposed river crossing at tunnel shaft (TSS3) on South Quay (as illustrated in **Drawing No. 247825-00-C-IS-1507 of Volume 3**).

This working area will support the construction of the river crossing as the tunnel passes through the existing quay wall at this location.

River Working Area N1

River Working Area N1 is located in the river channel, in the vicinity of the proposed river crossing at tunnel shaft (TSN6) on North Quay (as illustrated in **Drawing No. 247825-00-C-IS-1509 of Volume 3**).

This working area would support the construction of the river crossing as the tunnel passes through the existing quay wall at this location.

Working Area N1

Working Area N1 is located at No 1 Ferrybank (as illustrated in **Drawing No. 247825-00-C-IS-1511 of Volume 3**) and will support the construction of the interceptor sewer on North Quay, specifically tunnel shaft (TSN1) and connection pipework between the proposed interceptor sewer and the existing foul sewer adjacent to Arklow Town Marsh.

This working area will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Areas N2 and N3

Working Areas N2 and N3 are located on North Quay (as illustrated in **Drawing No's. 247825-00-C-IS-1511 and 247825-00-C-IS-1512 of Volume 3**) and will support the construction of the interceptor sewer on North Quay, specifically connection pipework between the proposed interceptor sewer and the existing foul sewer network.

These working areas will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Areas N4 and N5

Working Areas N4 and N5 are located on the North Quay (as illustrated in **Drawing No. 247825-00-C-IS-1512 of Volume 3**) and will support the construction of the interceptor sewer on the North Quay, specifically tunnel shaft (TSN2) and connection pipework between the proposed interceptor sewer and the existing foul sewer network.

These working areas will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area N6

Working Area N6 is located on North Quay (as illustrated in in **Drawing No.'s 247825-00-C-IS-1513 and 247825-00-C-IS-1514 of Volume 3**). This working area will support the construction of the tunnel shaft (TSN3) and interceptor sewer on North Quay.

For Working Area N6 there will also be a requirement to provide a temporary pedestrian walkway to facilitate pedestrian movements around Working Area N6 as part of the enabling works.

Working Area N7

Working Area N7 is located on North Quay (as illustrated in **Drawing No. 247825-00-C-IS-1513 of Volume 3).** This working area will support the construction of the interceptor sewer on North Quay, specifically connection pipework between the proposed interceptor sewer and the existing foul sewer network

This working area will be subject to typical enabling works as outlined in **Section 5.5.1.**

Working Areas N8 and N9

Working Areas N8 and N9 are located on North Quay (as illustrated in **Drawing No. 247825-00-C-IS-1514 of Volume 3**) and will support the construction of the interceptor sewer on North Quay, specifically tunnel shaft (TSN4) and connection pipework between the proposed interceptor sewer and the existing foul sewer network.

Working Area N8 will be subject to typical enabling works as outlined in **Section 5.5.1**.

For Working Area N9, there will be a requirement to provide a temporary pedestrian walkway and temporary access road around the adjoining working area to the north (Working Area N8). Further, the existing boundary wall for Marina Village will be removed and a new vehicular entrance will also be required as part of the enabling works.

Working Area N10

Working Area N10 is located on North Quay (as illustrated in **Drawing No. 247825-00-C-IS-1515 of Volume 3**) and will support the construction of the interceptor sewer on the North Quay, specifically tunnel shaft (TSN5).

This working area will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Areas N11 and N13

Working Areas N11 and N13 are located on Mill Road (as illustrated in **Drawing No.'s 247825-00-C-IS-1511 and 247825-00-C-IS-1515 of Volume 3**). These working areas will support the construction of the tunnel shaft (TSN7 and TSN8) and the interceptor sewer on Mill Road.

For Working Areas N11 and N13 there will also be a requirement to provide a temporary haul access road to facilitate vehicular movements as part of the enabling works. These roads will be 6m wide temporary trafficable surfaces to accommodate construction vehicles entering the adjoining WwTP site.

Working Area N12

Working Area N12 is located on Mill Road (as illustrated in **Drawing No. 247825-00-C-IS-1509 of Volume 3**) and will support the construction of the tunnel shafts (TSN6) and the interceptor sewer on Mill Road and connection pipework between the proposed interceptor sewer and the existing foul sewer network

This working area will be subject to typical enabling works as outlined in **Section 5.5.1**.

Working Area N14

Working Area N14 is located between Seaview Avenue and Mill Road (as illustrated in **Drawing No. 247825-00-C-IS-1516 of Volume 3**). This working area will accommodate the temporary access road that will run alongside the running track and connect Seaview Avenue to Mill Road. Further details are provided in **Section 5.4.2**.

5.5.5 Enabling Works at WwTP

5.5.5.1 Overview

Construction of the WwTP will be undertaken on the Old Wallboard site at Ferrybank, which has a history of industrial use as described in **Section 2.6 of Chapter 2**. In order to construct the WwTP, a suite of enabling works will be required. Enabling works for the WwTP will comprise the following activities that would likely occur in sequence, with the sequencing to be determined by the contractor based on his programme of work. The reasonable worst case has been considered herein.

- Removal of asbestos from the existing structures and site;
- Demolition of the existing structures on the site; and
- Excavation of soil and remediation of contaminated land and groundwater.

5.5.5.2 Asbestos Removal

An asbestos survey of the WwTP site has been undertaken by OHSS and the report is available in **Appendix 5.3**. This survey has identified asbestos containing material in the following areas on the site:

- The wall and roof cladding of the Old Wallboard building comprises asbestos cement sheets;
- The wall and roof cladding of the Stores building is asbestos sheet cladding;
- The ceiling of the stores building is asbestos sheet cladding;
- The roof cladding to the high section of the Wallboard building is asbestos cement sheets;
- The wall and roof cladding of the Masterglaze building is asbestos cement sheets;
- Rope seals to the lights in the Masterglaze building contain asbestos;
- Lino with asbestos paper backing is present in the electrical room of the Wallboard building;
- Vinyl floor tiles and bitumen containing asbestos are present in the locker room of the Wallboard building;
- Rain water goods in the buildings contain asbestos;
- The internal walls and ceiling of the prefab building contain asbestos;
- Asbestos cement debris is present around and within all of the buildings on the site; and
- Asbestos cement debris is present in the existing rock armour revetment on the seaward side of the site.

In the first instance, a Refurbishment / Demolition Asbestos Survey (RDAS) will be undertaken by the contractor so that all asbestos containing materials are correctly identified before any demolition works take place and so that they can be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006, as amended and all relevant guidelines[1].

All asbestos containing materials will be required to be removed by a competent contractor, with the appropriate trained staff, equipment and resources. All asbestos containing material will be extracted from the relevant locations and will be required to be double wrapped and labelled before being safely stored in an appropriately protected area, located away from most of the construction traffic on the WwTP site.

All of the asbestos containing material will be removed from the WwTP site and disposed of at an appropriately licensed facility in respect of which a waste permit or a waste licence is granted in accordance with the relevant procedures and legislation. No other construction activities will occur on the site during this phase of works.

5.5.5.3 Site demolition

Upon completion of the asbestos removal, demolition of the existing buildings and structures on site will occur. These structures are structurally unstable and partially collapsed in some areas of the site. The following structures will be demolished (following the removal of asbestos containing material):

- Gate Building;
- Storage Tank;
- Single Storey Prefab Units situated to the west of the site;
- Masterglaze Building;
- Stores Building;
- Substation;
- Wallboard Building;
- Metalclad Building; and
- Outbuilding to the north of the site.

The following activities will take place as part of the demolition (following the removal of asbests containing material):

- Removal of all materials from the ground floor of each of the buildings on the site;
- Removal of metal cladding sheets generally;

[1] Health and Safety Authority (2013) Asbestos-containing materials (ACMs) in Workplaces: Practical Guidelines on ACM Management and Abatement. Available from: http://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/Asbestos_Guidelines.pdf [Accessed 28 June 2018]

- Demolition of building frames; and
- Demolition of ground floor slabs/ grubbing up of foundations.

All demolition materials deemed to be waste would be removed from the site and transferred to an appropriately authorised facility in respect of which a waste permit or a waste licence is granted. No other construction activities will occur on the site during this phase of works.

5.5.5.4 Excavation, remediation and dewatering

On the basis of preliminary ground investigations carried out to date, the following contaminants are present in the soil on the Old Wallboard site at Ferrybank (Refer to **Section 14.3 of Chapter 14** for further detail):

- Made ground containing heavy metals (arsenic in one discrete location and lead between approximately 0.4m to 2.5m below ground level across the site);
- Nitrocellulose (also referred to as guncotton) at four discrete locations around the site between approximately 0.4 to 2.5m below ground level;
- Asbestos containing materials in four discrete locations around the site; and
- Nickel, zinc, lead, cadmium, barium, phosphate and ammoniacal nitrogen are present in the groundwater beneath the site.

Excavation

Soil and unsuitable material under the footprint of the buildings will be excavated to allow for the construction of the foundations. The excavated material will likely comprise a mixture of made ground and natural soils (Refer to **Section 14.3 in Chapter 14** for further detail on the baseline conditions). All excavated material would be disposed of at a suitable licensed facility in respect of which a waste permit or a waste licence is granted, if there is no opportunity for reuse on site identified during the detailed design.

During the construction of the vehicle access areas approximately 375mm of existing hardstanding and soil will be removed to enable the ground bearing slab to be constructed. In addition, approximately 300mm of hardstanding and soil beneath the landscaped areas will be removed to allow a suitable growing medium (topsoil) for the landscaping to be placed.

Dewatering

During the construction of the subsurface structures (i.e. the inlet sump, storm tanks, the service corridor and the outfalls), the depth of excavation will be below the water table. It would therefore be necessary to prevent groundwater ingress or dewater the water bearing sand and gravel soil. Considering the high permeability of the sand and gravels, groundwater exclusion will be achieved by installing deep temporary sheet pile walls.

Despite the groundwater exclusion, some dewatering from the areas of excavation will be necessary to remove residual groundwater within the sheet pile wall, manage surface water and to manage any small amounts of seepage through the sheet pile wall. The volume of water is not likely to exceed approximately 250m^3/day, with this volume considered as the reasonable worst case in the assessment.

Due to contamination of the groundwater it will not be possible to discharge directly into the Irish Sea. The strategy for removing groundwater from the site is likely to comprise either tankering off site to a suitable licenced facility in respect of which a waste permit or a waste licence is granted or treatment on site.

Onsite treatment, which is considered the most likely option, will likely occur by means of a coagulation-flocculation and filtration or other suitable proprietary treatment process. This will comprise the following activities:

- Dose the groundwater with a coagulant to support coagulation of contaminants;
- Remove the coagulant and contaminants by flocculation and filtration;
- Generation of a sludge that would contain coagulant material and the flocculated heavy metal contaminants;
- Remove the sludge from the site by tanker and disposal at an appropriately licensed facility. The quantity of tanker trips would depend on the level of groundwater being treated and the storage on site but it is anticipated that this may be up to approximately one tank visit per day.
- Discharge of the treated groundwater to sea, under a Section 4 licence from Wicklow County Council in accordance with the Local Government (Water Pollution) Acts, 1977 - 2007.

This treatment will be provided in readily available, mobile shipping containers that will facilitate quick installation and demobilisation as required during construction. The area required for treatment is expected to be in the order of a 15m x 15m compound to house the treatment units, chemical storage, and pump systems. An additional area of a similar size will also be required for waste sludge and backwash water tanks. The system can be powered by conventional low voltage generators on site.

Remediation strategy

The soils on the site present a risk to site users, however the construction of the proposed development will ensure that this risk is minimised, by either removing those contaminated soils from the excavations, or ensuring soils are covered, thus breaking the source-pathway-receptor linkage. This will be undertaken and managed by conventional construction practices including:

- Construction of buildings and hardstanding will provide a hard barrier that would prevent exposure.

- In areas of landscaping up to approximately 300mm depth of made ground will be removed to allow clean topsoil to be placed on the areas of landscaping. The topsoil will be underlain by a geotextile material to limit mixing of the underlying made ground with the topsoil. This will also prevent made ground from being exposed at the surface. Soft landscaping will include planting of low lying vegetation with shallow roots. Where larger plants are proposed e.g. gorse or trees, they will be planted in mounds of clean topsoil to provide them with a greater depth of topsoil and avoid the excavation of any contaminated soils.

5.6 Indicative Construction Methods for the Proposed Development

The main construction activities are listed below and discussed in detail in **Sections 5.6.1 - 5.6.6**:

- Diversion of existing foul sewers;
- Construction of the interceptor sewer network;
- Construction of the Alps SWO and Stormwater Storage Tank (including testing and commissioning);
- Construction of the WwTP (including testing and commissioning);
- Construction of the WwTP SWO and long sea outfall; and
- Upgrade of the revetment.

Those construction activities will occur in the sequence as described in **Section 5.3.2**.

5.6.1 Sewer Diversions

5.6.1.1 Overview

The interceptor sewer network and the Alps SWO and stormwater storage tank will not be commissioned until such time as the WwTP is fully commissioned and accepting wastewater for treatment. The existing wastewater and stormwater network will therefore be required to be functional until the proposed development becomes operational (i.e. throughout construction), therefore the sewer diversions described in **Section 5.6.1.2** will be required.

The interceptor sewer, Alps SWO and stormwater storage tank will be constructed off-line of the existing wastewater network without disturbing the current regime. This will be achieved by maintaining all current SWO discharge pipework, likely by sleeving the existing outfall pipes through working areas or alternatively locally diverting flows to the nearest existing SWO discharge pipe. The exception to this is at the Alps SWO and Stormwater Storage site where specific sewer diversions will be required.

Upon completion of the enabling works (described in detail in **Section 5.5**) sewer diversions will be required to maintain the operational wastewater network at this location as described in detail in **Section 5.6.1.2**.

5.6.1.2 Sewer Diversions for Alps SWO and Stormwater Storage Tank

New manholes MHA1 and MHA2 will be constructed using open cut techniques on the alignment of the existing 225mm diameter sewer (to the south of the Alps site). From MHA1 flows will be diverted to MHA2 via a new approximately 225mm diameter pipeline (extending from the existing sewer).

This diversion will enable all wastewater (in the existing 225mm diameter pipeline) to be temporarily diverted through to the existing sewer to the south (1200mm diameter pipeline). From MHA2, flows will continue to pass through the existing sewer and through to the existing SWO discharge point (into the Aovca River) for the duration of the construction works.

Some of the existing manholes (MH1, MH2, MH4 and MH21) and all associated wastewater pipelines will remain live until the proposed interceptor sewer becomes operational.

5.6.2 Alps SWO and Stormwater Storage Tank

5.6.2.1 Excavation

As discussed in detail in **Section 14.3 of Chapter 14**, bedrock in this area is classified as weak to medium strong, partially weathered, moderately fractured Shale/ Sandstone. On the basis of this information and the Rock Quality Designation (RQD) values detailed on the borehole logs, rock breaking or rock ripping would be required to form the excavations required to construct the Alps SWO and stormwater storage tank. These rock breaking or ripping techniques are described in detail in **Section 5.6.3.2**.

During excavation, measures will be required to protect the existing wastewater network in the area (particularly the 1200mm diameter pipeline that runs parallel to the proposed SWO and Stormwater Storage Tank). These protection measures will likely include installation of a row of sheet piles. Temporary support for the adjacent embankment to the south and the excavation itself may also be required, likely be achieved through the installation of additional sheet piles.

5.6.2.2 Installation of the SWO and Stormwater Storage Tank

Upon completion of excavation and once formation level is reached, a layer of concrete blinding will be installed and construction of the tank itself will commence. The tank will likely be reinforced concrete cast in-situ and the roof may be standard in-situ reinforced concrete or alternatively pre-cast concrete units may be used, with concrete poured to finished roof level. Once constructed, a number of spring assisted, lockable access covers will be installed in the roof.

Once the SWO and tank are in place, the proposed manholes (MHA3, MHA5, MHA6 and MHA7) will be constructed, using open cut techniques, in parallel with the construction of the associated sewers and pipework.

Mechanical and electrical installation will comprise the construction of a small electrical kiosk to provide a power source to enable monitoring of tank levels and overflow events. A non-powered static overflow screen will also be installed inside the tank and a water supply hose reel will be incorporated to allow wash down of the overflow screen/chamber floor within the tank.

5.6.2.3 Reinstatement, Levelling and Landscaping

This portion of the site willbe landscaped, with ground regraded locally to provide approximately 300mm thick layer of topsoil to bring the finished ground level above the SWO and stormwater tank to approximately 5.2mOD. Gabion basket retaining walls will be required at the northern and western sides of the SWO and tank.

Once the levels are regraded, the site will be seeded. A bitumen vehicular access route and parking facilities will be provided to the north to allow vehicular access from the gate for routine maintenance. Stairs and a 1.2m wide concrete footpath (approximately) will also be provided between the site and the manholes to the south.

A security fence (up to approximately 2.4m in height) complete with vehicle access gate will be installed around the full extent of the operational site boundary.

5.6.2.4 Testing and Commissioning

Following construction, testing will be undertaken for water-tightness in accordance with the guidance[2]. This will involve the tank being filled to its full capacity and water levels measured to ascertain if they drop (i.e. confirm that there if no loss of water from the tank) over a period of time. It will be the responsibility of the contractor to source the required water, however it is anticipated that it is likely that it would be sourced either through a connection to the local mains or via tankering to site.

Upon completion of the testing, the contractor will empty the structure. Any water used during the testing will be treated accordingly (to remove silt or other contaminants) and discharged (in accordance with an approved discharge licence) to a local water course or to the drainage network.

At this stage the manhole (MHA4) and adjacent sewer (Approximately 900mm diameter pipeline) will be constructed, again using open cut techniques, to the north-east of the SWO and tank. This manhole will be located on the alignment of the existing foul sewer (1200mm diameter pipeline) and provide the connection between the SWO and tank and the existing box culvert (and associated storm overflow sewer that currently discharges to the Avoca River).

[2] CEWSI (2011) Civil Engineering Specificaton for the Water Industry, 7th Edition

Flows will be diverted to the SWO and tank when the WwTP is fully commissioned and accepting wastewater for treatment. At this point all flows will be diverted from MHA2, through the SWO and tank and into the proposed interceptor sewer at MHA7.

The existing wastewater network pipes (to the north) will become redundant and abandoned. The pipes will be left in situ and typically concrete will be pumped to form a plug at either end of the sewer.

5.6.3 Interceptor Sewers

5.6.3.1 Overview

It is envisaged that the interceptor sewers will be constructed using a combination of open cut and tunnelling methods. In summary, the sewer on River Walk/South Quay between MHS1 to MHS15 will be laid using open cut methods. Tunnelling methods will be used to install the remainder of the interceptor sewer on South Quay (between TSS1 and TSS3), the river crossing and the North Quay interceptor sewer (between TSN1 and TSN8).

Sections 5.6.3.2 –5.6.3.4 describe the indicative construction activities associated with constructing the sewers using these methods. **Sections 5.6.3.5 - 5.6.3.9** describe the indicative associated works required to support the construction of the sewers.

5.6.3.2 Open cut Sewers (Land based)

Overview

It is proposed to construct the sewer using open cut methods on the upstream, land based sections on River Walk (i.e. between MHS1-MHS8). It should be noted that construction activities between (MHS5 and MHS8) will occur during October to March following consulation with Wicklow County Council.

As described in **Section 4.2.3 of Chapter 4**, the pipeline ranges from approximately 450mm to 750mm in diameter and invert levels are between approximately 2m - 4m below existing ground level in this section. Rock is at shallow depths (in some areas rock was encountered as shallow as approximately 1.5m below ground level) and the bedrock is classified as weak to medium strong, partially weathered, moderately fractured Shale/Sandstone, therefore rock breaking or ripping will be required as described below.

Rock breaking

The ground conditions in this area indicate that rock breaking or rock ripping is likely to be required to enable the contractor to undertake the excavation required to construct the proposed interceptor sewer. A number of techniques are available to the contractor which can be employed in combination or in isolation, such as percussive breaking, rock ripping, mechanical rock splitting, energetic materials or non-explosive demolition agents. Blasting with high explosives will not be allowed under the contract due to the proximity of sensitive receptors.

Mechanical rock splitting involves hydraulic splitting equipment forcing a wedge into a predrilled hole. However, due to the close spacing of drilling required, the technique can be slow and more suited to the accurate splitting of stone for commercial use.

Rock fracture due to energetic materials involves explosives which in effect burn extremely rapidly when ignited or 'initiated'. As a result of the chemical reaction thus triggered, energy is released at such a high rate that the material itself vigorously expands almost instantaneously and explodes imparting high forces into the surroundings. This technique is typically employed in large areas of bulk excavation.

A number of highly expansive chemicals (non-explosive demolition agents) are now available for 'low energy' breaking of concrete and rock. However, the productive effectiveness of the materials is limited by their mode of action, which is slow, taking around 12 hours per round, and sensitive to both the care taken in the mode of application and the properties of the host material.

Due to the volume and location of rock likely to be encountered at this location and generally as part of the proposed development, percussive breaking and rock ripping are the most likely techniques to be used by the contractor in this instance. Both methods are summarised below:

[1] Percussive Breaking

- Breaking rock or cemented material by purely surface impact percussive means is a constant activity that imparts high levels of energy directly into the ground, thereby generating relatively high levels of vibration.
- This technique and the machinery associated with it are often used to break hard materials at the surface, e.g. digging up roads with a concrete base; or for trimming the edges of excavations in rock.
- It may be used in similar circumstances to construct the interceptor sewers, i.e. for breaking small quantities of hard materials in confined areas (such as the trenches) or below ground for breaking up larger lumps of rock or concrete and 'tidying up' larger excavations.

[2] Rock Ripping

- If the strength of the rock allows, rock cane be fractured simply by 'ripping'. Rock ripping is typically undertaken by an excavator with a specialised ripper attachment.
- Again, this method means imparts high levels of energy directly into the ground, thereby generating relatively high levels of vibration, although less than blasting.

Construction Process

To form the trench for the sewer, the overburden will be excavated and a drag box or trench box will be installed as the excavation progresses. The excavation areas will be sized accordingly to accommodate the trench box/drag box.

The use of a trench box/drag box will minimise the working area by providing stability to the upper sides of the excavation.

Following the excavation of overburden, rock breaking or rock ripping will take place as described above. Following this, the excavated material will be removed (using excavators at ground level). This process will be repeated until formation level has been reached to enable the laying of the sewer.

Due to the relatively high-water table in the area (approximately 2m below ground level), dewatering works will be required to support the open cut construction of the sewer. Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections. Due to the nature of the weathered rock groundwater cut off will not be possible using trench boxes and would only be achieved if temporary sheet piles are employed on either side of the trench excavation. This is thought to be an unlikely approach for the contractor.

Discharge from the dewatering process will be passed to a suitably sized propriety silt removal system, before discharge to the Avoca River or the local sewer network. Any discharge to either sewer network or watercourse will be subject to and discharged in accordance with the licence granted by Wicklow County Council under the Local Government (Water Pollution) Acts, 1977 to 2007.

Once the excavation is dewatered, the sewer will be laid on its bedding material and the trench will be filled with suitable fill material to ground level. The area will subsequently be reinstated to its pre-construction condition.

5.6.3.3 Open cut Sewers (River based)

Overview

It is proposed to construct the sewer using open cut methods in the river based sections on River Walk and South Quay (i.e. between MHS9 - MHS15). As described in **Section 4.3.3 of Chapter 4**, in this section the pipeline ranges from approximately 750mm to 1200mm in diameter and has invert levels of approximately 2.5m – 4.5m below existing ground level.

An overview of the typical construction of the river based sewers that will be constructed using open cut methods is provided in Figure 5.2.

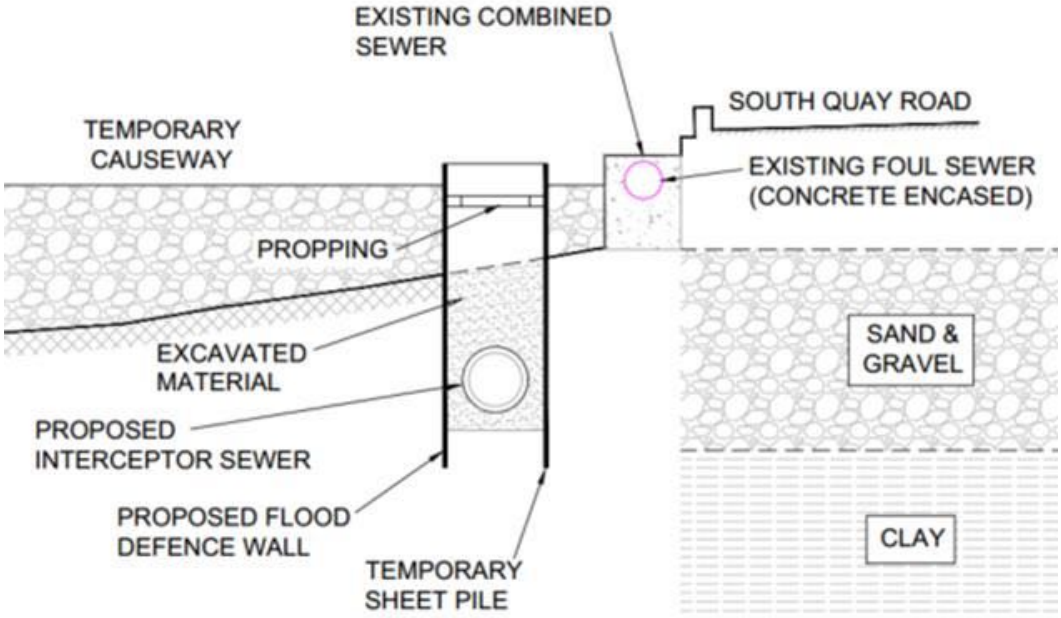

Figure 5.2: Overview of proposed open cut construction of the river based sewers

As outlined in **Section 4.3.2 of Chapter 4**, two areas of land will be reclaimed from the river channel (upstream of Arklow Bridge around MHS9 and downstream of Arklow Bridge between MHS10 to MHS15) to facilitate the construction of the interceptor sewer and to provide access for maintenance.

Scheme Integration (with Arklow Flood Relief Scheme)

This section of works physically overlaps with the proposed Arklow Flood Relief Scheme. Permanent sheet piles will be required to retain the reclaimed land (included as part of the proposed development). As currently proposed, these permanent sheet piles willdouble as the foundation of the flood defence wall planned as part of the proposed Arklow Flood Relief Scheme. The detailed design of the sheet pile wall that will be undertaken by the contractor will account for the requirements of the proposed Arklow Flood Relief Scheme. If the proposed Arklow Flood Relief Scheme was to commence in advance of the proposed development, then by agreement by both project proponents, these works may be undertaken by the contractors for the proposed Arklow Flood Relief Scheme.

The proposed development will terminate the sheet pile wall structure at capping beam level (as currently designed). The proposed Arklow Flood Relief Scheme will then install the flood defence wall and undertake all associated public realm works, including installation of any cladding materials. On the basis of the current design, we anticipate that the Arklow Flood Relief Scheme will use the sheet pile wall and capping beam (installed as part of the proposed development) as the foundation for its flood defence wall.

Construction process

Temporary Causeway

To facilitate construction of the interceptor sewer in the river channel, a temporary causeway will be required to support construction activities. The temporary causeway will include a sufficient working area for installing manholes, the interceptor sewer and sheet pile walls. The causeway would also include provision for approximately 10m wide haul road for HGVs and larger construction plant required to allow excavated material to be removed from the working area during the excavation of the trench.

The temporary causeway will be constructed from clean, suitable engineered fill (coarse granular material free from fines with a maximum particle size of 500mm) in a sequential manner from upstream (approximately 10m upstream of Arklow Bridge) to downstream (approximately 50m downstream of TSS1).

An overview of the temporay causeway is illustrated in Figure 5.2.

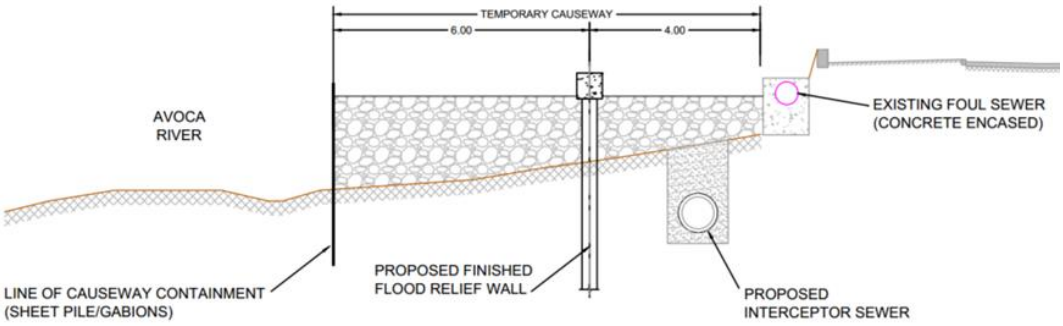

Figure 5.3: Overview of proposed temporary causeway required to construct the river based sewers

In order to mitigate and minimise the potential flood impact caused by the construction of the temporary causeway all instream works upstream of Arklow Bridge near MHS9, including the installation of the interceptor sewer under the bed of the southernmost arch and the underpinning and lowering of the second arch need to be completed in advance of the installation of the temporary causeway downstream of the Arklow Bridge.

A typical sequence for the construction of a temporary causeway of this nature is summarised below:

1. Access route from South Quay will be constructed from downstream to upstream (i.e. from east to west direction). It is proposed to commence works from the eastern side to reduce construction traffic in Arklow town centre.
2. The causeway will be contained on the river side to mitigate against siltation migration into the Avoca River. The two most likely methods to achieve this containment will by via either be an additional row of sheet piles on the river side of the causeway or alternatively a row of stone gabions wrapped in a geotextile membrane.

Either method will require that the containing material (ie the sheet piles or the gabion walls) are extended (i.e. to a height above the surface of the causeway) to be effective.

3. The clean engineered fill material will be transported to the site using tipping vehicles. This will be used as deposit material and be tipped directly into the previously contained area of the river channel from the vehicles by means of suitable plant. The tipping vehicles will be reversed along the causeway with material deposited directly from the end of the causeway in order to avoid large turning circles and double handling of material. A smaller size clean engineering fill material may be used along the line of the permanent sheet piles to aid their installation.
4. Following the deposition of initial loads, material will be spread out to form the temporary causeway. The deposit material will be spread within the contained area using a combination of excavators and dozers. Fill material will then be compacted using tracked machines to provide a suitable running platform for subsequent lorries. The height of the causeway will be in the order of approximately 300mm above mean high water spring levels.
5. The construction of the temporary causeway will continue upstream in this manner until the full route of the temporary causeway is constructed.
6. Following completion of construction of the river based sewer (i.e. when the causeway is no longer required), the causeway will be removed in a similar sequential manner. Long reach excavators will excavate and remove the deposit material from the river channel and place the material in tipping vehicles to be removed from site.

The installation of a temporary causeway is considered in stream works (i.e. within the river channel), therefore the contractor will be required to seek full approval from Inland Fisheries Ireland for all activities in the river channel prior to the commencement of works.

All temporary measures in the river channel will be required to be carried out in accordance with the Inland Fisheries Ireland guidance[3]. The seasonal restriction contained in the guidance (i.e. July to September inclusive) will apply to both the installation and removal of the causeway. As outlined in **Section 5.3.3**, it is likely that the contained causeway will be installed during one season, remain in place year round and be removed during the next available season when it is no longer required.

Standard best practice measures in accordance with the Construction Industry Research and Information Association (CIRIA) guidance[4] will be required to be employed by the contractor to manage silt run-off and pollution control.

[3] Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and adjacent to Water
[4] CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition.

Installation of sheet piles

Once the temporary causeway is in place, the sheet pile wall will be formed by vibrating steel sheets into the ground and the sheet piles will be interlocked to provide continuity.

Downstream of Arklow Bridge (between MHS10 and MHS15), the existing wastewater sewer is encased in concrete and runs parallel to South Quay on the riverside of the quay wall. Due to the historical nature and unknown depth of the quay wall, additional temporary support will likely be required to maintain this foul sewer and protect the existing quay wall. This additional support will typically comprise an additional row of temporary sheet piles installed close to the existing sewer. Propping may be required between the quay wall and the temporary sheet pile wall.

Dewatering

To provide groundwater cut off, the temporary sheet piles should extend into the underlying Cohesive Deposits (which based on existing ground investigation data were encountered at approximately 5.2m below the existing ground level). Once both lines of sheet piles are in place, the excavation will be dewatered.

Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections.

Discharge from the dewatering process will be passed to a suitably sized propriety silt removal system, before discharge to the Avoca River or the local sewer network. Any discharge to either sewer or watercourse will be subject to and discharged in accordance with a discharge licence granted by Wicklow County Council under the Local Government (Water Pollution) Acts, 1997 – 2007.

Laying the sewer

Once dewatered, the sewer will be laid on its bedding material and the trench will be filled with lean, suitable engineered fill, free from contamination and in accordance with the relevant engineering specificiations.

The row of temporary sheet piles may then by removed whilst the permanent row of sheet piles will be completed by installing a reinforced concrete capping beam (approx. 600mm x 600mm). The proposed finished level of the capping beam will be approximately 1.26mOD.

Public realm

Once the sheet piles have been capped, landscaping will occur at ground level in the areas of reclaimed land. The proposed ground levels (along the reclaimed land) will tie in with existing road levels (approximately 1.24mOD), therefore this area would receive approximately 300mm of topsoil and be seeded. As noted in **Section 5.3.4**, the proposed Arklow Flood Relief Scheme intends to complete public realm works in this area once consented.

5.6.3.4 Tunnelled sewers

Overview

It is proposed to construct the interceptor sewer using tunnelling methods in specific areas. Tunnelling will occur on a 24-hour basis 7 days a week between the launch and reception shaft until completion.

On the South Quay (Between TSS1 and TSS3), the pipeline will be tunnelled to an approximate minimum depth of 5m below ground level, up to an approximate maximum depth of 12m below ground level and the river crossing will be tunnelled to an average depth of approximately 10 - 12.5m below ground level. Similarly, on North Quay the tunnel will commence (at TSN1) at an approximate minimum depth of 5m below ground level up to an approximate maximum depth of 13m below ground level as the interceptor sewer reaches the WwTP site (at TSN8).

The ground where tunnelling is proposed is generally underlain by highly permeable and water bearing sands and gravels. The ground conditions have determined that tunnelling will be undertaken using a closed face TBM system, to prevent significant inflows of groundwater into the tunnel during installation of the interceptor sewers.

An overview of a typical setup of the TBM and pipe jacking frame in a tunnel shaft is illustrated in Figure 5.4.

Figure 5.4: Typical setup of the jacking frame installing the pipeline in a tunnel shaft

Tunnel Shafts

Overview

Tunnel shafts will be required during construction to facilitate the subsurface tunnelling. The tunnel shafts will comprise launch shafts, reception shafts or a shaft may serve as both launch and reception shafts (dependent on the specific contractor tunnelling methodology).

An overview of typical top-down construction of a tunnel shaft is illustrated in Figure 5.5.

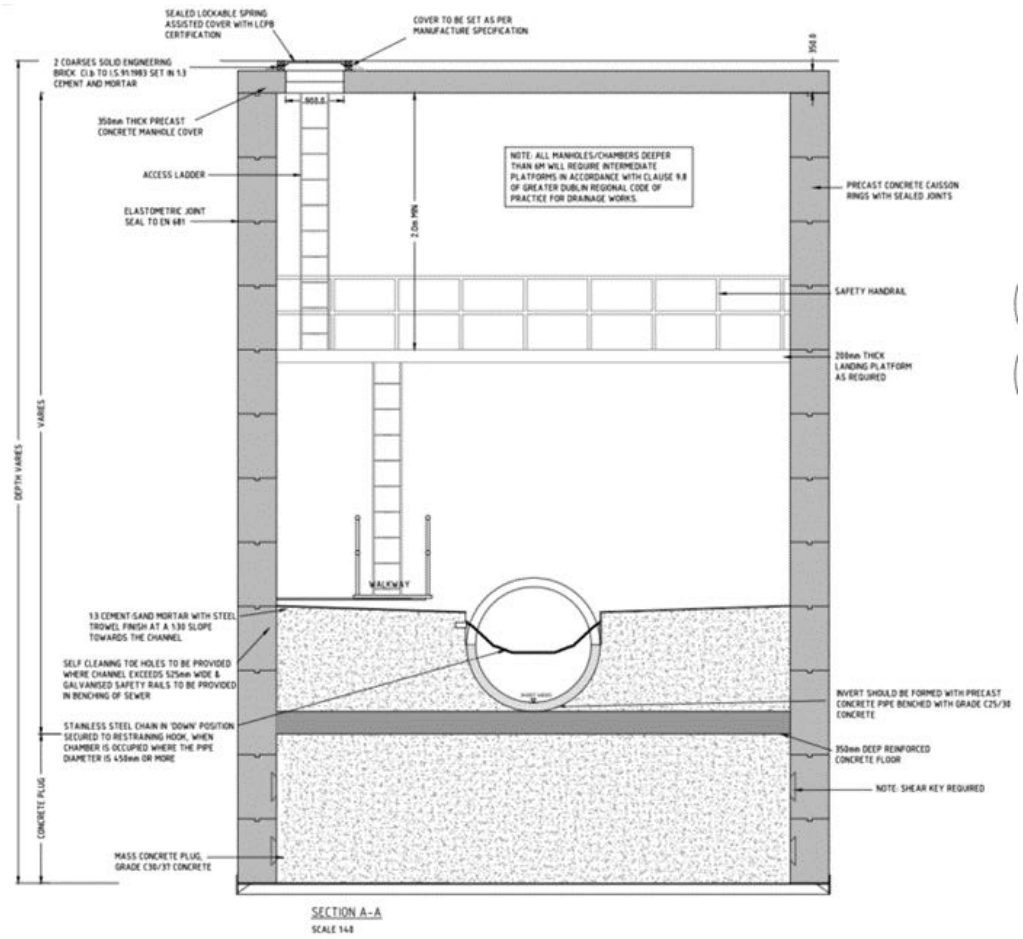

Figure 5.5: Typical top down caisson construction of a tunnel shaft

Construction process

The typical works that will take place to construct each of the tunnel shafts include (Refer to **Section 5.3.2.1** for further detail on the sequence of works):

- A circular shaft (approximately 8m in diameter) will be installed using a caisson top down construction method. Using this method, the shaft will be sunk beneath ground level by means of a series of concrete elements stacked from ground level.

- A jacking pressure will be applied (from ground level) to force the caisson elements in to the ground, aided by the excavation of the ground trapped within the caisson.
- As the top of each element drops below ground level a new element will be placed on top. As a consequence, the first caisson element will form the lowest segment of the shaft.
- The caisson elements will form the permanent works for the shaft, although an internal permanent structure could be formed as an addition to, or to replace, the caisson elements.
- The tunnel shafts and associated manholes will be installed to provide access to the interceptor sewer.
- The tunnel shafts willbe installed in the wet, i.e. this method would involve construction of the shaft without local dewatering. As a consequence, the shaft will contain water until a base plug (i.e. a depth of concrete) is installed. In order to resist uplift water pressures, the underwater base plug, will be of sufficient depth below the invert level of the tunnel shaft to resist the buoyant uplift forces on the shaft. It should be noted that typically, 1m of concrete is required for every 2m below groundwater level.
- The base plug may be poured by means of a tremie pipe with concrete that cures underwater. This method will require the removal of water from the tunnel shaft (by pumping), after the concrete has cured. All water extracted from the tunnel shaft will pass through a proprietary silt removal/treatment system and will be discharged to a local water course or drainage network (once an appropriate discharge licence is in place). Refer to **Section 5.9** and the Outline CEMP (**Appendix 5.1**) for further details.
- The weight of the shaft walls cannot be mobilised against buoyant forces as it will be impossible to form a connection between the base plug and the shaft walls with the shaft flooded.

Tunnelled Sewer Construction process

Launching the TBM and pipejacking

Once the tunnel shafts have been constructed, the pipeline will be installed using standard micro-tunnelling methods. Micro-tunnelling will be achieved by using a TBM to install the pipeline. The TBM will enter the ground from a launch shaft and pass to a reception shaft using pipe jacking techniques.

The typical works that will take place to construct the interceptor sewer from each of the launch tunnel shafts include:

- A jacking wall will be installed within the launch shaft to resist forces generated by the jacking frame;
- A headwall will be installed within the launch shaft to facilitate launching of the TBM into the soil. The headwall will incorporate a launch seal (located at the location where the pipeline would enter the tunnel) to create a water tight seal;

- The TBM will be lowered into the launch shaft using a mobile crane;
- Powerful hydraulic jacks will push the TBM and specially designed jacking pipes through the headwall, through the launch seal and into the soil;
- The TBM will excavate the soil by using cutting wheels located on the face of the TBM;
- As the soil along the alignment of the tunnel is excavated, the pipeline will be jacked into position, the hydraulic jacks will contract and the pipeline will be placed in the launch shaft. The pipeline will then be pushed into position by the hydraulic jacks; and
- The process will be repeated until the tunnel and pipeline reaches the reception shaft.

Management of excavated soil

The tunnelling equipment will generally comprise the following components:

- TBM;
- Control container including guidance system;
- Jacking frame; and
- Separation plant and water circuit equipment.

The TBM will be pushed into the soil by the jacking frame for excavation. The excavated soil will enter a crushing chamber located behind the cutting wheels of the TBM, where particles greater than a certain size would be crushed. Water will be pumped into the crushing chamber (from an above ground header tank that would be filled by tanker), to create a slurry water mixture. Once formed, the slurry will be pumped to the surface at the launch shaft.

The control container is typically located at the top of the launch shaft. This control container will house the control station for the TBM operators to enable them to manage all aspects of the tunnelling operation from ground level.

During pumping, the slurry will typically pass through a flow meter to enable the TBM operator to record and monitor the amount of slurry being produced. After passing through the flow meter, the slurry water mixture will be separated via vibrating shakers and screens that will remove gravel and coarse sand particles, cyclones that will remove fine sand and silt particles and a centrifuge will remove clay particles.

When these particles are removed from the slurry, they will be stockpiled for removal from the working area for disposal at an appropriately licensed facility in respect of which a waste permit or a waste licence is granted. The water portion of the slurry will be pumped back to the crushing chamber for reuse. This process will be repeated as the tunnelling progresses between tunnel shafts. On completion of a full section of tunnelling works between shafts, the residual slurry water will be tankered off site for disposal at an appropriately licensed facility in respect of which a waste permit or a waste licence is granted.

This recycled slurry water will also be passed through a flow meter, to provide the operator with information on the quantities of water entering and leaving the tunnelling process, in order to facilitate effective slurry removal. Slurry pressures will be monitored throughout to ensure that all pressures are sufficient to accommodate the insitu stresses acting on the face of the TBM. This pressure management, in conjunction with the jacking forces, will maintain stability, avoid groundwater intrusion and mitigate against excess excavation.

Ground stablisation

As the tunnelling and laying of the pipeline progresses, bentonite will be used as a lubricant. Bentonite will be pumped into the void between the soil and the pipeline (i.e. the annulus) at regular intervals (typically every 5 pipe lengths, i.e. approximately 12.5m). Bentonite will be mixed at ground level and constantly pumped along the pipeline for discharge via the lubrication ports.

The bentonite will be discharged through the lubrication ports to provide support for the ground around the annulus and minimise friction that may impact on the jacking forces. Lubrication pressures will be closely monitored to prevent ground movement and/or settlement as a result of any excess pressure.

Receiving the TBM

As the TBM reaches the reception shaft, it will enter a reception seal and be jacked until the entire TBM is clear of the reception seal and the shaft wall.

Once clear, the TBM will be removed from the reception shaft using a mobile crane. As outlined in **Section 5.3.2.1**, the TBM will then proceed to the next launch shaft to continue the tunnelling process.

Grouting

Once the pipeline is constructed and the TBM is removed, the annulus between the pipeline and soil will be grouted (via the same ports that were used to install the bentonite) to protect the interceptor sewer. The grout will be produced at ground level and pumped along the pipeline from the launch site in a similar manner to the bentonite.

5.6.3.5 Arklow Bridge works

Overview

The proposed interceptor sewer will pass under the most southern arch of Arklow Bridge. At this point, the sewer is approximately 3m - 3.5m below ground level and approximately 1m below the existing river bed. Similar to the open cut works in the river channel (as described in **Section 5.6.3.3**), this section physically overlaps the proposed Arklow Flood Relief Scheme.

Underpinning

Underpinning of two arches of the Arklow Bridge is required, to facilitate the construction of the sewer through the first arch and, for the second arch to mitigate any potential flood risk associated with the proposed development.

While both arches will be underpinned, only the second arch will require works to lower the floor of the bridge.

In order to mitigate and minimise the potential flood impact caused by the construction of the temporary causeway (Refer to **Section 5.6.3.3**) all instream works upstream of Arklow Bridge (near MHS9), including the installation of the interceptor sewer under the bed of southernmost arch and the underpinning and lowering of the second arch need to be completed in advance of the installation of the temporary causeway downstream of the bridge.

The underpinning and lowering of the floor of the bridge is likely to entail the following activities:

- Grouting each of the piers and the abutments of Arklow Bridge and the river bed to a depth of up to 2m below the piers and abutments, including drilling of holes to accommodate the grouting from the bridge deck, in order to stabilise the bridge and its formation during the underpinning works (Refer to Figure 5.6);
- Construction of a temporary causeway from the river bank to provide access to each of the piers and abutments;
- Creation of a bund around each pier or group of piers to allow works to be carried out in a dry environment;
- Removal of existing formation in a phased manner from the underside of each pier and abutment to a depth of approximately 1.6m below existing bed level and replacement with concrete (Refer to Figure 5.7); OR
- Construction of mini-piles around each pier to support the pier foundation (Refer to Figure 5.8); OR
- Construction of piles through the piers and abutments from the bridge deck to support the bridge during the underpinning works (Refer to Figure 5.9);
- Demolition of the existing concrete scour protection slabs and lowering of the floor of the bridge by approximately 1m on average (It should be noted that the floor of the second arch will be lowered by approximately 1.2m); and
- Construction of a new concrete scour protection slab between approximately 10m upstream to approximately 15m downstream of the bridge and beneath the arches of the bridge and the placement of riprap along the upstream and downstream edges of the concrete slab.

Grouting Works

Grouting of the bridge piers, pier foundations and the underlying natural materials beneath formation level is proposed for a number of reasons:

- To improve the structural strength of the bridge piers;
- To improve the bearing capacity of the underlying natural material below pier formation level; and
- To control ground water flow where excavations are required below existing river bed level.

Grouting will involve the drilling of holes using an Odex system and installation of temporary steel casings to support the holes.

A tube will then be installed in the hole and grout will beintroduced under pressure from the bottom of the hole upwards. Grouting will be carried out from the bridge deck for the piers and areas immediately beneath the piers.

Grouting will also be carried out from river bed level for areas adjacent to the piers below bed level and to augment the grouting beneath the piers. The grouting will be carried out to a depth of approximately 3m below existing river bed level. The grouting material will consist of cement only or a mixture of cement and bentonite, depending on the purpose of the grouting and the permeability of the material to be grouted. Figure 5.6 illustrates proposed grouting works at bridge piers.

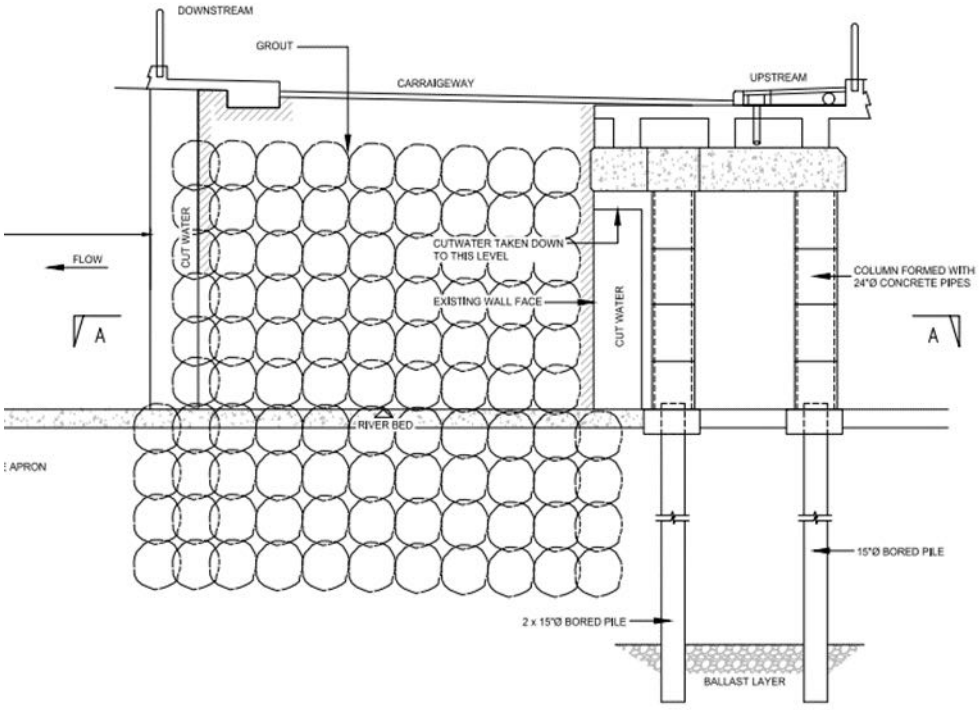

Figure 5.6: Typical grouting works at bridge piers

Traditional Underpinning

Traditional underpinning will comprise the removal of existing natural material below existing formation level in a phased manner from the underside of each pier to a depth of approximately 1.6m below existing bed level and replacement with concrete. The work would be carried out from the existing bed level. Grouting would be utilised under the arches to control groundwater and support the sides of the excavations.

It is expected that the underpinning would be carried out in two stages with the first stage taking a row of pins down to approximately 800mm below existing bed level and the second stage taking a second row of pins from the underside of the first row of pins to the final formation level. The dimensions of each pin would be approximately 1.0m wide by 0.8m long by half of the pier depth (0.7m – 0.9m approximately).

The depth would be limited to approximately 0.9m for the central pin. Construction of pins would be staggered to avoid working adjacent to a recently constructed pin. Figure 5.6 illustrates the traditional underpinning option.

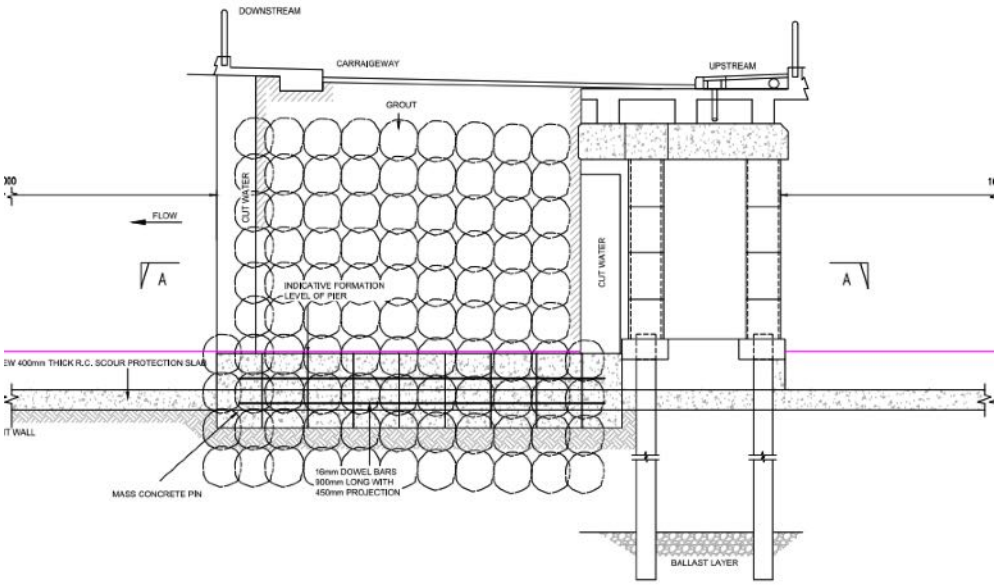

Figure 5.7: Traditional underpinning option

Mini- Piling

Mini-piling would be carried out from river bed level. Rotary drilling would be used to form a hole approximately 250mm diameter. Reinforcement and grout would be installed in each hole. Approximately 70 no. mini-piles would be installed around the perimeter of each pier. The top of the mini-piles would be encased in a reinforced concrete ring mean.

Following the completion of the mini-piling and the lowering of the bed level, the face of the mini-piles would be clad with concrete to a depth of approximately 200mm. Figure 5.7 below illustrates the mini-piling option.

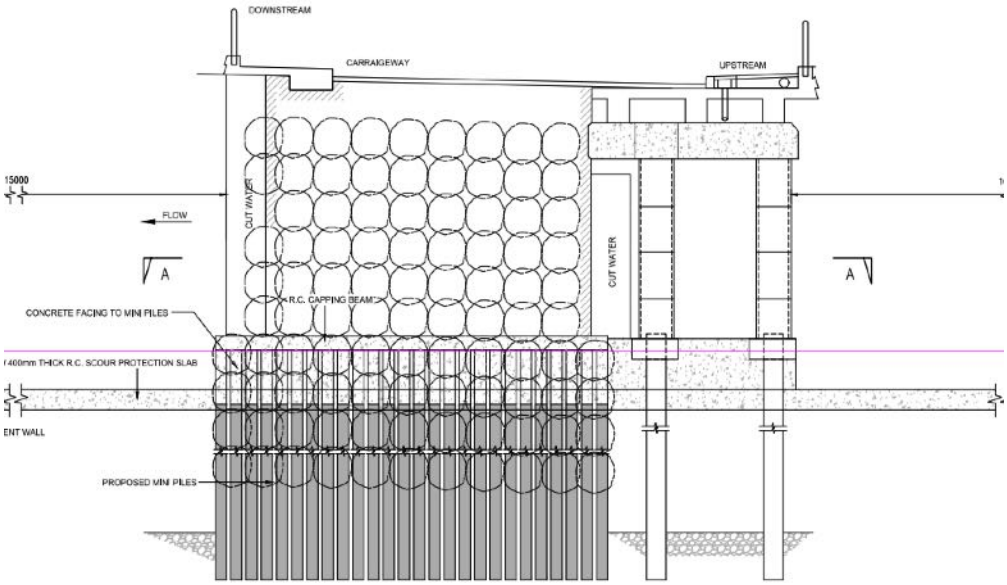

Figure 5.8: Mini piling option

Piling

Piling would be carried out from bridge deck (road) level. It would comprise the boring of appximately 350mm diameter holes and the placing of reinforcement and concrete within the hole. The piles would be founded approximately 10m below existing river bed level. Approximately seven piles would be constructed at each pier.

Following the completion of the piling and the lowering of the bed level, the face of the material below pier level would be faced with concrete to a depth of approximately 300mm in a similar fashion to the underpinning i.e. the natural material would be excavated to a depth of approximately 300mm from the face of the existing pier and replaced with concrete. Figure 5.8 shows a typical load bearing pile.

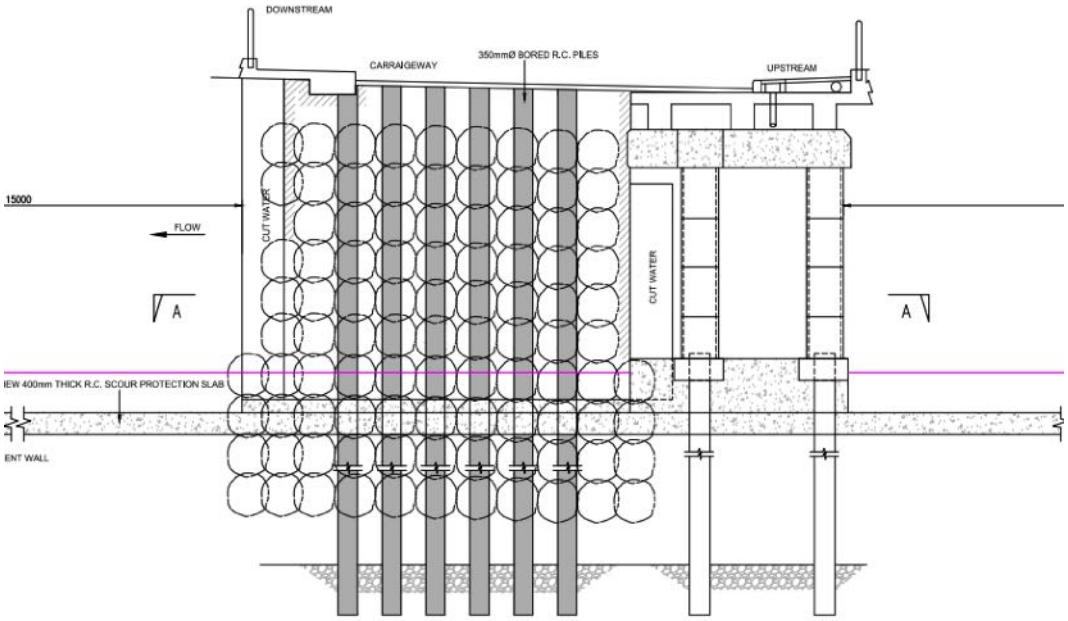

Figure 5.9: Load bearing pile

5.6.3.6 River Crossing

Overview

A tunnelled crossing of the interceptor sewer (approximately 120m in length) would be required under the Avoca River. The river crossing comprises approximately 1500mm diameter pipeline that will extend from TSS3 on South Quay (approximately 10m below ground ground level) to TSN6 on North Quay (approximately 12.5m below ground level).

Given current knowledge, it is believed that the existing sheet pile quay walls on the northern and southern sides of the river channel are approximately 12m long and supported by a series of tie back anchors that extend into the landside and possibly connect to either anchor blocks or a historical quay wall (Refer to Figure 5.10). Construction of the river crossing will therefore require cutting through the toe of the existing sheet pile quay walls.

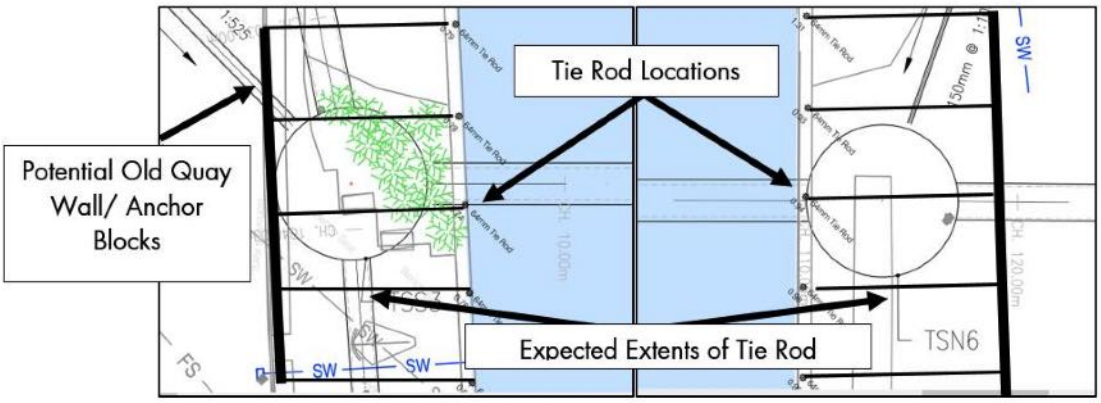

Figure 5.10: Indicative layout of existing infrastructure at the river crossing

Construction process

Construction of the tunnelled river crossing will require the installation of two tunnel shafts (TSS3 on South Quay and TSN6 on North Quay).

It is considered that a rectangular sheet pile cofferdam would be the most likely solution for tunnel shafts in these areas given the existing infrastructure constraints.The following sections describe a typical indicative construction sequence for installing a rectangular sheet pile cofferdam and the subsequent construction of the river crossing, which is further detailed in **Drawing No.'s 247825-00-C-IS-708 to 247825-00-C-IS-710 of Volume 3**.

Installing the cofferdams

1. The cofferdams will be located to minimise disruption to the existing tie back anchors. The tie back anchors are spaced at approximately 4.2m centre to centre and as such it is likely that at least two tie back anchors will need to be removed from the existing quay wall.
2. The stability of the quay wall (to allow removal of tie back anchors) will need to be addressed prior to the installation of the cofferdam. It is anticipated that additional tie back anchors will be installed adjacent to the proposed tunnel shafts (TSS3 and TSN6). These additional tie back anchors will be connected to each other and to the existing quay wall by a whaler beam. The additional tie back anchors will be ground anchors installed at 45°, and grouted into the competent soils below ground level. The whaler beam will be installed to transfer the load to the new tie back anchors at either side of the existing quay wall area that will be cut to facilitate tunnelling.
3. The rectangular cofferdams will be constructed at the proposed tunnel shaft locations (TSS3 and TSN6) by installing sheet piles to form a rectangular shape. The sheet piles will be interlocked to provide continuity between sheets. The western side of the sheet piles at TSS3 and corresponding eastern side of the sheet piles at TSN6 will be positioned to avoid the historic quay wall/anchor blocks.

Preparation works at the reception shaft (TSS3)

1. Once the cofferdam and any necessary propping frames are installed, partial excavation will be undertaken to below the invert level of the sewer at TSS3. It is anticipated that the contractor's likely sequencing will identify TSS3 as a reception shaft to facilitate other works likely to occur (around TSS3) concurrent with the installation of the river crossing.
2. Based on the geotechnical investigation information available (refer to **Section 14.3 of Chapter 14** for further detail), the invert level at TSS3 is likely to be within the water bearing sands and gravels that will require preparatory works prior to cutting through the existing quay wall. These preparatory works may include installing a well to dewater the area (at the point of entry) or grouting the area where the tunnel will pass through the existing quay wall (using grout lances) from the inside of the cofferdam to form a barrier. Holes in the existing quay wall may also be locally cut to accommodate grout lances to enable grouting.
3. Following the preparatory works at TSS3, an opening may be cut in the sheet piles to allow the pipeline to extend into the cofferdam. The area around the tunnel will then be sealed to prevent any further water ingress.
4. The cofferdam will then be fully excavated to formation level. Excavation may take place using long reach excavators or excavators placed directly into the cofferdam. The excavated material will be lifted to ground level and transported offsite to a suitably licenced waste facility for disposal. To prevent uplift in the permanent case a grout plug will be required.

Preparation works at the launch shaft (TSN6)

1. Should granular water bearing deposits be evident at the launch tunnel shaft (TSN6), pre-grouting of these deposits may be required to allow the TBM to launch.
2. Following excavation of the cofferdam to formation, holes in existing sheet piles may be locally cut to accommodate grout lances to enable grouting of the soil locally. This area will be grouted to ensure full coverage and thus provide water cut off and prevent migration of granular material during subsequent tunnelling operations.
3. Following grouting, the sheet piles will be cut at the location of the river crossing to allow tunnelling to commence between TSS3 and TSN6.

Tunnelling Works

1. A depth of overburden of 4m over the tunnelled crossing (greater that the guidance[5] of two times the pipe diameter) has been allowed for in order to prevent 'blow out' occurring during tunnelling operations. The overburden depth has also been designed to accommodate any future dredging that may be required in the river channel by Wicklow County Council.
2. Tunnelling of the river crossing will be undertaken in accordance with the same methodology as described in **Section 5.6.3.4**.

[5] British Tunnelling Society (2010) Specification for Tunnelling, 3rd Edition.

3. Once tunnelling works are complete and the TBM removed, a suitably sized manhole will be constructed at the location of both tunnel shafts (TSS3 and TSN6) within the confines of the rectangular cofferdam and the cofferdam backfilled with suitable material. An SWO will also be constructed at TSS3, which is predicted to spill on average once per bathing season or in the event of an extended power cut at the WwTP. The SWO will comprise approximately 1200 mm diameter pipeline, extending from TSS3 through the quay wall. A 10mm screen will be fitted within TSS3 to screen flows through this SWO.
4. The cofferdam sheet pile may then be removed or remain in place permanently.

5.6.3.7 Vent Stacks

12 vent stacks will be provided along the length of the interceptor sewers to vent any odour that may arise during operation. The vent stacks are propriety systems, similar to lighting columns.

The concrete foundation required will be approximately 1m x 1m x 1m deep and will be placed approximately 1m below ground level. Ducting will be installed using open cut techniques to connect the vent stacks to the interceptor sewer.

5.6.3.8 Connection Manholes

Along South Quay, connections will be required between the existing wastewater network and the proposed interceptor sewer network (via the spur pipelines as described in **Section 4.2.3 of Chapter 4**). The existing manholes on the wastewater network will be used as connection points insofar as possible however, a number of new manholes (i.e. MHS2A, MHS3A and MHS4A) and associated spur pipelines will be constructed using open cut techniques to link the existing sewers to the proposed interceptor sewer. If invert levels dictate, some of the additional manholes will be backdrop manholes (i.e. there may be a significant difference in the invert level of the existing and proposed sewers).

A similar methodology will be adopted along North Quay. However, where connections are required between the existing wastewater network and the proposed interceptor sewer inbetween tunnel shafts (e.g. MHN2A and MHN3), the contractor will typically construct additional manholes directly over the proposed interceptor sewer, rather than off-line. These connection manholes will be installed sequentially using open cut techniques.

5.6.3.9 Testing and Commissioning

The pipelines up to 1000mm diameter will be tested by means of either a water test (taken from existing adjacent watermain), an air test or by a visual inspection in accordance with the guidance[6]. Infiltration will also be tested in accordance with this guidance[6].

The pipelines greater than 1000mm diameter will be subjected to a visual inspection and infiltration test as per the relevant specification[7].

Prior to commissioning of the interceptor sewer network, a CCTV survey will be undertaken through all of the pipelines to close out testing.

The interceptor sewers will not be commissioned until such time as the WwTP is wastewater for treatment (i.e. fully commissioned). During commissioning, a series of activities will be required to turn in flows to the interceptor sewer network as outlined below:

- Flows in the existing foul sewer network will be temporarily over-pumped further downstream during construction into the existing foul network (i.e. the adjacent manhole) during the construction of connection manholes;
- On completion of the connection manholes and sewers, flows will be diverted to the proposed interceptor sewer, commencing at the downstream end with the flows nearest the WwTP turned in first until such time as all flows are diverted into the proposed interceptor sewer; and
- A number of existing foul sewers will then be abandoned and pumped with concrete to seal both ends of the pipeline.

5.6.4 WwTP

5.6.4.1 Overview

Construction of the WwTP will be undertaken on the Old Wallboard site at Ferrybank and generally comprise the following sequential activities:

- Construction of the building structures;
- Process, Mechanical and Electrical Installation in each of the buildings;
- Landscaping and development of site infrastructure; and
- Testing and Commissioning of the WwTP, SWO and long sea outfall.

[6] UK Water Industry Research Limited (2011) Civil Engineering Specification for the Water Industry, 7th Edition
[7] British Tunnelling Society (2010) Specification for Tunnelling, 3rd Edition

5.6.4.2 WwTP Structures and Buildings

Inlet Works building

Overview

The Inlet Works building is located to the north-west of the WwTP site and will extend up to approximately 16.5m above ground level and up to approximately 18.5m below ground level. A vent stack will also be incorporated and extend 1m above the maximum height of the building (Refer to **Section 4.3 of Chapter 4** for further detail).

Excavation will be required in this portion of the site (as described in detail in **Section 5.5.5.4**) to accommodate the Inlet Works building and groundwater controls will be installed as detailed in the Outline CEMP (Refer to **Appendix 5.1**). Given the depth below ground level of the excavation, piling will be required to provide support to the temporary excavations and permanent tension piles will also be required to resist uplift of the deeper underground structures.

Construction process

Following the enabling works described in **Section 5.5.5**, construction of the Inlet Works building will likely progress as per the following sequence of works:

- Phase 1:
  - Installation of the secant piles around the inlet sump to temporarily shore the sides of the excavation;
  - Installation of the capping beams to the secant pile walls; and
  - Installation of the sheet piles for the storm tank excavation.
- Phase 2:
  - Begin excavation of inlet sump;
  - Install temporary supports (top and intermediate waling beam supports) as excavation progresses; and
  - Dewater as required during the excavation.
- Phase 3 :
  - Excavate to the base of the inlet sump;
  - Progress excavation of the storm tank;
  - Install tension piles at the base of the inlet sump.
- Phase 4:
  - Construct the base slab of the inlet sump and first rise of the walls to the underside of the intermediate waling beam;
  - Backfill the cavity in the inlet sump between the secant pile wall and the permanent wall; and
  - Install tension piles at the base of the storm tank.

- Phase 5:
  - Remove the temporary intermediate supports in the inlet sump;
  - Progress construction of the inlet sump walls (to the underside of the upper waling beam) whilst continuing to backfill between the secant pile walls and the permanent walls of the inlet sump; and
  - Install the base of the storm tank.
- Phase 6:
  - Remove the upper waling support beam and cap off the inlet sump;
  - Cast the walls of the storm tank; and
  - Backfill between the storm tank wall and the sheet piles.
- Phase 7: Remove the temporary sheet pile walls.
- Phase 8:
  - Excavate approx. 2-2.5m below ground to remove made ground across the remainder of the building footprint;
  - Excavate further locally for those columns directly adjacent to the storm tank whose formation level will be at the base level of the storm tank; and
  - Excavate for the service tunnel between the Inlet Works Building and the process building; and
  - Dewater as required during excavation.
- Phase 9:
  - Construct the service corridor connecting the Inlet Works building to the process building, possibly from precast concrete culvert sections;
  - Cast concrete pad foundations and concrete columns; and
  - Backfill around the column locations and the service corridor;
- Phase 10: Construct the superstructure included the frame, slabs, shear walls and cores.

Process building

Overview

The Process building is located to the south-east of the WwTP site and will extend up to approximately14.5m above ground level and up to approximately 4.5m below ground level. A vent stack will also be incorporated and will extend 1m above the maximum height of the building (Refer to **Section 4.2 in Chapter 4** for further detail).

Excavation will be required in this portion of the site to accommodate the Process building (as described in detail in **Section 5.5.5.4**) and groundwater controls will be installed as detailed in the Outline CEMP (Refer to **Appendix 5.1**).

Construction process

Following the enabling works described in **Section 5.5.5**, construction of the process building will likely progress as per the following sequence of works:

- Phase 1:
  - Excavate the made ground over the footprint of the process building and continue to excavate if required until a suitable sub-formation level is met;
- Phase 2:
  - Complete the construction of the service corridor connecting the Inlet Works building to the process building; and
  - Backfill to ground level with engineered fill.
- Phase 3:
  - Construct the base slab of the process tanks (incorporating the footing of the steel frame); and
  - Construct the strip footings to support load bearing internal walls as required.
- Phase 4:
  - Construct the walls of the process tanks; and
  - Construct the frame of the superstructure enclosing the tanks.
- Phase 5:
  - Construct internal rooms and fit-out.

Sludge tank enclosure

Overview

The sludge tank enclosure is located to the east of the WwTP site and will extend up to approximately 8.5m above ground level. The sludge enclosure will comprise a fully open façade located around the tanks that will be contained therein (Refer to **Section 4.3 in Chapter 4** for further detail). Deep excavation will not be required in this portion of the site.

Construction process

Following the enabling works described in **Section 5.5.5**, construction of the sludge tank enclosure will likely progress as per the following sequence of works:

- Phase 1: Excavate the made ground over the footprint of the tank enclosure and continue to excavate if required until a suitable sub-formation level is met;
- Phase 2: Construct the concrete raft slab which supports the tanks and odour control unit;
- Phase 3: Install sludge tanks and odour control unit; and
- Phase 4: Install steel frame around the perimeter of the tanks.

Administration building

Overview

The Administration building is located to the south of the WwTP site and would extend to up to approximately 10.1m above ground level. Deep excavation would not be required in this portion of the site.

Construction process

Following the enabling works described in **Section 5.5.5**, construction of the Administration building is anticipated to employ a typical domestic scale method of construction. This will generally comprise:

- Phase 1: Excavation of made ground and construction of foundations;
- Phase 2: Construct walls and floors as the building progresses;
- Phase 3: Construct the roof;
- Phase 4: Installation of windows etc. to make the building weather tight; and
- Phase 5: Internal fit-out of the building.

5.6.4.3 Process, Mechanical and Electrical Installation

The process, mechanical and electrical equipment will be brought to site and installed upon completion of the construction of the buildings. It is likely that major installations such as the process equipment, the transformer and substation will be installed in the first instance followed by smaller equipment (such as the air handling unit [AHU] and odour control unit [OCU]) and then services in the buildings.

The contractor will be responsible for determining the specific methods and sequence of works for the process, mechanical and electrical installation in each of the buildings.

5.6.4.4 Landscaping and Site Infrastructure

It is anticipated that drainage, utilities and services infrastructure will be installed as required during the construction of the building structures on the WwTP site. Any ancillary civil infrastructure works will be completed once the structures have been constructed.

There is an area of public realm being provided by Irish Water to Wicklow County Council. This will be constructed using conventional methods.

The landscaping works associated with the WwTP site will be implemented upon completion of construction activities at this location. Hard landscaping will be installed between the buildings in the form of kerbs, roads and pathways with concrete and gravel finishes and appropriate marking and parking added. Soft landscaping in the form of the placing of soil, levelling and planting of vegetation will also be undertaken.

5.6.4.5 Testing and Commissioning

Upon completion of construction of the proposed development, a period of testing and commissioning will be undertaken. Testing and commissioning will comprise the following activities occurring in sequence:

- Level 1 testing - Pre-commissioning;
- Level 2 testing – Site acceptance tests; and
- Level 3 testing – Performance tests.

Level 1 Testing - Pre-commissioning

Level 1 testing will encompass all off line testing associated with pre-commissioning and start-up activities including the completion of all tests that can be conducted without the connection of any services (i.e. electrical power, chemicals, compressed air, fuel, or pressurisation), other than for the purpose of hydrostatic testing, any part of the equipment. Pre-commissioning will include commissioning checks including mechanical, electrical and instrumentation, control and automation elements as a minimum.

Level 2 Testing - Site Acceptance Tests

Level 2 testing will comprise any on line dry and wet functionality testing required following connection of services. Site acceptance testing will incorporate:

- Testing of each piece of plant and equipment individually;
- Testing of each system within the works both manually and automatically; and
- The interactions of the various systems and the setting to work of the plant as a whole.

Once each of the principal systems has been tested and accepted, the works will be process commissioned and optimised to achieve a status of process established. Site acceptance testing will include general testing (including domestic electrical installation, emergency lighting, fire and intruder alarms) in addition to functional testing of preliminary, secondary processes, sludge processes and associated pumping systems, generator changeover and a full (clean water) operational test of the WwTP.

Level 3 Testing - Performance Tests

Level 3 testing will comprise performance testing during which the contractor must ensure that the WwTP complies with the performance requirements as outlined in the tender documents. Performance tests will be undertaken following completion of the entire WwTP and will not accommodate testing of individual items or sections within the WwTP. Performance tests will include:

- Process commissioning including flow diversion and initial wastewater reception; and
- Final test on completion including continuous plant operation for a fixed period of time.

5.6.5 SWO and Long Sea Outfall

5.6.5.1 Long Sea Outfall

Overview

There are several methods by which the long sea outfall can be constructed and the contractor's methodology will ultimately depend on their available plant and equipment as well as their previous experience with laying marine outfalls. The contractor is responsible for determining which method is most appropriate.

The likely methods to construct the long sea outfall are presented in the following sections, based on current practice and site constraints/characteristics. These are:

- Horizontal directional drilling method;
- Flood and float method; and
- Bottom-pull method.

Construction of the outfall will include works from both the land and sea. It is expected that several vessels may be required during the construction of the outfall and that diving support is likely to be required at times.

Horizontal Directional Drilling method

Construction of the outfall using the horizontal directional drilling method would comprise three phases: pilot boring, pre-reaming and pipe positioning, each of which are described in the following sections and illustrated in Figure 5.11.

The following section assumes that the process would occur from a drilling rig located on the WwTP site (as this is the reasonable worst case for the purpose of the assessment).

It is noted that this method would not involve any change in the seabed geometry during construction or operation (as the pipeline would be tunnelled) and therefore there is no need to install scour protection along the route of the outfall.

It should be noted that the contractor may locate the rig on a suitable barge or jack-up platform (i.e. on the seaward end of the outfall). In this case, pilot boring would be undertaken from the seaward end of the outfall towards the landward end and thus geotechnical risks associated with exiting the seabed would be avoided. This would avoid loose sand material at the exit point and improve support to the hole at the seaward end of the outfall (as the hole can be supported with casing from the platform). The reaming and pull-back stages would be undertaken in a similar manner to that described below, from the landward side of the outfall.

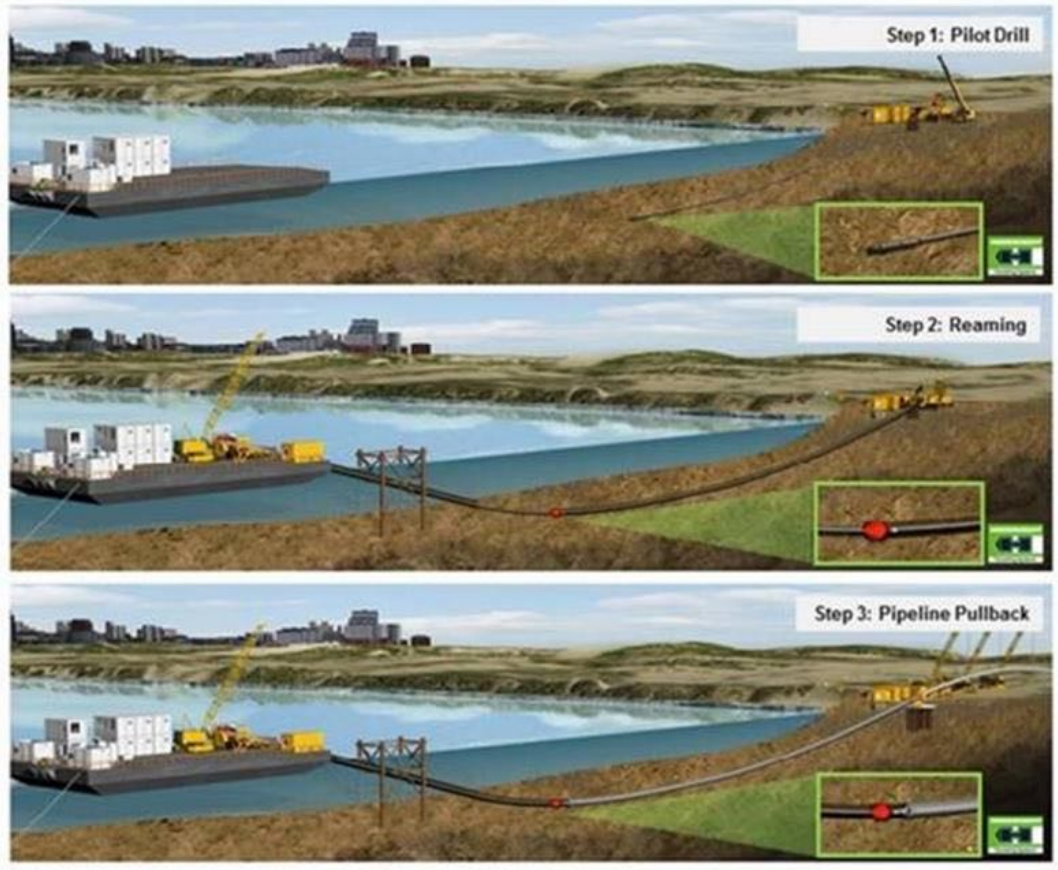

Figure 5.11: Typical HDD process for a sea outfall (Source: Stevens[8])

Pilot Boring

A drill rig would be positioned at a designated launch point (i.e. within the WwTP site), from which pilot boring would be carried out. The pilot boring would be undertaken to excavate along the alignment of the outfall.

Pilot boring would be carried out with a hollow bore pipe through the use of a mud-motor and a drill head. Boring fluid (generally a bentonite-water mixture) would be injected into the boring hole as excavation is occuring to transport the excavated soil and keep the borehole open. The boring pipe would be received on a barge or a jack-up platform located at the exit point (i.e. at the seaward end of the outfall).

Pre-reaming

Following the pilot boring, a reamer would be used to enlarge the hole in order to accommodate the outfall (i.e. the approximate 630mm diameter pipeline).

The drill head and steering tools would be removed as part of the pilot boring and the reamer would be installed from the barge or the jack-up platform (i.e. from the seaward end of the outfall).

[8] Stevens (2015) Trenchless solutions for sewer networks and sea outfalls. Available from: https://www.imesa.org.za/wp-content/uploads/2015/11/Paper-10-Trenchless-solutions-for-wewer-networks-and-sea-outfalls-Frank-Stevens.pdf [Accessed 11 June 2018]

Another hollow pipe would be connected behind the reamer to provide a connection between both sides of the drilling. The drill rig (located on the WwTP site) would then pull the reamer back into the hole and simultaneously rotate the pipe (that is undertaking the drilling) at the front.

The excavated soil would be transported through the reamed borehole with a return current of the drilling fluid with soil. The required number of reaming phases to achieve the final hole diameter would depend on the contractor's equipment.

It should be noted that the presence of sand/gravel materials at the site will require the contractor to consider and select the depth of cover, drill length, and specific methodology accordingly. It should be noted that loose sand materials at the exit point (i.e. on the WwTP site) may also lead to difficulties in keeping the hole open, although this can be mitigated through ground treatment, such as grouting, if necessary.

Pipe positioning

During this phase, the outfall pipeline would be laid out at the exit point and connected to the previous hollow pipe. A reamer would be placed between the pipes to ensure that the diameter of the hole is large enough to accommodate the approximately 630mm diameter pipeline. The rig would pull the pipes through the hole to the entry point, allowing the final pipe to be placed into the final position.

Following completion of the laying the oufall, the diffuser would be installed at the seaward end of the outfall pipe from barges or jack-up platforms and connected to the outfall pipe thereafter.

Flood and Float method

The use of the float and flood method would require the formation of trenches and the placement of suitable material to support and protect the long sea outfall once it is in position. The trench is described in **Section 4.2.5 of Chapter 4** and illustrated therein.

Constructing the Culvert

A temporary sheet pile cofferdam would likely be required to facilitate the installation of the outfall at the location of the revetment (similar to what is proposed for the SWO as described in detail in **Section 5.6.5.2**). This section of the long sea outfall would be routed underneath the upgraded revetment and would consist of a HDPE pipeline encased in a culvert. The installation of the outfall would take place prior to the revetment upgrade and dewatering would be undertaken as described in **Section 5.5.5.4**.

A precast concrete culvert would be constructed over the trenched outfall through the revetment to protect the outfall in this location. The culvert would be constructed using conventional methods.

The culvert would accommodate the outfall and thus facilitate the discharge of effluent under the revetment into the Irish Sea.

Trenching

Prior to the pipeline installation, the trench (in which the outfall is to be laid) would be excavated along the route of the long sea outfall. The seabed material (currently estimated to be up to 18,000m^3) would be removed to achieve the required depth and slope of the trench (which would be set out as part of the detailed design).

This trenching would be carried out through the use of barges that would be either anchored to the sea bed or jacked up using steel piles. The dredging equipment that will be used will depend on the contractor, but it is envisaged that either backhoe dredgers or grab dredgers will be used. It is anticipated that the excavated material would be left to the side of the trench, with some material being re-used as filter material in the trench, when the pipe has been laid and the rest naturally dispersing locally within the water column.

The Bedding Layer

Once the seabed material has been removed and the trench has been formed, the bedding stone would be placed along the bottom of the trench to form the bedding layer.

At this stage, it is anticipated that the bedding layer would be imported material brought to the site from local quarries on trucks or by sea. The laying of the bedding layer along the bottom of the trench is likely to be carried out through the use of barges, however the exact procedure would be confirmed by the contractor.

Laying the oufall pipeline

The float and flood method, also known to as the 'S-Bend method' would involve floating and towing the entire outfall pipeline into position on the surface of the sea and the subsequent lowering down of the pipe into the trench as illustrated in Figure 5.12.

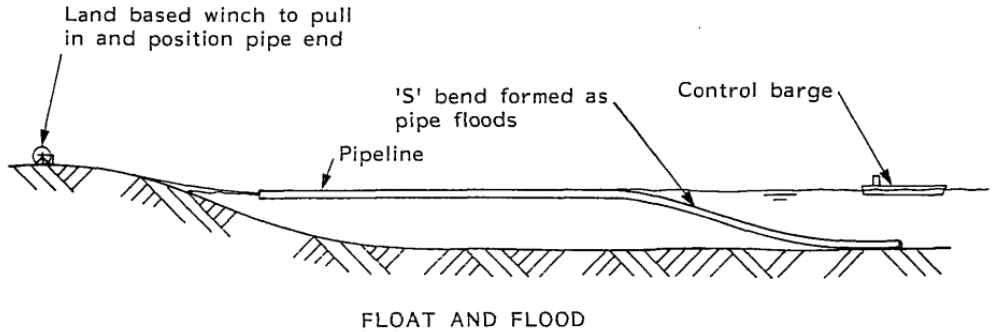

Figure 5.12: Flood and float method of installing the outfalls (Source: WRC[9])

Sections of the outfall pipe would be assembled on land (within the WwTP site) and readied for moving to the water. The pipe and diffuser would be sealed temporarily while full of air, which provides the buoyancy necessary to float.

[9] WRC (1990) Design guide for marine treatment schemes: Volumes I - IV

The pipeline would then be floated into the water using barges, which would tow and manoeuvre the outfall into position. The lowering operation would be achieved by replacing the air with water, which causes the outfall to sink into position. The rate of submergence would be controlled by the rate of air release.

Additional weight would be added where required (e.g. by using concrete ballast collars) in order to provide the negative buoyancy needed to sink the pipeline and place it in the bottom of the trench.

Backfilling the Trench

Once the outfall is laid in place, backfill material would be placed in the trench to protect and stabilise the outfall pipelines. First, a filter layer would be installed to surround the outfall pipe, followed by a rock armour layer to provide protection on the sea bed.

The exact procedure and depths of these backfill layers would depend on the equipment available from the contractor along with programme and cost considerations, however it is anticipated that this would be undertaken from the barges.

Diffuser assembly

Once the long sea outfall has been laid, the diffuser would be assembled at the seaward end of the outfall. The diffuser arrangement would include up to 6 diffusers of approximately 0.16m diameter at an approximate spacing of 10m intervals.

The diffuser would be prefabricated on land and placed on the seabed by barge as one complete unit. The exact procedure and depths of backfill required would depend on the equipment available from the contractor along with programme and cost considerations, however it is anticipated that this would be undertaken from the barges.

Scour Protection

To ensure against potential long term effect from scour on the seabed, suitable protection of the pipeline is required. A concrete mattress layer up to approximately 300mm thickness is proposed and would be finished at existing bed level so as to avoid any scour problems once operational.

Bottom Pull method

Overview

The use of the bottom-pull method would, in a similar manner to the flood and float method, require the formation of trenches and the placement of suitable bedding material to support and protect the positioned pipeline as described for the flood and float method above. The trenching, placement of the bedding layer, construction of the culvert, backfilling of the trench, the diffuser assembly and scour protection procedures would also be as described for the flood and float method above. Laying of the oufall would be undertaken as described below.

Laying the outfall pipeline

The bottom-pull method would involve joining and pulling sections of the outfall pipeline towards the sea by using a barge. The pipes would be pulled into place by the barge as illustrated in Figure 5.13.

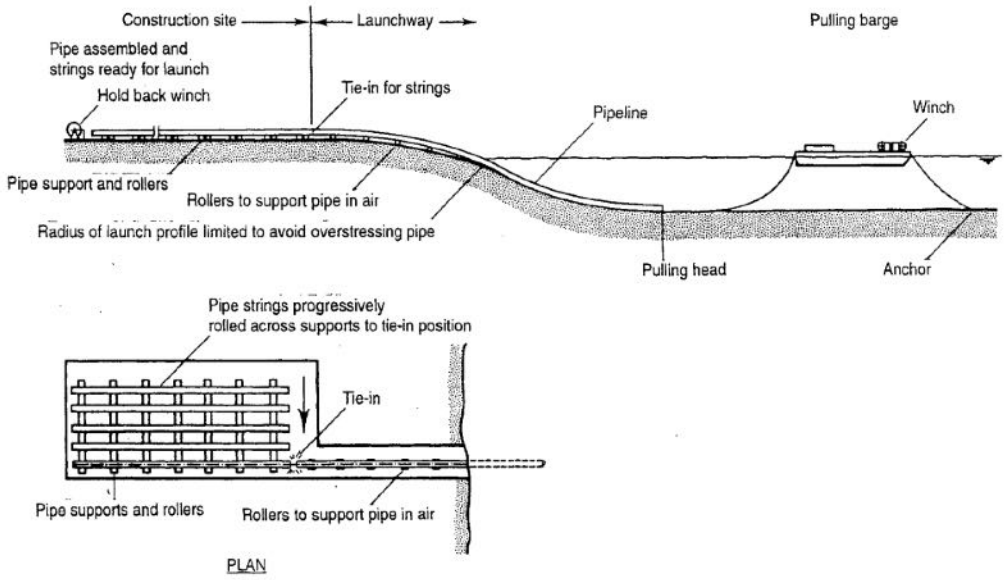

Figure 5.13: Bottom pull method of installing the outfalls (Source: CIRIA[10]

Sections of the outfall pipe would be arranged on land (within the WwTP site) and readied for placing on rollers. The rollers would be aligned with the route of the outfall and the location of the revetment crossing/culvert to ensure that the correct pipe alignment is achieved. Sections of the pipe would be joined in sequence to make pipe strings that could be placed onto the rollers.

The number and length of the pipe strings would be determined by the contractor based on the space that is made available within the WwTP site.

The pipe strings would be pulled by winches mounted on a barge anchored offshore in a stepped process. The first pipe string would be pulled towards the sea then the next string would be moved across the rollers and joined to the first string at the tie-in position. This procedure would be repeated until all the strings have been joined and the outfall pipe has been laid in position. Following the completion of pulling, the culvert (i.e. the interface between the outfall and the revetment) would be installed. The culvert would be installed thereafter in a similar to manner to the method proposed for the flood and float option.

[10] CIRIA (1996) Sea outfalls - construction, inspection and repair: Report 159.

5.6.5.2 SWO

Installation of cofferdam

A temporary sheetpile cofferdam will be constructed within the area of the existing revetment to facilitate the excavation and construction of the SWO that will discharge at the crest of the toe of the revetment.

A cofferdam will be required to facilitate excavation and dewatering will occur therein to provide a dry environment in a similar manner as described in **Section 5.5.5.4**. Following this, excavation will occur within the cofferdam.

Laying the outfall

Trenching will occur along the length of the SWO to the required depths, followed by the placement of the bedding layer, laying the pipeline and backfill of the trench as described in detail in **Section 5.6.5.1**.

It is anticipated that the construction of the SWO will be undertaken from within the WwTP site with the exception of the works in the revetment as described above.

Constructing the Outlet

As with the long sea outfall, an outlet structure will be required to be constructed over the SWO (i.e. at the crest of the toe of the revetment) to protect the pipeline in this location. The outlet structure will comprise a precast base slab, a headwall and wingwalls installed at the crest of the toe of the revetment that will be constructed upon removal of the existing rock armour, but prior to the replacement of the rock armour in this area using conventional methods. The outlet structure will accommodate the SWO and thus facilitate the discharge of excess stormwater under the revetment into the Irish Sea at Mean Low Water Springs level.

Non-return valves and Scour Protection

Appropriate non-return valves (flap valves or duckbill vales) will be fitted to the SWO in chambers within the WwTP site, to protect against sea ingress. A concrete apron will also be placed around the SWO discharge point at the toe of the revetment to protect against scour.

5.6.6 Revetment

5.6.6.1 Overview

Upgrading the revetment will require the removal of the existing rock revetment, its subsequent realignment and replacement of the rock armour as described in **Sections 5.6.6.2 - 5.6.6.4**. This will be carried out in a staged process along the revetment in sections of approximately 15 to 25m. It should be noted that no works will be undertaken within 10m of the GE cable which extends across the revetment.

By using this method, the section under construction can be quickly protected during storm events and thus flood risk for the WwTP site will be minimised during the revetment upgrade.

Construction of the revetment will be land-based, however diving works may be required e.g. to monitor the construction process.

5.6.6.2 Removing the Existing Revetment

Upon completion of the removal of any asbestos containing material in the revetment (as described in **Section 5.5.5.2**), the existing rock armour will be removed from crest to toe using excavators. Upon removal, the rock armour will be temporarily stored in a designated place within the site where it will be classified and sorted into suitable material for reuse and material to be transported offsite. Any material unsuitable for reuse would be removed from the site by trucks and transported to an appropriately licensed facility in respect of which a waste permit or a waste licence is granted for disposal.

The actual thickness and extent of the existing rock revetment is not known as there are no surveys available in this regard. Thus, it is not possible at this stage to determine the amount of rock armour that will need to be removed. Some of the rock armour material, if suitable, may be crushed on site (using a mobile crusher) and used as appropriate.

5.6.6.3 Importing Materials

It is envisaged that fill and rock armour material will be required to upgrade the revetment (Refer to **Section 5.8.5** and **Chapter 16** for further detail) and to form a temporary platform along the alignment of the existing revetment. This platform will enable the excavator to reach the toe of the revetment when the existing revetment has been removed.

At this stage, it is anticipated that the additional material required to be imported to construct the revetment will be transported to the site by road from a local quarry using trucks. This material, which will have been assessed and selected by the contractor for its compatibility in the existing marine environment at Arklow, will be brought to the site as close as possible to the construction stage, however storage will be made available on site if required.

5.6.6.4 Constructing the Upgraded Revetment

Construction of the upgraded revetment will be carried out from toe to crest by using suitable excavators located on the WwTP site. A schematic summary of the construction of the revetment is provided in Figure 5.14.

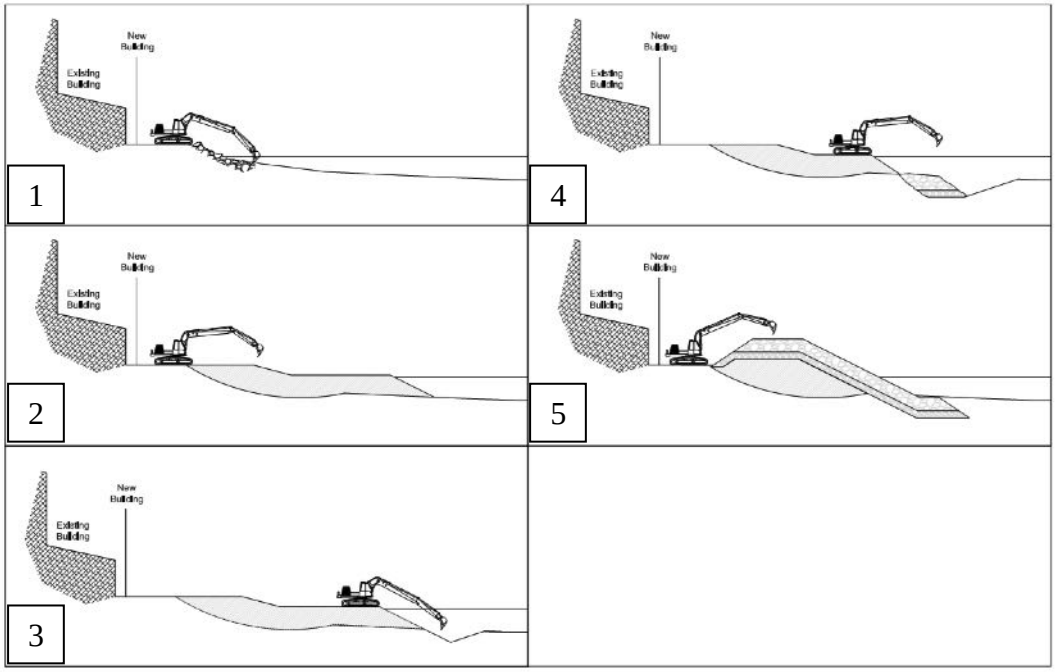

Figure 5.14: Envisaged procedure for the removal and subsequent replacement of the rock revetment

Fill material will be placed to form the foundation and new slope profile of the revetment. Once the foundation and slope profile has been formed, the geotextile layers will be spread along the slope and both layers of the rock armour will be laid on top of this. The armour layers and underlayer will be approximately 2.9m and 1.3m respectively and the toe of the revetment be buried underneath the level of the existing beach.

5.7 Traffic Management

5.7.1 Overview

A detailed construction traffic management plan will be prepared by the contractor in advance of any works taking place on site and submitted to Wicklow County Council for approval. This plan is required to control the impact of construction traffic on the local transport network and ensure compliance with the relevant measures outlined in this EIAR.

It should be noted that some strategic direction has been provided and high level agreements around traffic flows and diversions have been made with Wicklow County Council. The agreements have shaped the formation of the construction methodology and resulted in the proposed arragements outlined to support construction of the proposed development.

5.7.2 Construction Traffic

During the peak construction period, it is anticipated that up to 934 additional passenger car units per day may be generated during the peak construction period (Refer to **Chapter 7** for further information). Traffic flows and scheduling will be appropriately planned to ensure construction traffic flows in Arklow town are managed efficiently and effectively in accordance with the relevant legislative requirements.

Further detail on the assumptions made and a desciption of how the construction traffic has been quantified is provided in **Section 7.5 of Chapter 7**.

5.7.3 Site Access and Haulage

5.7.3.1 Overview

Dedicated construction access points will be required at each of the working areas as described in detail in **Sections 5.7.3.2 - 5.7.3.4**.

All site access routes will be connected to the existing local road network. Where an access point does not exist (e.g. traffic diversions via Seaview Avenue onto Bridgewater Northern Access Road), the footpath will be locally lowered as required to create the site entrance. Minor road works may also occur such as removal of existing kerbs, paving and a small amount of excavation prior to replacement of paving and realigned kerbs.

The contractor will be required to establish a temporary 6m wide trafficable paved area linking Seaview Avenue and Bridgewater Northern Road and in Working Area N14. This area will be reinstated to its pre-construction condition on completion of the works.

5.7.3.2 River Walk

Construction access and haulage routes will predominantly use the existing road network with some temporary site-specific diversions (Refer to **Chapter 7** for further detail on the existing road network). Temporary access roads will be required in some areas to navigate around construction activities (Refer to **Drawing No.'s 247825-00-C-IS-900 to 247825-00-C-IS-933 in Volume 3** for further detail).

The riverfront pathway to the west of River Walk (Chateaudune Promenade), will be closed for the full duration of the construction works in this area. The pedestrian walkway from Vale Road to Chateaudune Promenade will remain open to the public with a left turn only (i.e. pedestrians could travel westwards along the path).

Construction traffic will access this section of the site via River Lane (West), around Arklow town carpark onto Chateaudune Promenade and the exit will be via River Lane (East).

Construction and public access to River Walk will be via Condren's Lane Upper and exit will be via River Lane (East).

This section of River Walk (between Condren's Lane Upper and River Lane East) will become a one-way anticlockwise route of 5m width (including provision for pedestrian access). Construction activities in the working areas at the eastern end of River Walk are required to be complete and reopened before work in the western end of River Walk can commence.

To the west of River Walk, temporary works will be required to maintain access routes. Temporary structures will be provided along the northern and southern sections of the (eastern) River Walk carriageway and construction works will be centralised. Two-way traffic will be maintained. There are two areas in this portion of the site requiring night time works (short durations), therefore traffic will be be managed locally by the contractor.

Access to all residential and commercial properties will be provided for the full duration of the works, albeit through the one-way systems outlined above. At any given time a maximum of approximately 27 public parking spaces on River Walk will not be available for the duration of works in this area, however alternative public parking is available at the Arklow Town Council public car park located on River Lane East, a distance of approximately 200m away.

5.7.3.3 South Quay

Construction access and haulage routes will predominantly use the existing road network with some temporary site-specific diversions (Refer to **Chapter 7** for further detail on the existing road network). Temporary access roads would be required in some areas to navigate around construction activities.

During construction, construction traffic and public access to South Quay will remain from South Green or Harbour Road via Lower Main Street. However, the section between Doyle's Lane and Fogarty's Terrace will be one-way, in a westward direction. The current car park space opposite No.1 South Quay will also be unavailable throughout the duration of construction.

Construction on South Quay between South Green Junction to Harbour Road Junction will be ongoing for approximately 12 months. During construction works, there will be minor amendments to the current flow of traffic.

There are four tunnel shafts located in three discrete working areas (S13, S16 and S18) along this section. The contractor will only be permitted to occupy two of these working areas at any one time. Further, working area S13 (at TSS1) and working area S18 (at TSS2A and TSS3) cannot be occupied concurrently. This section of South Quay will not be a through road and will be made available to local residents only. A temporary surfaced access will be provided around TSS2 and to provide a driveway into the adjoining properties. All traffic to and from the Arklow Harbour willl use Harbour Road and turn right at the Harbour Road - South Quay junction to access the dock area.

5.7.3.4 North Quay

Similarly on North Quay, construction access and haulage routes will predominantly use the existing road network with some diversions to the current flow of traffic to facilitate construction activities. Activities at each of the working areas will progress on a sequential basis as described in detail in **Section 5.3.2**.

Access to all properties and business premises will be provided for the full duration of the works, however North Quay will not be a through road for a duration of approximately one year in total. Access to Mill Road will be maintained throughout.

Work between the roundabout to the north of Arklow Bridge and the Aldi junction will be carried out in two phases, the main works (i.e. construction of TSN1 and TSN2 and interconnecting pipeline that would take approximately 6 months) and minor works (i.e. construction of MHN2A, MHN3 & MHN4 that would take approximately 2 months).

For the main works listed above, a road closure will be required at TSN2, therefore construction and public access will be via Mill Road. For the minor works listed above, further road closures will be required (at MHN3 and MHN4) and diversions will be temporarily put in place around North Quay from the roundabout. These diversions will see vehicles use Seaview Avenue to access the Bridgewater Shopping Centre and North Quay. The contractor will be required to install a trafficable paved surface between Seaview Avenue and Mill Road adjacent to the running track (i.e. at Working Area N14).

Activities to the east of the Aldi junction and west of Marina Village (to support the construction of TSN3 and pipeline to TSN2) will take approximately six months. A road closure will be required and a diversion will be in place that willprovide construction and public access (to either side of two working areas) via Mill Road. Access to the Rowing Club and Arklow Shipping Limited will be provided through the Marina Village.

Two phases of activities to the east of Marina Village (to support the construction of TSN4 and pipeline to TSN3 and subsequent construction of TSN5 and pipeline to TSN4 and TSN7) will take approximately six months each. A road closure will be required and a diversion will be in place to provide construction and public access (to either side of the working areas) via Mill Road. Temporary access to local traffic accessing the Block 7 Apartments and Arklow Marina Village will be provided via Mill Road. Temporary access around TSN7 will also be provided.

Activities on Mill Road (to support the construction of TSN8) will require the provision of a temporary haul road. This haul road will allow vehicles to navigate around the working area and thus maintain traffic flows on Mill Road.

5.7.3.5 WwTP Site

Construction access and haulage routes will predominantly use the existing road network. It is anticipated that vehicles would access the site from Mill Road via those routes described above as access would be maintained to Mill Road throughout the construction period.

5.8 Site Management

5.8.1 Employment

Construction of the proposed development will generate employment opportunities as there will be a range of personnel employed directly to support the construction activites. As outlined in Table 5.1, it is anticipated that there will be up to approximately 150 construction employees on site during the peak construction period.

Table 5.1: Indicative construction employment associated with the proposed development

	Estimated Construction Employees															
	Year 1				Year 2				Year 3				Year 4			
Task	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Project Management Team/ HSQE / Employer's Reps	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	
Sewer Network (including Alps)																
Arklow Bridge Site Investigation Works Year 1			6													
Arklow Bridge Upgrade Works Year 2							8									
North of River				6	6	18	15	11							6	
South of River							16	27	12		10	15	15	15	6	
Total Staff on Sewer Network	*0*	*0*	*6*	*6*	*6*	*18*	*39*	*38*	*12*	*0*	*10*	*15*	*15*	*15*	*12*	*0*
Wastewater Treatment Plant																
Stripout & Demolition		30	40	30												
Short Sea Outfall Cofferdam & Pipeline Construction					20	20	15	10								
Revetment Upgrade					10	10	10	10								
Long Sea Outfall (Cofferdam worst case scenario)							10	10								
Treatment Plant Deep Excavation					40	40	20									
Treatment Plant Below Ground Construction						30	30	20								
Treatment Plant Above Ground Construction						20	30	60	60	50						
Treatment Plant External Finishes, Hardstands, Lighting & Landscaping										40	30					
Mechanical Fitout									5	5	10	20	20			
Electrical Fitout											5	15	15			
Commissioning													17	14	14	
Total Staff on Treatment Plant Site		*30*	*40*	*30*	*70*	*120*	*115*	*110*	*65*	*95*	*45*	*35*	*52*	*14*	*14*	
Total Staff on both Sites & Management Teams	**15**	**45**	**61**	**51**	**91**	**153**	**169**	**163**	**92**	**110**	**70**	**65**	**82**	**44**	**41**	**0**
												Potential Shift Work				

5.8.2 Hours of Working

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects.

The core construction working hours for the proposed development will be:

- 7am – 7pm: Monday to Friday;
- 8am – 2pm: Saturday; and
- Tunnelling works will occur 24 hours a day, 7 days a week as required.

These working hours correspond to the current construction programme, sequencing and durations as described in **Section 5.3**.

Underground activities serviced from the launch and reception tunnel shafts (i.e. construction of the tunnelled portion of the interceptor sewer) will occur 24-hours a day, 7-days a week. This will be undertaken in accordance with the permissible noise levels as described in detail in Chapter 10 (where 'daytime' noise limits are implemented during 7am to 7pm whilst lower permissible noise levels are stipulated outside of these hours).

All rock breaking/fracturing activities will be undertaken during daytime hours. The removal of waste material off site by road and regular deliveries to site will be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm).

It may be necessary in exceptional circumstances to undertake certain activities outside of the construction core working hours. Any construction outside of the construction core working hours will need to be agreed in advance with Wicklow County Council and scheduling of such works will have regard to nearby sensitive receptors.

5.8.3 Hoarding

A site boundary in the form of hoarding or fencing will be established around each of the working areas before any significant construction activity commences. The hoarding/fencing would be up to approximately 2.4m high to provide a secure boundary to what can be a dangerous environment for those that have not received the proper training and are unfamiliar with construction operations.

Site hoarding also performs an important function in relation to minimising nuisance and effects including:

- Noise emissions (by providing a buffer);
- Visual impact (by screening the working areas, plant and equipment); and
- Dust minimisation (by providing a buffer).

The erection of hoarding will be of a similar nature to what is carried out on most construction sites. Mounting posts will be erected by using a mini-digger and the posts would be set in concrete.

The size and nature of the posts and hoarding will depend on the requirements for any acoustic mitigation as well as preferences that the contractor may have. Where practicable, hoarding and fencing will be retained, re-configured and re-used between working areas as the construction activities progress.

5.8.4 Services and Site Lighting

Site services will be installed in parallel with the rearrangement and diversion of existing utilities, where relevant. The site will be powered by mains supplies or diesel generators where an electrical supply is not available.

Site lighting will typically be provided by tower mounted 1000W metal halide floodlights at each tunnel shaft. The floodlights will be cowled and angled downwards to minimise spillage to surrounding properties.

5.8.5 Materials

Construction of the proposed development will require the import of materials to site for construction activities as well as the export of materials generated and suplus to requirements. Where practicable, efforts will be made to manage materials in accordance with the waste hierarchy and promote the reuse and recycling of materials on site.

A summary of the estimated material types and indicative quantities of each type of material to be managed is provided in Table 5.2 and further detail on the indicative quantities and associated construction traffic to move these materials is available in **Chapters 7 and 16** respectively.

Temporary compounds have been provided within the site boundary for the storage of materials, with storage envisaged at the WwTP site, Working Area S19 and Working Area S1. The main construction compound located at the WwTP site will be used as the primary location for material storage. Stockpiling of materials outside of these working areas will not be permitted and management measures (as described in detail in the Outline CEMP in **Appendix 5.1**) will be implemented to ensure effective containment and handling of all materials during construction.

Table 5.2: Estimated Bulk Materials Quantities and Management during Construction

Nature	Aspect of the proposed development	Nature/ Source of Materials	Quantity and units of measurement
Import	Alps SWO and Stormwater Storage Tank	Topsoil	120m^3
		Site Grading/ Tank Perimeter Fill	1000m^3
		Concrete - Structures	450m^3
	Interceptor Sewers	Topsoil	450m^3
		Bitmac/Asphalt	165m^3

Nature	Aspect of the proposed development	Nature/ Source of Materials	Quantity and units of measurement
		As Dug material-under footpaths/grassed areas	385m^3
		Backfill under roads	865m^3
		Pea gravel bed & surround	575m^3
		Backfill	3755m^3
		B&S	2015m^3
		Haul Road Construction Material	8400m^3
		Concrete	9000t
		Concrete Pipes and Manhole Rings	4500t
		Stone Material	22000t
	Tunnel Shafts	Topsoil	745m^3
		Bitmac/Asphalt	1060m^3
		Concrete Base Plug	3075m^3
	WwTP	Granular Fill	9325m^3
	Revetment	Rock armour 6-10 tonne	51000m^3
		Underlayer Rock 0.3-1 tonne	27000m^3
		Granular Fill	25000m^3
	Outfall	Bedding layer	700m^3
		Filter layer	3700m^3
		Rock armour 60-300kg	6800m^3
Export	Alps SWO and Stormwater Storage Tank	Soil and rock	4,000t
	Interceptor Sewers	Open Cut Construction	9,700t
		tunnel shaft construction	23,600t
		river arch underpinning	1,400t
		tunnelling	6,110t
		service diversions	4,000t

Nature	Aspect of the proposed development	Nature/ Source of Materials	Quantity and units of measurement
		engineered fill from removal of the temporary haul road	17,000t
	WwTP	Inert Excavation Material	26,250t
		Non-hazardous Excavation Material	9,400t
		Hazardous Excavation Material	25,200t
	Revetment	Existing rock armour to be removed from site	42,000t
		Excavated seabed material for removal from site	50,000t
		Excavated material reused at revetment	32,000t

5.9 Environmental Management

An outline Construction Environmental Management Plan (CEMP) and schedule of mitigation measures has been prepared (Refer to Chapter 20). These documents define the minimum standards required of the contractor as they affect the environment, amenity and safety of local residents, businesses, the general public and the surroundings in the vicinity of the proposed development.

The contractor is required to integrate these measures into a detailed CEMP following appointment (prior to the commencement of any construction activities). Effective implementation of the CEMP will ensure that disruption and nuisance are kept to a minimum throughout the construction of the proposed development. The detailed CEMP will be required to have regard to the guidance[11] and industry best practice. The CEMP will be implemented throughout construction and the contractor will be required to review and update the CEMP as construction progresses.

In addition to the CEMP, it is anticipated that the contractor will prepare a Construction Management Plan and relevant Works Method Statements in advance of any works commencing on site. Every effort will be made to ensure that any significant environmental effects as described in this EIAR will be avoided, prevented or reduced by adopting the mitigation measures outlined in this EIAR.

[11] CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition

5.10 References

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6 Planning and Policy

6.1 Introduction

This chapter provides a summary of the hierarchy of national, regional and local planning and development policies in addition to those Irish Water policies of relevance to the proposed development.

6.2 National Planning Policy and Guidance

6.2.1 Project Ireland 2040: National Planning Framework

The Department of Housing, Planning and Local Government published Project Ireland 2040: National Planning Framework (NPF) in February 2018. The NPF is the overarching policy and planning framework for the social, economic and cultural development of the country.

The NPF was published together with a 10-year national investment plan as one vision – Project Ireland 2040, meaning that implementation of the NPF is fully supported by the Government's investment strategy for public capital investment and investment by the State sector in general.

The NPF is the overarching document guiding regional spatial and economic strategies and local development plans. The NPF identifies national strategic outcomes (including the sustainable management of water and other environmental resources) as well as strategic investment priorities (including water infrastructure). Specifically, urban wastewater is identified as a principal pressure on Ireland and the need to ensure adequate treatment and capacity to avoid direct discharges has been recognised in the NPF. Urban waste water treatment plant compliance and remedial actions are therefore a key short term priority.

Furthermore, National Policy Objective 63 states:

"Ensure the efficient and sustainable use and development of water resources and water services infrastructure in order to manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment."

The proposed development complies with the objectives of the NPF by providing infrastructure that will provide wastewater treatment and eliminate in so far as possible the discharge of untreated wastewater into the Avoca River therefore improving water quality in the river channel and more generally in Arklow town.

6.2.2 National Development Plan 2018 – 2027

The National Development Plan 2018 – 2027 (NDP) was published in conjunction with the NPF in February 2018. The NDP is the national plan setting out investment priorities to guide national, regional and local planning and investment decisions.

The NDP prioritises investment in high-quality infrastructure and specifically identifies €8.5 billion investment by Irish Water over the decade. The fragmentation of the water and wastewater network is recognised and the need for further investment to deliver new connections to provide an efficient, fit-for-purpose infrastructure network is recognised. The NDP states the following under National Strategic Outcome 9: Sustainable Management of Water and other Environmental Resources:

"Investment in our country's water services is critical in meeting the needs of our growing economy across the regions, of our people and their health and the protection and enhancement of the quality of our environment and ensures public health."

The proposed development is consistent with the NDP by providing infrastructure that will provide wastewater treatment and eliminate in so far as possible the discharge of untreated wastewater into the Avoca River therefore improving water quality in the river channel and more generally in Arklow Town.

6.2.3 National Flood Policy

The National Flood Policy was adopted by the Government in 2004 after an inter-departmental review on how to manage flood risk most effectively and efficiently. The National Flood Policy builds on the Arterial Drainage Acts 1945 and 1995, which permits the OPW, as the lead agency coordinating the management of flood risk in Ireland, to implement localised flood relief schemes.

The National Flood Policy identifies that *'the flooding problem cannot be eliminated but can be managed so as to minimise its impact'* and that there are '*a considerable number of heavily populated urban centres that are currently at risk of flooding and where flood defence may be the only feasible solution'.* The National Floods Policy generally advocates for sustainable flood prevention, mitigation and protection in areas of flood risk.

Arklow is one such area that is at risk of flooding and the OPW are currently proposing to develop the proposed Arklow Flood Relief Scheme in close proximity to the proposed development (Refer to **Section 2.6.7 of Chapter 2** for further detail). Given this potential for flood risk, the National Flood Policy has been considered throughout the design development of the proposed development.

The proposed Arklow Flood Relief Scheme has also been considered during the design development of the proposed development (Refer to **Section 3.6 of Chapter 3** for further detail). The likely significant effects of the proposed development and the proposed Arklow Flood Relief Scheme have been considered as part of the assessment of cumulative effects (Refer to **Sections 2.6.6 and 2.6.7 of Chapter 2** and **Chapter 19** for further detail).

Further, efforts have been made to mitigate flood risk should the proposed development proceed in advance of the Arklow Flood Relief Scheme (As described in detail in **Section 5.6.3.5 of Chapter 5**, the bridge underpinning works at the second arch will mitigate any potential flood risk associated with the proposed development.).

The proposed development is therefore consistent with the National Flood Policy as appropriate flood protection and mitigation will be facilitated to mitigate and protect against flood risk associated with the proposed development as described in detail in **Chapter 15**.

6.2.4 Ireland's Transition to a Low Carbon Energy Future 2015 - 2030

Ireland's Transition to a Low Carbon Energy Future 2015 – 2030 was launched by the Department of Communications, Climate Action and Environment in December 2015 to update energy policy and set out the framework to guide policy to 2030. It guides the national transition to a low carbon future that would transform Ireland into a low carbon society and economy by 2050.

This Policy outlines the extensive range of existing literature on climate change as well as the international policy framework for addressing climate change at the global, EU and national level with cognisance of the Climate Action and Low Carbon Development Bill 2015. Specifically, the energy vision for Ireland is set out in Section 2.6 and the objectives outlined in Section 2.7 state that:

"Ireland's energy policy addresses three core objectives – the 'three energy pillars':

- *Sustainability*
- *Security of supply*
- *Competitiveness – leading to affordable energy for domestic and business consumers.*

Sustainability is essential to reduce our dependence on imported fuels and to combat climate change through the reduction of energy-related GHG emissions in the transition to 2050.

Security of supply is necessary to the functioning of our society and economy.

Price competitiveness is needed both for business (which provides employment and creates wealth) and for households (which need affordable energy and protection against energy poverty).

Our new energy policy framework seeks to strike a balance between the three pillars to ensure a sustainable, secure and competitive energy system for Ireland."

The proposed development is in compliance with Ireland's Transition to a Low Carbon Energy Future 2015 - 2030 as cognisance has been taken throughout of the need to minimise energy requirements.

Provision has also been made for PV panels on the roof of the Process building, i.e. a source of renewable energy that will reduce reliance on fossil fuels (and associated energy related greenhouse gas emissions) and improve security of supply (Refer to **Section 4.3.7 of Chapter 4** for further information).

6.2.5 Irish Water Services Strategic Plan – A Plan for the Future of Water Services (2015-2020)

The Water Services Strategic Plan – A Plan for the Future of Water Services ('Strategic Plan'), as per Section 33 of the Water Service (No. 2) Act 2013, was published by Irish Water in October 2015 to set out the strategic delivery of water services to 2040. The Strategic Plan details current and future challenges which affect the provision of water services and identifies priorities to be tackled in the short and medium term.

The Strategic Plan identifies that many urban agglomerations do not have sufficient wastewater treatment and that raw sewage is currently discharging in Arklow, therefore infringing the requirements of the UWWT Directive.

Achieving compliance with the UWWT Directive is an immediate priority for Irish Water and the Strategic Plan recognises that substantial upgrading of the wastewater treatment network is required. Specifically, the following responsibilities for wastewater treatment are outlined:

"Our responsibilities for wastewater commence when effluent reaches the public wastewater network. We are responsible for its transfer to wastewater treatment plants, its treatment and the subsequent discharge of the treated effluent back into the water environment. We are also responsible for the treatment and disposal of the sludge that is generated from both our water and wastewater treatment plants."

Furthermore, the following specific objectives have been outlined as part of the Strategic Plan:

- **WW1:** Manage the operation of wastewater facilities in a manner that protects environmental quality;
- **WW2:** Manage the availability and resilience of wastewater services now and into the future; and
- **WW3:** Manage the affordability and reliability of wastewater services.

The proposed development is in compliance with the objectives outlined in the Strategic Plan by enabling the effective management and provision of wastewater treatment within the Arklow agglomeration which is currently lacking wastewater infrastructure.

6.2.6 Irish Water Business Plan – Transforming Water Services in Ireland to 2021

The Irish Water Business Plan – Transforming Water Services in Ireland to 2021 (Business Plan) was published by Irish Water in 2015 as a framework for delivering efficient national water and wastewater services.

The Business Plan identifies a range of national issues associated with the fragmented network and key deliverables to improve infrastructure and services for customers.

The Business Plan highlights that Arklow is one of a number of large urban areas with no treatment or preliminary treatment only. As such it is incompliant with the UWWT Directive and the Business Plan identifies that compliance with the UWWT Directive is a key metric to be achieved by 2021.

The proposed development is in compliance with the Business Plan by providing wastewater treatment within the Arklow agglomeration which is currently discharging untreated wastewater into the Avoca River. Further, this will ensure that Arklow is brought into compliance with the obligations of the UWWT Directive.

6.2.7 National Wastewater Sludge Management Plan

The National Wastewater Sludge Management Plan (NWSMP) outlines Irish Water's strategy to ensure a nationwide standardised approach for managing wastewater sludge over the next 25 years. It is required in order to set out the short, medium and long-term strategy for management of sludge produced at wastewater treatment plants under the control of Irish Water.

Irish Water has looked at how wastewater sludge is currently managed and has set out sustainable proposals for the investment in future treatment, transport and reuse or disposal of the sludge in keeping with the following objectives: -

- To avoid endangering human health or harming the environment;
- To maximise the benefits of wastewater sludge as a soil conditioner and source of nutrients;
- To ensure that all regulatory and legislative controls are met, and due regard is given to non-statutory Codes of Practice and industry guidance;
- To establish long term, secure and sustainable reuse/disposal methods;
- To ensure cost-effective and efficient treatment and reuse/disposal techniques;
- To reduce potential for disruption from sludge transport and sludge facilities;
- To extract energy and other resources where economically feasible; and
- To drive operational efficiencies, e.g. through the use of Sludge Hub Centres.

The proposed development is in compliance with the objectives of the NWSMP as it proposes to manage sludge effectively and make use of the regional sludge hub centres once operational.

6.3 Regional Policy Guidance

6.3.1 Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022

The Regional Planning Guidelines for the Greater Dublin Area 2010 - 2022 (Regional Planning Guidelines) set out the strategic policy for Dublin and the mid-east region over the twelve-year period to 2022. They provide a regional context to the National Spatial Strategy (the precursor to the National Planning Framework) and the individual development plans contained within the Greater Dublin Area.

The Regional Planning Guidelines effectively implement the National Spatial Strategy, whilst providing more detail and establishing a regional development and spatial framework that can be used to strengthen local authority development plans and other planning strategies at county, city and local level. The Regional Planning Guidelines prioritises value for money strategic state investments and a coordinated approach with Government agencies, departments and stakeholders.

Strategic policy PIP3 outlines the need to improve water quality and seeks that investment in wastewater infrastructure is prioritised to support the delivery of the economic and settlement strategy. Specifically, Table 11 which identifies 'Critical Strategic Projects – Waste Water and Surface Water', outlines the need for the *"Development of a high-quality treatment plant for Arklow town"* under point 6.

Arklow is designated as a Large Growth Town II in the Hinterland Area, defined as smaller in scale (than Large Growth Towns II) but a strong active growth town, economically vibrant with high quality transport links to larger towns/city.

Other strategic recommendations in the Regional Planning Guidelines of relevance include:

- **ER16:** *"Seek proactively the delivery of new sustainable water supply, waste water treatment and waste management infrastructure without which the future development of the Greater Dublin Area will be impossible."*
- **SR5:** *"The expansion and growth of towns in the Greater Dublin Area is predicated on the delivery of suitable and necessary infrastructure. Local Area and Development Plans need to take into account the current and future infrastructure needs of zoned lands and ensure that future development is only permitted where necessary water services have been provided to avoid causing a risk to the environment and is in accordance with existing and future discharge licences for waste water facilities."*
- **PIR15:** *"Seek continued investment in Wastewater treatment facilities and networks to meet the needs of the River Basin Management Plans and to achieve the targets for good water status for river, coastal and transitional waters in the Water Framework Directive."*

- **PIR16:** *"Ensure that future capacity is provided in growth towns through expansion and upgrading of facilities where necessary and/or exploration of alternatives such as connecting to adjoining drainage systems or changes to catchments to enable growth towns to provide for the population growth envisaged in the settlement strategy and thus enable a more sustainable settlement pattern to be supported."*

The proposed development complies with the strategic objectives and recommendations of the Regional Planning Guidelines regarding the need for investment in waste and surface water treatment and management in order to support the delivery of the economic and settlement strategies.

Arklow is a key growth town in the Greater Dublin Area, and investment in its water infrastructure is critical to realise the overall strategy for development in the region. In recent years, development has been constrained in Arklow town as a result of the lack of wastewater treatment. The proposed development will therefore facilitate the expansion and growth envisioned in the Regional Planning Guidelines.

6.3.2 Eastern and Midlands Regional Assembly Spatial and Economic Strategy

The Regional Planning Guidelines will be replaced by the Eastern and Midlands Regional Assembly Spatial and Economic Strategy (RSES). The RSES will take a strategic approach over a 12 - 20 year period to the spatial planning and economic strategy for nine counties containing twelve local authorities namely – Longford, Westmeath, Offaly, Laois, Louth, Meath, Kildare, Wicklow, Fingal, South Dublin and Dún Laoghaire-Rathdown County Councils along with Dublin City Council.

At the time of writing this EIAR, the Draft RSES is being prepared by the Eastern and Midlands Regional Assembly. It is anticipated that the Draft RSES will support similar objectives to those outlined in the NPF and NDP, therefore the proposed development is anticipated to be compliant with the policies and objectives outlined in the Draft RSES.

6.4 Local Policy Guidance

6.4.1 Wicklow County Development Plan 2016 – 2022

The Wicklow County Development Plan 2016 – 2022 (County Development Plan) sets the overall strategy for planning and sustainable development within the administrative boundaries of County Wicklow. The County Development Plan through the policies and objectives contained therein, provides the direction for the future development of County Wicklow.

6.4.1.1 Vision and Strategic Goals

The Vision for County Wicklow is:

"For County Wicklow to be a cohesive community of people enjoying distinct but interrelated urban and rural environments; where natural surroundings and important resources are protected; where opportunities abound to live and work in a safe atmosphere, allowing the people to enjoy the benefits of well paid jobs, a variety of housing choices, excellent public services, simple cultural and leisure opportunities, and a healthy environment."

Strategic Goal 7 pertaining to infrastructure is:

"To protect and improve the county's transport, water, waste, energy and communications, and maritime infrastructure, whilst having regard to our responsibilities to respect areas protected for important flora, fauna and other natural features."

6.4.1.2 Core Strategy

It is a statutory obligation that the County Development Plan must have a "Core Strategy" which inter alia:

- Defines a settlement hierarchy for the County that is consistent with the National Spatial Strategy and Regional Planning Guidelines;
- Transposes the prescribed Regional Planning Guidelines housing and population targets (set at County level) for the rural and urban centres identified within the settlement hierarchy of the county; and
- Provides an evidence based rationale for the land proposed to be zoned for residential and mixed-use development having regard to the capacity of existing zoned land and the phasing of development taking account of the location of public transport and services.

Arklow is categorised as a Hinterland Area Large Growth Town II, and on the third tier of towns in the county (behind Bray and Wicklow Town / Rathnew). Arklow town is projected to grow to 19,494 by 2022, 21,247 by 2025 and 23,000 in 2028. In terms of employment growth targets, the County Development Plan states that in order to achieve a jobs target ratio of 86%, an additional 4,661 jobs will be required between 2011 and 2028.

In order to assist in achieving these growth targets additional investment in the town's infrastructure is urgently required.

6.4.1.3 Water Infrastructure

The County Development Plan recognises that deficiencies in wastewater infrastructure are a barrier to the economic development and that addressing this issue is therefore critical to the success and well-being of County Wicklow residents.

The proposed development complies with Objective WI6 with regard to wastewater infrastructure:

"In order to fulfil the objectives of the Core Strategy, Wicklow County Council will work alongside and facilitate the delivery of Irish Water's Water Services Investment Programme, to ensure the provision of sufficient storage, supply and pressure of potable water to serve all lands zoned for development and in particular, to endeavour to secure the delivery of regional and strategic water supply schemes and any other smaller, localised water improvement schemes required during the lifetime of the plan."

6.4.1.4 6.4.1.4 Compliance with the County Development Plan

The proposed development is compliant with the County Development Plan as it will help create a safe and healthy environment whilst assisting in the protection of its natural resources. It will facilitate in the achievement of the population and employments targets set out for Arklow. The proposed development will also result in the realisation of Objective W16 with regard to the development of a WwTP in Arklow.

6.4.2 Arklow and Environs Local Area Plan 2018 – 2024

The Arklow and Environs Local Area Plan 2018 – 2024 (Arklow LAP) is the land use framework for guiding future development in the settlement of Arklow Town. The Arklow LAP provides for and controls the physical, economic and social development of the settlement in the interests of overall common good and in compliance with environmental controls. The role of the Arklow LAP is to put in place the local framework within which development can occur.

6.4.2.1 Vision and Strategy for Arklow

Similarly to the County Development Plan, the Arklow LAP contains a vision for the town infrastructure:

"To protect and improve the settlement's transport, water, waste, energy, communications and maritime infrastructure having regard to our responsibilities regarding the protection of the environment."

The Arklow LAP also supports the core strategy outlined in the County Development Plan with regard to the need for wastewater treatment to cater for the projected population within Arklow town. As noted in **Chapter 17**, recent development in Arklow town has been constrained due to the lack of wastewater treatment. The Arklow LAP specifically states (as part of the Infrastructure Strategy for Arklow) that it will seek:

"To facilitate Irish Water in the provision of necessary waste water infrastructure, in a sustainable manner."

6.4.2.2 Relevant Objectives

Specific objectives in the Arklow LAP of relevance to the proposed development are identified in Table 1.

Table 1: Arklow LAP objectives of relevance to the proposed development

Objective	Details	Relevance
Waterfront Strategy Objectives		
WZ5	To support and facilitate maritime activity and to encourage new developments that provide for an improved mix of uses including commercial, retail and residential uses and to particularly encourage tourism and leisure related developments.	The Arklow LAP notes that the future development of this WWTP will help to improve the river and beach quality and will in time open up the potential for the enhancement of the recreational and tourism uses in the waterfront
WZ6	To require any new developments in the Waterfront Zone to meet a high standard of design that respects the unique historical, environmental, visual and recreational amenities of the area.	The proposed development aligns with this objective in the Arklow LAP as the high standard of design respects the local area as described in **Chapters 3, 4 and 13**.
WZ7	To support and facilitate the development of new infrastructure necessary for the continued operation and development of the harbour	The proposed development aligns with this objective in the Arklow LAP as it will provide infrastructure that facilitates continued operation and development of the harbour.
WZ10	To ensure that access to the water, such as steps / slipways / river beaches etc. are maintained and improved	Whilst, the structure and resilience of coastal revetment will be improved as part of the proposed development, access will be restricted as it has been deemed unsafe to use the revetment as a walkway.
Tourism and Recreation Objectives		
TR6	To promote and encourage the recreational use of coastline, rivers and lakes and the development of 'blueways' subject to normal environmental protection and management criteria. Where such recreational uses involve the development of structures or facilities, the Planning Authority will ensure that the proposals will respect the natural amenity and character of the area, listed views and prospects onto and from the area in question. Where possible, such structures should be set back an appropriate distance from the actual amenity itself and should not adversely affect the unique sustainable quality of these resources.	The proposed development will improve water quality in the Avoca River and along the coastline, thus facilitating more recreational use of these areas.

Objective	Details	Relevance
Infrastructure, Transportation and Movement Objectives		
IT1	To support and facilitate the development of a waste water treatment plant in Arklow, at an optimal location following detailed technical and environmental assessment and public consultation.	The proposed development aligns with this objective in the Arklow LAP as it will provide the necessary wastewater treatment plant.
Heritage Objectives		
HT1	To maintain the favourable conservation status of all proposed and future Natural Heritage Areas (NHAs) in the plan area in particular the Arklow Marsh and to support environmentally sensitive measures to enhance the understanding and enjoyment of such natural areas.	The proposed development aligns with this objective in the Arklow LAP as it does not impact on the Arklow Town Marsh pNHA as described in **Chapter 11**.

6.4.2.3 Land Use Zoning Objective

The proposed development is located within the 'Waterfront (WZ)' land use zone which is described as:

"To facilitate the provision of high quality new residential developments at appropriate high densities with excellent layout and design, well linked to the existing town centre, community facilities and water amenities. To provide an appropriate mix of house sizes, types and tenures in order to meet household needs and to promote balanced communities. To also facilitate the provision of high quality new commercial, maritime, leisure, tourism and amenity uses at a scale that does not undermine the role of the existing Town Centre. To facilitate the extension and continued use of the existing employment, maritime and port uses within the zone. To facilitate the provision of a new Waste Water Treatment Plant with an appropriate high quality architectural design/appearance."

As outlined in Objective WZ7, new infrastructure is generally to be supported and to facilitated within this land use zone. The proposed development will be consistent with the land use zoning and provide the required wastewater treatment in the appropriately zoned area in Arklow town.

6.4.2.4 Phasing and Implementation

The Arklow LAP contains a phasing schedule linked with necessary investment in infrastructure. The Waterfront Zone is identified as a Priority 1 development area. Further, the proposed development is identified as a short-term deliverable (3-5 years) in the Implementation and Infrastructure Delivery Schedule Table as it is key to the overall development potential of Arklow town.

6.5 References

Department of Housing, Planning and Local Government, (2018), *Project Ireland 2040: National Planning Framework*

Department of Housing, Planning and Local Government, (2018), *National Development Plan 2018 – 2027*

Dublin Regional Authority and Mid-East Regional Authority, (2010), *Regional Planning Guidelines for Greater Dublin Area 2010 – 2022.*

Irish Water, (2015), *Irish Water Business Plan – Transforming Water Services in Ireland to 2021*

Irish Water, (2015), *Services Strategic Plan – A Plan for the Future of Water Services (2015 - 2020)*

Irish Water, (2015), *National Wastewater Sludge Management Plan*

Wicklow County Council, (2018), *Arklow and Environs Local Area Plan 2018 – 2024*

Wicklow County Council, (2016), *Wicklow County Development Plan 2016 - 2022.*