Preliminary Environmental Information Report

Calderdale Energy Park

7 April 2026

Volume 2, Chapter 22 : Materials and Waste
PINS Reference: EN0110023
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Reg 5 (2) (a).

Calderdale energy park

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22 Materials and Waste

22.1 Introduction

22.1.1 This Chapter of the Preliminary Environmental Information Report (PEIR) has been prepared by Nudge Circularity Ltd on behalf of the Applicant and presents the likely significant effects of the Proposed Development upon Materials and Waste. It is based on the environmental information available to date (which is detailed in this Chapter), as well as the current description of the Proposed Development as set out in **Chapter 4: The Proposed Development**.

22.1.2 The focus of this Chapter is on the Turbine Area and Bradford West Cable Corridor. The Materials and Waste assessment for the Access Routes will be provided in the Environmental Statement (ES), once the Applicant has further detailed design information required to assess these aspects.

22.1.3 This Chapter concludes that there are no likely significant effects from the Proposed Development upon Materials and Waste during the operation and maintenance and decommissioning phases. There are also no likely significant effects from the Proposed Development on the construction hazardous waste. However, the Applicant is not yet in a position to rule out potential likely significant effects arising from the construction materials and from construction inert and non-hazardous waste, due to not yet having detailed construction data relating to the Access Routes. This will be assessed further within the Environmental Impact Assessment (EIA) and presented in the ES when the Applicant undertakes further design work.

22.1.4 This Chapter does not include consideration of impacts on Minerals Safeguarding Areas (MSAs) as this will be covered in greater detail as part of the ES and wider DCO Application. A preliminary assessment of the mineral resources that could be affected by the Proposed Development has been provided in this Chapter.

22.1.5 The conclusions of the following topic assessments are relevant to the assessment of Materials and Waste:

- **Chapter 10: Hydrology and Hydrogeology, Geology and Peat**;
- **Chapter 11: Carbon and Climate Change**;
- **Chapter 14: Transport and Access**; and
- **Chapter 23: Other Environmental Matters**.

22.2 Legislation, Policy and Guidance

22.2.1 Key policy, legislation and guidance relating to Materials and Waste and of relevance to this preliminary assessment comprises the following national and local legislation, guidance and policy in **Table 22-1**.

Table 22-1: Legislation, Policy and Guidance Related to Materials and Waste

Type	Name	Relevance to Assessment
Legislation	The Environment Act 2021[1]	Operates as the UK's framework of environmental protection. The Act sets out resource efficiency and waste reduction as one of four priority areas. It includes key provisions on the responsibilities of businesses to deliver environmental principles, waste reduction targets and the circular economy.
	The EU Circular Economy Act (expected end 2026)[2]	Stated intention to foster the circular economy across Europe by promoting sustainability, increasing recycling rates, and establishing a single market for secondary raw materials. This is of importance due to the Regional Supply Chains for Wind Turbines.
	The Environment Protection Act 1990[3]	UK legislation that establishes legal responsibilities for businesses, local authorities, and individuals to prevent environmental harm and ensure proper waste management.
	The Environmental Permitting (England and Wales) Regulations 2016[4]	Regulation for when industrial and waste installations require environmental permit, or when an exemption needs to be registered. The act includes the processes for registration and enforcement actions.
	The Waste Electrical and Electronic	Focus on the collection, treatment, recycling, and recovery of electrical and electronic equipment (EEE) waste

[1] Environment Act 2021
[2] European Parliament, Circular economy act
[3] Environment Protection Act 1990
[4] The Environmental Permitting (England and Wales) Regulations 2016

Type	Name	Relevance to Assessment
	Equipment Regulations 2013[5]	to minimise landfill and promote resource efficiency.
Materials and Waste specific legislation	The Waste Regulations 2014 (amendment)[6]	The Waste Regulations 2014 (Amendment) transposes the Waste Framework Directive into UK Legislation. Places a duty of care on waste producers and all handlers of waste to manage waste in accordance with the waste hierarchy.
	The Waste (Circular Economy) (amendment) Regulations 2020[7]	Transposes the EU's 2020 Circular Economy Package in England and Wales. Aims to reduce adverse impact of waste generation and resource use by ensuring application of the waste hierarchy, restricting landfilling and incineration, and addressing hazardous waste and waste oils.
National planning policy	National Planning Policy Framework (NPPF) 2024[8]	The NPPF identifies the need for reuse, recycling and minimisation of off-site waste disposal. It also recognises the benefits of recycled materials use where viable.
	Draft NPPF 2025[9]	The Draft NPPF identifies that Minerals and Waste plans should set out specific proposals to facilitate a sufficient supply of materials to meet society's need and enable the delivery of sustainable waste management and a circular economy.

[5] The Waste Electrical and Electronic Equipment Regulations 2013
[6] The Waste (England and Wales) (Amendment) Regulations 2014
[7] The Waste (Circular Economy) (Amendment) Regulations 2020
[8] Ministry of Housing, Communities and Local Government, National Planning Policy Framework 2024
[9] Ministry of Housing, Communities and Local Government and Department of Levelling Up, Housing and Communities National Planning Policy Framework: draft text for consultation, December 2025. PM3: Minerals and Waste

Type	Name	Relevance to Assessment
	NPS EN-1, 2025[10]	States resource and waste management should be sustainable, implementing the waste hierarchy[11] and the circular economy. Proposals must demonstrate alignment with DEFRA's policy statement on the role of Energy for Waste (EfW) in treating residual waste. Waste management arrangements must be identified. Applicants should source materials from recycled or reused sources and use low carbon materials, sustainable sources and local suppliers. Assessment of the impact of the waste arising from development on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation should be provided.
	NPS EN-3 2025[12]	EN-3 aims to increase renewable electricity generation across the UK to achieve Net Zero by 2050 and ensure energy security through the approval of nationally significant renewable projects. Includes a section on onshore wind for the first time. It defers to EN-1 regarding Materials and Waste (other than providing supporting information on EfW plants). EN-3 is relevant to the need for the overall Proposed Development. The approach in EN-1 has been adopted (as above).

[10] Department for Energy Security and Net Zero, Overarching National Policy Statement for Energy (EN-1), 2025.
[11] Waste hierarchy as set out in regulation 12 of the Waste (England and Wales) Regulations 2011.
[12] Department for Energy Security and Net Zero, National Policy Statement for Renewable Energy Infrastructure (EN-3), 2025.

Type	Name	Relevance to Assessment
	NPS EN-5, 2025[13]	EN-5 explains why more grid investment is essential for energy security, reaching the UK's Clean Power 2030 ambition, and achieving net zero. It defers to EN-1 regarding Materials and Waste. The approach in EN-1 has been adopted (as above).
	25 Year Environment Plan[14]	The Plan aims to minimise waste, reuse materials as much as possible, and manage materials at the end of their life to reduce environmental impact. It sets ambitious targets for zero avoidable waste by 2050.
National Materials and Waste policy	National Planning Policy for Waste 2014[15]	Outlines ambition to promote a sustainable approach to resource use and management by driving waste management up the waste hierarchy[16]. It sets out waste planning policies and should be read alongside the NPPF, the Waste Management Plan for England and Hazardous Waste National Policy Statement.
	Simpler Recycling 2024[17]	Simpler recycling seeks to standardise waste collection across England and Wales commercial and residential properties. It requires businesses to standardise collection of waste materials in the operation and maintenance phase.

[13] Department for Energy Security and Net Zero, National Policy Statement for electricity networks infrastructure (EN-5), 2025.
[14] Department for Environment, Food and Rural Affairs, 25 Year Environment Plan - GOV.UK, Updated February 2023.
[15] Ministry of Housing, Communities and Local Government, National Planning Policy for Waste , October 2014
[16] Waste hierarchy as set out in regulation 12 of the Waste (England and Wales) Regulations 2011.
[17] Department for Environment, Food and Rural Affairs, Simpler Recycling in England: policy update, November 2024.

Type	Name	Relevance to Assessment
	Waste Management Plan for England 2021[18]	Provides a single national plan for waste management policies in England. Focuses on protecting the environment and human health preventing or reducing waste generation, managing waste, and improving resource use efficiency
	Resource and waste strategy 2018[19]	This Strategy reaffirms commitment to the waste hierarchy and introduces the circular economy concept. It aims to preserve material resources by minimising waste, promoting resource efficiency, and transitioning to a circular economy.
National Materials and Waste guidance	Planning Practice Guidance (PPG) Minerals (2014)[20]	The Minerals PPG (2014) provides a framework for planning authorities to consider the impact of Materials and Waste on the environment and economy. It emphasises the importance of managing Materials and Waste to ensure sustainable outcomes and to protect the environment.
	PPG Waste (2015)[21]	The Waste PPG provides guidance including: Developments generating significant waste should include a waste audit. Planning authorities must be satisfied that new development will not negatively affect existing waste facilities or hinder the waste hierarchy.
Local planning policy	West Yorkshire Climate and	This Plan identifies long-term objectives to achieve the region's 2038 net zero carbon target. It includes a range of initiatives to support outcomes

[18] Department for Environment, Food and Rural Affairs, Waste Management Plan for England 2021, January 20221
[19] Department for Environment, Food and Rural Affairs, Resources and waste strategy for England - GOV.UK, 2018.
[20] Ministry of Housing, Communities and Local Government, Minerals - GOV.UK, October 2014.
[21] Ministry of Housing, Communities and Local Government, Waste - GOV.UK, October 2015.

Type	Name	Relevance to Assessment
	Environment Plan 2025[22]	including reducing waste, improve material efficiency and circularity.
	Calderdale Local Plan 2018/19 -2032/33[23]	Provides a spatial framework for the use of land in the Borough. Chapter 26 provides the waste objectives for Calderdale. Policy WA1 Planning for Sustainable Waste Management includes evidence as to the arrangements for on-site waste management, during the construction and operation.
	Pendle Local Plan 2021-2040[24]	Provides a spatial framework for the use of land in Pendle. Policy DM15 soils, minerals and waste states that developments must not contribute to the sterilisation, erosion, or degradation of soils or mineral deposits. All new developments are encouraged to maximise recycled and secondary aggregate use. The waste hierarchy should inform waste management options. Policy DM16 Design and Placemaking seeks to promote sustainable development including through minimising waste, use of eco-friendly materials and construction techniques, using recycled materials or products with high recycled content. The Local plan references the Joint Lancashire Minerals and Waste Local Plan[25] which provides planning policy for minerals and waste sites.
	Bradford District Local Plan 2020-2038 [26]	Provides a spatial framework for the use of land in Bradford. Policy SP12:

[22] West Yorkshire Combined Authority, West Yorkshire Climate and Environment Plan 2025-2038, April 2025.
[23] Calderdale Council, Calderdale Local Plan , Adopted March 2023.
[24] Pendle Borough Council Local Plan (Fourth Edition), December 2025
[25] Lancashire County Council, Local planning policy for minerals and waste - Lancashire County Council 2018
[26] Bradford District Council Bradford District Local Plan | Bradford Council, February 2021

Type	Name	Relevance to Assessment
		Strategic Planning for Minerals seeks to maintain steady and adequate supply of minerals to meet local, regional and national requirements. SP 12: Waste Management Infrastructure supports the waste hierarchy. Policy EN21: Waste Management within Development provides support for the use of recycled and secondary materials and the minimisation of waste.
	Lancashire County Council Environment and Climate Strategy (2023-2025)[27]	The strategy provides a single point of reference on the council's environment and climate priorities. It includes 10 objectives including reducing waste and pollution (and increasing reuse and recycling).

22.3 Scoping and Stakeholder Engagement

2025 Scoping Opinion

22.3.1 In September 2025, a request for a Scoping Opinion was submitted alongside a Scoping Report to the Planning Inspectorate (PINS). **Table 22-2** presents the relevant Materials and Waste response from the PINS Scoping Opinion and confirms how the response is considered within the proposed scope of assessment (as set out below).

Table 22-2: Consideration of PINS Scoping Opinion for Materials and Waste

Consultee	PINS ID	Summary of Scoping Opinion Response	Consideration within Proposed Scope of Assessment
PINS	3.14.5	*The Inspectorate considers that insufficient information has been provided on the expected waste arisings associated with the proposed development. As such, the Inspectorate is currently not in a position to scope this matter out. The*	Preliminary information on Materials and Waste is included in this PEIR based on available information. This Chapter includes a more detailed description of materials requirements and waste streams expected at the construction, operation

[27] Lancashire County Council, Environment and Climate Strategy 2023-2025

Consultee	PINS ID	Summary of Scoping Opinion Response	Consideration within Proposed Scope of Assessment
		ES should provide an assessment of Materials and Waste across all phases of the proposed development. This should include a detailed description of waste streams, including expected quantities of waste arisings and any monitoring measures required to ensure compliance.	and maintenance and decommissioning phases. This includes the provision of expected quantities (where available) and proposed monitoring measures. Detailed assessment will be undertaken for the ES when further detailed design is available.

Further Stakeholder Engagement

22.3.2 No further engagement has been undertaken over and beyond that completed for the Scoping Report.

22.4 Assessment Methodology

Study Area

22.4.1 The study areas applicable to the Proposed Development as identified by the Institute of Sustainability and Environmental Professionals (ISEP) (formerly the Institute of Environmental Management and Assessment (IEMA)) Guidance for Materials and Waste[28] during construction and operation and maintenance are as follows:

- Proposed Development Study Area (PDSA**)** for construction and operation and maintenance phases, including materials use and waste generation. The PDSA is deemed to comprise the extent of the PEIR Boundary, which includes the footprint of the proposed works, together with any temporary land requirement during construction; and
- Expansive Study Area (ESA) extends to the availability of construction materials and the capacity of waste management facilities across an expansive area of influence.

[28] Institute of Sustainability and Environmental Professionals, IEMA guide to: Materials and Waste in Environmental Impact Assessment, 2020

22.4.2 The expansive area varies depending on the material and waste types and is as follows:

- Non-Hazardous and inert waste management – Lancashire and Yorkshire and the Humber;
- Hazardous waste – England;
- Availability of key construction materials, crushed rock, and sand and gravel – Lancashire and Yorkshire and the Humber;
- Availability of key construction materials concrete– North West and Yorkshire and the Humber; and
- Availability of key construction materials, steel – UK.

22.4.3 Proposed Development is located on the western edge of the Yorkshire and the Humber region. The Western Access Route will connect the Proposed Development to the existing highway network in Lancashire. Therefore, the assessment has considered Lancashire and the Yorkshire and Humber region for non-hazardous and inert waste management, and key construction materials, crushed rock, sand and gravel, and concrete.

22.4.4 This preliminary assessment has used the same study areas for the decommissioning phase of the Proposed Development.

Sources

22.4.5 Baseline data has been gathered for the study areas from the data sources listed in **Table 22-3**; these are referenced throughout the Chapter.

22.4.6 The Applicant's Calculations for the Proposed Development have provided quantities of the key materials required for the construction phase and waste

generated by the construction and operation and maintenance phases of the Turbine Area[29] and the Bradford West Cable Corridor[30].

Table 22-3: Summary of the Data Sources Used to Inform this Chapter

Development Phase	Study Area	Material or Waste type	Data Source used
Construction – Turbine Area and Bradford West Cable Corridor	PDSA	Material requirement	Applicant's Calculations[29, 30]
Construction – Turbine Area and Bradford West Cable Corridor	PDSA	Cut and Fill balance (Soils and Peat)	Applicant's Calculations[29, 30]
Construction	ESA (Lancashire and Yorkshire and the Humber)	Material Availability (Sand, crushed rock, and recycled aggregates)	Yorkshire and Humber Aggregate Working Party: Annual Monitoring Report 2021 (Published 2023)[31].

[29] The founded track thickness is developed with a 150mm type 1 surface and a 300mm 6F2 Capping layer giving a total of 450mm. This thickness of track is suitable for withstanding the axle loading from delivery and construction vehicles for the expected number of vehicle passes on a site of a scale like this. This also meets the requirements of a foundation class 2 track within DMRB CD225 - Design for new pavement foundations. Cut and fill volumes are calculated using Civils 3D design software, where we have designed a vertical and horizontal layout for the wind farm site. This design is based on geometrical parameters which are stated within our design basis statement. The Wind Turbine Generator foundations are based on delivered examples that the project team have undertaken, and structural modelling, in design software, using candidate turbine supplier's foundation loading documents, and their bolt cage heights to accurately size a foundation which will meet all design loads acting on the foundation when the turbine is in operation.

[30] Based on 9,500m overall cabling corridor length for a dual circuit cable arrangement designed in accordance with the Northern PowerGrids NSP/002 - Policy for the installation of Distribution Power Cables

[31] Yorkshire and Humber Aggregates Working Party YHAWP Area Aggregates Working Party: Annual Monitoring Report 2023, December 2023

Development Phase	Study Area	Material or Waste type	Data Source used
			Joint Lancashire Local Aggregate Assessment 2023[32]. North West Aggregates Working Party: Annual Monitoring Report 2023[33]
Construction	ESA (North West and Yorkshire and the Humber)	Material Availability (concrete)	Materials Products Association (MPA), Regional overview of Construction and Mineral Products 2024.[34]
Construction	ESA (UK)	Material Availability (Steel)	UK Government 2025 report: UK Steel Industry: Statistics and Policy[35].
Construction	ESA (England)	Hazardous waste landfill void capacity	Environment Agency Data: Remaining Landfill capacity in England in 2024[36].

[32] Lancashire Minerals and Waste local Plan Joint Lancashire Local Aggregate Assessment October 2023
[33] North West Aggregate Working Party North West Aggregate Working Party: Annual Monitoring Report 2023
[34] Materials Products Association (MPA), MPA_Regional_overview_of_construction_and_mineral_products_markets_in_GB_2024.pdf
[35] UK Parliament Research Briefing, UK Steel industry: Statistics and policy, April 2025
[36] Environment Agency, Remaining Landfill Capacity, September 2025

Development Phase	Study Area	Material or Waste type	Data Source used
Construction - Turbine Area and Cabling Bradford West Cable Corridor only	PDSA	Inert, non-hazardous and hazardous waste generation	Applicant's experience with a similar size project in the UK[37]
Construction, operation and maintenance and decommissioning	ESA (Lancashire and Yorkshire and the Humber)	Waste Management Facility throughput capacity	Environment Agency Waste Data Interrogator[38]
Operation and maintenance and decommissioning	ESA (Lancashire and Yorkshire and the Humber)	Inert and non-hazardous waste landfill void capacity	Environment Agency Data: Remaining Landfill capacity in England in 2024[36].
Operation and maintenance and decommissioning	ESA (England)	Hazardous waste landfill void capacity	Environment Agency Data: Remaining Landfill capacity in England in 2024[36].
Operation and maintenance	PDSA	Inert, non-hazardous and hazardous waste generation	Applicant's experience with similar size facilities operating in the UK[39]
Decommissioning phase	PDSA	Inert, non-hazardous and hazardous waste generation	Applicant's Calculations [29, 30] and industry data/publications (identified where used)

[37] Applicants experience with the construction of a similarly sized on-shore wind farm that has recently been completed.
[38] Environment Agency; 2024 Waste Data Interrogator - data.gov.uk September 2025
[39] Applicants recent experience with the operation of similarly sized on-shore wind farms.

Methodology

22.4.7 The preliminary assessment of significance of effects for Materials and Waste, for the PEIR, has been based on established EIA approaches provided by ISEP Materials and Waste Guidance[28], expert professional judgement and in accordance with relevant guidance. These approaches are listed in more detail below.

22.4.8 A preliminary assessment of the mineral resources that could be affected by the Proposed Development has been provided further below.

22.4.9 Assessment of the types and quantities of solid waste that will be generated from the construction, operation and maintenance and decommissioning phases of the Proposed Development, based on the Materials and Waste management assumptions included further below, are identified, where available, within this Chapter. For the decommissioning phase it is noted that ISEP Materials and Waste Guidance[28] states:

(1) '*Due to uncertainties relating to future technologies and infrastructure, this first edition of the guidance does not incorporate a proposed methodology to assess impacts and effects during decommissioning or end of first life. It is recommended, however, to drive best practice through knowledge transfer, that a Materials and Waste Topic Lead records and presents as part of an environmental assessment, any design approaches to maximise resource efficiency and circular economy outcomes at these lifecycle stages*.'

Sensitivity

22.4.10 In line with ISEP Materials and Waste Guidance[28] on sensitivity, materials have been assessed on the availability of resources to be consumed by the Proposed Development. Materials are assessed against regional or national availability depending on the material type.

22.4.11 The sensitivity of inert and non-hazardous waste relates to the availability of regional landfill void capacity in the absence of the Proposed Development. The sensitivity of the available landfill void capacity is assessed against regional inert and non-hazardous landfill void capacity for all phases of the Proposed Development.

22.4.12 This Chapter also considers the availability of waste management infrastructure for inert and non-hazardous waste in Lancashire and the Yorkshire and the Humber region. However, it is noted that ISEP Materials and Waste Guidance[28] does not identify waste management infrastructure as a sensitive receptor, stating:

(1) *"it is considered that infrastructure that is used to process and recover arisings (and hence divert them from landfill) is a beneficiary of waste feedstock, and has the ability to reduce adverse impacts. Such facilities are therefore an influencing factor in the reduction of the magnitude of waste impacts on landfill void capacity, rather than being a sensitive receptor in their own right.*

To this end, and as described in Baseline Information understanding the capacity and capability of waste processing and recovery facilities in a region or nationally, remains an integral part of the assessment process, and has a central role in accurately defining impacts and resultant effects."

22.4.13 The sensitivity of the available hazardous landfill void capacity is assessed against national hazardous landfill void capacity for all phases of the Proposed Development.

22.4.14 The key considerations for determining sensitivity with respect to Materials and Waste can be summarised as:

- Availability of key material resources (sand, aggregates, recycled aggregates and concrete) within the Yorkshire and the Humber region;
- Availability of Steel within the UK region;
- Landfill void capacity of inert and non-hazardous landfill sites in the Yorkshire and the Humber region;
- Throughput capacity of inert, non-hazardous and hazardous material treatment centres and restoration sites; and associated management of Materials and Waste on site within the Yorkshire and the Humber region; and
- Landfill void capacity of hazardous landfill sites across England.

22.4.15 ISEP Materials and Waste Guidance[28] provides sensitivity criteria for materials as set out in **Table 22-4** and these have been used in this preliminary assessment.

Table 22-4: Sensitivity for Materials Used in the Preliminary Assessment

Sensitivity	Description
Very High	Are known to be insufficient in terms of production, supply and/or stock; and/or Comprise no sustainable features and benefits compared to industry-standard materials.
High	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; and/or

	Comprise little or no sustainable features and benefits compared to industry-standard materials.
Medium	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; and/or Are available comprising some sustainable features and benefits compared to industry-standard materials.
Low	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; and/or Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.
Negligible	Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; and/or Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials. *
* Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.	

22.4.16 The receptor for inert and non-hazardous construction waste is Yorkshire and the Humber regional landfill void capacity, with the sensitivity criteria used in this preliminary assessment identified by ISEP Materials and Waste Guidance[28] in **Table 22-5**.

Table 22-5: Sensitivity for Inert and Non-hazardous Waste Used in this Preliminary Assessment

Sensitivity	Regional inert and non-hazardous landfill void capacity is expected to…
Very High	... reduce very considerably (by >10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.
High	...reduce considerably: by 6-10% as a result of wastes forecast.
Medium	...reduce noticeably: by 1-5% as a result of wastes forecast.
Low	...reduce minimally: by <1% as a result of wastes forecast.
Negligible	...remain unchanged, or is expected to increase through a committed change in capacity.

22.4.17 The receptor for hazardous waste is the national hazardous landfill waste volume capacity. The sensitivity criteria used in the preliminary assessment are taken from ISEP Materials and Waste Guidance[28] and provided in **Table 22-6**.

Table 22-6: Sensitivity for Hazardous Waste Used in this Preliminary Assessment

Sensitivity	National hazardous landfill void capacity is expected to…
Very High	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.
High	...reduce considerably: by 0.5-1% as a result of wastes forecast.
Medium	...reduce noticeably: by 0.1-0.5% as a result of wastes forecast.
Low	...reduce minimally: by <0.1% as a result of wastes forecast.
Negligible	...remain unchanged, or is expected to increase through a committed change in capacity.

Magnitude of Impact

22.4.18 The methodology for assessing the magnitude of impact category for materials comprises a percentage-based approach that determines the influence of materials consumption on the baseline market capacity (production, stocks or sales), in combination with the potential to sterilise (substantially) one or more allocated mineral site. Magnitude of impact categories for materials used in the preliminary assessment are provided in ISEP Materials and Waste Guidance[28] and are replicated in **Table 22-7**.

Table 22-7: Magnitude of Impact Categories and Descriptions for Materials Used in this Preliminary Assessment

Magnitude of Impact Category	The assessment is made by determining whether, through a development, the consumption of…
Major	...one or more materials is >10% by volume of the regional* baseline availability; and/or more than one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.
Moderate	…one or more materials is between 6-10% by volume of the regional* baseline availability; **and/or** one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.

Minor	…one or more materials is between 1-5% by volume of the regional* baseline availability; **and/or** the development has the potential to adversely and substantially[#] impact access to one or more allocated mineral site (in their entirety), placing their future use at risk.
Negligible	…no individual material type is equal to or greater than 1% by volume of the regional* baseline availability
No change	…no material is required

*or where justified, nationally.
[#] justified using professional judgement, based on the scale and nature of the allocated mineral site being assessed.

22.4.19 The methodology for assessing the magnitude of impact categories for waste uses the landfill void capacity approach identified in the ISEP Materials and Waste Guidance[28]. This uses estimations of waste types and quantities identified for the Proposed Development to determine the percentage reduction in identified landfill void capacity within the relevant ESA identified for inert, non-hazardous and hazardous wastes.

22.4.20 The magnitude of impact criteria for the landfill void capacity approach to be used for inert and non-hazardous waste in the preliminary assessment are provided in **Table 22-8** and for hazardous waste in**Table 22-8**.

Table 22-8: Magnitude of Impact Categories and Descriptions for Inert and Non-hazardous Waste Used in this Preliminary Assessment

Magnitude of Impact Category	Description
Major	Waste generated by the development will reduce regional landfill void capacity baseline[#] by >10%
Moderate	Waste generated by the development will reduce regional landfill void capacity baseline[#] by 6-10%.
Minor	Waste generated by the development will reduce regional landfill void capacity baseline[#] by 1-5%.
Negligible	Waste generated by the development will reduce regional landfill void capacity baseline[#] by <1%.
No change	Zero waste generation and disposal from the development.

[#] forecast as the worst-case scenario, during a defined construction and/or operational and maintenance phase.

Table 22-9: Magnitude of Impact Categories and Descriptions Used for Hazardous Waste in this Preliminary Assessment

Magnitude of Impact Category	Description
Major	Waste generated by the development will reduce national landfill void capacity baseline# by >1%
Moderate	Waste generated by the development will reduce national landfill void capacity baseline# by <0.5-1%
Minor	Waste generated by the development will reduce national landfill void capacity baseline# by <0.1-0.5%
Negligible	Waste generated by the development will reduce national landfill void capacity baseline# by <0.1%
No change	Zero waste generation and disposal from the development.

forecast as the worst-case scenario, during a defined construction and/or operational and maintenance phase.

Significance Assessment

22.4.21 ISEP Materials and Waste Guidance[28] chapter 11 outlines how, using the baseline and assessment data and forecasts, an assessment of a development's impacts can be undertaken to allow the effects to be identified and its significance evaluated.

22.4.22 The effect thresholds provided in **Table 22-10** has been used for the preliminary assessment. If an effect threshold is identified as 'moderate' or higher, then the effect is significant. Where a threshold is 'slight' or 'moderate' professional judgement in conjunction with documented justification will be used to determine the outcome. Where the effect is 'neutral' or 'slight' then the environmental effect is deemed not significant.

Table 22-10: Assessment matrix used to Evaluate Effects and Significance for Materials and Waste.

	Magnitude of Impact (Degree of Change)					
Sensitivity (or value)		No Change	Negligible	Minor	Moderate	Major
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large

	Magnitude of Impact (Degree of Change)					
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Limitations and Assumptions

22.4.23 Construction phase assessment of materials for the Proposed Development is based on preliminary design, which includes preliminary estimates of the quantities and types of materials that the Applicant's Calculations[29,30] have identified as required for the Proposed Development. At the time of completing this PEIR Chapter, Materials and Waste data was not available for the construction of the Access Routes.

22.4.24 A construction phase assessment of waste for the Turbine Area and the Bradford West Cable Corridor has been quantified using available data with information provided by the Applicant's Calculations. Professional judgement has also been applied to consider potential waste arising from materials, under a worst-case scenario.

22.4.25 Operation and maintenance phase waste generation data has been identified based on Applicant's experience for a development of this size and nature operating in the UK. It is likely that during the operation and maintenance phase of the Proposed Development that there will need to be a replacement cycle of the turbines as they are currently expected to have an operational life span of 20+ years[40]. However, it is not currently known what the replacement schedule is for the Proposed Development. An outline assessment of the potential impact of wind turbine replacement has been undertaken; a detailed quantitative assessment will be undertaken in the ES once further detailed information is available.

22.4.26 The Chapter is currently unable to quantitatively assess the decommissioning phase waste generation due to the need for further information on decommissioning activities. It is also assumed that the environmentally sensitive receptor for waste in 35 years will still be landfill void for all waste streams. Understanding landfill void

[40] https://www.renewableenergyhub.co.uk/main/wind-turbines/how-long-will-the-wind-turbine-last

35 years after initial operation of the Proposed Development is very challenging and the preliminary assessment has used current landfill void availability as the most recently available data for decommissioning phase assessment.

22.4.27 Research is referenced from the wind industry on the proportion of each wind turbine that would be expected to be recycled. However, the actual volume/weight or recyclability of the wind turbines that will be used is not known at this stage.

22.4.28 The preliminary figures, and preliminary assessment of these figures, provide a precautionary approach. A detailed assessment of the construction, operation and maintenance and decommissioning phases for Materials and Waste will be provided in the ES when further design information for the Proposed Development will be available.

22.5 Baseline Conditions

Overview

22.5.1 Materials required for the Proposed Development will impact on the volume of materials available in the region and nationally. Materials that are won from the ground; such as sand, aggregates, and recycled aggregates have been considered at the Lancashire and the Yorkshire and the Humber region level. Concrete has been considered at the North West and the Yorkshire and the Humber Region Level. While steel which is supplied on a national basis and often imported has been considered at the national level.

22.5.2 Materials have been considered for the Turbine Area and the Bradford West Cable Corridor (as mentioned above, the Access Routes will be considered at the detailed design stage, within the ES). All phases of the Proposed Development have been assessed.

22.5.3 An assessment of inert, non-hazardous and hazardous waste generated by the Proposed Development for the Turbine Area and the Bradford West Cable Corridor has been undertaken (as mentioned above, the Access Routes will be considered in the ES). All phases of the Proposed Development have been assessed.

22.5.4 The impact of these waste streams on the sensitive receptor of landfill void capacity for each waste type has been considered at different ESAs. Inert and non-hazardous waste has been considered at the Yorkshire and the Humber region level, while hazardous waste has been considered at a national level.

22.5.5 Decommissioning waste has been considered but as identified by ISEP (Section 22.4.9), it is not possible to know exactly what waste management techniques and capacity will be available in over 35 years' time.

Existing Baseline

22.5.6 Baseline information has been identified and reviewed for the following:

- Availability of key construction materials, including aggregates, sand, recycled/secondary aggregates and concrete at Yorkshire and the Humber region (identified materials or annual sales/production);
- Availability of steel in the UK;
- Inert and non-hazardous landfill void capacity in the Yorkshire and the Humber region; and
- Hazardous landfill void capacity in England.

Materials

22.5.7 Existing materials baseline data identified in the ESA is summarised in **Table 22-11**.

Table 22-11: Materials Baseline Data identified in the ESAs

Materials	ESA	Reserves /production / annual sales
Crushed Rock	Lancashire and Yorkshire and the Humber	444,089,000 tonnes (t)[31, 32]
Sand and Gravel		39,627,000t[31, 32]
Recycled / Secondary Aggregates		6,966,500t* produced (2022)[31, 33]
Concrete	Nort West and Yorkshire and the Humber	~2,150,000m^3 annual sales (2022)[34]
Steel	United Kingdom	5,600,000t (2023) produced in the UK annually[35] 8,900,000t annual demand serviced by import and UK production[41].
*Yorkshire and Humber Aggregates Working Party (YHAWP) note that this number is an estimate and should be treated with caution.		

Waste

22.5.8 The existing baseline for waste has been identified using two metrics: landfill void capacity data for the ESA and capacity of waste management facilities for the ESA, see **Table 22-12**. Available void/capacity has been identified using the most

[41] UK industry could supply 8 million tonnes of steel for public projects

recently available data from the Environment Agency Remaining Landfill Capacity data set 2024[36].

Table 22-12: Landfill Void Space and Waste Facilities Capacity Baseline Data in the ESAs

Facility Type	ESAs	Available void/capacity in 2024
Inert landfills	Lancashire Yorkshire and the Humber	17,946,500m^3 [36]
Non-hazardous landfills	Lancashire Yorkshire and the Humber	42,119,000m^3* [36]
Hazardous landfills	England	9,848,250m^3* [36]
Material Recovery Facilities (MRFs)	Lancashire Yorkshire and the Humber	5,513,000t/annum[38]
Metal recycling sites	Lancashire Yorkshire and the Humber	2,264,000t/annum[38]
Hazardous waste transfer facilities	Lancashire Yorkshire and the Humber	1,321,000t/annum[38]
* Not including Stable Non-Reactive Hazardous Waste (SNRHW cell) landfills		

Future Materials Conditions

Materials – Construction Phase

22.5.9 The Applicant's Calculations for the Proposed Development have provided quantities of the key materials required for the construction phase of the Turbine Area[29] and the Bradford West Cable Corridor[30], see **Table 22-13** for the available data.

Table 22-13: Estimated Materials Requirements for the Construction Phase of the Proposed Development

Material	Quantities* (provided by the Applicant)		Notes*
	Onsite	Offsite	
Peat[42]	544,800m^3	0	100% reused on the Proposed Development[43,44]
On-site excavated materials[45]	1,060,800m^3	0	Reused on the Proposed Development: Fill[46]: 566,000m^3 Landscaped material[47]: 494,800 m^3.
Non-calcareous stone (Crushed rock)	0	196,100m^3	Imported to be used for capping material and running surface.[48]
Recycled aggregate	0	83,900m^3	The Applicant has identified that washed and recycled railway ballast to be used in capping (estimated 30%).

[42] Excavated peat across all infrastructure construction areas on the site. Excavated and stored for reinstatement or transported to site reinstatement areas.
[43] Permanent displacement volumes reinstated across various areas and elements. Up to 2m depth in borrow pit areas, and site compounds. Reinstatement in dykes and in extracted areas.
[44] To be undertaken in accordance with CL:AIRE Definition of Waste: Development Industry Cope of Practice Version 2 March 2011
[45] These are excavated materials to form road cuttings, ditches, cuttings for hardstands, compounds, substation cuttings and track widening.
[46] Used for infilling and forming embankments and permanent reinstatement at base locations, hardstanding, site track, and compound formation. Also to sub capping and bunding around the substation.
[47] Used in borrow pit reinstatement, before peat placed, embankment forming, trackside berms, sub surface blade finger locations. Bunding to substation, and reinstatement of construction and batching plant locations.
[48] Non-Calcareous imported stone as structural layer on formation. This may be imported from hardstone/ granite quarries by rail to railheads at Leyland or Horton. This will give access to recycled processed spent rail ballast options for the network recycling hubs.

Material	Quantities* (provided by the Applicant)		Notes*
	Onsite	Offsite	
Sand	0	24,500m^3	Imported to the Proposed Development.[49]
Concrete	0	77,000t	Produced using on-site batching plant and imported materials.
Steel	0	4,600t	Imported onto the Proposed Development.
*Figures rounded up to the nearest hundred.			

22.5.10 A comparison of the estimated materials required for the construction of the Turbine Area and the Bradford West Cable Corridor; and the availability of materials in the identified ESAs is provided in **Table 22-14**.

Table 22-14: Comparison of material required for construction of the Proposed Development and baseline data identified.

Material	Required/ demand for the construction of the Proposed Development	Baseline data identified within ESAs	Proportion required of available ESA supply (%)
Crushed rock	195,800m^3 240,800t[50]	444,089,000t [31]	0.05%
Recycled/ secondary aggregates	83,900m^3 103,200t[48]	6,966,500t per year (2023) [31]	1.48% of annual supply
Sand (land won)	24,500m^3 28,700t[48]	39,627,000t [31]	0.07%
Concrete	77,000t	5,160,000t (2022) (based on 2,150,000m^3 sales[32])	1.39% of annual sales
Steel	4,600t	5,600,000t/per year[33]	0.001% of national annual supply (UK produced)

[49] Bedding and cover sand for the onsite cabling arrays and dual circuit cable arrangement for cabling corridor.
[50] Density taken from SEPA - UK Conversion Factors for Waste

Materials Operation and Maintenance and Decommissioning Phases

22.5.11 The Proposed Development will require minimal materials for operation and maintenance and during decommissioning due to the nature of wind farms. The Proposed Development may require some maintenance on access tracks, internal site access tracks and in hardstanding areas, but these will likely be limited to track repair.

22.5.12 The wind turbines will require routine maintenance of parts (wind turbines predominantly consist of recyclable materials such as metals and plastic with current recycling rates of 80-96%[51,52] achieved). There will be a requirement for some replacement and the details of this will be covered in the ES.

22.5.13 Major component replacement of all 34 wind turbines, not including the tower, foundations or infrastructure, is estimated to require approximately 9,300 tonnes[53] of materials comprising a mix of steel, iron, polymers and other material.

22.5.14 The decommissioning phase will generate some waste as well as materials for reuse and recycling; materials may be required for landscaping and aesthetics. However, this is expected to be significantly less than required in the construction phase.

Further Data Collection

22.5.15 Data relating to the design of the Proposed Development is required to provide definitive material requirements and likely waste generation assessments for the construction phase. The numbers above constitute a point in time assessment for the preliminary design. This information will be contained within the ES.

Future Waste Conditions

22.5.16 The Proposed Development will generate waste at the construction, operation and maintenance and decommissioning phases, and this is further considered for each phase below.

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[51] European Technology and innovation Platform on Wind Energy, How wind is going circular: blade recycling, 2019
[52] National Gird, Can wind turbines be recycled? 2023
[53] Based on an assumed mass per turbine of 780 tonnes taken from Wind Turbine Life Cycle Assessment data: Ventas V150 – 6.0 MW Life Cycle Assessment and Vestas V163 - 4.5 MW Life Cycle Assessment . The report then used data for the average nacelle and blade weights for a 6MW wind turbine representing 34.5% of the total mass of the turbine. Data taken from S.Semken *et al.* Direct-drive permanent magnet generators for high-power wind turbines: Benefits and limiting factors. January 2012

Construction Phase

22.5.17 Waste will be generated, and will require management, during construction. Materials required within the construction phase include peat, soils, aggregates, recycled aggregates, sand and steel for internal infrastructure such as access roads, landscaping, wind turbine foundations, cabling protection material and crane hardstanding. In addition to this, wind turbines, cabling, substation equipment and temporary compounds will be required.

22.5.18 The materials identified in **Table 22-13** (above) would be expected to generate minimal waste, especially minimal landfill waste as the Proposed Development will implement best practice construction management, procurement processes, material management systems; and all of the materials proposed for use are easily and readily able to be recycled/reused. Using a precautionary approach, a 5%[54] wastage rate of the materials brought to the Proposed Development has been assumed, as identified in **Table 22-13**. A 90%[55] recycling rate for the waste collected from these materials streams has also been assumed.

22.5.19 In addition, the Applicant's Calculations have identified that the Bradford West Cable Corridor will generate 5,655m^3 (5,994t)[30] of soils and 2,320m^3 (2,854t)[30] of crushed rock that will require management. In line with the worst-case scenario, this has been assumed to all be managed by inert landfill for the preliminary assessment.

22.5.20 The Proposed Development will also generate general construction waste such as formwork, packaging materials (pallets, wood, cardboard, plastic) and employee general waste (e.g. canteen waste). The Applicant estimates that the Proposed Development will generate the following general waste quantities:

- Construction phase – infrastructure (not including turbine installation): Two covered skips for each waste stream (refuse, wood, metals, cardboard, mixed plastics, Inert) every two months[56];
- Construction phase – turbine installation[53]: One set of skips (refuse, wood, metals, cardboard, mixed plastics) per three turbine assemblies;

[54] Professional opinion is that this is a precautionary rate for an infrastructure project of this size using the materials and construction methods identified.
[55] These are highly recyclable materials that are unlikely to be mixed with other materials due to the nature of their use in construction. It is also noted that general construction projects achieve a 90% recycling rate: Construction Products Association Construction Waste and Recycling 2014
[56] Based on an onshore wind farm that has recently been finished in the UK of a similar scale.

- Bradford West Cable construction phase[53]: 12 refuse skips for the whole installation; and
- Construction of Access Routes: Currently no data is available for this. However, the construction of access tracks is noted to generate small quantities of general waste[57].

22.5.21 Using the Applicant's Calculations alongside a forecast construction period of 30 months for up to 34 wind turbines, provides for a total refuse generation from the construction phase of the Proposed Development of 54 skips.

22.5.22 If the Proposed Development generates 54 skips of mixed construction waste (non-hazardous), assuming 40-yard skips, this will represent approximately 720t[58] of refuse, equating to 287t/annum. It is noted that much of this non-hazardous waste is likely to be sent for energy recovery. However, under a worst-case scenario, it is assumed that all of it is sent for non-hazardous landfill disposal.

22.5.23 It is expected that the Proposed Development will, in accordance with best practice and legislative requirement, segregate the following materials streams on-site, as waste for recycling: timber, cardboard, plastics, metals, and food waste. It is expected that these materials would be sent directly to a recycling facility for which there is capacity within the region (**Table 22-12**).

Table 22-15: Estimate of Waste Generation from Main Materials used in the Construction Phase and General Construction Waste

Material	Estimate Required	Estimated wastage (%)	Estimated waste total	Recycling rate	Refuse tonnage*
Inert waste estimate					
Crushed rock	240,800t	5.0%	12,040t	90%	1,204t
Recycled/ secondary aggregates	103,200t	5.0%	5,159t	90%	516t
Sand (land won)	28,700t	5.0%	1,432t	90%	143t
Soils					5,994t

[57] Authors experience and understanding.
[58] Using a worst-case scenario of 40-yard skips and a general construction waste density of 320kg/m^3. Density taken from SEPA - UK Conversion Factors for Waste using EWC code 17 09 04 mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03.

Material	Estimate Required	Estimated wastage (%)	Estimated waste total	Recycling rate	Refuse tonnage*
Stone from construction compound					2,854t
Total Inert					10,711t
Non-hazardous waste estimate					
Concrete	77,000t	5.0%	3,850t	95%	385t
Steel	4,600t	5.0%	230t	95%	23t
General Construction waste					719t
Employee waste[59]					532t
Total non-hazardous waste					1,658t
*Note due to rounding numbers may not add up exactly in the tables					

22.5.24 Based on the currently available data; the construction phase of the Turbine Area and the Bradford West Cable Corridor will generate an estimated 10,711t of inert waste and 1,658t of non-hazardous waste, as identified in **Table 22-15**.

22.5.25 In accordance with ISEP Materials and Waste Guidance[28], the estimated inert and non-hazardous waste generated has been assessed against the baseline data for inert and non-hazardous void capacity in the ESA in **Table 22-16**. Please note that tonnages have been converted into cubic meters (m^3) for this assessment.

[59] The Proposed Development's construction phase could support 150 direct years of employment in Calderdale, 273 direct years of employment in Yorkshire and the Humber, and 641 direct years of employment in the UK. Therefore, the Proposed Development will generate a total of 1,064 direct years of employment, who would generate approximately 532 tonnes of waste (based on 500kg per employee per year as identified in Business Waste: Office Waste Facts). In accordance with Simpler Recycling legislation this would be collected as paper and card, dry mixed recycling (plastic, Glass, cans), food waste and refuse.

Table 22-16: Comparison of Estimated Inert and Non-hazardous Waste Generation for the Construction of the Proposed Development against Baseline Data identified

Waste material	ESA landfill void capacity	Proposed Development: estimated volume of waste generation[60]	Landfill void required for Proposed Development
Inert waste	17,946,500m^3	9,489m^3	0.05%
Non-hazardous waste	42,119,000m^3	4,545m^3	0.01%

22.5.26 Construction phase hazardous waste has not been quantified in this preliminary assessment. Qualitative analysis has been undertaken based on the identified hazardous waste arisings from other wind turbine installation projects and the known hazardous materials associated with the infrastructure, wind turbines, foundations, substation and the cabling installation.

22.5.27 The construction phase is expected to generate hazardous waste through the use of materials such as oils, lubricants, adhesives and resins[61]. The expected hazardous waste generation will be minimal as the wind turbines, substations and much of the associated infrastructure will be manufactured offsite and assembled onsite. Offsite manufacture is recognised as being substantially more efficient process[62], with waste generated often collected for reuse or recycling at the factory.

22.5.28 Construction phase hazardous waste has been assessed against national available hazardous landfill void space, and baselined as 9,848,250t (**Table 22-12**).

Operation and Maintenance Phase

22.5.29 The Proposed Development will employ nine persons in Calderdale, 23 persons in Yorkshire and the Humber and 78 persons in the UK once it is operational. The operation and maintenance phase of the Proposed Development will therefore employ 32 people within the Yorkshire and the Humber region, equivalent to a Small and Medium Enterprise. It is estimated that 32 employees would generate

[60] Density taken from SEPA - UK Conversion Factors for Waste using EWC 17 09 04 mixed construction and demolition wastes, EWC 17 01 01 Concrete, EWC 19 12 02 Ferrous Metal, EWC 19 12 09 minerals (for example sand, stones), EWC 01 04 08 Waste gravel and crushed rocks.
[61] Centre for Environment Fisheries and Aquaculture Science, Use of Chemicals in Offshore Wind Farm Construction and Operation, 2022
[62] https://www.dutypoint.com/financial-benefits-of-offsite-production/

approximately 16 tonnes of waste per annum[63], which must be collected under Simpler Recycling legislation[64] for the following streams:

- Paper and card;
- Glass, plastic and metals;
- Food waste; and
- Residual (garbage).

22.5.30 In addition to employee waste, there will be waste generated by maintenance activities. The Applicant has identified that based on similar sized wind farms, the Proposed Development would be expected to generate nine skips per annum (all waste). Waste that is generated will be encouraged to be recycled, composted or sent for energy recovery minimising any impact on landfill void capacity. Under a worst-case scenario assessment, maintenance is expected to generate a maximum of 40 tonnes per annum of all waste streams, of both recyclable and refuse waste.

22.5.31 Annual inert and non-hazardous waste generation by the Proposed Development is therefore estimated to be a maximum of 56 tonnes per year of recyclables and refuse waste.

22.5.32 The Proposed Development is likely to require one cycle of major turbine component renewals over its lifetime (**Section 22.6.7**). Not enough detail is currently known to identify the exact waste generation that this would entail and over what length of time it would occur. Industry reporting indicates that 80-96%[49,50] of a wind turbine is currently readily recyclable, and the industry is seeking to improve this (see **Section 22.5.35**).

22.5.33 Review of Life Cycle Assessment of wind turbines indicates that larger onshore turbines have a total mass of between 490-780 tonnes per wind turbine[65],[66]. An estimated 34.5%[67] of the total mass is the nacelle and blades which will be replaced

[63] This article identifies that the average person in an office generate 2Kg of waste per day (all wastes) representing 500kg per person per year, Business Waste: Office Waste Facts
[64] Department for Environment, Food and Rural Affairs, Simpler Recycling: workplace recycling in England, 2025
[65]Example onshore Wind Turbine Life Cycle Assessment data: Ventas V150 – 6.0 MW Life Cycle Assessment
[66] Example onshore Wind Turbine Life Cycle Assessment data Vestas V163 - 4.5 MW Life Cycle Assessment
[67] Mass of Nacelle and blades identified as 34.5% of the total mass of the turbine based on S.Semken *et al.* Direct-drive permanent magnet generators for high-power wind turbines: Benefits and limiting factors. January 2012

after 20+ years under a worst-case scenario. Assuming complete replacement of the nacelle and blades this would generate 9,300 tonnes of end-of-use turbine components.

22.5.34 Assuming all polymers and casings are landfilled, while the metal components are recycled, provides a recycling rate of 65%[68]. The 20+year renewal would therefore be expected to generate approximately 3,255 tonnes of waste material for landfill, and 6,045 tonnes that would be recycled.

22.5.35 It is noted that the wind energy sector is working towards creating a circular economy for wind turbines[69] with organisations such as Offshore Renewable Energy (ORE) Catapult[70] seeking the advancement through projects such as the Circular Economy for the Wind Sector[71] project.

22.5.36 Greater detail is required to understand the impact of the potential replacement cycle on operation and maintenance waste for the Proposed Development; a detailed assessment will be provided in the ES.

22.5.37 The operational and maintenance phase is expected to generate limited hazardous waste through the use of materials such as oils, lubricants, adhesives and resins in routine maintenance procedures. Oils, lubricants, and materials contaminated by them (such as oily rags) that require disposal are managed through recycling or using EfW or incineration facilities as standard and so would not be expected to impact hazardous landfill void space.

Decommissioning Phase

22.5.38 Decommissioning will occur after a 35-year operational period of the Proposed Development. As identified by ISEP (see **Section 22.4.12**), it is challenging to identify how decommissioning material will be managed this far into the future.

22.5.39 The preliminary assessment is based on currently available data, which is limited for decommissioning. The decommissioning phase will include removal of other above-ground infrastructure, with the exception of turbine foundations, hardstandings and access tracks, which are likely to remain in-situ, significantly reducing wastes that need managing. Underground elements such as cabling is also likely to remain in situ, further reducing waste management. The ES will provide further information on anticipated decommissioning activities.

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[68] The composition of a nacelle and blades has been calculated using data from S.Semken *et al.* Direct-drive permanent magnet generators for high-power wind turbines: Benefits and limiting factors. January 2012

[69] National Grid Can wind turbine blades be recycled? , 2023

[70] Offshore Renewable Energy | Innovation Centre | ORE Catapult

[71] Circular Economy for the Wind Sector (CEWS)

22.5.40 The infrastructure and operational components of the Proposed Development are highly recyclable, with a significant proportion of crushed rock, recycled aggregate, concrete, sand and steel minimising the need for disposal to landfill.

22.5.41 It would be expected that a significant proportion of above ground components will be deconstructed and then sent for reuse, refurbishment, recycling or energy recovery. Current recycling and reuse from wind turbines is 80-96%[49,50] and it is expected that this figure would at worst stay the same, or likely improve.

22.5.42 It should be noted that the wind industry is addressing the challenges of decommissioning and recycling wind turbine blades. The European wind industry has committed to a self-imposed landfill ban[72] for wind turbine blades effective as of January 2026, reflecting a strong commitment to sustainability. This commitment will benefit wind turbines end of life management globally as the industry is incentivised to invest in reuse, recycling and recovery opportunities for the large European market.

22.6 Environmental Measures

22.6.1 This Section describes details of the environmental measures for Materials and Waste, which have been included within the design of the Proposed Development (as presented in **Chapter 4: The Proposed Development**). These measures are an inherent part of the design of the Proposed Development and have been included to benefit Materials and Waste management and achieve positive effects where possible, as well as avoid, reduce or compensate for the adverse environmental effects of the Proposed Development.

Construction Phase

22.6.2 The environmental measures proposed during the construction phase (including design), include:

- Optimisation of material use;
- Reuse of materials generated in the construction phase, such as seeking to balance cut and fill across the Proposed Development through reuse of soils in line with Contaminated Land: Applications in Real Environments (DoW:CoP[73]);
- Use of recycled materials where viable for design parameters;

[72] NedZero From January 1, 2026, a self-imposed European ban on dumping wind turbine blades will take effect. WindEurope is consolidating circular solutions and urging EU policy action. - NedZero

[73] CL:AIRE Definition of Waste: Development Industry Cope of Practice Version 2 March 2011

- Preference for offsite construction where viable;
- Identification of opportunities to use infrastructure for the temporary compounds that can be reassigned or reused upon completion of the Proposed Development; and
- Sustainable procurement considerations for Materials and Waste that encourage circular economy outcomes throughout the construction of the Proposed Development.

22.6.3 Environmental measures include a range of management plans which will be secured by a DCO requirement and are to be complied with during the construction of the Proposed Development. These management plans seek to avoid or reduce adverse effects and have positive effects that achieve best practice where possible.

22.6.4 Construction phase Materials and Waste management plans will support the Proposed Development in undertaking best practice Materials and Waste management, supporting delivery of the circular economy through prevention of material wastage, and efficient segregation for recycling and reduction of waste generation.

22.6.5 Management plans will provide clear processes which ensure that all materials removed from the Proposed Development will be handled in accordance with relevant planning, waste and environmental regulations and policy (see **Table 22-1**). Waste will be transferred using a registered waste carrier to a licensed waste disposal site or recycling centre.

22.6.6 Management plans that will be completed include:

- **Outline Construction Environment Management Plan (oCEMP) (Appendix 4-2):** to set out effective, site-specific procedures and mitigation measures to monitor and control material and waste impacts throughout the construction phase of the Proposed Development. This will set out measures to reduce adverse impacts from construction activities, so far as is practicable. The oCEMP will set out the monitoring and auditing activities required to ensure that such material and waste mitigation measures are carried out, and that they are effective.
- **Outline Construction Method Statement (oCMS):** will also work alongside the oCEMP to outline how construction tasks relating to Materials and Waste will be carried out safely and efficiently, with appropriate health, safety and environmental mitigation in place.
- **Outline Site Waste Management Plan (oSWMP):** that sets out the standard good practice measures that will be implemented by the appointed contractor to

manage waste generated by the construction of the Proposed Development. This document may form an appendix of the oCEMP. The oSWMP will include measures to reduce potential environmental effects associated with the storage and transportation of waste and these measures will include:

- Provision of measures to support adherence to waste legislation, including the Duty of Care imposed by Section 34 of the Environmental Protection Act 1990;
- Careful location of waste stockpiles and other storage areas;
- Use of best practice in the design of waste storage areas and the use of suitable containers;
- Consideration of and inclusion of measures to control and treatment of runoff from soil and soil stockpiles;
- Minimising storage periods; and
- Minimising haulage distances.

- **Outline Peat Management Plan (oPMP) (Appendix 10-3):** which will set out how peat will be managed during the construction phase of the Proposed Development.
- **Outline Soil Management Plan (oSMP):** to manage any potential impacts to the soil (and agricultural land) during and on completion of the construction of the Bradford West Cable Corridor and the Access Routes.

Operation and Maintenance

22.6.7 The environmental measures within the Proposed Development for the operation and maintenance phase include:

- Sustainable procurement considerations for materials such as reuse, recycling, recycled content and offsite manufacture, which encourage circular economy actions in the operation and maintenance of the Proposed Development; and
- **Outline Operational Environment Management Plan (oOEMP)**: to manage environmental impacts during the operation and maintenance phase, ensuring compliance with Materials and Waste regulations, best practices, and planning requirements.

Decommissioning

22.6.8 The environmental measures within the Proposed Development for the decommissioning phase include:

- Sustainable procurement considerations for materials that facilitate deconstruction, reuse and recycling to encourage circular economy actions during the decommissioning of the Proposed Development; and
- **Outline Decommissioning Environment Management Plan (oDEMP)** that sets out the principal decommissioning activities and the measures that will be implemented, so far as is practical, to reduce adverse impacts on amenity, traffic or the environment in the surrounding area. It will also set out the monitoring and auditing activities designed to ensure that such Materials and Waste mitigation measures are carried out, and that they are effective.

Monitoring

22.6.9 The outline management plans identified above shall include requirements for the principal contractor and sub-contractors to undertake monitoring and reporting measures regarding the delivery of the expected outcomes for Materials and Waste for the Proposed Development, in line with legal duties and best practice.

22.7 Potential Effects Scoped Out.

22.7.1 The Scoping Report sought to scope out all aspects of Materials and Waste from assessment. However, the PINS Opinion indicated that this was not possible due to the lack of information for PINS to agree to scope out this technical aspect. This Chapter of the PEIR provides a preliminary assessment of the likely effects (as below) arising from the Proposed Development, using data that is accurate at the time of writing, based on current design status. This data will be reviewed and updated in the ES as the design is finalised.

22.8 Preliminary Environmental Assessment

22.8.1 The Preliminary Environmental Assessment will detail the effects that are considered to be likely significant effects at this preliminary stage, including providing details of how and why such a conclusion has been reached.

22.8.2 This is a preliminary assessment of likely significant effects with the environmental measures in place, but without additional mitigation. Preliminary assessments of potential likely significant effects are based on a point in time design, and the current design parameters as set out in **Chapter 4: The Proposed Development**.

22.8.3 The PEIR adopts a precautionary approach. A further assessment of likely significant effects for Materials and Waste will be provided within the ES.

Materials

22.8.4 In assessing likely significant effects from materials required for the Proposed Development at this stage, the Chapter considers the sensitivity of receptors; and the potential magnitude (i.e. size) of change caused by the Proposed Development.

Preliminary Assessment of Construction Materials

22.8.5 Data gathering for the construction phase materials assessment is for the Turbine Area and the Bradford West Cable Corridor, it does not include the Access Routes, as this information has not been available at this preliminary stage. Information on construction phase materials for the accesses will be reported within the ES.

22.8.6 Baseline data identified indicates that the ESA availability of materials (**Table 22-11**), compared to the quantities of materials required to construct the Turbine Area and Bradford West Cable Corridor (**Table 22-13**), mean that the available data indicates the Proposed Development will consume a maximum of 0.07% of the identified land won materials, 1.48% of the recycled / secondary aggregate annual supply and 1.39% of concrete and 0.00% of steel within their respective ESA's (see **Table 22-14**).

22.8.7 The currently available data for the Turbine Area and the Bradford West Cable Corridor aligns with low sensitivity impact (**Table 22-4**) and negligible magnitude assessment (**Table 22-7**) providing a neutral or low significance (**Table 22-10**) and therefore is currently likely **Not Significant**. This has the potential to change with the provision of data for the Access Routes.

22.8.8 Data is required for Access Routes to undertake the preliminary assessment on construction phase materials for the whole Proposed Development. Without this data, a full significance assessment of this phase cannot be undertake, for the whole Proposed Development; this will be completed in the ES. Therefore, overall, there is potential for a likely **significant effect** on construction phase materials which cannot be ruled out at this stage, but this will be robustly assessed at ES and a conclusion on significance reached.

22.8.9 The identified ESA material baseline indicates the required materials are free from known issues regarding supply and stock. However, the expected source for ground won materials has not been identified at this preliminary stage. Therefore, the assessment of the potential to sterilise (substantially) one or more allocated mineral sites has not been undertaken at this stage.

22.8.10 The preliminary assessment is not currently able to identify the sustainability features and benefits of the material that will be used, at this early stage in the design; however it is noted that the Proposed Development is seeking to use 30% recycled aggregate and there are proposed sustainability procurement practices (Section □) which will support preferential procurement of higher sustainability materials where viable.

Preliminary Assessment of Operation and Maintenance Materials

22.8.11 Materials required during the operation and maintenance phase of the Proposed Development will be minimal compared to the construction phase (**Section 22.5.11**). The wind turbines will require replacement after approximately 20 years, however this would not require new foundations or infrastructure and so would be expected to have a significantly lower material impact compared to the construction phase. The operation and maintenance phase impact on materials is expected to have low sensitivity and a negligible magnitude and are therefore considered to be likely **not significant**.

Preliminary Assessment of Decommissioning Materials

22.8.12 Materials required during the decommissioning phases of the development will be minimal compared to the construction phase (**Section 22.5.11**). The decommissioning phase impacts on materials is expected to have low sensitivity and a negligible magnitude and are therefore considered to be likely **not significant**.

Waste

22.8.13 In assessing preliminary likely significant effects on inert, non-hazardous and hazardous waste, this Chapter considers the sensitivity of receptors; and the potential magnitude (i.e. size) of change caused by the Proposed Development over all phases. It also considers the impact of all waste streams on regional waste management facilities capacity and capability, as identified by ISEP Materials and Waste Guidance[28] (**Section 22.4.12**).

Preliminary Assessment of Construction Inert and Non-hazardous Waste

22.8.14 The construction phase sensitivity criteria (**Table 22-5**) states that there is a low sensitivity when the regional inert and non-hazardous landfill void capacity is expected to reduce minimally by <1% as a result of the wastes forecast. The baseline inert landfill void capacity identified is 17,946,500m^3 and non-hazardous landfill void capacity identified is 42,119,000m^3. A 1% volume for each landfill classification would therefore represent 179,465m^3 for inert waste and 421,190m^3 of non-hazardous waste.

22.8.15 The Turbine Area and the Bradford West Cable Corridor data provided indicates that the inert and non-hazardous waste impact of these components of the Proposed Development will use 0.05% of baseline inert landfill void capacity in the ESA and 0.01% of the non-hazardous landfill void capacity within the ESA.

22.8.16 The currently available data for the Turbine Area and the Bradford West Cable Corridor provides for low sensitivity impact (**Table 22-5**Table 22-4) and negligible magnitude assessment (**Table 22-8**) providing a neutral or low effect (**Table 22-9**) and therefore is currently likely **not significant**.

22.8.17 The conclusions of likely significance of environmental effect have the potential to change with the provision of data for the Access Routes. Therefore, the preliminary assessment cannot rule out a likely **significant effect** without the data for the Access Routes; a full assessment will be undertaken at ES using data for all components of the Proposed Development.

Preliminary Assessment of Construction Hazardous Waste

22.8.18 The low sensitivity criteria for national hazardous landfill void capacity reduction is based on causing a reduction of <0.1% as a result of waste forecasts (**Table 22-6**). The negligible magnitude criteria (**Table 22-9**) used in this assessment is the same as the low sensitivity criteria. Baseline data for hazardous landfill void space identifies that there is 9,848,250m^3 of void available in England, 0.1% of the available hazardous landfill void space therefore represents 9,848m^3.

22.8.19 The preliminary assessment recognises that hazardous waste will be generated by the construction of the Proposed Development. However, it is not expected to be in quantities above 9,848m^3 or 0.1% of available hazardous landfill void. It is not believed that the construction of the Access Routes will have a major impact on hazardous waste generation due to the nature of the track construction processes.

22.8.20 Therefore, the preliminary assessment would expect that the hazardous waste to have a low environmental sensitivity and a negligible magnitude leading to a neutral or slight effect, which is likely **not significant**.

Preliminary Assessment of Operation and Maintenance Inert and Non-Hazardous Waste

22.8.21 The Proposed Development's operation and maintenance inert and non-hazardous waste is assessed as generating 56 tonnes per annum (**Section 22.5.31**).

22.8.22 The wind turbines will require major component replacement after approximately 20+ years of operation. However, this will use existing infrastructure access, and the turbines components will likely be 65% recycled, meaning 3,255 tonnes of waste could be generated, significantly less than the construction phase.

22.8.23 Review of the sensitivity criteria (**Table 22-5**) and the magnitude categorisation criteria (**Table 22-8**) for inert and non-hazardous waste indicates that this would have a low sensitivity and negligible magnitude on inert and non-hazardous landfill void capacity within the region, leading to a neutral or slight effect, which is likely **not significant.**

Preliminary Assessment of Operation and Maintenance Hazardous Waste

22.8.24 The Proposed Development's operation and maintenance hazardous waste generation is expected to be limited (**Section 22.5.37**), with a large proportion being oil and lubricants, which would not be sent to hazardous landfill. The low sensitivity criteria for national hazardous landfill void capacity reduction is based on causing a reduction of <0.1% as a result of waste forecasts (**Table 22-6**). The negligible magnitude criteria (**Table 22-9**) used in this assessment is the same as the low sensitivity criteria.

22.8.25 The preliminary assessment therefore expects that the Proposed Development's operation and maintenance phase for hazardous waste will have a low sensitivity and a negligible magnitude, leading to a neutral or slight effect, which is likely **not significant.**

Preliminary Assessment of Decommissioning Inert and Non-hazardous Waste

22.8.26 Decommissioning of the Proposed Development will occur approximately 35 years after becoming operational, it is not known what the inert, non-hazardous or hazardous landfill void capacity will be available when decommissioning of the Proposed Development is set to occur. A preliminary assessment has therefore been undertaken against the most current data available and provided in the baseline data in **Section 22.5**.

22.8.27 The preliminary assessment uses the same sensitivity criteria (**Table 22-5**) and magnitude categorisation criteria (**Table 22-8**) for inert and non-hazardous waste at the decommissioning phase as for the construction and operation and maintenance phases. It is expected that the Proposed Development would have a high recycling rate (see **Section 22.5**) at the decommissioning phase.

22.8.28 The Proposed Development is expected to have a low sensitivity and negligible magnitude on inert and non-hazardous landfill void capacity within the region at the decommissioning phase and therefore a neutral or slight effect, which is likely **not significant.**

Preliminary Assessment of Decommissioning Hazardous Waste

22.8.29 The preliminary assessment uses the same sensitivity criteria (**Table 22-6**) and magnitude categorisation criteria (**Table 22-9**) for hazardous waste at the

decommissioning phase as the construction and operation and maintenance phases.

22.8.30 Decommissioning of the wind turbines and associated above ground infrastructure will generate hazardous waste. It is not expected to be in quantities above 9,848m^3 or 0.1% of available hazardous landfill void (see **Section 22.5**).

22.8.31 It is expected that the Proposed Development's decommissioning phase would have a low sensitivity and negligible magnitude on hazardous landfill void capacity and therefore a neutral or slight effect, which is likely **not significant.**

Additional Mitigation

22.8.32 At this stage, no additional mitigation is considered necessary for effects during the construction, operation and maintenance and decommissioning phases. Environmental design measures, and standard construction practice (management plans) are included in the assessment (see **Section 22.6**). The need for further mitigation (including any site-specific control measures) will be considered as design and assessment work continues to progress as part of the design for the ES. Any additional mitigation developed will be reported in the ES.

Residual Effects

22.8.33 The preliminary assessment has identified that for Materials and Waste; the operation and maintenance and decommissioning phases will be likely not significant. It has also been identified that the construction phase for hazardous waste will be likely not significant.

22.8.34 Significant effects cannot be ruled out for construction phase materials and for inert and non-hazardous waste, as there is not sufficient information for the Access Routes to enable a detailed assessment at this stage. An assessment of these components will be undertaken for the ES as further design information will be available.

Next Steps

22.8.35 This preliminary assessment of likely significant effects in relation to Materials and Waste has been undertaken following the ISEP Materials and Waste Guidance[28], having also been informed by the Scoping Opinion. Further consultation will be undertaken as part of the consultation on the PEIR. The preliminary assessment indicates effects are not likely to be significant for Materials and Waste at operation and maintenance and decommissioning and for hazardous waste in the construction phase of the Proposed Development. Construction phase assessment for materials and inert and non-hazardous waste requires data relating to the

construction of the Access Routes, which is currently not available, therefore we cannot rule out likely significant effects for these components at this stage.

22.8.36 The Applicant will have the benefit of increased information about the detailed design of the Proposed Development for the ES. More accurate data will be reflected in the ES and DCO Application to carry out a more detailed assessment of the significance of the effects arising from Materials and Waste as a result of the Proposed Development.

22.9 Conclusions

22.9.1 This Chapter provides a summary of the known environmental impacts of Materials and Waste for the Proposed Development using currently available data. It identifies legislation and policy (**Table 22-1**), relating to Materials and Waste which the Applicant must adhere to and outlines the proposed actions and management plans that will be secured by a DCO requirement to ensure compliance.

22.9.2 Baseline data and the future Materials and Waste conditions for the construction, operation and maintenance and decommissioning phases for the Proposed Development are provided based on the most up-to-date data currently available.

22.9.3 The Chapter has used the ISEP Materials and Waste Guidance[28] to assess the environmental effects for Minerals and Waste using the data identified for the Proposed Development at the relevant PDSAs and ESAs. The preliminary assessment findings of this Chapter are that Materials and Waste during the operation and maintenance and the decommissioning phases and for hazardous waste at the construction phase of the Proposed Development will be likely **Not Significant**.

22.9.4 The Chapter has not been able to undertake a full assessment of the construction phase of the Proposed Development for Material use and inert and non-hazardous waste; and therefore, **cannot rule out Likely Significant Effects** for Materials and Waste, on a worst-case basis, at this stage. However, a full assessment using design information will take place for the ES.

22.9.5 A summary of the preliminary assessment of likely significant effects is provided in **Table 22-17**. It also includes the next steps to be undertaken as part of the EIA.

Table 22-17: Preliminary Assessment of Likely Significant Effects Summary

Element	Preliminary Assessment of Likely Significant Effect	Further Information	Next Steps
Construction phase materials	**Cannot rule out Likely Significant Effect**	Design information for whole Proposed Development and consultee feedback	Complete ES chapter.
Construction phase inert and non-hazardous waste	**Cannot rule out Likely Significant effect**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Construction phase hazardous waste	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Operation and maintenance materials	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Operation and maintenance inert and non-hazardous waste	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Operation and maintenance hazardous waste	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Decommissioning materials	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.

Element	Preliminary Assessment of Likely Significant Effect	Further Information	Next Steps
Decommissioning inert and non-hazardous waste	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.
Decommissioning hazardous waste	**Likely Not Significant**	Detailed design for whole Proposed Development and consultee feedback	Complete ES chapter.

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