ABWP Phase I Decommissioning

Outline Offshore Waste Management Plan

Volume 3, Appendix 3.8



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Project name ABWP Phase I Decommissioning

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Contents

1 Introduction 9

1.1 Background 9
1.2 Scope of the Document 9
1.3 Roles and Responsibilities 10

2 Description of Proposed Works Offshore and Waste Generation 11

2.1 Overview 11

2.1.1 Programme 11

2.1.2 Pre-decommissioning Activities 11

2.1.3 Dredging 11

2.1.4 General Decommissioning Activities 12

2.2 Initial Review of Waste Generated Anticipated 12

2.2.1 Introduction 12

2.2.2 Wind Turbine Generators, Met Masts and Monopiles 12

2.2.3 Cables and Scour protection 14

3 Legislation, Policy and Objectives 15

3.1 Introduction 15
3.2 Waste Regulatory Framework 15
3.3 Local Council Targets 16
3.4 Duty of Care 17
3.5 Project Waste Management Objectives 17

4 Waste Management 19

4.1 Introduction 19
4.2 Waste Minimisation Measures 19
4.3 Material Management Options 20
4.4 Waste Management Controls 24

4.4.1 Training and Communication 24

4.4.2 Recording of Waste Arisings 24

4.4.3 Ongoing Review of Implementation 24

5 Further Actions 25

6 References 26

List of Tables

Table 1.1: Summary of Roles and Responsibilities to be Defined in the Detailed Offshore WMP 10

Table 2.1: Quantities arising from dredging activities 12

Table 2.2: Quantities of waste estimated from WTGs, Met Mast and Monopiles 13

Table 2.3: Quantities of waste estimated from Export cable, Inter-array cable and Scour Protection 14

Table 3.1: Proposed Waste Objectives 17

Table 4.1: Recommended Waste Minimisation Measures 19

Table 4.2: Anticipated Waste Streams during the Proposed Works Offshore 21

Table 1: Record of Decommissioning Waste Arisings – Example Template 28

Table 2: Record of Waste Carriers and Disposal Facilities – Example Template 28

List of Figures

Figure 1: Waste Hierarchy 16

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Glossary

Term	Meaning
Arklow Bank Wind Park (ABWP) Phase I	Arklow Bank Wind Park (ABWP) Phase I comprises: • Offshore infrastructure seaward of High Water Mark (HWM), including: – Seven Wind Turbine Generators (WTG) with a combined capacity of 25.2 MW; – One meteorological (met) mast; – Inter-array cables connecting the WTGs and met mast; and – One offshore export cable connecting WTG T4 with landfall at HWM; • Onshore infrastructure landward of HWM including: – One onshore cable connecting landfall at HWM with the onshore substation; and – One onshore substation compound, where the onshore substation and ancillary infrastructure are located.
Arklow Energy	Arklow Energy Limited, the entity seeking planning permission for the Proposed Works, i.e. the applicant.
Decommissioning	The final closing down and putting into a state of safety of a development, project or process when it has come to the end of its useful life (EPA, 2022).
Detailed Offshore Decommissioning Management Plan (DEMP)	The contractor-developed version of the Outline Offshore DEMP (see **Volume 3, Appendix 3.4**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Detailed Offshore Waste Management Plan (WMP)	The contractor-developed version of this document, to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Dredged material	Seabed material arising from localised dredging potentially required to facilitate safe vessel access during Proposed Works Offshore, and / or

Term	Meaning
	extraction of seabed material located inside monopile (MP) foundations, as part of MP decommissioning.
Dumping	Any deliberate disposal in the maritime area (including side-cast dredging, plough dredging, water injection dredging and other such dredging techniques of a substance or material from or in conjunction with a vessel or aircraft or offshore installation (Dumping at Sea Act 1996 (as amended)).
Duty of Care	In a waste management context, the duty of care is the requirement to manage waste without causing environmental pollution and to transfer waste only to appropriately authorised persons and facilities.
Hazardous waste	Waste that displays one or more hazardous properties and requires specialist classification, storage, handling, transport and treatment (Waste Management Act 1996 (as amended)).
High Water Mark (HWM)	Level reached by the sea at high tide, measured as the mean of high tides.
Inter-array cables	Subsea power lines that link individual wind turbine generators (WTGs) together in an offshore wind farm, forming an electrical network. In ABWP Phase I, inter-array cables connect WTGs and the met mast to each other and have an overall length of 7.4 km.
Landfall	The point where the offshore export cable transitions from the offshore marine environment to the onshore terrestrial environment.
List of Waste (LoW)	The classification system used to assign waste codes to hazardous and non-hazardous waste.
Meteorological (Met) mast	A mast with a number of meteorological sensors located at different heights to record meteorological and sea condition data.
Monopile (MP)	Hollow steel cylinder driven into the seabed typically used to anchor an offshore wind turbine generator (WTG). In ABWP Phase I, MPs support the seven WTGs as well as the meteorological (met) mast.
Non-hazardous waste	Waste that does not display hazardous properties but must still be correctly classified, segregated, stored and transferred (Waste Management Act 1996 (as amended)).
Offshore export cable	Subsea power cable that transports the total generated power from an offshore wind farm to the onshore power grid. In ABWP Phase I, the offshore export cable connects the wind turbine generator (WTG) T4 to landfall with an approximate overall length of 15.6 km. At landfall, the offshore export cable transitions to the onshore cable connecting to the onshore substation.
Offshore Site	Part of the Site where Proposed Works Offshore are proposed to take place. In this application for planning permission, the Offshore Site comprises the Sub Lease Area, where the ABWP Phase I wind turbine generators (WTGs), met mast and inter-array cables are located, and the offshore export cable 10 m corridor connecting WTG T4 to the landfall at high water mark (HWM) near Arklow Harbour.
Port marshalling area	The port-based area used for temporary storage, segregation, handling and onward transfer of recovered materials and wastes.
Pre-demolition audit	Inspection and verification process used before works commence to identify materials, hazardous components, reuse opportunities and likely waste streams.
Principal Decommissioning Contractor	In this document, meaning the contractor(s) appointed to undertake the Proposed Works Offshore and to prepare, implement and update the Detailed Offshore DEMP and associated management plans (including the Detailed Offshore WMP), keeping them as live documents until completion.
Proposed Works	The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).
Scour protection	Engineered barrier typically placed on the seabed around WTG foundations and subsea cables to prevents sediment erosion caused by

Term	Meaning
	accelerated water currents and waves, safeguarding the WTG's stability and protecting subsea cables. In ABWP Phase I, scour protection was originally introduced in the form of rock armour, however, this proved ineffective, and was removed in 2005. Since then, scour protection has been introduced through sandbags.
Segregation	The separation of waste streams by type at source to improve reuse, recycling, recovery and traceability.
Sub Lease Area	Area where the ABWP Phase I WTGs, met mast and inter-array cables are located, as defined in the Sub Lease granted by Sure Partners Limited (SPL) to Arklow Energy Limited (Arklow Energy) to construct and operate ABWP Phase I.
Transition Piece	The steel connection structure between the tower and the monopile (MP) foundation.
Waste	Any substance or object belonging to a category of waste specified in the First Schedule or for the time being included in the European Waste Catalogue which the holder discards or intends or is required to discard, and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved (Waste Management Act 1996 (as amended)).
Waste coordinator	The person appointed to oversee implementation, monitoring and review of waste management arrangements for the Proposed Works Offshore.
Waste Electrical and Electronic Equipment (WEEE)	Electrical and electronic items requiring separate handling, treatment and recovery from bulk structural materials.
Waste Hierarchy	The order of preference for managing waste, prioritising prevention, reuse, recycling and recovery ahead of disposal.
Waste Management Facility (WMF)	A permitted or licensed facility authorised to receive, treat, recover or dispose of waste.

Acronyms

Acronym	Meaning
ABWP	Arklow Bank Wind Park
ACP	An Coimisiún Pleanála
C&D	Construction and Demolition
DaS	Dumping at Sea
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
HWM	High Water Mark
JUB	Jack-up barge
KPI	Key Performance Indicator
LoW	List of Waste
LWM	Low Water Mark
MAC	Maritime Area Consent
MARA	Maritime Area Regulatory Authority
MBES	Multibeam echosounder
MP	Monopile

Acronym	Meaning
O&M	Operations and Maintenance
SWMP	Site Waste Management Plan
TP	Transition Piece
WEEE	Waste Electrical and Electronic Equipment
WMP	Waste Management Plan
WTF	Waste Transfer Form
WTG	Wind Turbine Generator

Units

Unit	Meaning
%	per cent
km	kilometre
knot	nautical mile per hour
kV	kilovolt
m	metre
m^3	cubic metre
mm	millimetre
MW	megawatt
nm	nautical mile
t	Metric tonne

1 Introduction

1.1 Background

1.1.1.1 Arklow Energy Limited (Arklow Energy) is seeking planning permission to decommission Arklow Bank Wind Park (ABWP) Phase I (referred to hereafter as 'the Proposed Works'). The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

1.1.1.2 This Outline Offshore Waste Management Plan (WMP) has been prepared to support the application for planning permission for the Proposed Works.

1.1.1.3 This Outline Offshore WMP is drafted as a living document and is intended to be updated following consent, Principal Decommissioning Contractor appointment, detailed method development and consultation with relevant authorities and stakeholders. The Outline Offshore WMP intends to demonstrate the appropriate Irish planning-stage approach of setting out minimum commitments, implementation principles and further actions, with the Detailed Offshore WMP to be finalised before Proposed Works Offshore commence.

1.1.1.4 The overarching aims of this Outline Offshore WMP are to:

- Ensure waste management during the Proposed Works Offshore complies with relevant legislation, policy and guidance;
- Increase resource efficiency and environmental performance; and
- Protect the environment and the community.

1.1.1.5 The scope of this outline Offshore WMP includes:

- Identifying the potential waste arisings that are expected to be generated during the Proposed Works Offshore;
- Reviewing international, national and local legislation, policy and guidance to determine required standards for offshore decommissioning waste management;
- Development of project-level objectives to help ensure that good waste management is adopted at an early stage, in line with the Waste Hierarchy and standards identified for the Proposed Works Offshore;
- Identifying waste minimisation measures to prioritise waste prevention; and
- Identifying waste management options for remaining wastes.

1.1.1.6 This Outline Offshore WMP is supported by the following appendices:

- **Appendix A: Proposed Offshore Waste Monitoring Template.**

1.1.1.7 The Outline Offshore WMP has been prepared having regard to the Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects (EPA, 2021), which set out the Irish good-practice approach for resource efficiency, waste prevention, segregation, tracking and review.

1.2 Scope of the Document

1.2.1.1 It should be noted that this Outline Offshore WMP only considers waste generated during Proposed Works Offshore. Waste management associated with Proposed Works Onshore is outside the scope of this Outline Offshore WMP, and separately covered in **Volume 3, Appendix 3.3: Outline Onshore WMP**.

1.2.1.2 This Outline Offshore WMP includes consideration of any potential dredging required to enable to Proposed Works Offshore. However, there is no indication that dredged material is contaminated, and given that it is proposed to be disposed within the Sub Lease Area, part of the Offshore Site, dredged material will not be treated as a waste and instead will be subject to and controlled under a Dumping at Sea (DaS) permit.

1.2.1.3 Dredged material is included in this document, not as a waste, but for completeness as the waste management measures outlined can also be relevant to dredged material in principle. Furthermore, the measures outlined in this document will help ensure the dredged material is managed appropriately and does not become a 'waste' material.

1.3 Roles and Responsibilities

1.3.1.1 It is important to set out the roles and responsibilities of the various parties involved with the Proposed Works Offshore to ensure that waste management obligations are managed effectively from the start of the decommission process. **Table 1.1** summarises the key roles and responsibilities to be defined during the Proposed Works Offshore and implementation of the Detailed Offshore WMP developed by the appointed Principal Decommissioning Contractor.

1.3.1.2 The Detailed Offshore WMP will be a live document during works and will be kept at the site for reference and must be accessible to all site operatives.

Table 1.1: Summary of Roles and Responsibilities to be Defined in the Detailed Offshore WMP

Party	Description	Responsibility
Arklow Energy	The Applicant is Arklow Energy Limited (referred to as "Arklow Energy").	Arklow Energy has overall responsibility for Offshore WMP. The Detailed Offshore WMP will include a joint declaration between the appointed Principal Decommissioning Contractor and Arklow Energy to ensure that the waste Duty of Care is complied with and to take all reasonable steps to ensure that materials are handled efficiently and waste is managed appropriately. Good practice promotes the early adoption of the Detailed Offshore WMP by the design team so that waste minimisation can be optimised throughout the planning process. Where necessary, any planning developments would be reflected in the Detailed Offshore WMP.
Waste coordinator (on behalf of Arklow Energy)	Waste Coordinator Appointing a waste coordinator is not a legal requirement; however, it will ensure that the waste objectives are met	Arklow Energy is responsible for the appointment of a waste coordinator (who could also be done through the Principal Decommissioning Contractor). Appointment of a waste coordinator would initiate the Detailed Offshore WMP process early and drive the waste objectives during the detailed design. (A waste coordinator is not yet appointed).
Principal Decommissioning Contractor	Contractor appointed to execute Proposed Works Offshore (not yet appointed).	The Principal Decommissioning Contractor (or appointed sub-contractor) will be responsible for managing the Proposed Works Offshore and will be responsible for producing the Detailed Offshore WMP (in accordance with this Outline Offshore WMP) and ensuring the Detailed Offshore WMP is implemented, monitored, reviewed and updated, during the works.
Subcontractor(s)	Subcontractors for the Proposed Works Offshore (appointed by the decommissioning contractor).	It is recommended that subcontractors working under the Principal Decommissioning Contractor produce their own detailed Offshore WMP in accordance with the measures outlined in this Outline Offshore WMP.

2 Description of Proposed Works Offshore and Waste Generation

2.1 Overview

2.1.1 Programme

2.1.1.1 The Proposed Works Offshore are anticipated to include two main campaigns:

- First campaign, focused on the decommissioning of WTGs and met mast; and
- Second campaign, focused on the decommissioning of TPs/MPs, scour protection removal and inter-array and offshore export cable removal; as well as post-decommissioning surveys.

2.1.1.2 Specific dates for each of the campaigns are not know at this stage, mainly because:

- Proposed Works Offshore will be undertaken when seabed level conditions are favourable for safe vessel access and to minimise the extent of dredging works required or avoid them all together, which may result in the Proposed Works Offshore being staged in different years; and
- Proposed Works Offshore will be programmed during favourable weather / sea state conditions to reduce the risk of downtime and risks to personnel (i.e. between May and October).

2.1.2 Pre-decommissioning Activities

2.1.2.1 Pre-decommissioning surveys will be undertaken within 6 weeks in advance of the commencement of each campaign in order to confirm bathymetric conditions, identify any obstructions and hazards, and update the decommissioning methodology (e.g. inform jack-up barge (JUB) penetration depths) and programme to be implemented by the appointed Principal Decommissioning Contractor, as required.

2.1.2.2 Should pre-decommissioning surveys indicate the likely need for localised dredging, additional pre-dredging bathymetric surveys within the Sub Lease Area will be undertaken a minimum of three days before dredging works commence to confirm bathymetry conditions and refine dredging / disposal areas, volume estimates and methodologies.

2.1.2.3 A **Pre-Decommissioning Audit** will be undertaken to verify the key materials and components present, and to evaluate their potential for reuse and recycling, aligning with the EPA's Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects (2021).

2.1.3 Dredging

2.1.3.1 Dredge material is estimated to arise from the Proposed Works Offshore. Mainly resulting from:

- Dredging potentially needed to provide safe vessel access to the WTGs and met mast; and
- The seabed material inside the monopiles (also referred to as 'soil plug').

2.1.3.2 All the dredged material is expected to be disposed of at sea, and be regulated under a DaS Permit.

2.1.3.3 During the pre-decommissioning surveys the volumes of dredging needed to allow safe movement of the needed vessels will be confirmed, ensuring these are kept within the limits / requirements of the DaS permit that Proposed Works Offshore will be required to secure from the Environmental Protection Agency (EPA).

2.1.3.4 **Table 2.1** summarises the likely maximum quantities of dredged material and the amounts that may be disposed at sea.

Table 2.1: Quantities arising from dredging activities

Material	Volume of Arisings (m³)	Estimate reuse onsite (m³)	Estimate disposal at sea (m³)	Estimate disposal at land non-hazardous (m³)	Estimate disposal at land hazardous (m³)
Dredging for vessel access	Up to 191,827.48*	0	191,827.48	0	0
'Soil Plug'	968	0	968	0	0

Notes: **Dredging volumes to allow for vessel access vary depending on the target seabed level, but this has been assumed as a maximum volume.*

2.1.4 General Decommissioning Activities

2.1.4.1 Components, particularly rotor blades, the met mast, transition pieces, monopiles and tower sections, may be cut into smaller sections to facilitate safe handling, transfer to shore and temporary storage. The port facility to be used for the Proposed Works Offshore, and the Principal Decommissioning Contractor responsible for onward transfer and treatment of the recovered materials and wastes, have not yet been confirmed. Once appointed, the Principal Decommissioning Contractor will transfer the segregated waste streams from the selected port or temporary storage area to appropriately authorised waste management facilities.

2.1.4.2 Any accessible scour protection sandbags identified during pre-decommissioning surveys will be recovered using a support vessel equipped with MBES (Multi-Beam Echo Sounder) and a grab dredger, which will lift individual sandbags to a skip on a supporting barge. The sandbag material will be managed as waste onshore, while the original sand fill will be returned to the seabed via controlled side-casting.

2.1.4.3 The offshore export and inter-array cables will be fully recovered using a multicat vessel. Cables will be located and unburied using a grapnel "under-run" or similar technique, then pulled aboard with clamps/cable puller systems at low tow speeds to minimise seabed disturbance. Recovered lengths will be cut into short, manageable sections and containerised for safe transport to port, enabling downstream segregation and recycling of metal conductors where practicable.

2.2 Initial Review of Waste Generated Anticipated

2.2.1 Introduction

2.2.1.1 This section summarises the anticipated waste streams (based on information available at the time of reporting), and outlines management options based on the constraints and opportunities of the Proposed Works Offshore.

2.2.1.2 Recovery rates[1] and waste material breakdown have been estimated based on publicly available information, known turbine material composition and represent the potential viable recovery rates for each of the expected waste type.

2.2.1.3 It would be the responsibility of the Waste Coordinator to confirm the waste streams, anticipated volumes and suitable management options upon appointment and up to the point of commencing the Proposed Works Offshore. In addition, Arklow Energy will ensure that any additional requirements such as waste licenses or permits are obtained to ensure full compliance with relevant legislation.

2.2.2 Wind Turbine Generators, Met Masts and Monopiles

2.2.2.1 **Table 2.2** below summarises the estimated waste types and volumes expected to arise from the Proposed Works Offshore, the expected waste type arising from each of the ABWP offshore

[1] Construction & Demolition Waste Statistics for Ireland, EPA. Accessed: March 2026. Available at: https://www.epa.ie/our-services/monitoring--assessment/

components has been estimated using publicly available[2] information and technical details on each of the Proposed Works Offshore components, but exact volumes are not known.

Table 2.2: Quantities of waste estimated from WTGs, Met Mast and Monopiles

Material	Mass (t)	Estimate reuse offsite (%)	Estimate recycle (%)	Estimate disposal non hazardous (%)	Estimate disposal hazardous (%)
WTG (including tower, rotor blades and nacelle) total weight for 7 WTG: 2,759 t					
Steel and Iron (17 04 05)	2,370.9	0	95 – 100	5 - 0	0
Cables (17 04 11)	82.8	0	90 – 100	10 – 0	0
Aluminium (17 04 02)	14	0	90 – 98	10 - 2	0
Rotor blades, mixture of polymer materials, fibre glass and carbon composites (17 09 04)	326.3	0	0 - 100[3]	0	0
Electronic components (16 02 13* / 16 02 14) 20% of the electronic components are assumed to be contaminated with Hazardous materials (e.g. insulating oils)	TBD*	0	50 - 70	40 – 24	10 – 6
Lubricants / oils (13 01 xx* / 13 02 xx*)	7.2	0	0 - 100	0	100 - 0
Met Mast total weight 10 t					
Steel and Iron (17 04 05)	10.0	0	95 – 100	5 - 0	0
Electronic components (16 02 14)	TBD*	0-100	50 - 70	50 – 30	0
Transition Pieces (for WTG TP 1 to 7, 132 t each, and Met Mast TP, 35 t) total weight 959 t					
Steel and Iron (17 04 05)	959	0	95 – 100	5 – 0	0
Aluminium (17 04 02)	3.5	0	90 – 98	10 - 2	0
Monopiles (for WTG MP 1 to 7 and Met Mast MP) total weight 646.49 t to the assumed cutting depth.					
Steel and Iron (17 04 05)	724.2	0	95 – 100	5 –0	0

[2] Offshore Wind in and around the Irish Sea, Agile Cymru, CATAPULT Offshore Renewable Energy. May 2025. Available at: https://cms.ore.catapult.org.uk/wp-content/

[3] The preferred approach is to recycle or repurpose the fibreglass composite materials arising from the wind turbine blades, where technically and commercially practicable and where suitable facilities and market capacity are available in Ireland at the time of decommissioning. The market for recycling and repurposing fibreglass composite materials is continuing to develop. Available options will therefore be kept under review and selected at the point of execution of the Proposed Works. If suitable recycling or repurposing options are not reasonably available at the relevant time, the materials will instead be managed through an appropriate recovery pathway in accordance with applicable legal and regulatory requirements and the waste hierarchy.

Notes: Rotor blades are made by complex layered mixtures of polymer materials, fibre glass and carbon composites that limit its recycling. ***To Be Defined (TBD):*** *Electronic components and WEEE quantities are not separately quantified in the supplied component weight schedule. These quantities will be confirmed through the pre-decommissioning audit and segregated from bulk metallic streams where practicable prior to transfer to authorised treatment routes.*

2.2.3 Cables and Scour protection

2.2.3.1 **Table 2.3** below summarises the estimated waste types and volumes expected to arise from the Proposed Work Offshore, the expected waste type arising from each of the ABWP Phase I offshore infrastructure components has been estimated using technical details, but exact volumes are not known.

Table 2.3: Quantities of waste estimated from Export cable, Inter-array cable and Scour Protection

Material	Mass (t)	Estimate reuse offsite (%)	Estimate recycle (%)	Estimate disposal non hazardous (t)	Estimate disposal hazardous (t)
Offshore Export Cable and Inter-array Cable					
Cables (17 04 11)	380.64	0	90 – 100	0 – 38.1	0
Cables (17 04 11)	102.49	0	90 – 100	0 – 10.2	0
Scour Protection					
Scour protection - Terrafix soft rock sandbags filled with seabed sediments (17 02 03)	TBD*	N/A	N/A	N/A	N/A

Notes: ***To Be Defined (TBD):*** *The latest bathymetry survey, conducted in 2025, did not record the presence of any sandbags within the Sub Lease Area, which are assumed to have degraded, moved or be buried. Therefore actual volumes of Scour protection removed cannot be anticipated.*

3 Legislation, Policy and Objectives

3.1 Introduction

3.1.1.1 This section of the Outline Offshore WMP describes the overarching principles of waste management. The key principles and targets are summarised in this section and are used to develop project specific objectives and targets.

3.2 Waste Regulatory Framework

3.2.1.1 The principal waste legislation for the Proposed Works Offshore is the Waste Management Act 1996, as amended (the Act). This Act provides the main legal framework for waste prevention, collection, transfer, recovery and disposal in Ireland, and requires waste to be managed without causing environmental pollution. Associated regulations include the Waste Management (Collection Permit) Regulations 2007, the Waste Management (Facility Permit & Registration) Regulations 2007, as amended, the Waste Management (Licensing) Regulations 2004, as amended, and the Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013, as amended.

3.2.1.2 The Waste Hierarchy applies to all project wastes under Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste, as amended (the Waste Framework Directive) , and as implemented in Ireland by the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) and the European Union (Waste Directive) Regulations 2020 (S.I. No. 323 of 2020). The Proposed Works Offshore will therefore prioritise prevention, preparing for re-use, recycling and recovery ahead of disposal.

3.2.1.3 In policy terms, this Outline Offshore Waste Management Plan has also been prepared having regard to A Waste Action Plan for a Circular Economy: Ireland's National Waste Policy 2020–2025, the Whole-of-Government Circular Economy Strategy 2022–2023 and the National Waste Management Plan for a Circular Economy 2024–2030. Together, these documents support waste prevention, stronger segregation, higher-value re-use and recycling, improved by-product and end-of-waste pathways, better domestic treatment capacity and reduced reliance on disposal.

3.2.1.4 The Circular Economy and Miscellaneous Provisions Act 2022 (No. 26 of 2022) and the Whole of Government Circular Economy Strategy 2026-2028 support this approach by promoting resource efficiency, longer material use and higher-value recovery. For the Proposed Works Offshore, this means that decommissioning methods and waste routes will be selected to maximise re-use, refurbishment, recycling and recovery where practicable.

3.2.1.5 The Regional Waste Management Plan for the purposes of waste planning, Ireland has been divided into three waste regions, namely the Eastern-Midlands Waste Region, the Southern Waste Region and the Connacht-Ulster Waste Region. The Proposed Works Offshore are situated within the Eastern-Midlands Waste Region (EMWR), which comprises 12 no. local authority areas covering counties Dublin Kildare; Louth; Laois; Longford; Meath; Offaly; Westmeath; and Wicklow. A Regional Waste Management Plan was developed for each region to provide a framework for the prevention and management of wastes in a safe and sustainable manner. The current waste plan for the EMWR is the Eastern-Midlands Region Waste Management Plan covers 2015 – 2021. The Waste Action Plan for a Circular Economy (WAPCE) stated that the three existing regional waste management plans will be replaced by a new single National Waste Management Plan for a Circular Economy (NWMP), which will contain targets for reuse, repair, resource consumption, and reducing contamination levels. The NWMP 2024 - 2030 was published in early 2024 after being subject to a Strategic Environmental Assessment, an Appropriate Assessment and a pre-draft consultation. The NWMP will be in respect of the Local Authority administrative areas, with the lead authority for the Eastern-Midlands Region (EMR) being Dublin City Council (DCC).

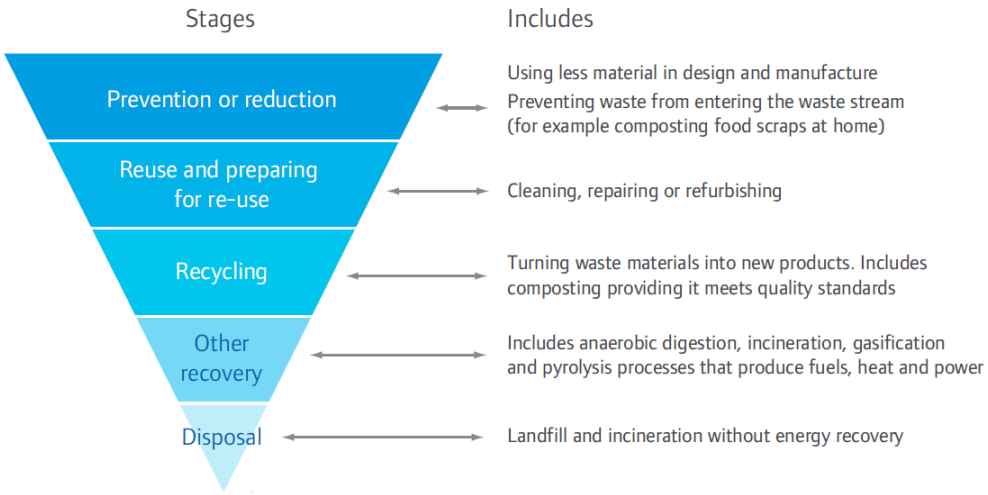


Figure 1: Waste Hierarchy

3.2.1.6 All waste streams will be classified using the List of Waste[4] and relevant EPA guidance before they leave the Offshore Site or any associated port facility.

3.2.1.7 Waste may only be transferred by holders of an appropriate authorisation under the Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007), as amended, and may only be accepted at facilities authorised under the Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007), as amended, or under an EPA licence, as applicable. Where a third party arranges recovery or disposal on behalf of the Project, the Waste Management (Registration of Brokers and Dealers) Regulations 2008 (S.I. No. 113 of 2008) may also apply.

3.2.1.8 If any waste is exported for specialist treatment, recovery or disposal, the movement will be regulated under the Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) and the applicable EU waste shipment regime. This may be relevant for specialist hazardous or composite waste streams where suitable treatment capacity is not available in Ireland.

3.2.1.9 Any disposal of dredged material or other material at sea will require compliance with the Dumping at Sea Act 1996 (No. 14 of 1996), as amended, and the applicable EPA permitting process. This is relevant to the Proposed Works Offshore where dredging may be required for vessel access or monopile removal.

3.2.1.10 Under the Waste Framework Directive Member States must achieve 70% of material recovery of non-hazardous, non-soil-and-stone Construction and Demolition waste by 2020.

3.3 Local Council Targets

3.3.1.1 At local level, the Proposed Works are located within the jurisdiction of County Wicklow.

3.3.1.2 The current national local-authority waste planning framework is the National Waste Management Plan for a Circular Economy 2024–2030, which was adopted by all 31 local authorities in February 2024.

3.3.1.3 Wicklow County Council also applies the County of Wicklow (Segregation, Storage and Presentation of Household and Commercial Waste) bye-laws 2018. While these bye-laws are primarily relevant to household and commercial waste, they are applicable to any commercial-type waste arising from onshore support compounds, offices, welfare facilities, warehouses or marshalling areas used by the Proposed Works within County Wicklow. These bye-laws are only applicable to the Proposed Works Onshore. No disposal or management of offshore components is proposed within County Wicklow. Waste generated from the Proposed Works Onshore (e.g.

[4] Guidance on the Interpretation and Application of List of Waste Entries and Sub-Entries. Environmental Protection Agency (EPA), February 2025. Available at: https://www.epa.ie/

the onshore substation and associated infrastructure) is addressed separately within **Volume 3, Appendix 3.3: Outline Onshore WMP**.

3.4 Duty of Care

3.4.1.1 Any person or contractor engaged in the collection of waste on a commercial basis is required to hold a Waste Collection Permit in accordance with the requirements of the Waste Management (Collection Permit) Regulations 2007, as amended. A Waste Collection Permit is issued to appropriate contractors by the National Waste Collection Permit Office (NWCPO). Waste materials collected by a suitably permitted waste contractor must only be transported to appropriately permitted or licensed waste facilities. Authorisation for receiving waste materials are provided in accordance with the Waste Management (Facility Permit & Registration) Regulations 2007, as amended, for waste permits and certificates of registration (COR) granted by the relevant Local Authority. Waste management authorisations granted by the Environmental Protection Agency (EPA) are issued in accordance with the Waste Management (Licensing) Regulations 2004, as amended, and the Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013, as amended..

3.4.1.2 To demonstrate compliance, Arklow Energy and its contractors will implement an auditable waste control system through the Detailed Offshore Waste Management Plan. That system will:

- Assign clear responsibilities for waste classification, segregation, storage, transfer approval, documentation and incident reporting;
- Identify each waste stream by source, description, List of Waste code and hazardous / non-hazardous status before off-site transfer;
- Verify that all collectors hold a valid waste collection permit and that all receiving facilities hold the relevant authorisation;
- Keep a record for each load showing the waste stream, quantity, origin, carrier, permit details, destination, receiving facility and intended recovery / disposal route; and
- Retain supporting evidence, including transfer records, receipt / acceptance evidence, inspection records and incident reports.

3.4.1.3 For the Proposed Works Offshore location, the only mandatory electronic waste tracking system specifically identified is for hazardous waste moved within Ireland under the European Communities (Shipments of Hazardous Waste Exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011).

3.5 Project Waste Management Objectives

3.5.1.1 A list of proposed waste objectives for the decommissioning works is provided in **Table 3.1**. These combine general objectives and specific targets, based on national and local policy framework, best practice guidance and professional judgement.

Table 3.1: Proposed Waste Objectives

No.	Objective	Basis
1	Waste should be managed in line with the Waste Hierarchy	Priority must be given to waste prevention, followed by reuse on-site, efficient recycling, recovery and disposal as a last resort.
2	Waste should be managed following a good practice approach	Arklow Energy will adopt an emphasis on the upper levels of the Waste Hierarchy (waste prevention and reuse on-site) and the development of effective systems (e.g. Key Performance Indicators (KPIs)) to implement and monitor the Offshore WMP.
3	Waste should be managed as sustainably as possible	When identifying suitable waste management options, Arklow Energy will take into consideration the relative economic, social and environmental advantages and disadvantages of the options available.
4	The project should aim to divert as much waste as possible from landfill through prevention, reuse, recycling and recovery where practicable.	Estimated volumes of arisings have been provided by the project team (see **Section 2.1.4**). These are to be confirmed by the Principal Decommissioning Contractor once appointed. At this stage a target diversion from landfill of >70% is proposed for decommissioning wastes; generally accepted best practice aims towards >95% diversion from landfill where feasible.

No.	Objective	Basis
		The Detailed Offshore WMP will determine in greater detail the achievability of these targets and strive for a good practice approach.
5	Minimise greenhouse gas emissions	The Detailed Offshore WMP will take into account the wider sustainability agenda, considering energy/ fossil fuel consumption and the overall efficiency of recycling and recovery operations, including transport.
6	Waste should be managed with due regard for Health and Safety	Waste management has a significant interface with health and safety. Health and safety must be taken into account when assessing waste management options and where necessary may be an overriding factor in determining waste management options.

4 Waste Management

4.1 Introduction

4.1.1.1 In line with the Waste Hierarchy, priority must be given to waste prevention. Waste minimisation measures are outlined in **Section 4.2**. After minimisation measures, remaining waste must be managed in line with the objectives listed in **Section 3.5**. Management options are proposed in **Section 4.2**.

4.1.1.2 The Detailed Offshore WMP will be maintained as a live document by the Principal Decommissioning Contractor, providing further details on how the measures will be implemented prior to commencement of works. There will also be a requirement during Proposed Works Offshore for continual monitoring of waste and review of waste arisings against that predicted to demonstrate compliance with the waste management objectives and measures proposed.

4.2 Waste Minimisation Measures

4.2.1.1 Recommended measures to achieve the waste objectives in **Table 3.1** for the Proposed Works Offshore are set out in **Table 4.1**.

4.2.1.2 Given that the Proposed Works Offshore comprise decommissioning infrastructure, there is inevitably limited opportunity for minimising wastes. Some of the minimisation measures outlined in this table consider measures for maximising reuse/recycling opportunities rather than purely minimising waste generation.

Table 4.1: Recommended Waste Minimisation Measures

Waste Minimisation Measure Standard Practice Good Practice Best Practice	Practice
Project-wide materials inventory and pre-demolition audit	Prepare and maintain a project-specific materials inventory and pre-decommissioning / pre-demolition audit before Proposed Works Offshore commence, using design records, maintenance data and verification surveys to identify materials, hazardous constituents and likely reuse/recycling outlets. This is consistent with Best Practice Guidelines or the preparation of resource & waste management plans for construction & demolition projects (2021) and Decommissioning of Offshore Renewable Energy Installations (2019) both of which emphasise early inventorying, accurate characterisation and updating of the waste picture as the project develops.
Education and awareness	Waste minimisation should be underpinned by education and awareness throughout all levels of the project team, from the design team to the Principal Decommissioning Contractor on-site who would handle the decommissioning materials. Personnel should receive awareness training via e.g. site inductions and tool-box talks which all site workers would attend before working on site. Records of training received would be retained.
Detailed Offshore WMP and pre-approved waste routes	The Detailed Offshore WMP should define waste streams, segregation requirements, documentation, authorised carriers/facilities and review procedures before offshore removals begin. Offshore decommissioning guidance highlights the need for an active waste management plan, duty of care controls and early confirmation of downstream treatment routes to avoid misrouting wastes or sending material to lower-value outlets.
Blade segmentation to preserve recovery value	Segment rotor blades using a method that protects worker safety and preserves clean composite fractions for potential downstream recycler. Guidance on blade recycling stresses that transport and handling logistics are a major constraint, so cutting strategy, containment and early coordination with the receiving facility are important to avoid contaminating the material and losing recycling options.
Rotor blade circularity plan	For rotor blades, prepare a dedicated blade management plan that assesses the Waste Hierarchy. Rotor blades are widely recognised as the most challenging wind turbine waste stream because they are composite materials. Sector guidance recommends planning blade transport, segmentation and

	recycling routes early, and several industry programmes are now scaling chemical and material recovery routes to avoid landfill.
Met mast sensor and instrument recovery	Remove met mast instruments, sensors, cabling, batteries and electronic units separately from the steel lattice/tower structure so that reusable equipment and Waste Electrical and Electronic Equipment (WEEE) streams can be directed to refurbishment or specialist recycling routes. This follows the same offshore decommissioning principles used in oil and gas for accurate materials inventories, reuse assessment and segregation of electronic and potentially hazardous components from bulk steel.
WTG tower and nacelle pre-strip	Before lifting or cutting WTG tower and nacelle sections, remove or drain oils, lubricants, hydraulic fluids, batteries and WEEE/electrical subcomponents, and keep these streams separate from clean metallic fractions. This reduces contamination of recyclable steel and non-ferrous metals and aligns with offshore oil and gas waste guidance on hazardous waste characterisation, segregation and duty of care.
Transition piece clean-steel recovery	Prior to cutting and lifting transition pieces, remove loose internals, ladders, cables and ancillary equipment where practicable so that the bulk TP steel can be recovered as a cleaner metal stream.
Survey-led dredging minimisation	Use pre-decommissioning and, where needed, pre-dredging bathymetric surveys to refine the dredge footprint, confirm volumes and avoid generating unnecessary dredged material.
Scour protection selective recovery	Where residual scour protection sandbags or associated material are found, undertake targeted recovery only for confirmed items and separate the geotextile/bag material from recovered infill material as far as practicable.
Inter-array and export cable recovery and segregation	Recover cables using a route-specific strategy that maximises recovery of recyclable copper, steel and polymer fractions, while minimising seabed disturbance. Agree the onshore receiving and recycling route before offshore retrieval begins, including requirements for section length, contamination tolerance and packaging/containment.
Port and yard segregation controls	At the marshalling port and dismantling yard, keep major waste streams (e.g. ferrous metals, non-ferrous metals, cables, WEEE, oils, hazardous waste and composite materials) in dedicated, labelled storage areas/containers to protect quality and traceability.
Repurposing and reuse challenge process	Introduce a formal decision gate for high-value components and materials (particularly steel sections, instruments and cables) so that disposal is only selected after reuse, refurbishment, repurposing and recycling options have been demonstrably assessed.

4.3 Material Management Options

4.3.1.1 For each of the materials forecast to arise from the Proposed Works Offshore, an assessment of the best management option has been carried out following the Waste Hierarchy.

4.3.1.2 Waste materials will be segregated on-site to achieve the best recycling rates and highest value use. Management options are presented in **Table 4.2**. The options identified are presented as suggestions for consideration. Some of these options may not prove to be practicable due to site or programme constraints. It would be the responsibility of the Principal Decommissioning Contractor and/or Arklow Energy to identify the practicability of whether certain waste materials are reused or recycled.

4.3.1.3 Facilities chosen will be assessed to ensure that their recycling performance meets or exceeds industry best practice and compares favourably with other suitable sites in the area.

4.3.1.4 It would be the responsibility of the Principal Decommissioning Contractor to confirm the waste streams, anticipated volumes and suitable management options upon appointment and up to the point of commencing decommissioning. In addition, the Principal Decommissioning Contractor would ensure that any additional requirements such as waste licenses or permits are obtained to ensure full compliance with relevant legislation.

Table 4.2: Anticipated Waste Streams during the Proposed Works Offshore

Waste Streams Anticipated	European Waste Code(s)	Activity Generating the Waste	Anticipated Quantities of Waste Arising	Anticipated % Waste Diverted from Landfill *	Management Options
*green: majority diverted from landfill, amber: >50% diverted, red: majority sent to landfill)					
Scour protection sandbags (once emptied)	17 02 03	Scour protection - Terrafix soft rock sandbags.	Undetermined	Plastic Packaging target >55%	Sandbags used as Scour protection will be removed, emptied and transferred as a material stream (plastic packaging) for recycle at authorised facility. Sand used to fill the Scour protection will be treated as Dredged sediment and handled as Dredged material under the applicable EPA Dumping at Sea permit.
Steel and Iron	17 04 05	WTG Tower, transition pieces and Monopiles decommissioning	Approximately 4,308.6 t	95–100%	Steel and iron arisings will be segregated as a priority material stream and transferred to authorised metal recycling facilities. Prior to cutting and transport, structures will be stripped of loose items and contaminating materials where practicable to maximise recyclability and value recovery. Where feasible, suitable secondary steel components may also be assessed for reuse or repurposing before recycling. Established Irish metal recyclers provide an economically viable option for this waste stream.
Aluminium	17 04 02	WTG Tower decommissioning	Approximately 17.5 t	90–98%	Aluminium will be segregated from mixed metallic waste to preserve material quality and maximise recovery value. Where suitable, reusable items will be identified during pre-strip and dismantling activities; otherwise, the material will be sent for specialist non-ferrous metal recycling through authorised facilities. This is expected to represent a high-value recyclable stream with limited disposal requirement where good segregation is maintained.
Rotor blades	17 09 04	Rotor blade decommissioning	Approximately 326.3 t	100% - blades will be subject to repurposing, recycling or recovery routes	Rotor blades represent the most technically challenging waste stream associated with the Proposed Works Offshore. They will be segmented and transferred to a pre-identified specialist recycling or recovery outlet. Potential routes may include composite repurposing initiatives and specialist recovery / recycling routes, including cement co-processing or emerging composite recycling solutions, subject to contractor confirmation, facility acceptance criteria and shipment controls where required. Early confirmation of a downstream route will be necessary.

Waste Streams Anticipated	European Waste Code(s)	Activity Generating the Waste	Anticipated Quantities of Waste Arising	Anticipated % Waste Diverted from Landfill *	Management Options
*green: majority diverted from landfill, amber: >50% diverted, red: majority sent to landfill)					
Electronic components (WEEE)	16 02 13* / 16 02 14	Removal of nacelle electrical systems, controls, instrumentation, met mast sensors and associated electrical equipment	TBC; to be confirmed by pre-decommissioning audit	50–70%	Electronic and electrical components will be removed separately from bulk structural materials so that reusable items, recyclable WEEE fractions and hazardous subcomponents can be managed appropriately. Non-hazardous WEEE will be directed to authorised WEEE treatment and recovery facilities, while contaminated or hazardous components will be managed separately through authorised hazardous waste routes. Early segregation during decommissioning will be important to maximise reuse and recycling potential and minimise contamination of bulk recyclable streams.
Lubricants / oils	13 01 xx* / 13 02 xx*	Draining of lubricants, hydraulic oils and other operational fluids from WTG and nacelle systems prior to lifting and dismantling	Approximately 7.2 t	Majority diverted from landfill	Oils and lubricants will be drained and removed in advance of lifting and dismantling to reduce spill risk and prevent contamination of recyclable metallic fractions. Suitable waste oils will be directed, where practicable, to authorised recovery or regeneration routes. Contaminated or off-specification oils will be transferred to appropriately authorised hazardous waste treatment facilities. This stream will require management by a specialist hazardous waste contractor with the necessary collection, packaging, documentation and downstream treatment arrangements.
Cables	17 04 11	Recovery of internal WTG cables, inter-array cables and offshore export cable	Approximately 575.7 t	90–100%	Recovered cables will be segregated and stored in a manner that protects material quality and facilitates downstream recovery of copper, aluminium, steel and polymer fractions. The preferred route will be transfer to authorised cable and metal recycling operators. Cable lengths, cutting methods and contamination control will be coordinated with the receiving facility in advance of retrieval to maximise recovery value. This is anticipated to be one of the principal recyclable value streams arising from the Proposed Works Offshore.

Waste Streams Anticipated	European Waste Code(s)	Activity Generating the Waste	Anticipated Quantities of Waste Arising	Anticipated % Waste Diverted from Landfill *	Management Options
*green: majority diverted from landfill, amber: >50% diverted, red: majority sent to landfill)					
General site waste generated	20 01 08 (food waste) 20 01 01 (paper/ card) 20 01 39 (plastics) 15 01 04 (metal cans) 20 03 01 (mixed waste)	Waste arising from vessels, port marshalling areas, welfare facilities, stores, offices and general housekeeping activities associated with offshore works	Minimal	Target >70% diversion from landfill	General operational wastes will be managed through source segregation at port and other support locations. Separate receptacles will be provided for food waste, paper/cardboard, plastics, cans and mixed dry recyclables, with only residual waste directed to general residual waste treatment. The Detailed Offshore WMP will identify the collection arrangements, storage controls and authorised facilities to be used. This stream is expected to be comparatively small relative to the structural and material recovery streams, but good segregation will remain important to meet project waste objectives.
Packaging waste	15 01 04 (metal) 15 01 01 (paper/ card) 15 01 02 (plastic) 15 01 03 (wood)	Packaging associated with consumables, storage, replacement parts, containers and materials used during decommissioning and marshalling	Minimal	Overall target >70%[5] Glass Packaging target >75% Paper and Cardboard Packaging target >85% Metal Packaging target >80% Plastic Packaging target >55% Wood Packaging target >30% Aluminium Packaging target >60%	Packaging waste will be managed in accordance with the principles of prevention, reuse and recycling. Opportunities for supplier take-back, returnable packaging and reuse of pallets, crates and drums will be considered where practicable. Remaining packaging waste will be segregated by material type, including paper/cardboard, plastics, timber and metals, and transferred to authorised recycling facilities. Effective segregation at source is expected to provide a high diversion rate for this waste stream.

[5] A Waste Action Plan for a Circular Economy Ireland's National Waste Policy 2020-2025, Department of Communications, Climate Action and Environment (2020). Available at: https://assets.gov.ie/

4.4 Waste Management Controls

4.4.1 Training and Communication

4.4.1.1 It is the Principal Decommissioning Contractor's responsibility to ensure all site operatives receive training to enable them to identify their roles and responsibilities whilst handling waste during the decommissioning works, including providing awareness of waste minimisation measures (including how incoming packaging material is to be minimised and handled). This would be in the form of inductions and/or tool-box talks.

4.4.2 Recording of Waste Arisings

4.4.2.1 Duty of Care requires an auditable system which records all wastes generated and details their movement. It is the Principal Decommissioning Contractor's responsibility to implement a monitoring system and carry out sufficient auditing of decommissioning waste. Example monitoring templates are provided in **Appendix A: Proposed Offshore Waste Monitoring Template** which provide the minimum level of data that should be collected by the contractor. Data should be collected in digital format.

4.4.2.2 Information would be obtained from the Duty of Care compliance records (e.g. waste transfer notes) and should provide a breakdown of the following:

- Quantity of each waste stream generated;
- Breakdown of waste quantities reused, recycled, recovered or disposed of at landfill, all against the targets set beforehand; and
- Details of waste carriers and disposal facilities.

4.4.3 Ongoing Review of Implementation

4.4.3.1 The Detailed Offshore WMP should be updated as the Proposed Works Offshore progress. This will help to identify which waste streams are not achieving their anticipated recycling potential, so that alternative methods to handle that waste stream can be explored for the remainder of the project.

4.4.3.2 One of the outcomes of the Detailed Offshore WMP would be the production of a record of waste arisings generated, to enable Arklow Energy and Principal Decommissioning Contractor to compare volume and types of wastes being generated against the original estimates

5 Further Actions

5.1.1.1 The Outline Offshore WMP sets the direction for the Detailed Offshore WMP to be produced by the Principal Decommissioning Contractor for management of waste associated with the Proposed Works Offshore.

5.1.1.2 A Detailed Offshore WMP will need to be prepared prior to commencement of the decommissioning works. This should include accurate waste estimates and development of the options for waste management in accordance with the principles detailed herein.

5.1.1.3 The Detailed Offshore WMP is a live document and should be updated during Proposed Works Offshore as required reflecting any changes in conditions or waste management options.

6 References

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Appendix A Proposed Offshore Waste Monitoring Template

Table 1: Record of Decommissioning Waste Arisings – Example Template

Waste stream	LoW code	Waste category [inert, non-hazardous or hazardous]	Forecast amount m^3 / tonnes	Waste minimisation option [design out, reuse, recycle, segregate, offsite sorting, landfill]	Actual amount (Total) m3	Actual amount (breakdown) m^3 / tonnes						
						Reuse onsite	Reuse onsite	Recycled for use onsite	Recycled for use onsite	Sent to transfer facility	Sent to exempt site	Sent to landfill

Table 2: Record of Waste Carriers and Disposal Facilities – Example Template

Waste details		Waste carrier and or broker			Disposal facility This may include more than facility. such as transfer station, treatment facility, landfill. Include details for each facility.		
Waste stream	LoW code	Contractor name	Registration No	Expiry date of registration	Facility name	Licence or permit No	Conditions of licence checked?