Environmental Impact Assessment Report (EIAR) – Volume 2

Chapter 17 – Material Assets – Material Resources, Energy and Waste

Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Port of Waterford Company

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CHAPTER 17

MALONE O'REGAN ENVIRONMENTAL

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All appendices referenced in this document are presented in EIAR Volume III

APPENDICES CHAPTER 17

Appendix 17-1: Port of Waterford Environmental Policy

17 MATERIAL ASSETS – MATERIAL RESOURCES, ENERGY AND WASTE

17.1 Introduction

This chapter documents an assessment of the potential effects that the Proposed Development will have on the supply of material resources, energy and waste infrastructure. It details the mitigation measures that will need to be undertaken where necessary.

During the Construction Phase, the Proposed Development will require various materials for land reclamation and the construction of the wharf extension, the ORE facilities and administrative buildings. The construction work itself will require powered plant and equipment. These works will produce typical construction and demolition ('C&D') wastes.

During the Operational Phase, the Proposed Development will require material resources in the form of fuel for the associated vessels, office / welfare supplies for staff and equipment for the maintenance of the offshore ORE. The Proposed Development will have mains electricity supply requirements and will produce typical office wastes. In addition, waste arising from the support vessels and ORE maintenance will be brought ashore at the port.

17.2 Methodology

The assessment methodology consisted of a desk-based study focusing on relevant legislation and guidance. In addition to the relevant guidance documents listed in Chapter 1 and the relevant legislation, the guidance documents consulted during this chapter included:

- Best Environmental Management Practice in the Building and Construction Sector (European Commission Joint Research Centre ('ECJRC') 2012) [1];
- Waste Action Plan for a Circular Economy 2021-2025 (Government of Ireland, 2020) [2];
- Whole of Government Circular Economy Strategy (Government of Ireland, 2021) [3];
- Circular Economy and Waste Statistics Highlights Report 2022 (EPA, 2024) [4];
- National Waste Statistics Summary Report for 2020 (EPA, 2022) [5];
- National Hazardous Waste Action Plan ('NHWP') 2021-2027 (EPA, 2021) [6];
- Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects (EPA, 2021) [7];
- Guidelines for the Identification and Proper Management of Hazardous Fractions in Construction and Demolition Waste (EPA, 2024) [8]; and,
- Ireland's Environment – An Integrated Assessment (EPA, 2020) [9].

17.3 Receiving Environment

17.3.1 Material Resources

The primary material resources required during the Construction Phase of the Proposed Development will be:

- Dredged materials;
- Rock;
- Aggregates (including infill materials and asphalt);
- Concrete;

- Steel; and,
- Glass.

Table 17-1 below outlines national production figures for the general types of major resources that will be required for the construction of the Proposed Development. The steel figures were sourced at European level [10] and therefore reflect likely disruptions arising from the war in Ukraine, the global energy situation, post-COVID shortages and other global factors. The glass figure was obtained from Statista [11]. The figures for aggregate and concrete-derived materials were drawn from the Irish Concrete Federation ('ICF') [12]. Approximately 50% of all extracted materials (aggregates, rock, sand, etc.) within the EU are utilised within the EU's construction industry [7].

Table 17-1: Annual Production of Various Construction Materials

Construction Material	Production Figure	Year	Relevant Production Area
Aggregates	38,000,000 tonnes	2022	Ireland
Concrete paving/slabs	2,000,000 m^2	2022	Ireland
Ready Mix Concrete	5,000,000 m^3	2022	Ireland
Crude Steel	126,219,000 tonnes	2023	EU-27*
Glass	36,930,000 tonnes	2023	EU-28^

*Figure excludes UK production. There is minimal steel production in Ireland. ^Figure includes UK production.

The material resources that will be required for the Proposed Development during the operational phase will consist of:

- Fuel for the various vessels and the shore-side equipment;
- Equipment for the maintenance and repair of the OREs; and,
- Typical office / welfare supplies for the additional bulk handling terminal, the onshore ORE support offices and the SOV / CTV crews.

The vessels will utilise Marine Gas Oil, which is a high-quality, low-sulphur distillate fuel sourced from crude oil. Its use reduces the environmental effect of shipping. Shore-side equipment will be either electrical (see section 17.3.2 below) or diesel-powered.

The approximate annual fuel requirements at the Port of Waterford in 2023 were:

- 548,379 litres of Marine Gas Oil supplied to ships docked at the Port;
- 59,625 litres of Marine Gas Oil for the tugboats[1];
- 11,500 litres of Hydrotreated Vegetable Oil ('HVO', a renewable diesel alternative) for the pilot launches;
- 130,000 litres of diesel for the three existing loading cranes and bulk handling equipment; and,

[1] In 2023, a total of 92 tugboat transports were carried out (42 single-tug transports and 25 two-tug transports) at a distance of ca. 16km per journey (8km out and 8km back) for a total travelled distance of ca. 1,472km (795 nautical miles). Fastnet Shipping provides tugboat services to the Port of Waterford (Towage/Tugs - Port of Waterford) via use of the 25-ton MT Bargarth (Bargarth - Fastnet Shipping). Based on data provided [44], a fuel efficiency figure of 75 litres/nautical mile was used in the above calculation (75 x 799).

- 10,000 litres of diesel for the loaders and stackers.

The total fuel requirement for 2023 was therefore ca. 749,814 litres (excluding LGV and HGV usage).

The global wind turbine operational / maintenance market, which will be used to source materials for the maintenance and repair of the OREs, is worth ca. €21.7 billion ($25.31 billion) [13].

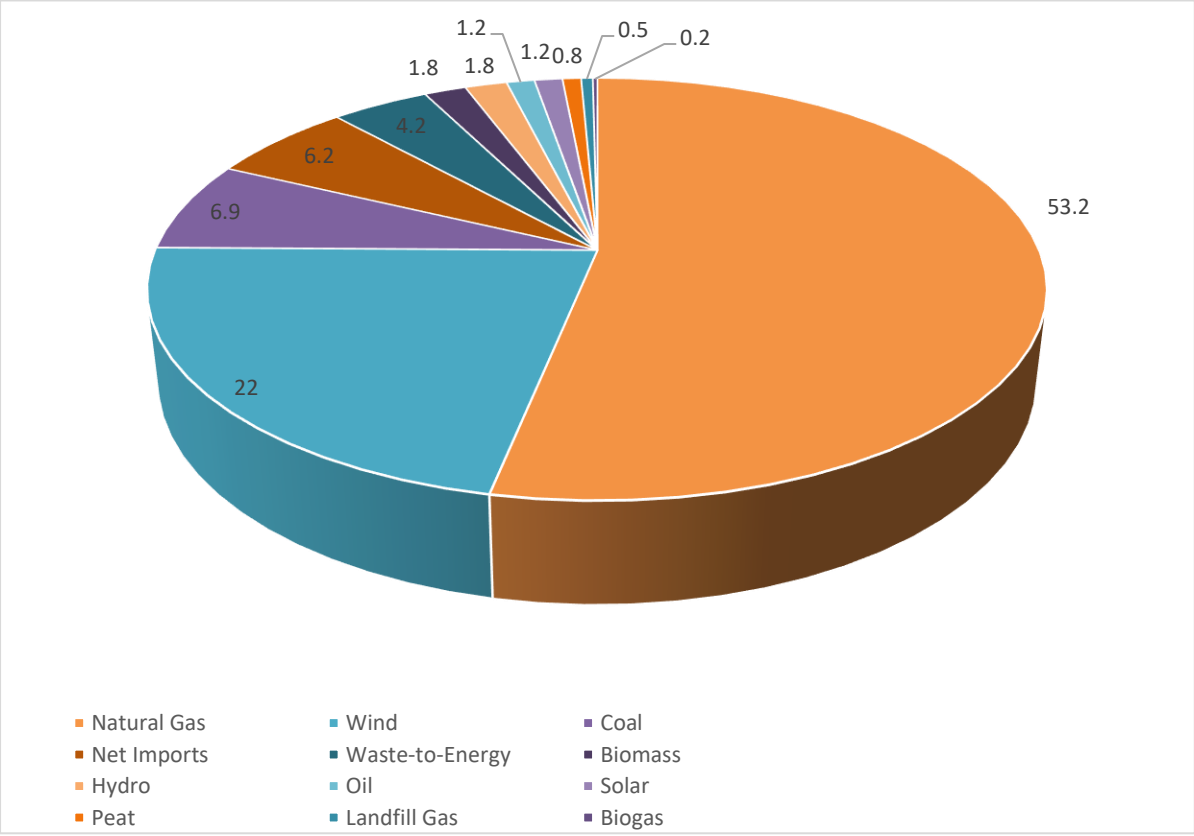
The office and welfare supplies requirement for the Proposed Development will consist entirely of typical stationery, printing and hygiene supplies. Due to the ubiquity of this type of resource requirement, this has been scoped out and is not considered further.

17.3.2 Energy

Total energy production in Ireland in 2023 [14] was 163.8 TWh. After losses from inefficiencies, transformer losses, etc., total energy consumption in the same period was 140.77 TWh. The primary direct source was oil (which provided 78.29 TWh of energy consumed—55.6% of the total), with natural gas providing 19.3 TWh (13.7%) and renewable power supplying 7.37 TWh (5.24%).

Electrical energy provided 31.23 TWh in 2023 (22.2% of total provided power) [14]. The largest single source of electrical energy was natural gas, with wind supplying over a fifth of energy input into electrical generation – see Figure 17-1 below [14].

Figure 17-1: Electrical Generation by Source (%, 2023)



The overall efficiency of electrical supply in Ireland has increased from 33.2% in 2003 to 59.1% in 2023, partly due to increases in the use of high-efficiency gas-fired power plants and the rise in the use of renewable sources such as wind and solar, which are by nature more efficient than fossil fuels [14].

Average peak daily demand on the National Electricity Grid varies seasonally [15]. The highest peak recorded as of August 2025 is 7,502 MW (recorded on 8th January 2025). Night-time demand is typically 65-70% of peak demand.

The energy requirements of the industrial sector in 2023 totalled 24.01 TWh (17.1% of all consumption) [14]. The construction industry sub-sector required ca. 0.76 TWh of energy, representing ca. 3.17% of industrial energy demand. Just over three-quarters (0.58TWh) of this energy was sourced from oil, with a further 17% provided via electrical energy [14]. Energy requirements within construction projects include:

- Provision of electricity to the Site;
- Fuel for plant and equipment;
- Lighting of working sites;
- Office equipment used within site / project management; and,
- Heating / Lighting of welfare / office accommodation.

In 2023, the commercial services sector as a whole required 16.51 TWh of energy, representing an 11.7% share of energy consumption [14]. The majority of this energy (13.02 TWh) was sourced via electricity, with a further 2.02 TWh provided directly from natural gas.

According to the "Energy Reduction and Decarbonisation Summary" document created for the Port of Waterford in 2023 [16], electrical energy usage at the Port of Waterford (Quay Side, offices and Marine Point Common Areas combined) in 2022 totalled 1,436,085 kWh. This included the electricity required to power the electric gantry cranes and the lighting systems.

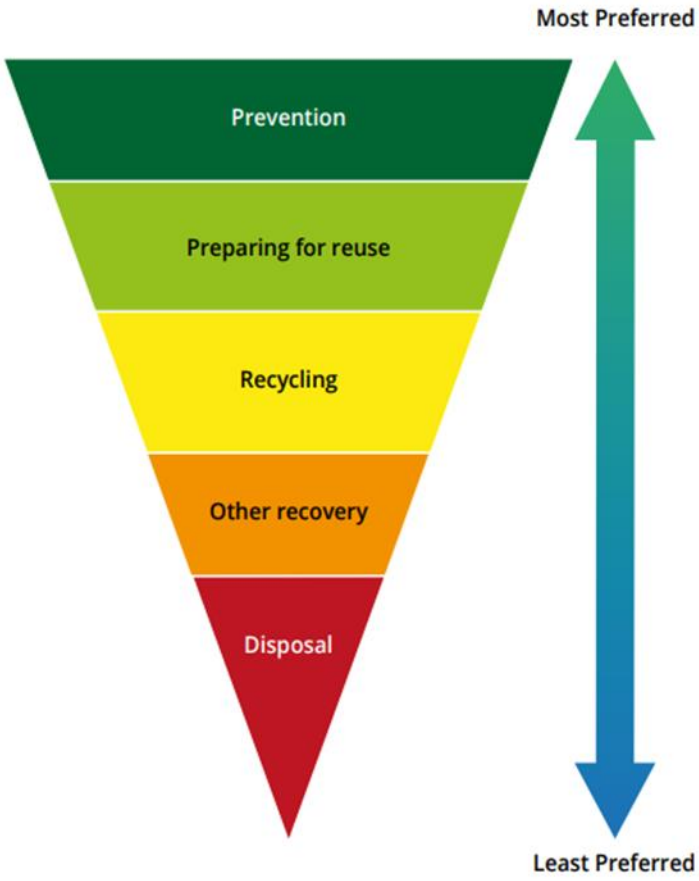
17.3.3 Waste

17.3.3.1 General Waste Environment

In EU Member States, national waste management concepts are set out through Directive 2008/98/EC (the Waste Framework Directive ('WFD') which requires member states to promote re-use and recycling of waste. In Ireland, the WFD was incorporated into national law through the Waste Directive Regulations 2011 (S.I. No. 126 of 2011). The Regulations require that national waste management and waste legislation should take account of the waste hierarchy (see Figure 17-2 below), which sets out the order of preference for the control and management of waste and requires waste prevention to be the first priority.

Projects such as the Proposed Development should seek to 'design out' waste as a matter of principle and then seek to reuse, recycle or recover waste, with final disposal being the last option.

Figure 17-2: Waste Hierarchy



Ireland's national waste management policies for 2020 to 2025 are outlined in the Government's Waste Action Plan for a Circular Economy (2021) [2]. Subsequently, in 2024, the Regional Waste Management Planning Offices collectively produced the National Waste Management Plan for a Circular Economy 2024 – 2030 [17] to set out a framework for the prevention and management of waste. This document includes an ambition of 0% national total waste growth over the lifetime of the plan.

The latest Circular Economy and Waste Statistics Highlight Report on this plan was issued in 2024 and found that general waste production in 2022 stood at 15.7 million tonnes, a decrease of 10.8% on the comparable 2021 figure [4].

The C&D sector generated ca. 8.3 million tonnes of waste in 2022, a slight reduction from the 9 million tonnes generated in 2021 [18]. Soils, natural stones and dredging spoil made up over 6.7 million tonnes (ca. 82%) of this C&D waste [18]. This is a considerable reduction from the 2021 figure of 7.7 million tonnes (85%). One potential factor in this reduction is the increase in the amount of material classed as by-product rather than waste under Regulation 27 of the European Communities (Waste Directive) Regulations 2011 (as amended) – just over 2.6 million tonnes of soil and stone were determined as by-product in 2022, removing this material from the waste stream [18].

The Waste Framework Directive created a 2020 target of 70% (by weight) of non-hazardous C&D waste (excluding natural soils and stone) *"for reuse, recycling and other material recovery (inc. beneficial backfilling operations using waste as a substitute)"*. Ireland met this target, with 80.8% of this waste group being recovered in 2022 [18]. Within the "soils, stones

and dredging spoil" fraction, backfilling[2] was by far the most significant treatment method, with 93% of this waste stream (6.28 million tonnes) treated via backfill [18].

17.3.3.2 Hazardous Waste

A total of ca. 389,908 tonnes of hazardous waste was produced in Ireland in 2022, which included ca. 60,207 tonnes of construction and demolition waste / contaminated soil [19] and ca. 4,700 tonnes of commercial waste [20]. A total of 43% of all hazardous waste produced was treated within Ireland, and 142,961 tonnes of hazardous waste were sufficiently treated within Ireland to permit re-classification as non-hazardous waste [19].

The EPA statistics show that hazardous waste production in 2023 had reduced to 381,764 tonnes, of which just over 49% was treated within Ireland [21]. The reduction from the 2022 figure is largely due to a reduced volume of hazardous soil and stone being accepted.

Exported hazardous waste goes to various other EU countries and to the United Kingdom for treatment and/or disposal. All accepting countries are signatories to the Basel Convention [21].

17.3.3.3 Waste at Sea

The International Convention for the Prevention of Pollution from Ships (the MARPOL Convention) is the major international convention governing marine pollution [22]. It was adopted in 1973, with further protocols and Annexes following in the decades since. Annex IV (27th September 2003) deals with marine pollution arising from ship sewage, and Annex V (31st December 1988) deals with marine pollution arising from waste. This includes a total ban on the disposal of plastic at sea [22].

A total of 158 countries had signed up to the base MARPOL Convention by 2019, with 144 countries being signatories to Annex IV and 154 countries being signatories to Annex V [22]. This means that over 98% of world tonnage is carried by ships flagged to signatory states. All such ships are subject to MARPOL requirements, regardless of where they sail.

On a European level, Directive 2019/883/EU is concerned with "port reception facilities for the delivery of waste from ships". This Directive repealed the earlier Directive 2000/59/EU and amended Directive 2010/65/EU. It was incorporated into Irish law through the European Union (Port Reception Facilities for the Delivery of Waste from Ships) Regulations 2022 (S.I. 351 of 2022). The legislation requires any ship entering an EU port to deliver all waste to the port facilities unless the ship has sufficient storage capacity to hold accumulated waste until the next port-of-call is reached.

As stated in Chapter 1, Section 1.2, the Port of Waterford is ISO14001 certified and an EcoPort. As such, it complies with PERS. It has a Waste Management Plan ('WMP') [23] in place, which is kept under ongoing review and amended as required. The WMP was last reviewed in May 2024, and the next full formal review is due in 2029 [23]. The Harbour Master has the responsibility for ensuring compliance with the WMP.

The Port of Waterford has Standard Operating Procedures ('SOPs') for the landing of ships' waste [23], which the SOP divides into three categories:

- General waste (packaging, bottles, cartons, wood, paper etc;
- Swill (animal-derived items and food waste); and,
- Hazardous waste.

[2] Backfilling is defined as in the WFD as a recovery operation where suitable waste is used for reclamation or engineering purposes in excavated areas or landscaping, serving as a substitute for non-waste materials. The volume of waste used must be only that strictly necessary for the intended purpose.

The SOP includes the requirement for ships to provide the Harbour Master with 'advance waste notification' of the types and quantities of waste to be landed. Waste being landed must be appropriately segregated, identified and packaged.

Under the Port's WMP, waste offloaded from ships is required to be placed into designated containers in the existing waste compound located at the southwestern end of the bulk quays. These containers are emptied on an as-needed basis by a licensed contractor and disposed of as appropriate. Records are maintained detailing all wastes landed from ships and all waste removed from the Port. Hazardous wastes such as oil drums, asbestos and pyrotechnics are not accepted at the Port [23].

In 2021, the Port of Waterford produced a total of 2.49 tonnes of onsite-generated MSW and accepted a total of 10.16 tonnes of ships' waste [23].

17.3.3.4 ORE Waste

Maintenance of wind turbines consists of cleaning, lubricating, repairing and replacing constituent parts, including bearings, gearboxes and the blades. Generally, approximately 90% of each wind turbine as a whole is currently recyclable by standard methods [24]. However, turbine blades are made from a combination of fibreglass and epoxy resin to enable them to withstand high wind conditions. This means that historically, the disposal of worn or damaged turbine blades is both expensive and technically difficult. The growing global use of wind-power and the lifespan of turbine blades have led to an increasing volume of waste blades requiring recycling or disposal. Recent studies indicate that by 2050, annual waste blade material volumes within Europe could reach 325,000 tonnes – with offshore windfarms contributing ca. 78,000 tonnes per annum [25]. Blades for 2MW turbines average 5.8 tonnes, with blade mass increasing in cubic proportion to turbine size [26], while offshore turbines with 10MW capacities may have blades weighing up to ca. 42 tonnes and future generations of offshore turbines potentially having blades of up to ca. 65 tonnes [27]. Based on the target levels for Irish wind energy, blade waste volumes could reach a cumulative total of 120,000 tonnes by 2050 [28].

Research into technically and economically viable solutions, including changes to blade production itself in order to produce recyclable blades, is ongoing [24] with at least one company producing operational recyclable blades [29] and another company developing a technology to allow current epoxy-resin blades to be placed within the circular economy [30]. In addition, a three-year project between various stakeholders aimed at commercialising the value chain for recycling wind turbines began in 2021. This included the use of shredded blade material in cement production and advancing pyrolysis techniques to permit the separation of composite materials [24]. A study of Irish blade waste determined that co-processing blade waste in Germany at a 10% material substitution rate was environmentally better than deposition in Irish landfills, and that theoretical co-processing in Ireland would be environmentally better than co-processing in Germany [28].

17.4 Characteristics and Potential Effects of the Proposed Development

17.4.1 Construction Phase

17.4.1.1 Material Resources

Resource efficiency will be integrated into the project from the planning and design stage through to project completion.

The Construction Phase of the Proposed Development will consist of minimal demolition works, reclamation work and the building of the required structures (including the wharf extension, yard areas, offices and warehouses).

The existing rock armour will be removed and stored for later reinstatement during the final stages of the Construction Phase. The downward access ramp will be demolished, with ca. 3,000m^3 of material from the ramp reused as infill material for the reclamation element of the Proposed Development.

Capital dredging will be required to be carried out locally at the downstream end of the wharf extension to achieve the proposed berth depth of -10mOD Poolbeg. There will be a need to remove ca. 7,000m^3 of material from the riverbed to facilitate the construction of the wharf extension.

Table 17-2 below shows the estimated construction material requirements for the Proposed Development against the typical annual supply of those materials.

Table 17-2: Key Materials used for Construction vs Material Supply

Key Material	Proposed Development Requirements	Annual Supply (latest)	Proportion of Annual Supply Required
Brick/Masonry^	390 tonnes	39,750,000 – 56,750,000 tonnes^	<0.001%
Concrete (inc. piles)*	5344 m^3	5,000,000m^3	0.11%
Concrete paving	5,845 m^2	2,000,000m^2	0.29%
Dredged material~	7,800 tonnes	450,000 tonnes	1.73%
Glass	12 tonnes	36,930,000 tonnes	<0.0001%
Steel (inc. piles)	6,287 tonnes	126,219,000 tonnes	0.005%
Stone (inc. rock armour and aggregates)	182,635 tonnes	38,000,000 tonnes	0.48%
Timber	78 tonnes	1,174,950 tonnes#	0.007%

^ Based on European annual production of 25 billion bricks [31], and 1.59 – 2.27 kg for a standard brick [32]

*Based on requirement of ca.12,825 tonnes and a standard density of 2,400 kg/m^3

~Based on standard density of 1,300kg/m^3 and annual supply of 450,000 tonnes dredged under current licence

#The 2023 forecasted Net Realisable Volume of 20cm+ timber production for ROI and NI was 2,611,000m^3. Sitka spruce is the most common farmed tree in Ireland, with a density of 450kg/m3. [33]

It can be determined from Table 17-2 that the effects of the Proposed Development on the available natural and material construction resources will be not significant.

The impacts arising from materials delivery are assessed in the following chapters:

- Air Quality (Chapter 9);
- Climate (Chapter 10);
- Terrestrial Noise and Vibration (Chapter 11); and,
- Material Assets – Traffic and Transport (Chapter 16).

17.4.1.2 Energy

Energy requirements during the Construction Phase will be met using mains power or battery operation where possible. Where necessary, diesel-powered plant and/or generators may be used.

The total diesel requirement of the Construction Phase (excluding transport) was estimated as been 1,791,455 litres (see Chapter 10, section 4.1 above) across the 18-24 months of the Construction Phase. This calculates to 0.018 TWh of energy[3], which represents 0.46% of the total 2023 oil-derived energy consumption of the industrial sector. It was therefore apparent that the effects of the Proposed Development during the Construction Phase on total energy availability will be not likely and not significant.

17.4.1.3 Waste

Waste management of the Construction Phase will take account of industry guidelines, including the use of the waste hierarchy, and best practice guidelines. The EPA guidance [7] lays out the best practice approach both prior to a construction project (designing for reduced waste and material re-use / recovery and the reduction of over-ordering through planned procurement) and during the active stage (through the management of resources and waste).

The EPA guidelines divide construction projects into Tier 1 and Tier 2 projects. The Proposed Development is a Tier 2 project and will therefore require a bespoke Resource and Waste Management Plan ('RWMP'), which will be submitted to the Planning Authority prior to the works commencing.

The Construction Phase of the Proposed Development will begin with site preparation. This will include the demolition and/or removal of:

- The downstream ramp;
- The existing mooring dolphin;
- The fendering at the downstream end of the wharf; and,
- Steel beams within the downstream end of the wharf.

Some of this removed material will be retained for re-use within the extended wharf (see Section 17.5.1.1 below). Removed material that will not be suitable for re-use will be removed from the Site by licensed waste contractors.

Site preparation will be followed by site reclamation works, consisting of dredging at the downstream end of the extension (to achieve the required depth) and infilling of the area behind the open wharf with imported rock. Suitable dredged material will be retained on-site to be treated and reused as fill material. Dredged material that is not suitable for re-use will be removed to a suitably permitted / licensed facility for recovery and / or disposal.

Following site preparation, sources of waste materials during the Construction Phase will include, but will not be limited to:

- Construction materials from cut-offs and cutting errors;
- Excess materials that cannot be returned to the supplier;
- Damaged/contaminated materials;
- Material packaging / wrapping;
- Waste oil from plant / equipment; and,
- Canteen / welfare waste.

Wastes will consist of materials such as:

- Construction materials such as concrete, bricks, metals, etc;

[3] 1 litre of diesel provides ca. 10kWh of energy

- Glass;
- Plastic;
- Insultation materials;
- Packaging materials;
- Contaminated spill kits;
- Waste oils; and,
- Canteen / food waste.

Table 17-3: Waste Codes and Descriptions

Waste Code	Waste Description	Waste Source
Wastes from MFSU of coatings, adhesives, sealants and printing inks		
08 01 XX	Wastes from MFSU & removal of paint/varnish	Paint
08 04 XX	Wastes from MFSU of adhesives/sealants	Waterproofing/sealants
Oil wastes and wastes of liquid fuels		
13 01 XX	Waste hydraulic oils	Plant/equipment
13 02 XX	Waste engine, gear and lubricating oils	Plant/equipment
Waste Packaging, Absorbents, Wiping Cloths, Filter Materials and Protective Clothing		
15 01 XX	Packaging	Materials packaging
15 02 02*	Absorbents, filter materials, wiping cloth, protective clothing contaminated by dangerous substances	Spill kits
Construction and Demolition Wastes		
17 01 XX	Concrete, bricks, tiles and ceramics	Construction materials
17 02 XX	Wood, plastic and glass	
17 03 XX	Bituminous mixtures, coal tar and tarred products	Paving etc
17 04 XX	Metals (including alloys)	Construction metals and internal wiring
17 05 XX	Soil (including excavated soil from contaminated sites), stones and dredging spoil;	Excavation material
17 06 04	Insultation materials	Building and electrical insulation
17 08 XX	Gypsum-based construction materials	Construction materials
17 09 XX	Other construction and demolition wastes	
Municipal Wastes (Household and similar commercial, industrial and institutional wastes		
20 01 08	Kitchen and canteen waste	From construction staff welfare facilities
20 01 28	Paint, inks, adhesives and resins	Construction materials

Waste Code	Waste Description	Waste Source
20 03 01	Mixed municipal wastes	General site waste

No likely or significant impacts on the waste infrastructure are expected to arise during the Construction Phase.

17.4.2 Operational Phase

17.4.2.1 Material Resources

The Operational Phase of the Proposed Development will have no significant material resource requirements other than fuel.

The Proposed Development will provide support facilities for ORE facilities, including berthing pontoons for ORE support vessels, and will enhance the capacity of the Port of Waterford in terms of berth catering, bulk handling, storage facilities and road and rail links. The Port is a service provider and does not produce goods or materials in its own right. As stated in section 17.3.1 above, the material resources to be considered during the Operational Phase of the Proposed Development will therefore consist of:

- Fuel (for the vessels, loading cranes and bulk handling machinery); and,
- Equipment for the maintenance and repair of the ORE installations.

Each CTV or SOV journey to and from the offshore ORE sites will total ca. 32.4 nautical miles[4]. The Proposed Development has been designed to accommodate each ORE Operator utilising one SOV and up to 2 CTVs, meaning a total of two SOVs and four CTVs.

It has been conservatively estimated that each SOV will make 26 journeys per annum, meaning a total annual travelling distance of ca. 1,685 nautical miles (2 x 26 x 32.4). At a typical fuel efficiency of 20 litres per nautical mile [34], the annual SOV fuel requirements was therefore predicted to total ca. 33,700 litres.

CTV journeys per annum will total 1,460 (4 x 365), meaning a total annual travelling distance of 47,304 nautical miles. At a typical fuel efficiency of 30 litres per nautical mile [35], the annual CTV fuel requirements were predicted to total ca. 1,419,120 litres.

The ORE support vessels will also require fuel for in-field use (e.g., moving between turbines, holding position relative to the turbines and for the generation of onboard electricity). However, the quantities required cannot be calculated at the time of writing (August 2025), as specifics related to the ORE installations (precise number and spacing of turbines, work programmes of the ORE Operators, etc) were not confirmed.

The additional wharf space within the Proposed Development will lead to an increase in the number of tugboat and pilot launch trips required and an increase in the use of the harbour cranes and bulk handling equipment. Based on the expected increase in shipping numbers, the Proposed Development will lead to an additional 46 tugboat journeys per annum at 16km per journey, for an estimated total of 397 nautical miles. At an estimated fuel efficiency of 75 litres per nautical mile (see section 17.3.2 above), the additional tugboat journeys will result in an additional fuel demand of 29,775 litres of Marine Gas Oil. The additional pilot launch trips were therefore predicted to increase HVO requirements by ca. 3,187 litres per annum.

[4] This distance is based on the distance from the Port of Waterford to potential ORE developments of ca. 25km to 30km, provided to MOR Environmental by the Port of Waterford. Conservatively, 30km distance was taken and converted into nautical miles. This figure is an estimate, based on the currently available data; however, sailing to ORE developments located further than 30km will not have a material impact on the conclusion of this assessment.

As set out in Chapter 10 (Section 10.4.2, Table 10-14) above, it was estimated that the increased use of cranes and bulk handling machinery will require an additional 60,000 litres per annum.

The current and estimated future fuel requirements at the Port of Waterford are set out in Table 17-4 below.

Table 17-4: Current and Future Annual Liquid Fuel Needs at the Port of Waterford

Element	Type of Fuel	Annual Fuel Requirements (litres)		
		Current	Additional (est.)	*TOTAL*
SOVs	Marine Gas Oil	N/A	33,700	*33,700*
CTVs	Marine Gas Oil	N/A	1,419,120	*1,419,120*
Ships	Marine Gas Oil	548,379	270,748	*819,127*
Tugboats	Marine Gas Oil	59,625	29,775	*89,400*
Cranes^	Diesel	130,000	60,000	*190,000*
Ancillary Equipment	Diesel	10,000	10,000	*20,000*
Pilot Launches	HVO	11,500	3,187	*14,687*
TOTAL FOSSIL FUEL REQUIREMENTS*		**748,004**	**1,823,343**	**2,571,347**
Total Liquid Fuel Requirements#		759,504	1,826,530	2,586,034

^At the expanded wharf *Diesel and Marine Gas Oil total #Includes the use of HVO

In 2023, Ireland used an average of ca. 81,750 barrels of oil [36] per day, equating to ca. 12,998,250 litres[5] per day or 4,744 million litres per annum. The estimated total fossil fuel requirements of the Proposed Development will therefore account for ca.0.04% of national oil usage.

The Proposed Development will therefore have an imperceptible (and thus not significant) impact on available fuel resources.

17.4.2.2 Energy

Electricity

During the Operational Phase of the Proposed Development, the electrical energy requirements (other than shipping fuel and diesel for the onshore cranes and equipment) will consist of power for the offices, warehouses, lighting and ancillary equipment.

The energy requirements onboard sea-going vessels include onboard equipment, welfare facilities, heating / cooling, lighting, etc. While at sea, these needs are typically met through the use of fossil fuel-powered electrical generators and / or the use of battery storage systems. This fuel usage is included in Table 17-4 above.

Berthed vessels may have their energy needs met by connecting to onshore energy supply infrastructure. This process is known as cold-ironing or Shore-Side Electricity Supply ('SSE'). Article 9 of European Directive 2023/1804 (Alternative Fuels Infrastructure Directive) sets out a TEN-T maritime port target of 31st December 2029 for SSE provision to container ships and

[5] 1 barrel of oil holds 42 US gallons or 158.99 litres

passenger ships. In 2019, a total of 5.9 TWh of on-shore-provided energy was required by berthed ships across 489 EU ports [37].

There is currently no SSE provision at the Port of Waterford. The Port Authority is studying the feasibility of providing SSE for the ORE berths in the future.

Electrical usage at the Port of Waterford in 2022 totalled 1,436,085 kWh, including offices, quay side, lighting and electric gantry cranes [16].

As set out in Chapter 10 (Section 10.4.2, Table 10-14) above, the additional electrical energy demands of the Proposed Development (two gantry cranes for the ORE support, lighting, buildings and ancillary machinery) are expected to total ca. 596,918 kWh per annum. This represents 0.005% of the electrical energy requirements of the commercial services sector.

The impact of the Proposed Development on the energy demand of Ireland will therefore be imperceptible and not significant.

This will be further mitigated by solar panels on the rooftops of the buildings; see section 17.5.2.

Belview Quay is currently supplied with mains electricity via an existing 750kV substation. As part of the Proposed Development, this substation will be replaced with a new 750kV Electricity Substation. The effect of the Proposed Development on the energy infrastructure will therefore be neutral and was deemed to be not significant.

17.4.2.3 Waste

Waste produced during the operational phase of the Proposed Development will include but will not be limited to typical offices wastes (e.g., packaging, plastic, cardboard etc.), hazardous wastes (e.g., toner / printer cartridges, waste maintenance oil, sludge from SuDS oil interceptors), ships' waste from the ORE support vessels (MSW-style waste, food waste and sludge from bilge water interceptors and on-board wastewater treatment systems), waste arising from ORE maintenance (e.g., broken machine / electrical parts and waste hydraulic fluids) and waste from the additional activity at the expanded wharf, including additional landed ships' waste.

The Proposed Development will include a waste handling area to receive and store arising waste. Waste from the onshore elements will be removed to the waste handling area. Waste landed from the SOVs and CTVs will be removed from the vessels and transported to the waste handling area by the relevant crew. Waste will be removed from the Port on an as-needed basis by suitably licensed waste contractors, as per the Port's current WMP and associated SOPs.

Sludge from the CTV / SOV bilge water tanks and SOV on-board wastewater treatment (see section 18.4.2.2 below) will be pumped out by specialist contractors and removed to appropriate treatment facilities.

Waste material from the ORE installations and the MSW-style waste and catering waste from the ORE vessels will be landed at the Port of Waterford. The ORE operators will be responsible for ensuring the landed waste is managed in the same manner as the Port's WMP (see section 17.3.3.3 above). The makeup and weight of this waste cannot be determined at the time of writing (August 2025). However, waste from the SOVs was predicted to reach ca. 5m^3 every two weeks, totalling ca. 65m^3 per annum. Waste from the CTV will be less than that arising from the SOVs, due to the shorter duration of the CTV voyages and the differing maintenance capabilities of the CTVs and SOVs. Therefore, the effect of ORE-related waste, conservatively estimated at ca. 130m^3 per annum, on national waste figures and the national waste infrastructure, will be not likely and not significant.

The increased wharf capacity will lead to an increase in the volume of ships' waste landed at the Port to be managed in line with the port's WMP. However, the total volume of ships' waste landed at the Port in 2023 was 10.16 tonnes [23]. Therefore, the effects of any increase, estimated at less than 5 tonnes per annum, in landed ships' waste will be not likely and not significant.

The MAC issued for the Proposed Development will have a 60-year duration, and a further MAC will be sought at the end of this term. It was envisioned that with continued technological advancements and improvements in engineering practices, operational lifetimes of ORE developments will potentially increase beyond the current typical 25 – 40-year expectancy during the first decades of the planned ORE and that it will be possible to replace turbines / foundations with newer specifications and designs. Any waste arising from such 'repowering' work or from full decommissioning of the OREs will be managed in compliance with all relevant legislation and guidance.

Should the ORE developments be fully decommissioned, the Proposed Development will be used solely for port-related activities. In that event, the WMP will be updated to include any amendments to the use of the structures in place at that time.

Waste arising from the Proposed Development will therefore have a not likely and not significant effect on national and local waste infrastructure.

17.4.3 Unplanned Events

As with all construction projects and industrial facilities, there will be a risk that accidents or unplanned events may occur at the Site and that such incidents could result in a potential risk to the environment. Incidents with the potential to impact material resources, energy and waste include:

- Spillage of wastes;
- Spillage of fuels;
- Extreme weather events such as storm surges;
- Fire; and,
- Power outages.

Such events could impact on the ability of berthed vessels to leave or access the port. This could then affect the energy requirements of the Facility and/or impact on the volume of waste held at the port. There will be a Stand-Alone Emergency Lighting System in place, conforming to NSAI IS 3217:2023 standards[6].

Hazardous waste materials will be stored in lockable containers, which will prevent such wastes from contaminating soil or surface / ground water. All waste storage areas will be fit for purpose and will be contained, bunded or defined. Construction staff and those Port / shipboard staff responsible for waste handling will receive training in the management of waste spills.

There is a bunded area within the Port of Waterford for the storage of containers found to be leaking.

The design of the Proposed Development includes the provision of a single 90,000 litre-capacity fuel tank for each ORE Operator. These tanks will be located in bunds to prevent

[6] The National Standards Authority of Ireland's Standard for the design, installation, commissioning and maintenance of emergency lighting systems Important Update: Irish Standard for Emergency Lighting (I.S. 3217:2023) | NSAI

accidental spillage from the tanks contaminating soil or water. Re-filling of the fuel tanks will be carried out by trained and qualified personnel and will also take place in a contained area.

Extreme weather events are an acknowledged risk factor for any port development. This is assessed in Chapter 10: Climate.

Fire risk will be managed through the Port of Waterford's existing operational procedures.

In the event of a power outage, normal service would be able to resume once mains power is re-established.

17.5 Proposed Mitigation Measures and/or Factors

17.5.1 Construction Phase

17.5.1.1 Material Resources and Waste

The main contractor will prepare a detailed RWMP, which will provide information on the control and management of resources and waste, and detail how potential environmental impacts from construction waste will be controlled. The following guidance will be referred to in the preparation of the detailed RWMP and will be followed during the Construction Phase of the Proposed Development:

- CIRIA C811 – Environmental Good Practice on Site (5th edition) [38];
- CIRIA C532 – Control of Water Pollution from Construction, Guidance for Consultants and Contractors [39];
- C584 – Coastal and Marine Environmental Site Guide for protection of water quality and, in turn, aquatic life, during the Construction Phase of the works [40];
- CIRIA C753 – The SuDs Manual [41]; and,
- Guidance and Protection of Fisheries during Construction Works in and adjacent to Water [42].

The contractor will ensure that all personnel working on-site will be trained and aware of the measures detailed within the RWMP. Efficient use of material construction resources is closely tied to waste reduction measures. Mitigation measures to reduce the demand for material resources and the volume of waste arising will include, but not be limited to:

- The re-use of appropriate demolition materials and dredge material in the reclamation works;
- The re-use of existing rock armour;
- Demolition works will be planned to ensure the maximum possible level of re-use of materials within the Proposed Development itself;
- Clean, non-hazardous and inert demolition materials not suitable for re-use within the Proposed Development will be sent to authorised facilities for reuse, recovery or recycling where appropriate;
- Rock and aggregates required for the Construction Phase will be sourced from local quarries as much as practicable;
- Careful auditing of procurement to reduce excess ordering;
- Materials ordered on 'as needed' basis to reduce excess materials;
- 'Just-in-time' delivery of materials to reduce risk of material spoilage / damage;
- Encouragement of careful working practices to reduce mis-cuts;

- Implement supply chain systems that permit the return of packaging, surplus materials and, where possible, off-cuts; and,
- Segregation of construction waste to maximum recovery / re-use / recycling.

All waste produced through the Construction Phase will be managed in full compliance with all relevant legislation and will only be removed from the Site by appropriately licensed waste carriers. All waste shipments will be correctly documented, and all waste records will be retained.

In the event of hazardous waste being produced during the Construction Phase (including any material removed during site preparation works), such wastes will be segregated, contained, classified, transported and disposed of by appropriately permitted waste handlers in full compliance with all relevant legislation.

17.5.1.2 Energy

A detailed Construction Environmental Management Plan ('CEMP') will be prepared by the main contractor in advance of works commencing. This will include measures for the efficient use of energy during the construction phase, such as:

- Energy-efficiency policies, including an avoidance of unnecessary idling of engines;
- Use of higher-efficiency equipment;
- LED lighting; and,
- Automated lighting systems.

17.5.2 Operational Phase

17.5.2.1 Material Resources and Energy

The Port of Waterford has an Environmental Management System in place which complies with ISO14001 requirements. The Port has also achieved EcoMerit certification and is an EcoPort. The Environmental Policy [43] (see Appendix 17-1) includes the following objectives:

- To reduce consumption of natural resources and to use energy responsibly and efficiently;
- To continuously assess our environmental performance; and,
- To continually improve by setting and reviewing environmental objectives and targets.

The Environmental Policy commits the Port of Waterford to providing the necessary personnel to meet its objectives, raise environmental awareness throughout its staff and promote this awareness to all stakeholders.

The ORE operators will be responsible for developing and operating in strict compliance with their own Environmental Policies that will need to align with the Port's policy.

The buildings (ORE support offices and warehouses) that make up the shore-bound aspect of the Proposed Development will be designed with energy efficiency and the minimisation of power usage as a priority. Lighting will be reduced to a minimum while not in use.

The Proposed Development design includes the provision of ca. 2,100m^2 of PV panels, which will provide up to 273,000 kWh of power, which will reduce the requirement for electricity from the grid and the effect on electricity as a resource.

ORE operators have indicated that future SOV and CTV vessels may be electrically powered in the future. Therefore, the Proposed Development design will be future-proofed to provide for future capacity for electric SOVs and CTVs and for the possibility of the provision of SSE to the ORE support vessels.

17.5.2.2 Waste

All waste generated during the operational phase of the Proposed Development, including all waste landed from the SOVs and the CTVs, will be managed in compliance with all relevant legislation.

The OREs will operate under a preventative maintenance policy to avoid the unnecessary production of waste. During general maintenance, waste arising (such as waste lubricating oil and standard parts removed for replacement) will be returned to shore to be segregated and sorted for reuse or recycling where possible. All wastes received from SOVs and CTVs will be placed into correctly labelled receptacles.

All wastes produced across the Proposed Development will be appropriately segregated prior to storage in suitably identified containers. All such waste will be handled in full compliance with relevant legislation and guidance. All waste will be collected by appropriately licensed waste handlers / carriers.

Records will be retained for each waste consignment, detailing information including the volumes and types of each waste, the recipient, the final destination and the ultimate treatment/disposal method. The Port submits these records to the Sustainable Energy Authority of Ireland ('SEAI') as part of their ECOMERIT certification.

17.6 Cumulative and In-Combination Effects

Within this chapter, the Cumulative and In-Combination Effects assessment has been completed in the context of the national waste, material resource and energy provision. Therefore, all existing developments surrounding the Proposed Development have already been taken into account through the national figures presented in section 17.3.

In terms of waste, the Port carries out maintenance dredging under a Dumping at Sea Permit, issued by the EPA, Reg. No. S0012. However, there will be no cumulative or in-combination effect, as this Permit refers to the sediments that are deposited at a designated location defined within this Permit, in the coastal waters outside the Waterford Estuary. Any other waste generated by the Proposed Development of the Port Activities will be managed by different means, as discussed in this chapter.

Following the implementation of the Proposed Development, total fossil fuel use at the Port of Waterford will represent ca. 0.06% of the national oil usage. Taking into account maintenance dredging, additional ca. 492,000 litres[7] of marine diesel per annum will be required. This will result in a total fuel requirement of ca. 3,078,034 litres annually, or 0.065% of the national oil usage.

The total electrical requirements of the Port of Waterford following the Proposed Development will be ca. 2,033,003 kWh (0.002 TWh). Although the Proposed Development will result in a 42% increase in electrical demand, the total electrical demand will represent only 0.015% of the electrical energy demand of the commercial services sector [14].

The above cumulative effects were considered not significant.

No other cumulative effects in the context of waste, material resources and energy were identified.

[7] The Port of Waterford provided kWh arising from dredging for 2019 (refer to Chapter 10 for more detail and assumptions regarding this data). Plough/bed levelling 1,078,840 kWh + dredging 3,924,000 kWh)=5,002,840kWh = 18,010,224 MJ @ SEAI conversion factor 43.31MJ/kg and SEAI gas oil density of density of gas oil as 845 kg/m3 = 492,123.6 litres or ca. 492,000 litres.

17.7 Interactions with Other Environmental Attributes

The other environmental attributes with which this chapter interacts are:

- Chapter 5 - (Population and Human Health). Excessive requirements for material resources can limit the ability of the population to meet local needs. Improperly managed waste can affect the local population in terms of both health and enjoyment of the environment. Excess pressure on energy systems can lead to energy shortages, which could affect human health. The Construction and Operational Phases requirements of the Proposed Development for material resources and energy, and the anticipated waste production during both Construction and Operation Phases have been assessed in this chapter. It can be concluded that the effects of the Proposed Development will be not likely and not significant. Therefore, the effect of material sources, energy provision and waste management on the local population and human health will be not likely and not significant;
- Chapter 7 - (Soils and Geology). Improperly managed waste can cause soil pollution. The effect of waste arising from the Proposed Development was assessed in this chapter. Due to the volumes of waste arising and the nature of the mitigation measures in place, the effects of waste from the Proposed Development will be not likely and not significant. Therefore, the effect of waste on soils and geology will be not likely and not significant;
- Chapter 8 - (Water). Improperly managed waste can be a source of water pollution. The effect of waste arising from the Proposed Development was assessed in this chapter. Due to the volumes of waste arising and the nature of the mitigation measures in place, the effects of waste from the Proposed Development will be not likely and not significant. Therefore, the effect of waste on water will be not likely and not significant; and,
- Chapter 16 - (Material Assets – Traffic and Transport). The delivery of material resources and the removal of waste will contribute to traffic levels. The effect of the Proposed Development on local traffic levels was assessed in Chapter 16, with the conclusion that the effects would be not likely and not significant. Therefore, the effect of material resources and waste on traffic and transport will be not likely and not significant.

17.8 Indirect Effects

The Proposed Development will provide infrastructure for, and support to, the production of renewable energy. The indirect effect will therefore be to increase the contribution of renewable electricity to the national energy balance and reduce the dependence of the Irish national grid on imported energy. This will result in a slight positive indirect effect.

17.9 Residual Effects

In view of the volumes of material resources required, the effect of the Proposed Development on the various material resources will be not likely and not significant.

The effect of the Proposed Development on energy demands will be not likely and not significant. The effect on the energy infrastructure will be neutral and thus not significant.

The effect of the Proposed Development on waste infrastructure will be not likely and not significant.

17.10 Monitoring

The use of energy and the production of waste will be monitored under the current Environmental Policy.

17.11 Reinstatement

Not relevant.

17.12 Difficulties Encountered in Compiling this Information

It was not possible to determine the total and fully accurate fuel requirements for the CTVs and the SOVs in terms of fuel usage at the ORE installations. The fuel figures provided in this Chapter are estimates based on the distance travelled and fuel usage for typical CTV and SOV vessels.

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