
TABLE OF CONTENTS

21.0	MATERIALS AND WASTE.....	3
21.1	Introduction	3
21.2	Legislation, Planning Policy Context and Other Guidance.....	3
21.3	Assessment Methodology and Significance Criteria	9
21.4	Baseline Conditions	24
21.5	Proposed Development Design and Impact Avoidance	36
21.6	Impacts and Likely Significant Effects.....	37
21.7	Essential Mitigation and Enhancement Measures.....	45
21.8	Residual Effects and Conclusions	46
21.9	Summary of Residual Effects.....	46
21.10	References.....	49

TABLES

Table 21-1:	Outline Scope of the Materials and Waste Assessment	13
Table 21-2:	Materials Receptor Sensitivity.....	15
Table 21-3:	Inert and Non-hazardous Landfill Capacity Sensitivity	16
Table 21-4:	Hazardous Landfill Capacity Sensitivity	17
Table 21-5:	Materials Magnitude of Impacts.....	18
Table 21-6:	Inert and Non-hazardous Waste - Magnitude of Impact	18
Table 21-7:	Hazardous Waste - Magnitude of Impact.....	19
Table 21-8:	Effect Thresholds.....	20
Table 21-9:	Significance of Effect	20
Table 21-10:	Responses to the Statutory Consultation Feedback	22
Table 21-11:	National Consumption and Sales for Key Construction Materials.....	25
Table 21-12:	2022 Construction Material Sales by Region (MPA, 2023).....	25
Table 21-13:	Potential Recycled Content (Percentage by Weight)	26
Table 21-14:	Landfill Capacity (end of 2022) in Yorkshire and the Humber, the North East and England	27
Table 21-15:	Summary of Waste Inputs by Facility, for the Yorkshire and the Humber and North East Regions 2022	30
Table 21-16:	Hazardous Waste Incineration Facilities and Cement Kilns Accepting Hazardous Waste.....	31
Table 21-17:	Hazardous Liquid Waste Treatment Facilities in England.....	32
Table 21-18:	Historic Landfill Sites within the Proposed Development Site	33
Table 21-19:	Standard, Good and Best Practice Recovery Rates by Material	34
Table 21-20:	Construction Material Use and Waste Types Arising from the Construction of the Proposed Development.....	38
Table 21-21:	Construction Material Estimates for the Proposed Development	40

Table 21-22: Construction Waste Summary	42
Table 21-23: Summary of Residual Effects	47

PLATES

Plate 21-1: Historic Landfill Capacity Trend (2005 to 2022) for Non-hazardous Waste in the Yorkshire and the Humber and North East Regions ('000s m ³)	28
Plate 21-2: Historic Landfill Capacity Trend (2005 to 2022) for Inert Waste in the Yorkshire and the Humber and North East Regions ('000s m ³)	28
Plate 21-3: Historic Landfill Capacity Trend (2005 to 2022) for Hazardous Waste in England ('000s m ³)	29
Plate 21-4: The Waste Hierarchy, Recreated from Defra's Guidance on Applying the Waste Hierarchy (Defra, 2011)	37

VOLUME II: FIGURES (ES VOLUME II, EN070009/APP/6.3)

Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites

VOLUME III: APPENDICES (ES VOLUME III, EN070009/APP/6.4)

Appendix 21A: Minimum Liquid Discharge Waste Sites

Rev: 0

21.0 MATERIALS AND WASTE

21.1 Introduction

21.1.1 This chapter of the Environmental Statement (ES) identifies the potential impacts and effects on materials and waste as part of the Environmental Impact Assessment (EIA) of the Proposed Development.

21.1.2 The assessment has been undertaken in accordance with current best practice guidance and follows the methodology set out in the Institute of Environmental Management and Assessment's (IEMA) guide to Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (referred to herein as the IEMA Guidance) (IEMA, 2020).

21.1.3 This chapter is supported by Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3) and Appendix 21A: Minimum Liquid Discharge Waste Sites (ES Volume III, EN070009/APP/6.4).

21.2 Legislation, Planning Policy Context and Other Guidance

21.2.1 This section identifies and describes legislation, planning policy and guidance that is of relevance to the assessment of materials and waste effects.

Legislative Background

21.2.2 The assessment has taken account of relevant waste management legislation, including, but not limited to:

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (2017 No. 572) (HM Government, 2017);
- Waste Framework Directive (2008/98/EC) (EU, 2008);
- Environmental Protection Act 1990 (1990) (HM Government, 1990);
- The Hazardous Waste (England and Wales) Regulations 2005 (2005 No. 894) as amended (HM Government, 2005);
- The Waste (England and Wales) Regulations 2011 (2011 No. 988) as amended (HM Government, 2011);
- The Environmental Permitting (England and Wales) Regulations 2016 (2016 No. 1154) (HM Government, 2016); and
- Environment Act 2021 (2021 c. 30) (HM Government, 2021).

21.2.3 The Waste (England and Wales) Regulations 2011 (as amended) (HM Government, 2011) transposes the requirements of the Waste Framework Directive (Waste FD) (EU, 2008) in England and Wales and is most relevant to waste producers. The regulations require the Secretary of State to establish waste prevention programmes and waste management plans that apply the waste hierarchy. The waste hierarchy is defined in the Waste FD and prioritises waste prevention, followed by preparing for reuse, recycling, recovery and finally disposal as the means of managing waste.

21.2.4 The Waste (England and Wales) Regulations 2011 (as amended) (HM Government, 2011) also require businesses to apply the waste hierarchy when managing waste, and require that measures are taken to ensure that, by the year 2020 and beyond, at least 70% by weight of non-hazardous construction and demolition (C&D) waste is subjected to material recovery. The target specifically excludes naturally occurring materials with European Waste Catalogue (EWC) Code 17 05 04 (soil and stones other than those mentioned in 17 05 03* (soils and stone containing dangerous substances)).

21.2.5 A departure from the waste hierarchy can be undertaken to achieve the best overall environmental outcome where this is justified by lifecycle thinking on the overall impacts of the generation and management of the waste. However, the following considerations must also be taken into account:

- environmental protection principles of precaution and sustainability;
- proximity principle for treatment and disposal of waste to be as close to its source as possible;
- technical feasibility and economic viability;
- protection of resources; and
- overall environmental, human health, economic and social impacts.

Planning Policy Context

National Policy Statements

21.2.6 The materials and waste assessment takes into consideration national policy that concerns the use of materials and waste generation and its management. The following national policies statements (NPSs) are relevant to the assessment.

Overarching National Policy Statement for Energy (EN-1) (2023)

21.2.7 Section 5.15 of the NPS (EN-1) (Department for Energy Security and Net Zero (DESNZ), 2023a)) relates to resources and waste management. The NPS states:

- 5.15.2 *“Sustainable waste management is implemented through the waste hierarchy, which sets out the priorities that must be applied when managing waste.”*
- 5.15.3 *“Disposal of waste should only be considered where other waste management options are not available or where it is the best overall environmental outcome.”*
- 5.15.4 *“All large infrastructure projects are likely to generate some hazardous and non-hazardous waste. The EA’s Environmental Permit regime incorporates operational waste management requirements for certain activities. When an applicant applies to the EA for an Environmental Permit, the EA will require the application to demonstrate that processes are in place to meet all relevant Environmental Permit requirements.”*

- 5.15.8 *“The applicant should set out the arrangements that are proposed for managing any waste produced and prepare a report that sets out the sustainable management of waste and use of resources throughout any relevant demolition, excavation and construction activities.”*
- 5.15.9 *“The arrangements described and a report setting out the sustainable management of waste and use of resources should include information on how re-use and recycling will be maximised in addition to the proposed waste recovery and disposal system for all waste generated by the development. They should also include an 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.”*
- 5.15.10 *“The applicant is encouraged to refer to the Waste Prevention Programme for England: Maximising Resources Minimising Waste (Defra, 2023a) and should seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that this is the best overall environmental outcome.”*
- 5.15.12 *“The UK is committed to moving towards a more ‘circular economy’. Where possible, applicants are encouraged to source materials from recycled or reused sources and use low carbon materials, sustainable sources and local suppliers. Construction best practices should be used to ensure that material is reused or recycled onsite where possible.”*
- 5.15.13 *“Applicants are also encouraged to use construction best practices in relation to storing materials in an adequate and protected place on site to prevent waste, for example, from damage or vandalism. The use of Building Information Management tools (or similar) to record the materials used in construction can help to reduce waste in future decommissioning of facilities, by identifying materials that can be recycled or reused.”*

National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (2023)

21.2.8 NPS EN-4 (DESNZ, 2023b) does not include any matters relevant to the materials and waste assessment.

National Policy Statement for Electricity Networks Infrastructure (EN-5) (2023)

21.2.9 NPS EN-5 (DESNZ, 2023c) does not include any matters relevant to the materials and waste assessment.

National Planning Policy

National Planning Policy Framework (2023)

21.2.10 The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities (DLUHC), 2023) does not contain specific waste policies as these are detailed within the revised Waste Management Plan for England (Department for the Environment, Food and Rural Affairs (Defra), 2021a) and the

National Planning Policy for Waste (MHCLG, 2014b), however the following overarching policies are relevant to waste and resources:

- the environmental objective set out at paragraph 8 of the NPPF is to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy; and
- the environmental objective set out in paragraph 216 of the NPPF is to so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously.

Planning Policy Guidance for Minerals (2014) (MHCLG, 2014a) and NPPG for Waste (2015) (MHCLG, 2015)

21.2.11 The separate PPGs for Minerals and Waste were published to provide more in-depth guidance than the NPPF. They aim to make planning guidance more accessible and ensure that it is kept up to date. The guidance sets out local authority obligations for minerals and waste planning.

National Planning Policy for Waste (2014) (MHCLG, 2014b)

21.2.12 The National Planning Policy for Waste sets out detailed waste planning policies to be applied in conjunction with the NPPF. It states that “*when determining planning applications for non-waste development, Local Planning Authorities should, to the extent appropriate to their responsibilities, ensure that:*

- *the likely impact of proposed, non-waste related development on existing waste management facilities, and on sites and areas allocated for waste management, is acceptable and does not prejudice the implementation of the waste hierarchy and/or the efficient operation of such facilities;*
- *new, non-waste development makes sufficient provision for waste management and promotes good design to secure the integration of waste management facilities with the rest of the development...; and*
- *the handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal.”*

The Waste Management Plan for England (2021) (Defra, 2021a)

21.2.13 The Waste Management Plan for England provides an overview of waste management in England and reiterates the requirement for all waste producers and waste management providers to implement the waste hierarchy. It also highlights the need for waste to be managed using the proximity principle and confirms England’s commitment to recovering at least 70% by weight of non-hazardous C&D waste by 2020 (excluding soils and stones). Recovery is assumed in the context of this policy to include reuse, recycling and incineration with energy recovery.

A Green Future: Our 25 Year Plan to Improve the Environment (2018) (Defra, 2018a)

21.2.14 A Green Future: Our 25 Year Plan to Improve the Environment (2018) "sets out goals for improving the environment within a generation and leaving it in a better state than we found it". It details how the Government will work with communities and businesses to do this. The following policies are of note:

- "make sure that resources are used more efficiently and kept in use for longer to minimise waste and reduce its environmental impacts by promoting reuse, remanufacturing and recycling;
- work towards eliminating all avoidable plastic waste by the end of 2042 and all avoidable waste by 2050;
- reducing food supply chain emissions and waste;
- reducing litter and littering; and
- improving management of residual waste."

Our Waste, Our Resources: A Strategy for England (Resources and Waste Strategy for England) (2018) (Defra, 2018b)

21.2.15 The Strategy for England (2018) aims to help the Government to meet the commitments outlined in the 25 Year Plan and "sets out how we will preserve our stock of material resources by minimising waste, promoting resource efficiency and moving towards a circular economy. At the same time we will minimise the damage caused to our natural environment by reducing and managing waste safely and carefully, and by tackling waste crime."

21.2.16 The strategy combines actions to be taken now and commitments for the coming years. Key targets and milestones which could be relevant to the Proposed Development include:

- roll out of a deposit return scheme – 2025;
- legislation for mandatory separate food waste collections – by the end of March 2026;
- 75% recycling rate for packaging (subject to consultation);
- 65% recycling rate for municipal solid waste – 2035; and
- municipal waste to landfill 10% or less – 2035.

Environmental Improvement Plan 2023 (Defra, 2023b)

21.2.17 The Environmental Improvement Plan (EIP) builds on the 25 Year Plan to Improve the Environment published in 2018, which covered topics including waste and resources, air quality and nature.

21.2.18 The EIP confirms that Defra will publish the new maximising resources and minimising waste programme in England. The programme will set out the

Government's priorities for action across seven key sectors, including construction, to manage resources and waste in accordance with the waste hierarchy.

- 21.2.19 The Government is working to publish a revised Code of Practice for the sustainable use of soil on construction sites, which will help to reduce the amount of soil sent to landfill.
- 21.2.20 In addition, a Soil Reuse and Storage Depot scheme will be developed to help prevent soil that would otherwise be classified as waste going to landfill and encourage remediation and reuse of soil. The scheme will be piloted by Defra by 2026.
- 21.2.21 In the longer term, the EIP includes commitments to eliminate avoidable plastic waste by 2042 and avoidable waste by 2050.

Local Planning Policy

- 21.2.22 The materials and waste assessment has taken into consideration local policy that concerns the use of materials and waste generation and management. Details of local planning policy relevant to the Proposed Development are presented below.

Tees Valley Joint Minerals and Waste Development Plan Documents (DPDs) Core Strategy DPD (Tees Valley, 2011a).

- 21.2.23 The Tees Valley Joint Minerals and Waste DPDs are prepared jointly by the boroughs of Darlington, Hartlepool, Middlesbrough, Redcar and Cleveland, and Stockton-on-Tees, bringing together the planning issues which arise from minerals and waste within the sub-region. The Minerals and Waste Core Strategy contains the long-term spatial vision and the strategic policies needed to achieve the key objectives for minerals and waste developments in the Tees Valley. Relevant policies include:

- Policy MWC4: Safeguarding of Minerals and Resources from Sterilisation (within Mineral Safeguarding Areas (MSAs), non-minerals development will only be permitted in the circumstances outlined in the Minerals and Waste Core Strategy);
- Policy MWC8: General Locations for Waste Management Sites (aims to locate large waste management facilities within the general industrial areas to the north and south of the River Tees); and
- Policy MWC11: Safeguarding of Port and Rail Facilities (development proposed on or in the vicinity of these sites will only be permitted where it would not prejudice the transportation of minerals resources and waste materials by water and rail).

Tees Valley Joint Minerals and Waste Development Plan Documents: Policies and Sites Development Plan Document (Tees Valley, 2011b)

- 21.2.24 The Policies and Sites DPD, which conforms with the Core Strategy DPD, identifies specific sites for minerals and waste development and sets out policies which will be used to assess minerals and waste planning applications. The sites are deemed to be safeguarded for the purposes of this assessment. Relevant policies include:

-
- Policy MWP5: Haverton Hill (Stockton-on-Tees);
 - Policy MWP6: New Road, Billingham (Stockton-on-Tees);
 - Policy MWP8: South Tees Eco-Park (Redcar and Cleveland); and
 - Policy MWP10: Construction and Demolition Waste Recycling (use of existing or permitted minerals and waste sites at Hart Quarry, Stockton Quarry, South Tees Eco-Park, Haverton Hill, Port Clarence and New Road, and development sites whilst operational)

21.2.25 The sites listed above cover the following strategic objectives:

- to safeguard sustainable minerals transport infrastructure and promote the use of sustainable transport, in particular the existing rail and port facilities in the Tees Valley for the movement of minerals and waste and to promote the re-use, recycling and recovery of from waste (Haverton Hill and New Road, Billingham).
- to promote the development of resource recovery parks where symbiotic relationships between industries can flourish (South Tees Eco-Park).
- to promote the management of waste close to its point of production whilst recognising the existing role and future potential of the Tees Valley in specialist waste management (South Tees Eco-Park).

Other Guidance

21.2.26 Additional guidance documents relevant to the materials and waste assessment which have been considered include:

- Waste & Resources Action Programme (WRAP) Designing Out Waste: A Design Team Guide for Civil Engineering (WRAP, n.d. a); and
- WRAP Designing Out Waste: A Design Team Guide for Buildings (WRAP, n.d. b).

21.3 Assessment Methodology and Significance Criteria

21.3.1 For this assessment, materials and waste comprise:

- the consumption of materials (key construction materials only); and
- the generation and management of waste during construction, operation and decommissioning.

21.3.2 Materials are defined in the IEMA Guidance (IEMA, 2020) as *“physical resources that are used across the lifecycle of a development. Examples include key construction materials such as concrete, aggregate, asphalt and steel.”*

21.3.3 Other material assets considered include built assets such as landfill void capacity and allocated/safeguarded mineral sites (e.g. quarries, wharves, rail depots concrete plants) and waste sites.

21.3.4 Waste is defined as per the Waste FD (2008/98/EC) (European Union (EU), 2008) as *“any substance or object which the holder discards or intends or is required to discard.”*

-
- 21.3.5 Impacts upon MSAs (an area designated by a Mineral Planning Authority which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development) are not assessed in the materials and waste assessment in accordance with the IEMA Guidance (IEMA, 2020). Safeguarded mineral sites such as quarries, wharves and depots are included. MSAs are included for context in the baseline since they are a planning consideration and are considered further in the Planning Statement (EN070009/APP/5.2) submitted with the Development Consent Order (DCO) Application.
- 21.3.6 Impacts on allocated/safeguarded waste sites are not included in the IEMA Guidance, however, they are included in this chapter for completeness.
- 21.3.7 This section outlines the methodology that has been employed for assessing the likely significant effects associated with materials and waste. The IEMA Guidance (IEMA, 2020) offers two methods for the assessment of waste. Method W1 - Void Capacity, has been selected as this is a more detailed methodology, is appropriate for larger and more complex projects and recommended for statutory EIAs. In Method W1, the magnitude of impact from waste is assessed by determining the percentage of the remaining landfill void capacity that will be depleted by waste produced during the construction and/or operation phases of the development.
- 21.3.8 In Method W2 – Landfill Diversion, developments are compared to a good practice landfill diversion rate of 90% to determine magnitude of impact. This is a simpler approach for smaller and less-complex projects and for non-statutory EIAs and is therefore not considered suitable for this assessment.
- 21.3.9 Some of the operational hazardous wastes likely to be generated by the Proposed Development may not be suitable for landfill disposal e.g. liquid waste. Therefore, in addition to Method W1 – Void Capacity, hazardous operational waste has been compared to national hazardous waste management facility waste inputs.

Study Area

- 21.3.10 The study areas for the assessment of impacts related to materials and waste have been defined in line with the IEMA Guidance. Two study areas are defined: a Proposed Development Study Area (within which waste associated with the Proposed Development is generated, construction materials are used and allocated/safeguarded mineral and waste sites and MSAs are present), and an Expansive Study Area (within which landfills and other waste management facilities (including hazardous waste management facilities) that manage waste generated by the Proposed Development are likely to be located and construction materials are available). Together the Proposed Development Study Area and Expansive Study Area are referred to in this chapter as 'the Study Areas'.

Proposed Development Study Area

- 21.3.11 The Proposed Development Study Area for construction and operational waste generation, and for use of construction materials (key construction materials only), comprises the Proposed Development Site (i.e., the footprint of the proposed works, together with any temporary land requirements during permitted
-

- preliminary works and construction). This includes temporary offices, compounds and storage areas.
- 21.3.12 The Proposed Development Study Area for impacts on allocated/safeguarded mineral and waste sites and presence of MSAs is aligned to the Proposed Development Site Boundary.
- 21.3.13 Figure 1-1: Proposed Development Location (ES Volume II, EN070009/APP/6.3) displays the boundary of the Proposed Development Site.
- 21.3.14 Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3) displays the boundary of the Proposed Development in the context of historic and authorised landfills and waste and mineral sites. Permitted waste sites (blue squares) and waste site applications (pink circles) within the 500 m buffer are labelled with a licence number, allowing identification of sites in the vicinity of the Proposed Development Site. Sites within the Proposed Development Site are provided in Section 21.4: Baseline Conditions.

Expansive Study Area

- 21.3.15 The Expansive Study Area for non-hazardous and inert waste management comprises the Yorkshire and the Humber, and North East regions. Both regions are included since the Proposed Development Site is close to the border between them, and waste could be managed in either. The Expansive Study Area and regions include the following sub-regions as outlined in the Environment Agency's (EA) 2022 Waste Summary Tables for England - Version 2 (EA, 2023a):
- Former Humberside, North Yorkshire, South Yorkshire, West Yorkshire; and
 - County Durham, Northumberland, Tees Valley Unitary Authorities and Tyne & Wear.
- 21.3.16 The Expansive Study Area for hazardous waste management is England.
- 21.3.17 The Study Area for hazardous waste management is defined based on professional judgement and informed by consideration of the proximity principle. The proximity principle for hazardous waste in England is outlined in Principle 2 - Infrastructure Provision in the Strategy for Hazardous Waste Management in England, and states *"We look to the market for the development of hazardous waste infrastructure, which implements the hierarchy for the management of hazardous waste and meets the needs of the UK to ensure that the country as a whole is self-sufficient in hazardous waste disposal, facilities are put in place for hazardous waste recovery in England, and the proximity principle is met"* (Defra, 2010). Planning for hazardous waste management is also undertaken at a national level.
- 21.3.18 The Expansive Study Areas for the availability of key construction materials (aggregates, asphalt, concrete and steel) are national (United Kingdom (UK) or Great Britain (GB), depending upon baseline information availability), and Yorkshire and the Humber, and the North East regions.

Impact Assessment Methodology

Scope of Assessment

21.3.19 The assessment of materials and waste considers the following:

- waste producers have a legal duty of care to manage their waste in accordance with regulations and to ensure that any waste leaving the site where it is generated is transferred to a suitably licensed facility for further treatment or disposal;
- facilities transferring, treating or disposing of waste must be either licensed or apply for an exemption from a licence, and impacts arising from the operation of waste management facilities are considered as part of the planning and permitting process for these facilities themselves;
- as part of their planning function, Waste Planning Authorities (WPAs) are required to ensure that sufficient land is available to accommodate facilities for the treatment of all waste arising in the area, either within the WPA area, or through export to suitable facilities in other areas; and
- Mineral Planning Authorities are similarly required to ensure an adequate supply of minerals, sufficient to meet the needs of national and regional supply policies, and local development needs.

21.3.20 The following matters are not considered in the assessment of materials and waste:

- Waste arising from extraction, processing and manufacture of construction components and products. This is based on the assumption that these products and materials are being developed in a manufacturing environment with their own waste management plans, facilities, and supply chain, which are potentially in different regions of the UK or the world and therefore outside of the geographical scope of this study. Such matters cannot be accurately predicted and assessed as they relate to procurement decisions that cannot be assured. Waste arising from extraction, processing and manufacture of construction components and products are scoped out of the assessment as agreed by the Planning Inspectorate (the Inspectorate) which is outlined in the Scoping Opinion (Appendix 1E (ES Volume III, EN070009/APP/6.4)).
- Other environmental impacts associated with the management of waste from the Proposed Development (e.g. on water resources, air quality, noise or traffic resulting from the generation, handling, on-site temporary storage or off-site transport of materials and waste) are not included in this assessment, as they are addressed separately in other relevant chapters of this ES (e.g. Chapter 8: Air Quality, Chapter 9: Surface Water, Flood Risk and Water Resources, Chapter 11: Noise and Vibration and Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2)). The environmental impacts associated with the management of waste from the Proposed Development have been scoped out of the assessment as agreed by the Inspectorate which is outlined in Appendix 1E (ES Volume III, EN070009/APP/6.4).

- Direct impacts on MSAs. The Proposed Development Site lies within MSAs for salt and gypsum (anhydrite), however, impacts on MSAs are not assessed in the materials and waste assessment in accordance with the IEMA Guidance (IEMA, 2020). MSAs are included for context in the baseline since MSAs are a planning consideration and are considered further in the Planning Statement (EN070009/APP/5.2) submitted with the Development Consent Order (DCO) Application.
- Effects associated with decommissioning of the Proposed Development. The Proposed Development has a long design life and potentially even longer operational life and as such it is not considered possible to reliably forecast decommissioning requirements and infrastructure far in the future. The Phase 1 and Phase 2 Hydrogen Production Facilities will each have a design life of 25 years. However, the operational life could be longer subject to market conditions and plant condition, and this ES does not assume that the facilities will be removed after 25 years, but as it is based on annual waste basis, any extension of the lifetime will not impact on the results of this assessment. A Decommissioning Environmental Management Plan (DEMP) will be prepared which would consider in detail all potential environmental risks on the Proposed Development Site and contain guidance on how risks can be removed or mitigated. Effects associated with the decommissioning phase would be no worse than those experienced during the construction of the Proposed Development as agreed by the Inspectorate which is outlined in the Consultation Report (EN070009/APP/5.1).
- Effects on the availability of materials during the operation of the Proposed Development. Forecast materials and waste effects are (using professional judgement) considered negligible in relation to the scale and nature of the Proposed Development as agreed by the Inspectorate which is outlined in the Consultation Report.

21.3.21 Table 21-1 provides the outline scope of the materials and waste assessment.

Table 21-1: Outline Scope of the Materials and Waste Assessment

PROPOSED DEVELOPMENT PHASE	POTENTIAL EFFECTS	SCOPE IN/ OUT
Construction	Changes in demand for materials	Scoped in
	Changes in available landfill void capacity	Scoped in
	Changes to allocated/safeguarded mineral site	Scoped in
	Changes to allocated/safeguarded waste site	Scoped in
Operation	Changes in availability of materials	Scoped out
	Changes in available landfill void capacity	Scoped in
	Changes in available hazardous waste management facility capacity	Scoped in

PROPOSED DEVELOPMENT PHASE	POTENTIAL EFFECTS	SCOPE IN/ OUT
Decommissioning	Changes in demand for materials	Scoped out
	Changes in available landfill capacity	Scoped out
	Changes to allocated/safeguarded mineral site	Scoped out
	Changes to allocated/safeguarded waste site	Scoped out

Value / Sensitivity of Receptors

21.3.22 The sensitive receptors for the assessment of the construction phase materials and waste impacts are:

- Landfill void capacity in the Expansive Study Area of Yorkshire and the Humber and North East (non-hazardous and inert landfill void capacity), and England (hazardous landfill void capacity) – as defined in the IEMA Guidance (IEMA, 2020) *“landfill is a finite resource, and hence – through the ongoing disposal of waste – there is a continued need to expand existing and develop new facilities, This requires the depletion of natural and other resources which, in turn, adversely impacts the environment.”*; and
- Materials, national and regional availability of key construction materials – as outlined in the IEMA Guidance (IEMA, 2020) *“materials are, in their own right, sensitive receptors. Consuming materials impacts upon their immediate and (in the case of primary material) long-term availability; this results in the depletion of natural resources and adversely impacts the environment.”*

21.3.23 The sensitive receptors for the assessment of operational phase materials and waste impacts are:

- Landfill void capacity in the Expansive Study Area of Yorkshire and the Humber and the North East (non-hazardous and inert landfill void capacity), and England (hazardous landfill void capacity).

21.3.24 The IEMA Guidance (IEMA, 2020) *“does not consider waste processing and recovery facilities as sensitive receptors, rather: they are part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal. Waste processing and recovery facilities are, hence, different to landfills, in that the latter are finite resources.”* However, since some of the operational hazardous wastes likely to be generated by the Proposed Development may not be suitable for landfill disposal (e.g. liquid waste), hazardous operational waste is compared to national hazardous waste management facility capacity in this assessment.

Materials

21.3.25 The sensitivity of materials relates to the availability and type of construction materials to be consumed by the Proposed Development. The IEMA Guidance

(IEMA, 2020) criteria described within Table 21-2 is used to determine the sensitivity of materials.

Table 21-2: Materials Receptor Sensitivity

EFFECTS	CRITERIA FOR MATERIALS RECEPTOR SENSITIVITY
Negligible	<p>On balance, the key materials required for the construction of the Proposed Development are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock.</p> <p><i>And/or</i></p> <p>are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials.*</p>
Low	<p>On balance, the key materials required for the construction of the Proposed Development are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock.</p> <p><i>And/or</i></p> <p>are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.</p>
Medium	<p>On balance, the key materials required for the construction of the Proposed Development are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock.</p> <p><i>And/or</i></p> <p>are available comprising some sustainable features and benefits compared to industry-standard materials.</p>
High	<p>On balance, the key materials required for the construction of the Proposed Development are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock.</p> <p><i>And/or</i></p> <p>comprise little or no sustainable features and benefits compared to industry-standard materials.</p>
Very High	<p>On balance, the key materials required for the construction of the Proposed Development are forecast are known to be insufficient in terms of production, supply and/or stock.</p> <p><i>And/or</i></p> <p>comprise no sustainable features and benefits compared to industry-standard materials.</p>
<p><i>* 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.</i></p>	

Waste

- 21.3.26 The sensitivity of waste relates to availability of landfill capacity in the absence of the Proposed Development as outlined in the IEMA Guidance (IEMA, 2020) "*landfill capacity is recognised as an unsustainable and increasingly scarce option for managing waste.*" The sensitivity of landfill capacity is assessed based on a review of historic landfill void capacity trends where available and information from relevant policy documents.
- 21.3.27 The criteria described within Table 21-3 and Table 21-4 has been used to determine the sensitivity of landfill capacity.

Table 21-3: Inert and Non-hazardous Landfill Capacity Sensitivity

EFFECTS	CRITERIA FOR INERT AND NON-HAZARDOUS LANDFILL CAPACITY SENSITIVITY
Negligible	Across construction and/or operational phases, the baseline/future baseline (i.e. without the Proposed Development) of regional inert and non-hazardous landfill capacity is expected to remain unchanged, or is expected to increase through a committed change in capacity.
Low	Across construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional inert and non-hazardous landfill capacity is expected to reduce minimally by <1% as a result of wastes forecast.
Medium	Across construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional inert and non-hazardous landfill capacity is expected to reduce noticeably by 1 to 5% as a result of wastes forecast.
High	Across construction and/or operational phases, the baseline/future baseline (i.e. without the Proposed Development) of regional inert and non-hazardous landfill capacity is expected to reduce considerably by 6 to 10% as a result of wastes forecast.
Very High	Across construction and/or operational phases, the baseline/future baseline (i.e. without the Proposed Development) of regional inert and non-hazardous landfill capacity is: <ul style="list-style-type: none"> ● expected to 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.

Table 21-4: Hazardous Landfill Capacity Sensitivity

EFFECTS	CRITERIA FOR HAZARDOUS LANDFILL CAPACITY SENSITIVITY
Negligible	Across the construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional (or where justified, national) hazardous landfill capacity is expected to remain unchanged or is expected to increase through a committed change in capacity.
Low	Across the construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional (or where justified, national) hazardous landfill capacity is expected to reduce minimally by <0.1% as a result of wastes forecast.
Medium	Across the construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional (or where justified, national) hazardous landfill capacity is expected to reduce noticeably by 0.1 to 0.5% as a result of wastes forecast.
High	Across the construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional (or where justified, national) hazardous landfill capacity is expected to reduce considerably by 0.5 to 1% as a result of wastes forecast.
Very High	<p>Across the construction and/or operational phases, the baseline/future baseline (i.e., without the Proposed Development) of regional (or where justified, national) hazardous landfill capacity is:</p> <ul style="list-style-type: none"> ● expected to 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.

Magnitude of Impacts

21.3.28 The magnitude of impact describes the degree of variation from the baseline conditions as a result of the Proposed Development. The IEMA Guidance (IEMA, 2020) for assessing the magnitude of impact from materials comprises a percentage-based approach that determines the influence of construction materials use on the baseline national demand from the construction of the Proposed Development. The criteria used to assess the magnitude of impact for materials are provided in Table 21-5.

Table 21-5: Materials Magnitude of Impacts

	CRITERIA FOR MATERIALS MAGNITUDE OF IMPACTS
No change	Consumption of no materials is required.
Negligible	Consumption of no individual material type is equal to or greater than 1% by volume of the national* baseline availability.
Minor	Consumption of one or more materials is between 1 to 5% by volume of the national* baseline availability; and 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.
Moderate	Consumption of one or more materials is between 6 to 10% by volume of the national* baseline availability; and One allocated mineral site is substantially** sterilised by the development rendering it inaccessible for future use.
Major	Consumption of one or more materials is >10% by volume of the national* baseline availability; and More than one allocated mineral site is substantially** sterilised by the development rendering it inaccessible for future use.
*a national baseline is used in the absence of regional construction material consumption data. **justified using professional judgement, based on the scale and nature of the allocated mineral site being assessed.	

21.3.29 The IEMA Guidance (IEMA, 2020) methodology for assessing the magnitude of impact for waste comprises a percentage-based approach that determines the influence of waste generation from the construction of the Proposed Development on the baseline landfill capacity. The criteria used to assess the magnitude of impact for inert and non-hazardous waste, and hazardous waste, are provided within Table 21-6 and Table 21-7 respectively.

Table 21-6: Inert and Non-hazardous Waste - Magnitude of Impact

	CRITERIA FOR WASTE MAGNITUDE OF IMPACTS
No change	Zero waste generation and disposal from the development.
Negligible	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline# by <1%.
Minor	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline# by 1 to 5%.

CRITERIA FOR WASTE MAGNITUDE OF IMPACTS	
Moderate	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by 6 to 10%.
Major	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by >10%.
<i># forecast as the worst-case scenario, during a defined construction and/or operational phase.</i>	

Table 21-7: Hazardous Waste - Magnitude of Impact

CRITERIA FOR WASTE MAGNITUDE OF IMPACTS	
No change	Zero waste generation and disposal from the development.
Negligible	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by <0.1%.
Minor	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by <0.1 to 0.5%.
Moderate	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by <0.5 to 1%.
Major	Waste generated by the development will reduce Expansive Study Area landfill capacity baseline [#] by >1%.
<i># forecast as the worst-case scenario, during a defined construction and/or operational phase.</i>	

Significance Criteria

21.3.30 Table 21-8 describes the effect thresholds used in determining the significance of potential effects, whilst Table 21-9 indicates which effects are deemed to be significant. Specific IEMA Guidance (IEMA, 2020) is used for the materials and waste assessment, therefore the assessment does not use the thresholds outlined in Chapter 2: Assessment Methodology (ES Volume I, EN070009/APP/6.2).

Table 21-8: Effect Thresholds

		MAGNITUDE OF IMPACT				
		NO CHANGE	NEGLIGIBLE	MINOR	MODERATE	MAJOR
SENSITIVITY OF RECEPTOR	VERY HIGH	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	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

Table 21-9: Significance of Effect

EFFECT	MATERIALS	WASTE
Neutral	Not Significant	Not Significant
Slight		
Moderate	Significant	Significant
Large		
Very large		

21.3.31 Where a significance of effect could fall into two categories (i.e. neutral or slight, slight or moderate), professional judgement has been used to justify and determine which category a receptor falls into, to arrive at a single rating. Where professional judgement has been utilised in these cases a justification has also been provided.

Sources of Information/ Data

21.3.32 The following sources of information have been reviewed and have informed the assessment:

- Tees Valley Joint Minerals and Waste DPD¹: Core Strategy and Policies and Sites (Tees Valley, 2011a and Tees Valley, 2011b);

¹ Covers Redcar, Stockton-on-Tees and Hartlepool local authority areas, together with Darlington and Middlesbrough.

-
- EA's 2022 Waste Summary Tables for England - Version 2 (EA, 2023a) including remaining land capacity;
 - EA's 2022 Waste Data Interrogator (EA, 2023b);
 - EA's Permitted Waste Sites - Authorised Landfill Site Boundaries (EA, 2022a);
 - EA's Historic Landfill Sites (EA, 2022b);
 - EA's Environmental Permitting Regulations - Waste Sites (EA, 2022c);
 - Make UK's A New Deal for Steel: Laying the Foundations for a Vibrant UK steel industry, 2018 data (Make UK, 2019);
 - Mineral Products Association's (MPA's) Minerals and mineral products sales in Great Britain, 2018 data (MPA, 2023);
 - Project-specific information provided by the design team; and
 - Relevant legislation and national policy, as detailed in Section 21.2.

Consultation

Scoping Opinion

- 21.3.33 An EIA Scoping Opinion was requested from the Inspectorate on 6 April 2023. A response was received on 17 May 2023. For the Scoping Opinion and the Applicant's responses to them, refer to Appendix 1E (ES Volume III, EN070009/APP/6.4).

Statutory Consultation

- 21.3.34 The PEI Report was published for statutory consultation on 14 September 2023 and the consultation period ended on 26 October 2023. A second statutory consultation was held between 13 December 2023 and 23 January 2024, and additional targeted consultation was held between 9 February 2024 and 10 March 2024. The matters raised have been reviewed and an explanation of how the Applicant has had regard to them is set out in the Consultation Report (EN070009/APP/5.1).

Table 21-10: Responses to the Statutory Consultation Feedback

CONSULTEE	DATE AND METHOD OF CONSULTATION	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/HOW COMMENTS HAVE BEEN ADDRESSED
Environment Agency	26/10/23	<p>Proximity to landfill sites</p> <p>The proposed development will interact with several areas of historic landfill and is also in close proximity to operational landfill sites. The effects of these landfill sites on your DCO application should be considered. Further work should assess the risks posed by any disturbance to ground in or around the existing historic and operational landfill sites. Landfill sites can generate leachate and landfill gas which pose a risk of harm to the environment. Historic landfill sites are generally not well engineered and, as such, may pose a greater risk of pollution if disturbed.</p>	<p>Proximity to landfill sites</p> <p>The assessment in Chapter 21: Materials and Waste (ES Volume I, EN070009/APP/6.2) has considered the potential impacts associated with disturbance to the ground in and around existing historic and operational landfill sites, including discussion on the potential for landfill gas and leachate migration to affect potential receptors. No likely significant effects are predicted.</p>

Use of the Rochdale Envelope

- 21.3.35 To ensure a robust assessment of the likely significance of the environmental effects of the Proposed Development, the EIA has been undertaken adopting the principles of the Rochdale Envelope approach where appropriate in line with the Inspectorate's Advice Note Nine (The Inspectorate, 2018). This involves assessing the maximum (or where relevant, minimum) realistic worst-case parameters for the elements where flexibility needs to be retained (building dimensions or operational modes for example).
- 21.3.36 Due to construction phasing, there will be a period following the opening of Phase 1 where Phase 1 will be operational and Phase 2 is in construction. Phase 1 operational waste has not been added to the Phase 2 construction waste as operational waste quantities are small in the context of construction waste quantities.
- 21.3.37 Given the above, this assessment presents a reasonable worst-case approach.

Assumptions and Limitations

Assumptions

- 21.3.38 Construction waste volumes associated with the Proposed Development have been estimated based on the Proposed Development's project cost (construction value which is a subset of project cost is normally used in the calculation but this is not yet confirmed), as detailed information regarding waste arisings is not available at this stage. Total project cost is higher than construction value therefore this is considered a worst case.
- 21.3.39 Since the Proposed Development will be constructed over a number of years, total construction waste has been divided equally across the number of years per phase (two years and nine months for Phase 1 and two years and six months for Phase 2). For the purpose of the assessment it is assumed that excavated materials will be generated in one calendar year.
- 21.3.40 Worst case assumptions have been made to inform this assessment, in particular that all construction materials will be used in the same calendar year and all construction waste will be sent to landfill (excluding liquid waste and excavated material that is recovered or reused on site). This ensures that a robust, worst-case assessment of the waste impacts of the Proposed Development is provided.
- 21.3.41 The exact types and quantities of operational waste are not yet available. A worst-case assumption that all operational waste (excluding liquid waste) will be sent to landfill has been made to inform this assessment, ensuring that a robust assessment is provided.
- 21.3.42 It is assumed that key construction materials (aggregates, asphalt and concrete) will be sourced locally (e.g. within the region), taking into account the proximity principle. Other materials may be sourced from the rest of the UK or imported into the UK.

-
- 21.3.43 Data on the bulk density of materials has been used to convert quantities between volume (m³) and weight (tonnes) where required.
- 21.3.44 It is assumed there will be minimal wastage from some of the construction materials, as these will be delivered to specified sizes, therefore piling, piping, structural steel and major equipment are not included in the waste assessment.
- 21.3.45 The estimated wastage rates for each material are based on the good practice rates in WRAP's Designing Out Waste Tool for Civil Engineering (5%).
- 21.3.46 Any demolition works to clear the Site will be undertaken by STDC prior to and irrespective of the Proposed Development taking place. Thus, the demolition works to be undertaken by STDC do not form part of the DCO Application for the Proposed Development. Any remediation works required to create a suitable development area will be undertaken by STDC under reserved matters approval, or other planning approvals, before the commencement of the construction of the Proposed Development on the Main Site, with STDC obtaining all necessary consents and permits. However, notwithstanding this, the volumes of excavated material used in the assessment considers a worst case to deal with a scenario where remediation works are not undertaken by STDC and need to be undertaken by the Applicant.

Limitations

- 21.3.47 The assessment is based on information available at the time of writing.
- 21.3.48 Future availability of construction materials is not available, therefore UK and GB data has been used to establish a quantitative national baseline of the consumption of key construction materials which is used as a proxy for availability.
- 21.3.49 There is no publicly available information at the regional level regarding any potential changes to landfill capacity by the time of the Proposed Development's construction and operation. Therefore, landfill capacity is assumed to remain the same as the current baseline.

21.4 Baseline Conditions

Existing Baseline

Regional and National Availability of Key Construction Materials

- 21.4.1 Table 21-11 summarises national consumption and sales (providing an indication of availability) in 2018 for steel, in 2021 and 2022 for aggregates, asphalt and concrete (the most recent years for which data is available), which are the key construction materials expected to be used during Proposed Development construction.
- 21.4.2 Regional data is presented in Table 21-12. Sales of construction materials by region are provided for the regions surrounding the Proposed Development.

Table 21-11: National Consumption and Sales for Key Construction Materials

MATERIAL	NATIONAL CONSUMPTION/SALES (MILLION TONNES, YEAR)	BASELINE DATA YEAR	DATA DESCRIPTION
Steel	17	2018	UK total consumption (Make UK, 2019)
Aggregates of which:	279.8	2021	Minerals and mineral products sales in Great Britain (MPA, 2023)
• Crushed rock	148.2		
• Sand and gravel - land won	47.7		
• Sand and gravel - marine	14.3		
• Recycled and secondary	69.6		
Asphalt	28.3		
Concrete of which:	77.5		
• Ready-mixed concrete	52.7		
• Concrete products	24.8		

Table 21-12: 2022 Construction Material Sales by Region (MPA, 2023)

CONSTRUCTION MATERIAL	YORKSHIRE AND THE HUMBER	NORTH EAST	TOTAL
Crushed rock (million tonnes)	9.2	5.1	14.3
Sand and gravel (million tonnes)	2.1	1.6	3.7
Ready-mixed concrete (million m ³)	1.1	0.6	1.7
Asphalt (million tonnes)	1.9	0.9	2.8

21.4.3 Potential recycled content for the main construction materials are outlined in Table 21-13. These *good practice* rates are derived from WRAP's Designing Out Waste Tool for Civil Engineering (WRAP, n.d. c).

Table 21-13: Potential Recycled Content (Percentage by Weight)

MATERIAL TYPE	POTENTIAL RECYCLED CONTENT (% BY WEIGHT)
Concrete	16
Asphalt	25
Aggregates	50
Steel reinforcement	100
Structural steel	60

Mineral Safeguarding Areas, Allocated / Safeguarded Mineral and Waste Sites

21.4.4 The Proposed Development Site lies within MSAs for:

- marine dredged sand and gravel at Tees Dock (Tees Valley, 2011a);
- gypsum (anhydrite) across the whole of the Tees Valley Plan area (Tees Valley, 2011a); and
- salt, across the whole of the Redcar and Cleveland Local Plan area (Redcar and Cleveland Borough Council, 2018).

21.4.5 MSAs are scoped out of the assessment.

21.4.6 As outlined in Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3), the Proposed Development Site lies within:

- a safeguarded wharf at Tees Dock (Redcar and Cleveland) (Tees Valley, 2011a); and
- safeguarded waste site at New Road (Stockton-on-Tees) (Tees Valley, 2011b).

21.4.7 A “General Location for Large Waste Management Facilities”, covers industrial areas to the north and south of the River Tees (Tees Valley, 2011a), this general location is not included in Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3). As outlined in the Tees Valley Joint Minerals and Waste Development Plan Documents: Core Strategy (Tees Valley, 2011a), allocations and proposals for large waste management facilities would be supported in this general vicinity.

Landfill Capacity

21.4.8 The EA’s Waste Management Information includes information about waste sent to landfills and remaining landfill capacity. Remaining landfill capacities at the end of 2022 as outlined on the EA’s 2022 Waste Summary Tables for England – Version 2 (EA, 2023a) for the non-hazardous and inert waste Expansive Study Area (Yorkshire and the Humber and the North East) and the hazardous waste Expansive Study Area (England) are shown in Table 21-14.

21.4.9 Merchant landfills are operated for commercial purposes, accepting waste from construction projects and operating businesses. Merchant landfills are therefore considered to form the baseline. In contrast, restricted landfills are sites that deal

with their own produced waste (i.e. not operating for commercial purposes). Therefore, additional capacity is excluded from the baseline. Some non-hazardous landfills have a Stable Non-Reactive Hazardous Waste (SNRHW) cell (e.g. for asbestos). SNRHW cells usually form only a small fraction of the overall capacity. Therefore, for assessment purposes non-hazardous landfills with SNRHW cells are considered in the same way as non-hazardous landfills.

Table 21-14: Landfill Capacity (end of 2022) in Yorkshire and the Humber, the North East and England

LANDFILL TYPE	SUB-REGION			
	YORKSHIRE AND THE HUMBER	NORTH EAST	TOTAL IN YORKSHIRE AND THE HUMBER AND THE NORTH EAST	ENGLAND
	LANDFILL CAPACITY ('000S M ³)			
Hazardous merchant	-	-	-	7,922
Non-hazardous with SNRHW cell	1,243	2,296	3,539	Not used in the assessment.
Non-hazardous	40,580	7,522	48,102	
Inert	24,928	7,078	32,006	

21.4.10 The EA has published landfill capacity data each year since 2005. The historic capacity trend for 2005 to 2022 for inert and non-hazardous waste in the Yorkshire and the Humber, and North East regions, and for hazardous waste in England, are presented in Plate 21-1, Plate 21-2 and Plate 21-3.

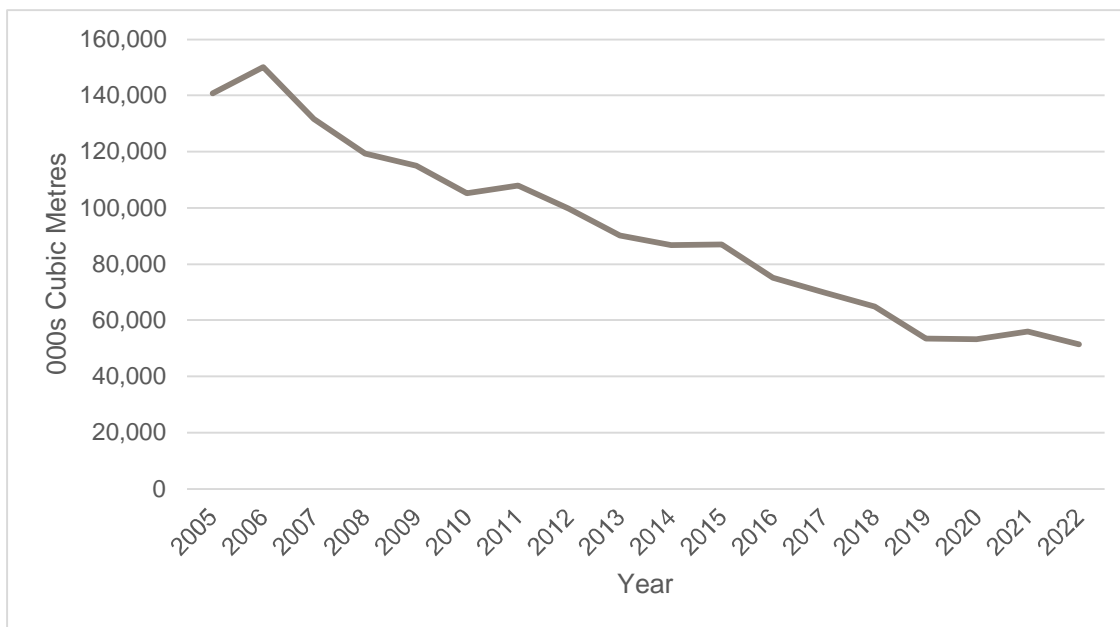


Plate 21-1: Historic Landfill Capacity Trend (2005 to 2022) for Non-hazardous Waste in the Yorkshire and the Humber and North East Regions ('000s m³)

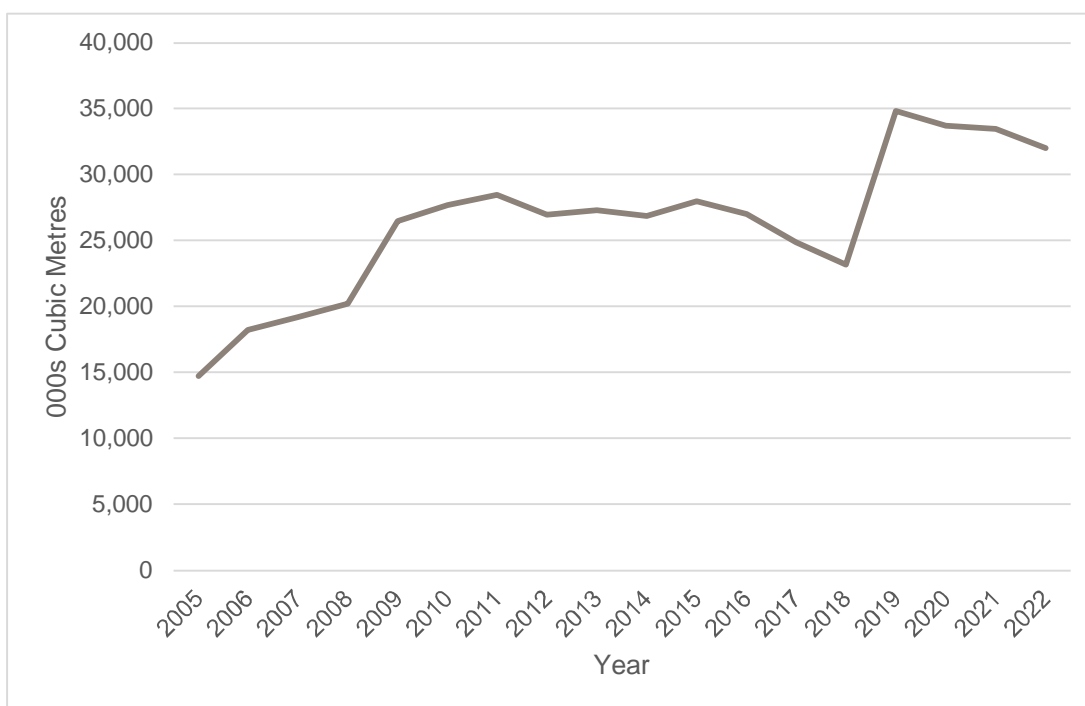


Plate 21-2: Historic Landfill Capacity Trend (2005 to 2022) for Inert Waste in the Yorkshire and the Humber and North East Regions ('000s m³)

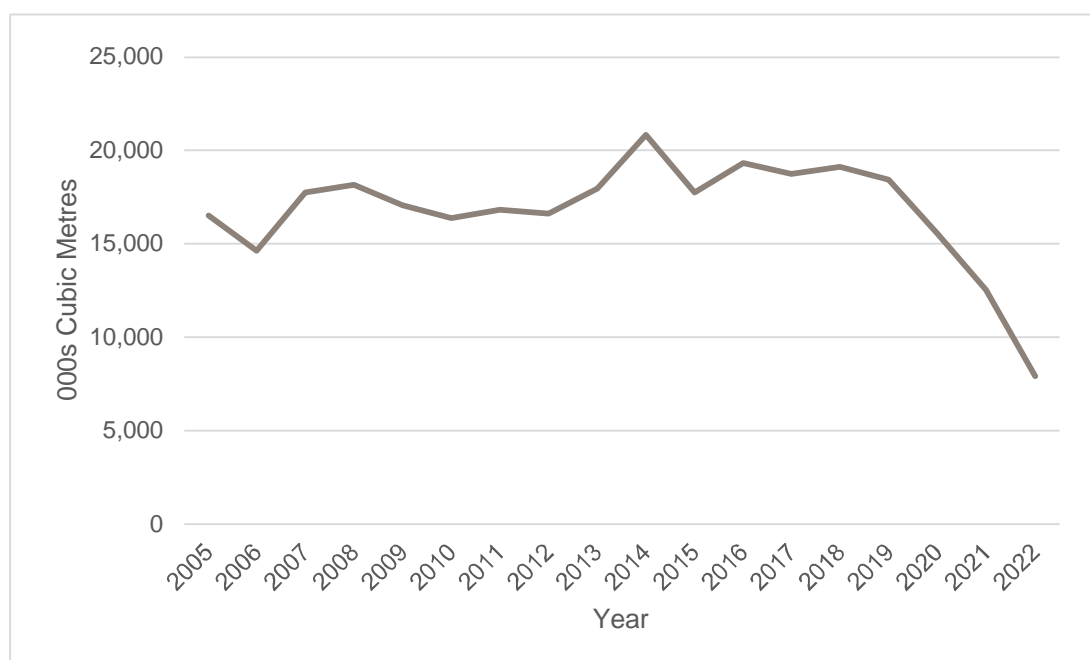


Plate 21-3: Historic Landfill Capacity Trend (2005 to 2022) for Hazardous Waste in England ('000s m³)

Waste Management Infrastructure

21.4.11 There are five permitted waste sites within the Proposed Development Site as shown as blue squares in Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3) (licence numbers provided):

- Bran Sands Landfill (Licence Number 651944, issued);
- B S Redcar Works (Licence Number 654026, surrendered);
- Port Clarence Landfill (Licence Number 644943, expired);
- Port Clarence Hazardous Waste Landfill Site (Licence Number 646681, expired); and
- Blast Furnace, British Steel Corporation Redcar Works Complex (Licence Number 634991, expired).

21.4.12 These sites are listed in the EA's Environmental Permitting Regulations – Waste Sites dataset (EA, 2022c). Only Bran Sands Landfill has a current licence. The other four sites have expired or surrendered licences.

21.4.13 Capacity data for other types of waste infrastructure is publicly available (e.g. Environmental Permitting Regulations – Waste Sites (EA, 2022c)). However, the permitted capacity is not necessarily representative of the actual operational capacity of the infrastructure. Therefore, inputs data are collated from the EA's Waste Data Interrogator for 2022 – Waste Received (Excel) – Version 2 (EA, 2023b) and presented in Table 21-15 for the Yorkshire and the Humber and North East regions. Inputs are not totalled since the double counting of waste moving between the site types listed in the Waste Data Interrogator cannot be discounted.

Table 21-15: Summary of Waste Inputs by Facility, for the Yorkshire and the Humber and North East Regions 2022

FACILITY TYPE	YORKSHIRE AND THE HUMBER (TONNES RECEIVED)	NORTH EAST (TONNES RECEIVED)
Landfill	4,699,570	2,990,612
Metal Recycling Site (MRS)	2,066,585	1,109,236
On/in land	1,029,020	597,432
Transfer	5,349,356	2,712,520
Treatment	16,167,935	3,746,719
Combustion	126,603	-
Incineration	2,776,309	1,183,427
Storage	354,371	170,969
Processing	274,871	75,731

National Hazardous Waste Management Facilities

- 21.4.14 Since some of the operational hazardous wastes likely to be generated by the Proposed Development will not be suitable for landfill disposal (e.g. liquid waste), hazardous operational waste is compared to national hazardous waste management facility capacity in this assessment.
- 21.4.15 Liquid hazardous waste from the Proposed Development's operation may be managed by high-temperature incineration or by physico-chemical treatment. Alternatively, in the longer term, some form of waste treatment may be developed on or near to the Proposed Development to manage waste associated with carbon capture and other carbon capture facilities in the area. However, in the absence of such facilities, this assessment conservatively does not consider the potential for such waste treatment facilities to be developed.
- 21.4.16 Due to the specialised nature of hazardous waste management, hazardous waste facilities typically receive wastes from a wider area, and therefore this assessment considers the national capacity for managing hazardous wastes.
- 21.4.17 The EA's 2022 Waste Summary Tables for England – Version 2 (EA, 2023a) reported that the remaining merchant (non-restricted) hazardous landfill capacity in England was 7.9 million m³ in 2022.
- 21.4.18 There are a number of high-temperature hazardous waste incinerators in England (excluding facilities which manage only clinical waste and received less than 500 tonnes), as well as cement kilns which are permitted to accept hazardous waste. These facilities as reported in the EA's Waste Data Interrogator for 2022 (EA, 2023b), and are shown in Table 21-16.

Table 21-16: Hazardous Waste Incineration Facilities and Cement Kilns Accepting Hazardous Waste

FACILITY	LOCATION	2022 WASTE RECEIVED (TONNES OF HAZARDOUS WASTE)
<i>Hazardous Waste Incinerators</i>		
Avonmouth Treatment Centre	Bristol	5,661
East Kent Waste Recovery Facility	Kent	4,442
Ellesmere Port Incinerator	Cheshire	66,817
Fawley High Temperature Incinerator	Hampshire	30,677
Fine Environmental Services – Seal Sands	Tees Valley	8,008
Twinwoods Co-incinerator	Bedford	3,358
Derriford Incinerator	Devon	2,821
Tradebe Heysham Limited	Lancashire	11,723
<i>Cement Kilns accepting Hazardous Waste</i>		
Cauldon Cement Plant	Staffordshire	14,811
Ketton Works	Rutland	24,022
Tunstead Cement and Lime Works	Derbyshire	8,790
Rugby Cement Plant	Rugby	22,366
Ribblesdale Cement Works	Ribble Valley	27,211
Whitwell Quarry Lime Works	Derbyshire	31,411
Total		262,118

21.4.19 The EA's Waste Data Interrogator for 2022 (EA, 2023b) shows that the following quantities of liquid hazardous waste were treated by permitted facilities in England (excluding waste in EWC Code Chapter 13 Oil Wastes and Wastes of Liquid Fuels) – refer to Table 21-17. Inputs are totalled, however, double counting of waste in the Waste Data Interrogator cannot be discounted, as waste e.g. residues from a waste management process, can move from one facility type to another and the data is based on inputs to individual facilities.

Table 21-17: Hazardous Liquid Waste Treatment Facilities in England

FACILITY PERMIT TYPE	2022 WASTE RECEIVED (TONNES)
T05: Physico-chemical treatment installation	251,585
T06: Chemical treatment installation	100,465
T10: Haz waste treatment installation	174,904
T11: Haz waste transfer/treatment installation	45,932
Total	572,886

Historic and Authorised Landfills

21.4.20 The EA's Permitted Waste Sites – Authorised Landfill Site Boundaries spatial data (EA, 2022a) identifies one authorised landfill (shown as areas of green hatching) within the Proposed Development Site as shown in Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3):

- Bran Sands Landfill (licence number 651944, operated by York Potash Processing and Ports Limited with a A02 licence type: Other Landfill Site taking Special Waste). This site is shown on Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3) as both an area of green hatching and a permitted waste site (blue square).

21.4.21 Historic landfills are potentially relevant to this assessment since excavations in historic landfill can give rise to waste that require appropriate management. The EA's Historic Landfill Sites spatial data (EA, 2022b) identifies six historic landfill sites within the Proposed Development Site, as detailed in Table 21-18 and shown in Figure 21-1: Historic and Authorised Landfills and Waste and Mineral Sites (ES Volume II, EN070009/APP/6.3).

Table 21-18: Historic Landfill Sites within the Proposed Development Site

HOLDER REFERENCE	SITE REFERENCE	SITE NAME	SITE ADDRESS	LICENCE HOLDER	FIRST INPUT	LAST INPUT	TYPES OF WASTE
EAHLD05492	0700/R20, CLE/R20	To the West of the Wolviston to Seal Sands Link Road	Saltholme Mounting, Billingham, Cleveland	Cleveland County Council	03/11/1981	31/12/1982	Inert, Industrial
EAHLD05490	CLE/R4/1, 0700/R4, CLE/170/1	South of the Seal Sands Road	Adjacent to the Monsanto site	Cleveland County Council	31/12/1973	31/12/1978	Inert, Industrial, Commercial
EAHLD05497	0700/CLE/061	Seabanks Lagoon Site No.4	Seal Sands, North Bank, Middlesbrough, Cleveland	ICI Limited	06/03/1978	19/01/1979	Inert, Industrial
EAHLD05592	0700/CLE/255	West Coatham Lane	Dormanstown, Redcar, Cleveland	Chief Economic and Development Officer	25/01/1993	01/02/1993	Inert
EAHLD05591	0700/CLE/051	Redcar Trunk Road Landscaping	Redcar, Cleveland	British Steel Corporation	14/09/1977	10/08/1979	Inert, Industrial
EAHLD05682	IPC 68, 0700/CLE/068, BRI002	Blast Furnace Plant	Redcar Complex, Cleveland	British Steel Corporation	Information not available	Information not available	Industrial

21.4.22 Further information regarding historic landfill sites within the Proposed Development Site is presented in Chapter 10: Geology, Hydrogeology and Land Contamination (ES Volume I, EN070009/APP/6.2).

Waste Targets

21.4.23 The national target for recovery of C&D waste is 70% by weight, as set out in the Waste FD (EU, 2008) and the Waste Management Plan for England (Defra, 2021a). The target specifically excludes naturally occurring materials with EWC Code 17 05 04 (17 05 04 soil and stones other than those mentioned in 17 05 03* (soils and stone containing dangerous substances)). Recovery is deemed to include reuse, recycling, and other recovery (e.g. energy recovery).

21.4.24 A good practice landfill diversion target of 90% has been achieved and exceeded by major UK developments as outlined in the IEMA Guidance (IEMA, 2020). In 2020, the most recent year for which data is available, the UK generated 59.1 million tonnes of non-hazardous C&D waste, of which 54.8 million tonnes was recovered. This represents a recovery rate of 92.6% (Defra, 2023c).

21.4.25 Standard, good and best practice recovery rates by material are provided by WRAP (WRAP, 2007). Recovery rates for key construction materials and other construction wastes relevant to the Proposed Development are provided in Table 21-19.

Table 21-19: Standard, Good and Best Practice Recovery Rates by Material

MATERIAL	STANDARD PRACTICE RECOVERY (%)	GOOD PRACTICE RECOVERY (%)	BEST PRACTICE RECOVERY (%)
Metals	95	100	100
Packaging	60	85	95
Concrete	75	95	100
Inert	75	95	100
Plastics	60	80	95
Miscellaneous	12	50	75
Electrical equipment	Limited information	70	95
Cement	Limited information	75	95
Liquids and oils	100	100	100
Hazardous	50	Limited information, cannot be 100% since some hazardous waste (e.g. asbestos) must be landfilled.	

Future Baseline

- 21.4.26 There is no publicly available information on any potential changes to national or regional material availability by the time of the construction of the Proposed Development. Construction material demand, such as ready mixed concrete, is closely aligned to both the quantity of construction taking place and the general economy. It is deemed inappropriate to forecast future availability as the demand is unlikely to be linear and it is not possible to set a future baseline for material resources. As such, future availability is assumed to remain the same as the current baseline as outlined in Table 21-11 and Table 21-12.
- 21.4.27 There is no publicly available information regarding any potential changes to landfill capacity by the time of the Proposed Development's construction.
- 21.4.28 Due to the cyclic nature of inert landfill capacity (e.g. landfill capacity decreasing, and then new sites or landfill cells being opened with landfill capacity increasing), it is not realistic to forecast future landfill capacity. Therefore, inert and hazardous landfill capacity is assumed to remain the same as the current baseline as outlined in Table 21-14.
- 21.4.29 For non-hazardous waste and hazardous waste, using the current rate of decline of landfill capacity and forecasting into the future would lead to the inevitable conclusion that there would be no void space remaining. However, this is not a credible scenario as if there is still a need for landfill, then the WPA will need to consent new landfill capacity to replace that which has been used up. Therefore, non-hazardous and hazardous landfill capacity is assumed to remain the same as the current baseline, as outlined in Table 21-14.

Receptor Sensitivity

Material Receptor Sensitivity

- 21.4.30 Material receptor sensitivity is determined as *low*. On balance, the key construction materials required for the construction of the Proposed Development are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock. Key materials required for construction and operation are likely to be available comprising a high proportion of sustainable features and benefits (e.g. recycled content).
- 21.4.31 Potential recycled content for the main construction materials is outlined in Table 21-13 above.

Waste Receptor Sensitivity

- 21.4.32 Waste receptor sensitivity is determined as *very high*. A scenario in which no landfill void space is available is deemed to be unrealistic as outlined in the Future Baseline above, however, since there is no publicly available information on any potential changes to landfill capacity by the time of the construction and operation of the Proposed Development, a worst-case scenario is considered (e.g. landfill capacity is assumed to remain the same but a very considerable reduction in capacity cannot be excluded).

21.5 Proposed Development Design and Impact Avoidance

- 21.5.1 The EIA process aims to avoid, prevent, reduce or offset potential environmental effects through design and/or management measures. These are measures that are inherent in the design and construction of the Proposed Development (also known as embedded measures).
- 21.5.2 The following impact avoidance measures have either been incorporated into the design or are standard construction or operational practices. These measures have, therefore, been taken into account during the impact assessment and will be secured by a Requirement of the Draft DCO (EN070009/APP/4.1).

Construction

- 21.5.3 The Framework Construction Environmental Management Plan (CEMP) (EN070009/APP/5.12) sets out the key measures to be employed during the construction of the Proposed Development, to control and minimise the impacts on the environment. The Framework CEMP sets out how impacts upon materials and waste will be managed during construction. (A) Final CEMP(s) will be prepared by the Engineering, Procurement and Construction (EPC) Contractor(s) in accordance with the Framework CEMP prior to construction. The submission, approval, and implementation of the Final CEMP(s) will be secured by a Requirement of the Draft DCO (EN070009/APP/4.1).
- 21.5.4 To manage and monitor waste generated on the Proposed Development Site during the construction of the Proposed Development, an Outline Site Waste Management Plan (SWMP) has been developed as part of the Framework CEMP (EN070009/APP/5.12) which will allow for waste streams to be estimated and monitored. The Outline SWMP sets out how waste will be managed during construction, and opportunities to prevent waste, reuse materials and recycle or recover waste will be explored in accordance with the waste hierarchy.
- 21.5.5 The Final SWMP will require that the EPC Contractor(s) segregates waste streams on-site, and for material that cannot be reused on site, the requirement is for them to be taken to a waste facility for recycling, recovery or disposal. All waste removal from the Proposed Development Site will be undertaken by fully licensed waste carriers and taken to permitted waste facilities.
- 21.5.6 A Final SWMP will be prepared by the EPC Contractor(s) in accordance with the Outline SWMP prior to construction. The submission, approval, and implementation of the Final SWMP will be secured by a Requirement of the Draft DCO (EN070009/APP/4.1).
- 21.5.7 The Proposed Development will aim to prioritise waste prevention, followed by preparing for reuse, recycling and recovery and lastly disposal to landfill as per the waste hierarchy as illustrated in Plate 21-4.

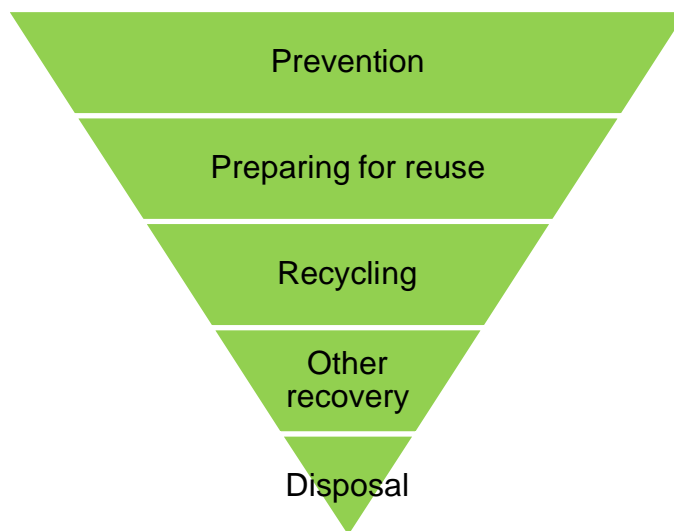


Plate 21-4: The Waste Hierarchy, Recreated from Defra's Guidance on Applying the Waste Hierarchy (Defra, 2011)

Operation

- 21.5.8 The Hydrogen Production Facility will require an Environmental Permit and will comply with this under the Environmental Permitting (England and Wales) Regulations 2016. The permit will include procedures for the management of materials and waste in accordance with relevant legislation. The Applicant has also begun engagement with the Environment Agency under the enhanced pre-application scheme and is finalising an application for an Environmental Permit anticipated to be submitted in 2024.
- 21.5.9 The Proposed Development will be operated in line with appropriate standards, whilst the operator will implement and maintain an Environment Management System (EMS) which will be attested to International Standards Organisation (ISO) 14001 (International Organisation for Standardization, 2015). The EMS will outline requirements and procedures required to ensure that the Proposed Development Site is operating to the appropriate standard.
- 21.6 Impacts and Likely Significant Effects
- 21.6.1 This section identifies the impacts and likely significant effects resulting from the Proposed Development as described in Chapter 4: Proposed Development and Chapter 5: Construction and Programme Management (ES Volume I, EN070009/APP/6.2). The magnitude of impacts is defined with reference to relevant baseline conditions, and effects determined in accordance with the identified methodology.
- 21.6.2 The prediction of impacts and the assessment of effects (and their significance) in relation to materials and waste associated with the Proposed Development takes into account the effectiveness of the mitigation measures as summarised in Section 21.5.

21.6.3 Where applicable, the assessment reports the temporary and permanent effects on materials and waste that would be directly or indirectly affected by the Proposed Development by virtue of their proximity to the Proposed Development Site, or through a shared relationship or inter-dependency.

Changes to Allocated Mineral and Waste Sites

21.6.4 Only a very small area of the Proposed Development Site lies within the safeguarded wharf at Tees Dock and safeguarded waste site at New Road. Works in these areas are unlikely to be required and would not adversely or substantially impact access to the sites. The sites would not be sterilised by the development or render the sites inaccessible for future use.

Construction

21.6.5 Table 21-20 summarises the likely types of materials that will be used, and waste types that are likely to be generated, during the Proposed Development's construction phase.

Table 21-20: Construction Material Use and Waste Types Arising from the Construction of the Proposed Development

CONSTRUCTION ACTIVITY	MATERIALS USED	WASTE TYPES GENERATED
Permitted Preliminary Works	<ul style="list-style-type: none"> fill material for construction purposes including slag; primary/secondary/ recycled aggregates for ground stabilisation; and topsoil and subsoil for landscaping and restoration. 	<ul style="list-style-type: none"> surplus excavated materials including slag; surplus topsoil and subsoil; unsuitable and contaminated soils and excavated materials; vegetation from site clearance; clearance of other materials; and construction worker waste from offices and welfare areas/canteens.
Site construction	<ul style="list-style-type: none"> aggregates; asphalt and bituminous materials; in-situ cast concrete; precast concrete products (structural components, kerbs, drainage pipes, shaft and tunnel lining, chambers and channels); structural steel; 	<ul style="list-style-type: none"> Horizontal Directional Drilling and tunnel spoil arisings; Excavated material from construction activities such as open-cut pipeline installation; excess, offcuts and broken/damaged construction materials; existing infrastructure removed during works;

CONSTRUCTION ACTIVITY	MATERIALS USED	WASTE TYPES GENERATED
	<ul style="list-style-type: none"> • cabling; and • drilling fluids. 	<ul style="list-style-type: none"> • packaging from materials delivered to site; • construction worker waste from offices and welfare areas/canteens; • waste oils from construction plant; • drilling fluids; • waste from dewatering and testing (hydrotesting); • paints and coatings; and • commissioning wastes.

Construction Materials

21.6.6 The estimated main types and quantities of materials to be used during the Proposed Development's construction are presented in Table 21-21. The table also includes estimates of potential material wastage. There is assumed to be limited or no wastage from some of the construction materials as these will be delivered to specified sizes, therefore piling, piping, structural steel and major equipment are not included in the waste assessment.

21.6.7 The following data is sourced from WRAP's Designing Out Waste Tool for Civil Engineering (WRAP, n.d. c):

- data on the bulk density of materials has been used to convert quantities between volume (m³) and weight (tonnes) where required; and
- the estimated wastage rates for each material are based on the *good practice* rates.

Table 21-21: Construction Material Estimates for the Proposed Development

ACTIVITY	MATERIAL TYPE	MATERIAL DENSITY (t/m ³)	QUANTITY (m ³)	QUANTITY (TONNES)	WASTAGE RATE (%)	WASTAGE (m ³)	WASTAGE (TONNES)
Temporary construction facilities – backfill import	Aggregate	1.9	51,160	97,204	5	2,558	4,860
Early works – backfill import	Aggregate	1.9	117,600	223,440	5	5,880	11,172
Backfill import – other	Aggregate	2.4	66,570	126,483	5	3,329	6,324
Concrete – foundations	Steel	7.85	19,550	46,920	5	978	2,346
Rebar – foundations	Steel	7.85	517	4,060	5	26	203
Piping	Steel	7.85	1,008	7,910	0	-	-
Structural steel	Steel	7.85	561	4,400	0	-	-
Concrete – paving	Concrete	2.4	11,100	26,640	5	555	1,332
Sub-base course – roads	Aggregate	1.9	13,030	24,757	5	652	1,238
Base course – roads	Aggregate	1.9	9,775	18,573	5	489	929
Binder course – roads	Asphalt	2.4	3,265	7,836	5	163	392
Wearing course – roads	Asphalt	2.4	3,265	7,836	5	163	392
Total construction material wastage					-	14,792	29,187

- 21.6.8 For the construction of the Proposed Development, no individual construction material is equal to or greater than 1% by weight of the UK/GB baseline consumption (aggregates 0.18%, concrete 0.09%, steel 0.07% and asphalt 0.06%). The sensitivity of the receptor is classified as low (as per Table 21-1) whilst the magnitude of impact is considered to be negligible (as per Table 21-5), resulting in a Slight Adverse (Not Significant) effect.
- 21.6.9 Individual construction materials expected to be used for the construction of the Proposed Development equate to between 1 to 5% or less than 1% by weight of the regional baseline consumption (aggregates 2.7%, concrete 1.8% and asphalt 0.6%). The sensitivity of the receptor is classified as low (as per Table 21-2) whilst the magnitude of impact is considered to be minor or negligible (as per Table 21-5), resulting in a Slight Adverse (Not Significant) effect.

Construction Waste

- 21.6.10 Since final material quantities for all construction materials are not yet available, the estimates based on total wastage from construction material are likely to be an underestimation. Therefore, construction waste volumes associated with the Proposed Development have also been estimated based on the Proposed Development's project cost (construction value which is a subset of project cost is normally used in the calculation but this is not yet confirmed).
- 21.6.11 This high-level estimate of construction waste (excluding demolition and excavation) has been calculated based on the total project cost for the Proposed Development and a published benchmark based on average m³ of waste per £100,000 (WRAP, n.d. d). The best practice benchmark for industrial buildings is 5.5 m³ of waste per £100,000. A conversion factor of 1.497 tonnes/m³ (Construction Resources and Waste Platform, 2010) has been used to convert m³ into tonnes. The best practice benchmark has been used since waste generation is expected to be at the lower end of the scale, since much of the capital expenditure will be associated with modular process engineering components which will be manufactured off-site, hence the on-site waste generation from assembly of these components is expected to be relatively small.
- 21.6.12 The estimated construction waste volume associated with the Proposed Development is 94,600 m³ (141,616 tonnes). Since the Proposed Development will be constructed over a number of years, this total has been divided equally across the number of years per phase. Phase 1 will be two years and nine months in duration, therefore construction waste volume during this phase would be 31,533 m³ (47,205 tonnes) per year if split equally. Phase 2 will be two years and six months in duration, therefore construction waste volume during this phase would be 37,840 m³ (56,646 tonnes) per year if split equally. The higher of these two volumes is used in the assessment.

Excavated Material

- 21.6.13 At this stage, it is assumed that any remediation works required to create a suitable development area would be undertaken by STDC before the Applicants commencement of the construction of the Proposed Development on the Main

Site. The scope of STDCs remedial works will include mitigation of any identified risks to controlled waters and / or human health, with STDC to obtain all necessary consents and permits for the works.

- 21.6.14 The Applicant will also review the scope of any remedial measures considered to be required following the completion of (referred to herein as 'Additional'), or in place of, the remedial works undertaken by STDC. Additional remedial measures before or during construction, could include measures such as a discovery strategy for unexpected contamination, and will be reviewed following review of both Ground Investigation (GI) and relevant remediation specifications and verification reports from STDC. The process for securing the delivery of remedial measures (including if STDC do not carry them out and any Additional measures) is secured by DCO Requirement. Where required, these works would be managed and controlled through the Final CEMP(s), noting that a Framework CEMP (EN070009/APP/5.12) has been prepared and submitted as part of this DCO Application.
- 21.6.15 Estimates of waste from the Proposed Development Site, conservatively, assume that some hazardous and non-hazardous material generated during any remedial works required for the development before or during construction activities could require disposal from the Proposed Development Site. The volume estimates will be further refined following review of both GI and relevant remediation specifications and verification reports from STDC (if taken forward by them) undertaken post DCO consent pursuant to a DCO Requirement.
- 21.6.16 The Proposed Development's design is being progressed to optimise the requirements for cut and fill, and where possible, this will be minimised to reduce the import and export of materials and waste, although the design is expected to generate excavated material that will require off-site treatment or disposal. The existing minimum ground level at the Main Site is approximately 6.83 m Above Ordnance Datum (AOD). Development platform elevations post site clearance and remediation will be at 7.1 m AOD for Phase 1, where the final high pavement point will be above 7.4 m AOD. The development platform for Phase 2 will be approximately 7.1 m AOD but will not exceed 8 m AOD.

Total Construction Waste

- 21.6.17 A summary of construction waste associated with the Proposed Development is set out in Table 21-22.

Table 21-22: Construction Waste Summary

ACTIVITY	WASTE (m ³)
Excavation associated with the Proposed Development	Hazardous waste A proportion of potentially contaminated material assumed to be hazardous with off-site disposal (currently assumed as 39,255 m ³ , the volume estimates will be further refined following review of both GI and relevant remediation specifications and

ACTIVITY	WASTE (m ³)
	verification reports from STDC (if taken forward by them) undertaken post DCO consent, pursuant to a DCO Requirement). Non-hazardous waste 170,067 m ³ of surplus excavated material.
Construction of the Proposed Development	37,840 m ³ per year.

- 21.6.18 Total non-hazardous and inert construction waste from the Proposed Development is estimated at 37,840 m³ (construction waste) per year. A worst-case scenario where all waste is disposed of to landfill has been applied. This volume equates to 0.05% of the 83.6 million m³ of inert and non-hazardous landfill capacity within the waste management Expansive Study Area (the Yorkshire and the Humber and North East regions).
- 21.6.19 In practice, a large proportion of non-hazardous and inert waste from the Proposed Development is likely to be recycled or recovered (e.g. sent for energy recovery) rather than disposed of to landfill, further reducing the overall quantities of waste for disposal. With a recovery rate of 70%, the percentage of landfill capacity required reduces to 0.01%. With a recovery rate of 90%, the percentage of landfill capacity required reduces to 0.005%.
- 21.6.20 Where possible the material will be recovered on-site as fill under an appropriate permit. Following reuse activities, the current total surplus non-hazardous excavated material for the Proposed Development is estimated at 170,067 m³. A worst-case scenario where all of this waste surplus material is disposed of to landfill has been applied. This volume equates to 0.2% of the 83.6 million m³ of inert and non-hazardous landfill capacity within the waste management Expansive Study Area (the Yorkshire and the Humber and North East regions). Based on the above, construction of the Proposed Development is estimated to result in less than a 1% reduction of landfill capacity within the non-hazardous waste management Expansive Study Area on an annual basis. Accordingly, for non-hazardous and inert waste, the sensitivity of the receptor is classified as very high (as per Table 21-3 Table 21-3 and Section 21.4) whilst the magnitude of impact is considered to be negligible (as per Table 21-6), resulting in a Slight Adverse (Not Significant) effect.
- 21.6.21 At this stage, no estimate of general hazardous waste generation during the Proposed Development's construction is available (apart from materials generated during excavation). Based on the size and scale of the Proposed Development, the quantities of hazardous waste (e.g. oils, batteries, aerosol cans etc.) are anticipated to be small compared to the overall construction waste arisings and anticipated to be <0.1% of the hazardous waste landfill capacity in England (7,922 m³). Many hazardous waste types have well-defined waste management routes, including recovery, and are unlikely to be sent directly to landfill. Procedures for the storage and management of these wastes will be set out in the Final SWMP. Accordingly, for hazardous waste, the sensitivity of the receptor is classified as very high (as per

- Table 21-4 and Section 21.4) whilst the magnitude of impact is considered to be negligible (as per Table 21-7), resulting in a Slight Adverse (Not Significant) effect.
- 21.6.22 Construction site operations will also generate waste streams from temporary offices, welfare facilities, material packaging and construction plant maintenance. The quantities are anticipated to be small compared to the main construction wastes and are not included in this assessment. Procedures for the storage and management of these wastes will be set out in the Final SWMP.
- 21.6.23 The volume of hazardous waste generated by excavation requiring off-site disposal for the Proposed Development will be assessed further following a confirmatory GI. For an assumed volume of 39,255 m³, under a worst-case scenario that all waste is disposed to hazardous landfill, this equates to 0.5% of the 7.9 million m³ of the hazardous waste landfill capacity in England. Accordingly, for hazardous waste, the sensitivity of the receptor is classified as very high (as per Table 21-4 and Section 21.4) whilst the magnitude of impact is considered to be minor (as per Table 21-7), resulting in a Moderate Adverse (Significant) Effect.
- 21.6.24 In practice, a proportion of hazardous waste generated by excavation from the Proposed Development could be non-hazardous and/or likely to be sent to a waste management facility rather than disposed of to landfill, further reducing the overall quantities of waste for disposal to landfill (e.g. <0.1% of hazardous waste landfill capacity in England). This would reduce the resulting effect to Minor Adverse (Not Significant) however, the worst case outlined above is used in the assessment.

Operation

- 21.6.25 Operational (process) waste from the Proposed Development will comprise waste from site offices and waste from the Hydrogen Production Facility (including thermal reclamation waste) processes which may be hazardous waste. The main waste types and quantities of waste associated with the operation of the Proposed Development are currently estimated based on a similar sized plant to be nine tonnes per month for inert and non-hazardous wastes (108 tonnes per year) and 20 tonnes per month for hazardous waste (240 tonnes per year).
- 21.6.26 The Proposed Development will include ancillary infrastructure including an option to send liquid effluent to a Minimum Liquid Discharge (MLD) Plant on the Main Site. This plant will produce a brine stream that will be taken off from site to a suitable third-party treatment site. A list of sites that received this kind of waste in 2022 is provided in Appendix 21A (ES Volume III, EN070009/APP/6.4).
- 21.6.27 In the event that inert and non-hazardous wastes from the Proposed Development are disposed of to landfill, the annual quantity is likely to result in a reduction of <1% (836,470 m³) of regional inert and non-hazardous waste landfill void capacity. Accordingly, for inert and non-hazardous waste, the sensitivity of the receptor is classified as very high (as per Table 21-3 and Section 21.4) whilst the magnitude of impact is considered to be negligible (as per Table 21-8), resulting in a Slight Adverse (Not Significant) effect.
- 21.6.28 The IEMA Guidance (IEMA, 2020) recommends assessing impacts of hazardous waste with reference to the available landfill capacity nationally. In the event that

hazardous waste from the Proposed Development is disposed of to landfill, the annual quantity is likely to result in a reduction of <0.1% (7,922 m³) of national hazardous waste landfill void capacity. Accordingly, for hazardous waste, the sensitivity of the receptor is classified as very high (as per Table 21-4) whilst the magnitude of impact is considered to be negligible (as per Table 21-7), resulting in a Slight Adverse (Not Significant) effect.

21.6.29 Since some of the operational hazardous waste likely to be generated by the Proposed Development will not be suitable for landfill disposal (e.g. liquid waste), hazardous operational waste has been compared to national hazardous waste management facility capacity in this assessment. In the event that waste is sent to a hazardous waste management facility, the annual quantity is likely to be small in the context of national capacity.

21.7 Essential Mitigation and Enhancement Measures

Construction

Essential Mitigation

21.7.1 A potential significant effect has been identified in relation to hazardous waste from excavation of material requiring disposal during construction of the Proposed Development. The volume estimates will be further refined following review of both GI and relevant remediation specifications and verification reports from STDC (if taken forward by them) undertaken post DCO consent, pursuant to a DCO Requirement). In practice, the proportion of material from the Proposed Development Site classed as hazardous may be lower; with any hazardous excavated material being sent to a waste management facility rather than disposed of to landfill. This would further reduce the overall quantities of hazardous waste for disposal to landfill. Waste management routes will be confirmed by the EPC Contractor(s).

21.7.2 No further or additional mitigation measures related to materials and waste are proposed.

Enhancement Measures

21.7.3 No enhancement measures related to materials and waste are proposed at this stage.

Operation

Essential Mitigation

21.7.4 No significant effects during operation of the Proposed Development are identified. Therefore, no further or additional mitigation measures as related to materials and waste are proposed.

Enhancement Measures

21.7.5 No enhancement measures related to materials and waste are proposed at this stage.

Decommissioning

Essential Mitigation

21.7.6 No essential mitigation related to materials and waste are proposed at this stage.

Enhancement Measures

21.7.7 No enhancement measures related to materials and waste are proposed at this stage.

21.8 Residual Effects and Conclusions

Construction

21.8.1 A potential significant effect has been identified in relation to hazardous waste from excavation of material requiring disposal during construction of the Proposed Development. The volume estimates will be further refined following review of both GI and relevant remediation specifications and verification reports from STDC (if taken forward by them) undertaken post DCO consent, pursuant to a DCO Requirement). In practice, the proportion of material from the Proposed Development Site classed as hazardous may be lower; with any hazardous excavated material being sent to a waste management facility rather than disposed of to landfill. This would further reduce the overall quantities of hazardous waste for disposal to landfill. Waste management routes will be confirmed by the EPC Contractor(s).

Operation

21.8.2 No residual significant materials and waste effects resulting during operation of the Proposed Development have been identified.

Decommissioning

21.8.3 No residual materials and waste effects resulting during decommissioning of the Proposed Development have been identified.

21.9 Summary of Residual Effects

21.9.1 Summaries of the residual effects associated with the construction and operation of the Proposed Development are presented in Table 21-23.

Table 21-23: Summary of Residual Effects

PROPOSED DEVELOPMENT PHASE	RECEPTOR/ RECOURCE	IMPORTANCE AND VALUE/ SENSITIVITY	MAGNITUDE OF IMPACTS	LIKELY SIGNIFICANT EFFECTS	PROPOSED MITIGATION / ENHANCEMENT	RESIDUAL EFFECTS
Construction	Changes in demand for materials	Low	Negligible	Slight Adverse (Not Significant) Effect	No additional mitigation measures are proposed.	Slight Adverse (Not Significant) Effect
	Changes in available non-hazardous and inert landfill void capacity	Very High	Negligible	Slight Adverse (Not Significant) Effect	No additional mitigation measures are proposed.	Slight Adverse (Not Significant) Effect
	Changes in available hazardous landfill void capacity	Very High	Minor	Moderate Adverse (Significant) Effect	No additional mitigation measures are proposed at this time; however, the hazardous excavated material volume estimates will be further refined following a confirmatory site investigation undertaken post DCO consent, pursuant to a DCO Requirement.	Moderate Adverse (Significant) Effect
	Changes to allocated/safeguarded mineral site	No sensitivity applied since sensitivity criteria is not	Only a very small area of the Proposed Development Site lies within the safeguarded wharf at Tees Dock and the safeguarded waste site at New Road. The		No additional mitigation measures are proposed.	Not Significant

PROPOSED DEVELOPMENT PHASE	RECEPTOR/ RECOURCE	IMPORTANCE AND VALUE/ SENSITIVITY	MAGNITUDE OF IMPACTS	LIKELY SIGNIFICANT EFFECTS	PROPOSED MITIGATION / ENHANCEMENT	RESIDUAL EFFECTS
		available for this receptor.	hydrogen route does not pass through the safeguarded wharf at Tees Dock and the overlap in the area of the safeguarded waste site at New Road covers an existing road. Any works in these areas of land and would not adversely or substantially impact access to the sites. The sites would not be sterilised by the development or render the sites inaccessible for future use.			
	Changes to allocated/safeguarded waste site	No sensitivity applied since no assessment criteria available for this receptor.			No additional mitigation measures are proposed.	Not Significant
Operation	Changes in available landfill void capacity	Very High	Negligible	Slight Adverse (Not Significant) Effect	No additional mitigation measures are proposed.	Slight Adverse (Not Significant) Effect
	Changes in available hazardous waste management facility capacity	No sensitivity applied since no assessment criteria available for this receptor.	In the event that waste is sent to a hazardous waste management facility, the annual quantity is likely to be small in the context of national capacity.		No additional mitigation measures are proposed.	Not Significant

21.10 References

- Construction Resources and Waste Platform (2010). *Benchmarks and Baselines 2009*. No longer available online.
- Department for Environment, Food and Rural Affairs (Defra) (2010). *The Strategy for Hazardous Waste Management in England*. No longer available online.
- Department for the Environment, Food and Rural Affairs (Defra) (2011). *Guidance on Applying the Waste Hierarchy*.
- Department for the Environment, Food and Rural Affairs (Defra) (2018a). *A Green Future: Our 25 Year Plan to Improve the Environment*.
- Department for the Environment, Food and Rural Affairs (Defra) (2018b). *Our Waste, Our Resources: A Strategy for England*.
- Department for the Environment, Food and Rural Affairs (Defra) (2021). *The Waste Management Plan for England*.
- Department for the Environment, Food and Rural Affairs (Defra) (2023a). *Waste Prevention Programme for England: Maximising Resources Minimising Waste*.
- Department for the Environment, Food and Rural Affairs (Defra) (2023b). *Environmental Improvement Plan*.
- Department for the Environment, Food and Rural Affairs (Defra) (2023c). *UK Statistics on Waste*.
- Department for Energy Security & Net Zero (DESNZ) (2023a). *Overarching National Policy Statement for Energy (EN-1)*.
- Department for Energy Security & Net Zero (DESNZ) (2023b). *National Policy Statement for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)*.
- Department for Energy Security & Net Zero (DESNZ) (2023c). *National Policy Statement for Electricity Networks Infrastructure (EN-5)*.
- Department for Levelling Up, Housing & Communities (DLUHC) (2023). *National Planning Policy Framework*.
- Environment Agency (EA) (2022a). *Permitted Waste Sites – Authorised Landfill Site Boundaries*.
- Environment Agency (2022b). *Historic Landfill Sites*.
- Environment Agency (2022c). *Environmental Permitting Regulations – Waste Sites*.
- Environment Agency (2023a). *2022 Waste Summary Tables for England – Version 2*.
- Environment Agency (2023b). *2022 Waste Data Interrogator – Version 2*.

-
- European Union, EU (2008). *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (2008/98/EC)*.
 - HM Government (1990). *Environmental Protection Act 1990 (as amended)*.
 - HM Government (2005). *Hazardous Waste (England and Wales) Regulations 2005 (as amended)*.
 - HM Government (2011). *Waste (England and Wales) Regulations 2011 as amended, SI 1889*.
 - HM Government (2016). *The Environmental Permitting (England and Wales) Regulations 2016*.
 - HM Government (2017). *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations')*.
 - HM Government (2021). *The Environment Act*.
 - Institute of Environmental Management and Assessment (IEMA) (2020). *IEMA guide to: Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach*.
 - International Organization for Standardization (2015). *ISO 14001:2015 Environmental Management Systems. Geneva: International Organisation for Standardisation*.
 - Make UK (2019). *A new deal for steel: laying the foundations for a vibrant UK steel industry*.
 - Mindat (2023). *Billingham anhydrite mine, Billingham, Stockton-on-Tees, North Yorkshire, England, UK*.
 - Mineral Products Association (MPA) (2020). *Profile of the UK Mineral Products Industry: 2020 Edition*.
 - Ministry of Housing, Communities & Local Government (MHCLG) (2014a). *Planning Policy Guidance for Minerals*.
 - Ministry of Housing, Communities & Local Government (MHCLG) (2014b). *National Planning Policy for Waste*.
 - Ministry of Housing, Communities & Local Government (MHCLG) (2015). *National Planning Policy Guidance for Waste*.
 - Planning Inspectorate (2018). *Advice Note Nine: Rochdale Envelope*.
 - Redcar and Cleveland Borough Council (2018). *Redcar and Cleveland Local Plan Policies Map 2018*.
 - Tees Valley (2011a). *Tees Valley Joint Minerals and Waste Development Plan Documents. Core Strategy*.
 - Tees Valley (2011b). *Tees Valley Joint Minerals and Waste Development Plan Documents. Policies and Sites*.
-

- Waste and Resources Action Programme (WRAP) (2007). *Waste Recovery Quick Wins. Improving Recovery Rates without Increasing Costs. No longer available online.*
- WRAP (n.d. a). *Designing Out Waste: A Design Team Guide for Civil Engineering. No longer available online.*
- WRAP (n.d. b). *Designing Out Waste: A Design Team Guide for Buildings. No longer available online.*
- WRAP (n.d. c). *Designing Out Waste Tool for Civil Engineering. No longer available online.*
- WRAP, (n.d. d). *SmartWaste Data and Reporting (Excel file not available online, projects completed to the end of November 2012).*