Haweswater Aqueduct Resilience Programme -The Proposed Bowland Section

Environmental Statement

Volume 2

Chapter 12: Materials and Waste

June 2021

Water for the North West

Haweswater Aqueduct Resilience Programme – Proposed Bowland Section

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12. Materials and Waste

12.1 Introduction

1) This chapter presents an assessment of the likely significant effects of the Proposed Bowland Section in respect of materials and waste. As for other proposed tunnel replacement sections across the Proposed Programme of Works, the controlled generation and sustainable management of surplus materials and waste from the Proposed Bowland Section would be a key environmental objective. . However, the strategy for dealing with surplus materials for part of the Proposed Bowland Section (and all of the Proposed Marl Hill Section) is quite different from the other three sections. This difference is explained further in Section 12.2.

2) This chapter begins by reviewing the legislation and planning policies relevant to materials and waste. The assessment area and methodology are then outlined. The nature and value of the existing baseline environment are then identified before an assessment is made of the potential effects on the materials and waste for the Proposed Bowland Section and the Proposed Marl Hill Section. As the same Site Waste Management Plan (SWMP) and waste management facilities would be used along the Proposed Bowland Section and the Proposed Marl Hill Section, this assessment discusses the sections holistically and does not look at individual compound locations or tunnel sections.

3) Embedded mitigation and good practice measures are explained further in Sections 12.4.4 and 12.4.5 with essential mitigation measures further outlined in Section 12.7.

4) For the purposes of this chapter, materials and waste are defined as:

- The use of material resources
- The generation and management of waste and materials.

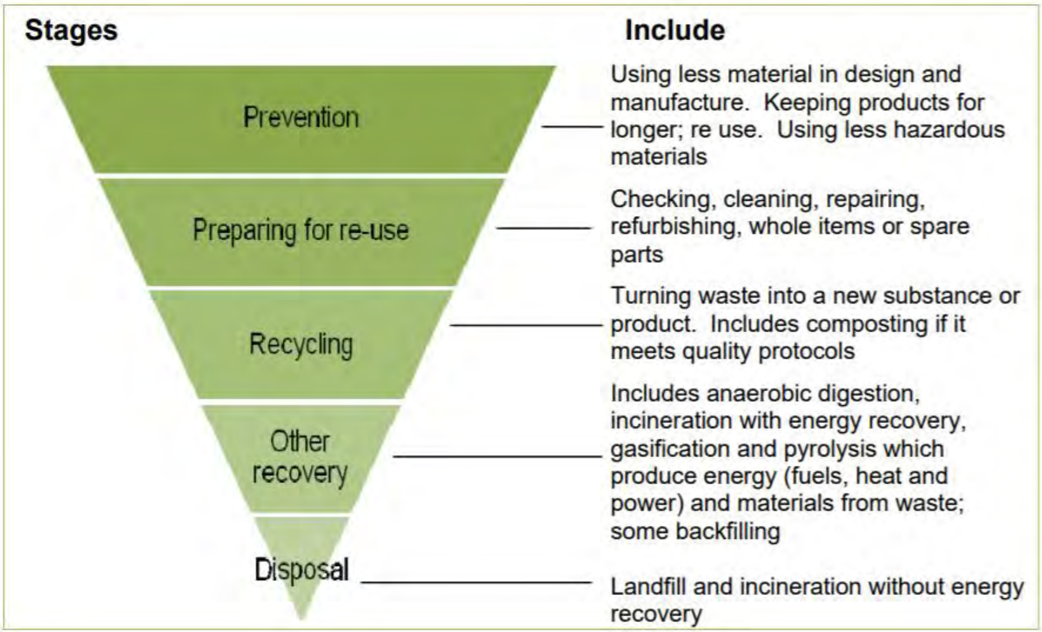
5) Material resources are defined as the materials and construction products required for construction, improvement, and maintenance. Material resources include primary raw materials such as aggregates and minerals, and manufactured products for construction.

6) Waste is defined as per the Waste Framework Directive (2008/98/EC)[1] as '*any substance or object which the holder discards or intends or is required to discard*'.

7) The overall waste management approach for the Proposed Bowland Section and the Proposed Marl Hill Section is to prioritise waste prevention, followed by preparing for re-use, recycling and recovery, and lastly disposal to landfill. This is as per the internationally recognised waste hierarchy shown in illustration 12.1 below.

[1] Waste Framework Directive (2008/98/EC) [Online] Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32008L0098&from=EN [Accessed: 10-01-2021]

Illustration 12.1: Waste Hierarchy[2]



8) This assessment has been developed and undertaken following the approach set out in Highways England's *Design Manual for Roads and Bridges* (DMRB) *LA 110 Material Assets and Waste* (2019),[3] supplemented by guidance contained in Highways England's *Major Projects' Instructions* (MPI) (2017).[4] Whilst these documents were originally developed for road transport projects, in the absence of specific guidance for the water industry they are considered to provide a comprehensive and robust basis for the assessment of large infrastructure projects.

9) As the context of LA 110 is distinctly different from the Proposed Bowland Section and the Proposed Marl Hill Section, this assessment's methodology uses LA 110 as a basis and has modified as appropriate those aspects not relevant to a tunnelling aqueduct project.

10) The LA 110 guidance provides environmental assessment advice which reflects both legislative and best practice requirements and has been successfully deployed on a range of infrastructure projects in the UK. It seeks to ensure information about the environmental effects of projects is collected, assessed, and used to inform option choice, design and decision-making in a timely and cost-effective manner.

12.2 Scoping and Consultations

12.2.1 Scoping and Consultations

11) A materials and waste chapter was included within the Proposed Bowland and Marl Hill Section - EIA Scoping Reports (October 2019)[5][6] which was submitted to the relevant planning authorities for comment in October 2019. A Scoping Addendum was then submitted in February 2021 due to design changes and refinements. Scoping Report responses were provided by each of the local authorities and these have been reviewed and the October 2019 Scoping Report responses incorporated into the assessment. Scoping comments and responses are outlined in Appendix 4.1.

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[2] Guidance on applying the Waste, 2011 [Online] Available from: Hierarchyhttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf [Accessed: 27-04- 2020]

[3] Highways England (2019) *Design Manual for Roads and Bridges LA 110 Material Assets and Waste* [Online] Available from: https://www.standardsforhighways.co.uk/dmrb/search/6a19a7d4-2596-490d-b17b-4c9e570339e9 [Accessed: 27-04- 2020]

[4] Highways England (2017) *Major Projects' Instructions MPI-57-052017 (Rev 1)* [Online] Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR030003/TR030003-000707-Highways%20England%20-%20Environmental%20Impact%20Assessment.pdf [Accessed: 27-04-2020]

[5] Haweswater Aqueduct Resilience Programme Proposed Bowland Section - EIA Scoping Report (October 2019)

[6] Haweswater Aqueduct Resilience Programme Proposed Marl Hill Section – EIA Scoping Report (October 2019)

12) The scope of this assessment covers:

- Waste and materials that would be generated by construction and demolition activities undertaken during the proposed construction period
- Waste generated by workers on sites during the proposed construction period.

13) All waste arisings are reported in tonnes and cubic metres rounded to the nearest whole number.

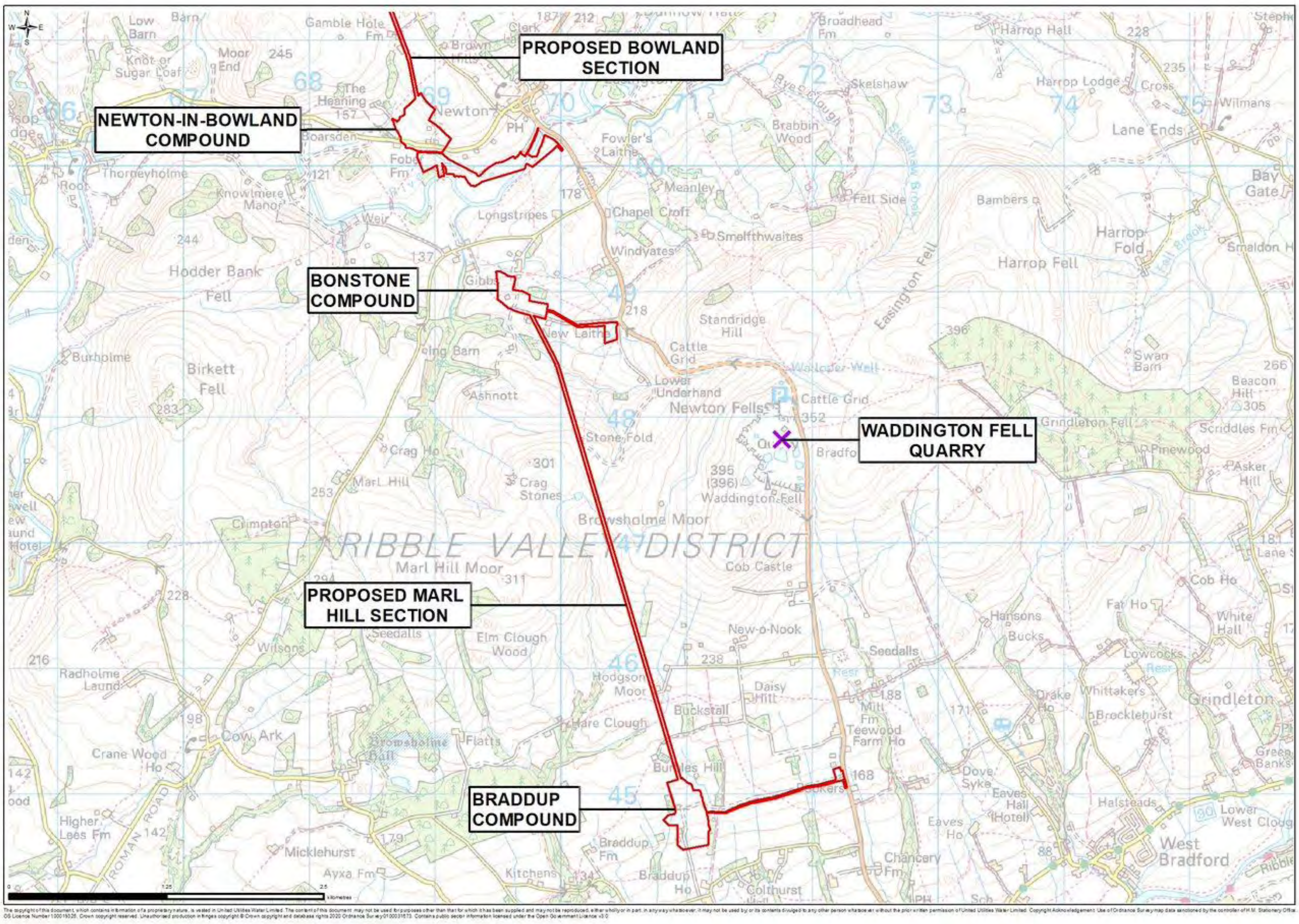
12.2.2 Scope of Surplus Materials Destinations

14) As stated in the Introduction, the proposed surplus materials management strategy for the Proposed Bowland Section is quite different from some of the other proposed sections. Significantly, it is anticipated that surplus materials management for this proposed section would align closely to the Proposed Marl Hill Section. A key basis of assessment is that surplus materials from the Newton-in-Bowland compound serving the Proposed Bowland Section launch portal, and surplus materials from the Braddup and Bonstone compounds serving the Proposed Marl Hill Section, would be directed to the same final destination, Waddington Fell Quarry. For this reason, waste and surplus materials from the Proposed Marl Hill Section has also been considered in this chapter, thereby providing a reasonable worst-case scenario in terms of surplus materials and waste volumes.

15) Waddington Fell Quarry is presently subject to a separate planning application[7] to Lancashire County Council which is seeking consent to revise and enhance the quarry's current approved restoration proposals to enable acceptance of surplus materials from HARP. As shown in Illustration 12.2, Waddington Fell Quarry is located off the Slaidburn Road in relative proximity to the Newton-in-Bowland compound and the two compounds serving the Proposed Marl Hill Section. The key benefit to the use of the quarry as the final destination for surplus materials from both tunnel sections is that it significantly reduces the volume of road haulage journeys from the compounds, south through the Clitheroe area and onto the strategic road network.

[7] Lancashire County Council planning application reference LCC/2021/0015 '*Revised and enhanced quarry restoration scheme incorporating tunnel arisings from the Haweswater Aqueduct Resilience Programme (HARP namely the Bowland and Marl Hill tunnel sections*'.

Illustration 12.2: Waddington Fell Quarry, Newton-in-Bowland Compound (Proposed Bowland Section) and Proposed Marl Hill Compounds



16) At the north (reception) shaft end of the Proposed Bowland Section it is anticipated that surplus materials (approximately 6,000 cubic metres (m^3)) would be retained on site for landscaping purposes.

12.2.3 Scope of Materials Assessment

17) Due to the nature of material demands for construction of this type, the input materials are closely defined and restricted, creating minimal opportunity to adjust material composition and inclusion of additional recycled materials. Specialist materials would be required that would prevent the inclusion of recycled aggregates as defined in LA 110, and the use of material resources is therefore excluded from the scope of assessment.

Concrete

18) The Proposed Bowland Section and the Proposed Marl Hill Section construction needs are deemed to be highly specialised due to design requirements relating to durability and compliance with drinking water regulations. The construction design requires specific concrete that would most likely be sourced from abroad, but with the possibility of finding a UK-based supplier. Furthermore, estimates for the volume of specialised concrete requirements and their sustainable qualities are not currently available.

19) The requirement for the specialised concrete results in no opportunity for alternatives that can meet the design needs. This removes the opportunity for integrating alternative recovered materials or materials with sustainability features or credentials. For this reason, the assessment cannot account for allocation aggregate comprised of re-used / recycled content.

20) Specialised concrete is the only significant material by volume within the construction design. The LA 110 methodology states '*Where primary materials are mandated within DMRB, they should be excluded from the material recovery, recycling or re-use calculation.*' The concrete required for the construction of the Proposed Bowland Section and the Proposed Marl Hill Section is specialised because it must meet very specific standards for durability and structural integrity; therefore, it can be considered mandated and not included with material calculations.

Grout

21) Grout would be used to seal the tunnel structures. The volume of grouting material required in the Proposed Bowland Section and the Proposed Marl Hill Section is estimated to be approximately 5,000 tonnes. This volume is deemed non-significant in the context of materials and waste volumes on the Proposed Bowland Section and the Proposed Marl Hill Section and with little to no waste expected. Therefore, grout has not been considered within the assessment.

Backfill

22) Backfill was removed from the assessment in the scoping exercise; however, the re-use of surplus excavated materials from the construction of the Proposed Bowland Section and the Proposed Marl Hill Section is considered as a potential mitigation measure to reducing waste.

Material Procurement

23) United Utilities' Environmental Management requirements would govern all contractor agreements in relation to construction, the SWMP and material procurement. Sustainable Materials Procurement standards used by United Utilities are referenced in the Construction Code of Practice (CCoP) (refer to Appendix 3.2) and instruct the Contractor to ensure that all building materials would be sustainably sourced where possible, and would be handled and stored to prevent unnecessary damage, spillage or leakage to ground and groundwaters, as well as wastage and theft. The Contractor shall, during their procurement process, ensure the minimum amount of surplus possible and deliveries should be planned to minimise the number of vehicle journeys required.

24) Furthermore, in line with United Utilities' Environmental Management requirements on reducing use of virgin aggregates, the Contractor must use reclaimed alternatives where practicable and by taking into account the environmental impact of the materials to be used (with respect to their source, manufacturing process, use and end-of-life disposal) during their procurement process. When procuring aggregates and other granular or flowable materials, the Contractor must default to using a reclaimed or recycled material that has been produced in accordance with the Waste and Resources Action Programme (WRAP) Quality Protocol End of Waste Criteria, wherever technically possible.

25) Throughout the conclusion of the design and construction planning, opportunities to incorporate re-used and recovered materials would be continually reassessed. If feasible alternatives are identified, then they would be assessed as a potential, improved scenario.

26) In conclusion, materials have been deemed out of the scope of this assessment.

12.2.4 Demolition Waste

27) As no existing structures would be removed or demolished, no demolition waste would be generated.

12.2.5 Operational Waste

28) The material assets and waste assessment reports on the first year of operational activities (the opening year). Operational impacts of subsequent years have not been included in this assessment as it not anticipated there would be a significant net increase in materials consumption or waste generation compared to the operation of the existing aqueduct. It is anticipated that the project would result in a net decrease in materials consumption or waste generation in the short term, due to the efficiencies offered from new structures which would require less maintenance in comparison to the existing structures.

12.2.6 Consultation

29) During this assessment, consultation has taken place with relevant statutory and non-statutory consultees, stakeholders and third parties, through both correspondence and virtual meetings. This is summarised in Appendix 4.1.

12.3 Key Legislation and Guidance

30) The following section covers the documents and legislation which are relevant to the assessment of materials and waste, set out under the categories of national legislation and guidance, local planning policy, and other relevant documents.

12.3.1 National Legislation and Guidance

31) Table 12.1 sets out key legislation and guidance of relevance to the assessment of materials and waste.

Table 12.1: Materials and Waste Key Legislation and Guidance

Applicable Legislation and Guidance	Description
The Waste (England and Wales) Regulations 2011[8] (as amended)	Define the fundamental structure and authority for waste management and control of emissions into the environment.
The Environmental Permitting (England and Wales) Regulations 2016[9]	Provide a consolidated system for permitting of waste operations (amongst other activities not relevant in this context).
The Hazardous Waste (England and Wales) Regulations 2005[10] (as amended)	Set out the regime for the control and tracking of the movement of hazardous waste.
Environmental Protection Act 1990[11] (as amended)	Defines the fundamental structure and authority for waste management and control of emissions into the environment.
Waste Management Plan for England 2013[12]	Details government policy on waste planning, which is of relevance to the management strategy for solid waste generated during the construction and operation of the Proposed Bowland Section and the Proposed Marl Hill Section.
National Planning Policy for Waste 2014[13]	Details government policy on waste planning, which is of relevance to the management strategy for solid waste generated during the construction and operation of the Proposed Bowland Section and the Proposed Marl Hill Section.

[8] The Waste (England and Wales) Regulations 2011 [Online] Available from: http://www.legislation.gov.uk/uksi/2011/988/contents/made [Accessed: 15-02-2021]

[9] The Environmental Permitting (England and Wales) Regulations 2016 [Online] Available from: http://www.legislation.gov.uk/uksi/2016/1154/contents/made [Accessed: 15-02-2021]

[10] The Hazardous Waste (England and Wales) Regulations 2005 [Online] Available from: http://www.legislation.gov.uk/uksi/2005/894/contents/made [Accessed: 15-02-2021]

[11] Environmental Protection Act 1990 [Online] Available from: http://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed: 15-02-2021]

[12] *Waste Management Plan for England 2013* [Online] Available from: https://www.gov.uk/government/publications/waste-management-plan-for-england [Accessed: 15-02-2021]

[13] National Planning Policy for Waste 2014 [Online] Available from: https://www.gov.uk/government/publications/national-planning-policy-for-waste [Accessed: 15-02-2021]

Applicable Legislation and Guidance	Description
EU Landfill Directive 1999/31/EC[14]	Transposes through The Environmental Permitting (England and Wales) Regulations 2010[15] (as amended); which identify the different types of landfill and requirement for implementation of the waste hierarchy.
The Site Waste Management Plans Regulations 2008[16]	Identify opportunities to design out waste; as well as the types and quantities of waste likely to be produced during construction; opportunities for sustainable management of the waste to be identified; and to monitor and report on the actual management of these wastes throughout the construction period.
Environment Bill 2020 policy statement[17]	The Environment Bill 2020 sets out the UK plans to manage the natural environment with consideration of the legislative implications arising from Brexit.

12.3.2 Local Planning Policy

32) Table 12.2 sets out relevant local planning policy documents relevant to the assessment of materials and waste.

Table 12.2: Local Planning Policy

Applicable Legislation and Guidance	Description
Joint Lancashire Minerals and Waste Local Plan[18]	Provides site-specific policies and allocations, and detailed development management policies for minerals and waste planning in the areas covered by the Councils of Lancashire, Blackpool, and Blackburn with Darwen.

12.3.3 Other Relevant Documents

33) The following Codes of Practice, documents and regulations may also be relevant to the assessment of materials and waste:

- CL:AIRE[19] Definition of Waste Code of Practice, 2016 (Version 2).

34) National and local planning policies are discussed in greater detail within Chapter 5: Planning Policy and Context.

[14] Council Directive 1999/31/EC 1999 [Online] Available from: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31999L0031 [Accessed: 15-02-2021]
[15] The Environmental Permitting (England and Wales) Regulations 2010 [Online] Available from: https://www.legislation.gov.uk/ukdsi/2010/9780111491423/contents [Accessed: 15-02-2021]
[16] The Site Waste Management Plans Regulations 2008 [Online] Available from: http://www.legislation.gov.uk/uksi/2008/314/contents/made [Accessed: 15-02-2021]
[17] *Environment Bill 2020 policy statement* (2020) [Online] Available from: https://www.gov.uk/government/publications/environment-bill-2020/30-january-2020-environment-bill-2020-policy-statement [Accessed: 15-02-2021]
[18] Joint Advisory Committee for Strategic Planning (2013) *Joint Lancashire Minerals and Waste Local Plan* [Online] Available from: https://www.lancashire.gov.uk/media/228119/Local-Plan-Part-One-website-1-.pdf [Accessed: 15-02-2021]
[19] CL:AIRE *Definition of Waste: Code of Practice, 2016* [Online] Available from: https://www.claire.co.uk/projects-and-initiatives/dow-cop#:~:text=Definition%20of%20Waste%3A%20Code%20of%20Practice&text=The%20DoW%20CoP%20enables%3A,occurring%20soil%20materials%20between%20sites&text=the%20reuse%20of%20both%20contaminated,sites%20within%20defined%20Cluster%20projects [Accessed: 15-02-2021]

12.4 Assessment Methodology and Assessment Criteria

12.4.1 Assessment Methodology

35) LA 110 required the definition of two geographically separate study areas. The first of these assessment areas comprises the indicative development envelope boundaries for the Proposed Bowland Section and the Proposed Marl Hill Section as shown on Figure 3.1 in Volume 3. This shows indicative areas of land within which construction, operation and decommissioning phase activities may take place.

36) The second of these study areas considers the wider North West region, as well as the Yorkshire and the Humber region, as defined by LA 110, in terms of waste management facilities and potential sources of construction materials.

37) An assessment has been undertaken to assess the impacts of the material resources and waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section; all wastes are considered together as the same waste management facilities would be used.

38) For the purpose of this assessment a reasonable worst-case scenario has been adopted. This means that all excavated wastes are assumed to go to landfill within the regional landfill capacity. Mitigation measures will be assessed to identify opportunities to address the impacts of the worst-case scenario.

39) As part of this detailed assessment, the following tasks have been carried out:

- The relevant waste legislation, policies and guidance have been reviewed to identify material use and waste management objectives and targets
- The likely types of material resources and waste arisings have been identified, and the quantities estimated for the Proposed Bowland Section and the Proposed Marl Hill Section
- The impacts have been evaluated against the national materials markets and the capacity of the regional waste infrastructure
- Opportunities to reduce, re-use, recover and / or recycle material resources and waste arisings have been assessed through a review of the Proposed Bowland Section and the Proposed Marl Hill Section (including proposed building materials, construction methods and design, where available) and in accordance with industry best practices.

40) As noted previously, LA 110 provides guidance for the assessment of the environmental effects associated with the use of material resources and the generation and management of waste in highway construction, improvement, and maintenance projects. In the absence of industry-specific guidance, LA 110 has been referred to and adapted where needed for the purpose of this assessment, as it provides a comprehensive and consistent approach to linear infrastructure projects.

41) The main outputs from the detailed assessment are:

- Identification of likely significant effects associated with material resources and waste arisings
- Measures proposed to mitigate any likely significant effects.

42) There are potential sources of contamination within the development envelope boundaries of the assessment area that may impact on the characterisation and management of the material resources and waste arisings. As a reasonable worst-case assumption, it has been assumed that 95 % of excavated materials would be inert, 4 % of excavated materials non-hazardous, and 1 % potentially hazardous. There is presently no evidence to suggest that contaminated material from human activity would be encountered. The completed intrusive ground investigation, existing information and ongoing investigations provide an indication of the physical and chemical properties of the excavated arisings within the route alignment. This will inform an SWMP, identifying opportunities for re-use of the excavated arisings and the facilities or locations that could manage any arisings removed from site. The approach to assessing contaminated materials accounts for the potential risk of encountering naturally occurring contamination; however, the volumes would a very small proportion of the total volume.

43) The tunnelling would produce a significant volume of excavated surplus material, estimated at 477,000 m^3 across both tunnelling operations. The opportunities to re-use or recover this material

would depend on the type of excavation method used (which may impact on the physical and chemical properties of the spoil) and the environmental constraints in the area. The capacity of the local road network to accommodate the movement of surplus material consignments has also been considered in Chapter 16: Transport Planning.

44) Only two very short (around 285 m combined) sections of open-cut trenching would be undertaken for the Proposed Bowland Section. Additionally, two very short (around 550 m combined) sections of open-cut trenching would be undertaken for the Proposed Marl Hill Section. In practice, excavated material on open-cut water pipeline projects is often reinstated in the trench after the pipe has been laid and commissioned. Therefore, there would be far less surplus material requiring an off-site management solution compared with tunnelling.

45) The assessment will identify and assess a range of management routes for the spoil, which may include both on-site and off-site options. This may include identifying facilities or locations which may be suitable for re-use, recovery, or disposal of the tunnel spoil.

46) Tunnelling and open-cut trenching have been assessed against a range of criteria to identify their feasibility and environmental performance, with preference given to options which would avoid the need for disposal.

47) In addition to the excavated surplus materials, other waste arisings from construction have been assessed and integrated into the waste assessment against a range of criteria. The waste arisings from construction are based on the known construction plans, accounting for waste produced by construction workers on site and additional personnel attending site.

12.4.2 Assessment Criteria for Waste

48) The assessment criteria outlined in Table 12.3 will be used to determine whether likely environmental effects are considered significant or not.

49) As discussed in Section 12.1, there are no recognised significance criteria against which direct and indirect waste effects for the construction of the Proposed Bowland Section and the Proposed Marl Hill Section can be assessed. Therefore, there is no clear approach towards magnitude or sensitivity. As such, the criteria for the assessment have been derived from professional experience previously gained from the application of Environmental Impact Assessments (EIAs) to large-scale infrastructure projects, with additional guidance from LA 110. The criteria consider:

- The net change in solid waste arisings that could be attributed to the Proposed Bowland Section and the Proposed Marl Hill Section
- The magnitude of waste requiring landfill disposal (inert, hazardous, and non-hazardous)
- The availability of landfill disposal capacity (inert, hazardous, and non-hazardous) in the local and regional area.

50) Table 12.3 below sets out the significance criteria. As data sources provided information in varying units, the criteria have been presented in m^3 and tonnes. A conversion factor of 1.94 tonnes / m^3 has been applied, based upon United Utilities' sampling.

Table 12.3: Assessment Criteria

Significance Value	Net Impact on Landfill Capacity (m^3)	Net Impact on Landfill Capacity (Tonnes)
Very High	Net increase in waste arisings relative to the future baseline leading to a severe, national and regional-scale reduction in landfill void space capacity (m^3) (Inert >10 million, Hazardous >100,000, Non-hazardous >250,000).	Net increase in waste arisings relative to the future baseline leading to a severe, national and regional-scale reduction in landfill tonnage capacity (Inert >19.4 million, Hazardous >194,000, Non-hazardous >485,000).
High	Net increase in waste arisings relative to the future baseline leading to regional-scale reduction in landfill void space capacity (m^3). New large-scale facility would need to be constructed (Inert 2 million >10 million, Hazardous 20,000 >100,000, Non-hazardous 50,000 >250,000).	Net increase in waste arisings relative to the future baseline leading to regional-scale reduction in landfill tonnage capacity. New large-scale facility would need to be constructed (Inert 3.88 million >19.4 million, Hazardous 39,000 >194,000, Non-hazardous 97,000 >485,000).
Medium	Net increase in waste arisings relative to the future baseline leading to local-scale reduction in landfill void space capacity (m^3). New small-scale facility would need to be developed (Inert 500,000 <2 million, Hazardous <20,000, Non-hazardous <50,000).	Net increase in waste arisings relative to the future baseline leading to local-scale reduction in landfill tonnage capacity. New small-scale facility would need to be developed (Inert 970,000 <3.88 million, Hazardous <39,000, Non-hazardous <97,000).
Low	Some net increase in waste arisings relative to the future baseline or reduction in landfill void space capacity for waste (m^3). Waste could be accommodated in existing infrastructure without additional facilities needed, maybe some inert landfill <500,000.	Some net increase in waste arisings relative to the future baseline or reduction in landfill tonnage capacity. Waste could be accommodated in existing infrastructure without additional facilities needed, maybe some inert landfill <970,000.
Negligible	No net increase in waste arisings relative to the future baseline or reduction in landfill void space capacity for waste (m^3).	No net increase in waste arisings relative to the future baseline or reduction landfill tonnage capacity for waste.

51) For the purposes of this assessment, medium, high or very high impacts were considered significant in the context of the EIA Regulations.

12.4.3 Assumptions, Limitations and Uncertainties

52) This assessment of materials and waste has limitations, as it is predominantly based on a review of the baseline information available at the time of the assessment. The assessment examines a reasonable worst-case scenario, whereby all waste would be placed in landfill. This reasonable worst-case assessment will demonstrate the highest impact significance of the Proposed Bowland Section and the Proposed Marl Hill Section from materials and waste; however, it is not anticipated that such an impact would be achieved.

Baseline Data and Future Baseline

53) The baseline data sources used in this assessment represent the most recently available stakeholder information; however, conditions may have changed since publication of this data. For example, as mineral planning permissions are granted, and as existing mineral reserves are worked, conditions

described in this would decrease in accuracy. Additionally, as available waste management capacity is used and licences or permits are granted, modified, and surrendered, this assessment would fail to reflect present-day conditions. It cannot be guaranteed that data are error-free; nor can it be guaranteed that any commercial decisions taken by site operators have not affected the data.

54) Environment Agency data identify waste disposal capacity in the regions surrounding the site; this would inform the Contractor in planning the treatment of surplus materials and waste at a later stage in the development process.

55) Future Landfill capacity is calculated by applying volume to tonnage ratios based on United Utilities' sampling for soils. A ratio of 1.94 tonnes / m^3 has been applied to source data to inert waste. A ratio of 1.5 tonnes / m^3 has been applied to hazardous waste. A ratio of 0.83 tonnes / m^3 has been applied to non-hazardous waste.

Materials Assessment

56) There is limited information available at the current time regarding the precise material requirements, including:

- The exact source
- Information of material that would contain secondary / recycled content
- Information on known sustainability credentials of the materials to be consumed
- Type and volume of materials that would be recovered from off-site sources for use in construction
- Details of the on-site storage and stockpiling arrangements.

57) The assessment has been supported by the following additional information which has been used to address impacts from materials:

- SWMP
- Materials Management Plan (MMP)
- Waste from workers on site
- Construction waste.

Site Waste Management Plan

58) Prior to construction, an SWMP would be developed using the BRE SMARTWaste[20] tool, to enable a systematic approach to reducing waste volumes and to manage associated processing facilities and equipment. BRE SMARTWaste supports the preparation, implementation, and review of the SWMP focussing on nine areas:

- Responsibilities
- Waste minimisation
- Forecasting of waste arising
- Waste management options
- Duty of care
- Training and communication
- Actual versus forecast waste performance
- Ongoing review of implementation
- A final completion review.

[20] BRE SMARTWaste [Online] Available from: https://www.bresmartsite.com/products/smartwaste/ [Accessed: 15-02-2021]

59) The Contractor would use this tool to develop, maintain and update the SWMP, with regular reviews throughout the duration of the work.

Waste from Workers on Site

60) Waste generation associated with workers on site is calculated based on assumed ratios of 0.027 tonnes / person / month. This waste generation rate is derived from the average annual household waste generation rate in the UK of 407 kg / person / year in 2015[21] and has been adjusted assuming an average 5.5-day working week over a six-year project duration.

61) The waste generation figures above have been used for the forecast of waste from workers on site. It is calculated in tonnes for each construction compound as well as for the overall Proposed Bowland Section and Proposed Marl Hill Section.

62) Waste generation from workers would be managed through the SWMP.

Construction Waste

63) There is limited information on construction wastes. Most notably:

- The estimated waste quantities (by weight) associated with the construction of the Proposed Bowland Section and the Proposed Marl Hill Section
- The amount of waste (by weight) that would be re-used, recycled, and diverted from landfill on site or off site (in other projects and community projects)
- Details of on-site storage and segregation arrangements in compounds and satellite compounds.

64) A bulking factor of 1.8 has been applied to estimated volumes of excavated materials. United Utilities' sampling data assumed a ratio of 1.94 tonnes / m^3 to calculate tonnage for inert, hazardous, and non-hazardous waste inert waste.

65) United Utilities' soil sampling identified ratios to identify the type of surplus excavated materials and estimate inert, hazardous, and non-hazardous waste quantities. It is assumed that the surplus excavated materials would consist of 95 % inert, 1 % hazardous and 4 % non-hazardous materials.

66) In the reasonable worst-case scenario, no methods for re-use or recycling have been identified for surplus excavated materials. It is assumed that 100 % of construction waste relating to excavation would be diverted to landfill.

12.4.4 Embedded Mitigation and Good Practice

67) Embedded mitigation is inherent to the design, and good practice measures are standard industry methods and approaches used to manage commonly occurring environmental effects. The assessments presented in Section 12.6 of this chapter are made taking into account embedded mitigation and the implementation of good practice measures.

68) The need for any additional topic-specific essential mitigation (generally for effects likely to be significant in the context of the EIA Regulations) is then considered in Section 12.7.

12.4.5 Embedded Mitigation

69) The design has sought to avoid impacts by proposing to avoid, reduce or offset any potential effects.

70) Chapter 3: Design Evolution and Development Description explains the evolution of the design with input from the environmental team, including mitigation workshops and the use of geographic information system (GIS) based constraints data.

71) Embedded mitigation measures with particular relevance to materials and waste are explained below.

[21] Department for Environment Food & Rural Affairs (Defra) (2017) *Digest of Waste and Resource Statistics – 2017 Edition* [Online] Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607416/Digest_of_Waste_and_Resource_Statistics__2017_rev.pdf [Accessed: 15-02-2021]

Waddington Fell Quarry

72) As stated previously, Waddington Fell Quarry is the proposed destination for surplus excavated material arisings from the Newton-in-Bowland compound of the Proposed Bowland Section and for both compounds serving the Proposed Marl Hill Section. The surplus excavated material would be managed through an MMP and would not become waste, removing the need to dispose of it as inert waste as in the baseline case. Note that as this site is under the CL:AIRE regime, it is not a waste site; therefore, the location is not deemed to be part of regional landfill capacity.

73) While it is assumed that the majority of the excavated material would be suitable to be treated under the MMP, there is still the possibility of some hazardous and non-hazardous materials at the Proposed Bowland Section and the Proposed Marl Hill Section. Hazardous and non-hazardous materials would continue to be treated as waste and would be disposed of accordingly at licensed facilities.

74) In the interests of a robust assessment, modelling of the inert surplus material volumes against forecast regional landfill capacity has been undertaken in this chapter as part of a reasonable worst-case assessment. However, this worst-case approach is not adopted elsewhere in the Environmental Statement, where EIA topics have based their respective environmental and transport planning assessments on Waddington Fell Quarry providing the only waste management solution for surplus materials arising from the Proposed Marl Hill Section and Newton-in-Bowland compound.

Lower Houses Shaft

75) Lower Houses Shaft has been identified as an on-site location that would require materials for landscaping. Approximately 6,000 m^3 of surplus excavated material arisings from the Proposed Bowland Section would be managed through an MMP and used as materials for landscaping at Lower Houses Shaft. This would reduce the total quantity of materials being received by Waddington Fell Quarry.

Waste Hierarchy and Design Process

76) The waste hierarchy has been applied throughout the design process and would govern the approach to waste from excavation.

77) The tunnelling methodology would allow the recovery of material with some processing, minimising overall potential waste arisings.

78) The Contractors would consider the potential for the treatment of any naturally occurring contaminated excavated materials. This may allow for such materials to be re-used or disposed of as non-hazardous, preserving the existing hazardous landfill capacity. In addition, testing of materials to assess and classify them appropriately in order to avoid inappropriate use of waste facilities would be required. At this stage it is not possible to predict whether treatment would be practicable, so the assessment has assumed that all hazardous material would be disposed of at hazardous waste facilities.

79) The assessment accounts for a reasonable worst-case scenario. Throughout the Contractor's design and construction planning, opportunities to re-use and recover surplus material would be continually reassessed. If feasible alternatives were identified, they would be assessed on a continual basis as a potential, improved scenario, and recorded in the SWMP.

Construction Code of Practice (CCoP)

80) A CCoP (refer to Appendix 3.2) has been produced for the Proposed Bowland Section and the Proposed Marl Hill Section to guide the Contractor's processes towards meeting the necessary materials and waste standards. The Contractor would be subject to the requirements of the CCoP, which details the relevant environmental legal and contractual requirements for the Contract of the Works, as well as the management processes, systems and reporting United Utilities have developed to enable this. It is aligned to the United Utilities' Environmental Management requirements, which document the commitment to protecting the environment:

- The Contractor would develop an SWMP which would set the framework for the management of wastes generated during the construction process. The aim of the SWMP would be to minimise the volume of waste generated, maximise resource efficiency by applying the waste hierarchy and manage the segregation and storage of waste.
- MMPs would be developed by the Contractor describing the methods for re-using material at specific sites or a cluster of sites. The movement and placement of materials would be as described in the MMP tracking system and recorded in a verification report for each site.
- The Contractor would set out the principles for procurement and specification of materials to prevent waste and promote use of sustainably sourced materials and products.
- The Contractor would be required to undertake regular audit and inspection of waste management activities to ensure compliance with the requirements of this CCoP, statutory controls and other nominated undertaker policies and procedures relevant to the management of surplus excavated material and waste.

Site Waste Management Plan

81) In response to regulatory changes, United Utilities signed up to the Waste and Resources Action Programme (WRAP),[22] which originally aimed to divert 50 % of the capital delivery waste away from landfill. As of 2015, a new target to divert not less than 95 % was implemented.

82) The majority of the United Utilities' waste reduction target is to be achieved through appropriate solution design. As it is deemed difficult to completely eliminate the remaining surplus materials generated during construction, excavation or demolition, the waste could be managed and treated so that it could be re-used or recovered, rather than being disposed of in landfill. An SWMP would be created and implemented by the Contractor to support the targets towards waste diverted away from landfill, where possible.

83) The SWMP would be prepared in accordance with United Utilities' Environmental Management requirements, accounting for the implementation of BRE SMARTWaste and engagement with relevant stakeholders. This SWMP would be reviewed throughout the duration of the design and construction phases to ensure it remained current and took into account any changes in design and construction practices. The SWMP would evaluate all wastes against the waste hierarchy (as presented in Illustration 12.1) to prevent, prepare for re-use, recycle, recover, and dispose of waste in that order of priority. The SWMP would be a live document and would be reviewed and updated at key points within the life cycle of the Proposed Bowland Section and the Proposed Marl Hill Section to facilitate the identification and implementation of waste prevention at the design stage, and re-use, recycling and recovery opportunities during the construction, reducing quantities of waste sent for disposal to landfill. The key site manager responsible for the SWMP would be identified within the draft design stage version, along with details of registered waste carriers and waste disposal facilities that would have been identified for use. The SWMP would be completed as soon as is practicable.

84) Once the draft design-stage SWMP has been finalised it would be passed to the Contractor who would be responsible for discharging the remaining requirements of the SWMP during the construction phase. These are likely to include:

- Identifying and recording waste management and recovery actions to reduce the forecast quantity of residual waste estimated and increase the quantity of waste re-used or recycled
- Specifying waste carriers who would be employed to transport waste from the site for re-use, recycling, treatment, or disposal
- Identifying the sites that the waste would be taken to and confirming that the operators of those sites hold a waste management licence or registered exemption

[22] WRAP [Online] Available from: https://www.wrap.org.uk/ [Accessed: 15-02-2021]

- Updating the plan to record actual waste movements as waste is re-used, recycled, recovered, or disposed of
- Where relevant, drawing on any lessons learnt, identifying any action to address these for the next development.

85) The SWMP would also set out how all construction phase materials would be managed, and would reference any specific MMPs developed under relevant statutory and industry-regulated codes of practice (e.g. Department for Environment Food & Rural Affairs (Defra) *Code of Practice for the Sustainable Use of Soils on Construction Sites*,[23] CL:AIRE *Definition of Waste Code of Practice*[24] and / or Environment Agency Quality protocol: aggregates from inert waste (end of waste criteria for the production and use of aggregates from inert waste).[25]).

86) With a tunnelling operation, it is not possible to avoid the generation of surplus material. It is therefore necessary to minimise volumes as far as practicable and find destinations for the material as high up the waste hierarchy as possible. Construction works would not be scheduled to commence until 2023 at the earliest, and it is therefore considered that the Contractor would be best placed to manage the surplus excavations once the contract has been awarded. Based on the locations of waste disposal and treatment facilities and available transportation infrastructure relative to the Proposed Bowland Section and the Proposed Marl Hill Section, for the purposes of assessment it is assumed that surplus material would be transported from construction sites to the strategic road network.

12.4.6 Good Practice Measures

87) Good practice measures of particular relevance to materials and waste are explained below.

Consents and Licences

88) The appointed Contractor would be responsible for obtaining, where required, all necessary waste carrier, broker and dealer registrations, and environmental permits, mobile plant deployments or waste exemptions in relation to the storage, sorting, treatment, use, disposal and transportation of waste in the course of constructing the Proposed Bowland Section and the Proposed Marl Hill Section. The appointed Contractor would similarly be responsible for preparing any documentation required of those statutory and industry-regulated codes of practice (e.g. CL:AIRE *Definition of Waste Code of Practice* and / or Environment Agency Quality protocol: aggregates from inert waste (end of waste criteria for the production and use of aggregates from inert waste).

12.5 Baseline Conditions

12.5.1 Baseline Waste Infrastructure

89) Baseline waste conditions have been established comprising existing quantities of waste generated by other activities in the assessment area, along with the location of current waste management facilities. The current capacity of the waste infrastructure and waste arisings in the waste disposal areas for the North West and Yorkshire and the Humber planning regions have been identified.

90) Detailed information on 2018 baseline conditions has been collected from sources such as planning documents published by North West and Yorkshire and the Humber planning regions and data on waste facility capacity published by the Environment Agency. These regions are reflected in Table 12.4 and Table 12.5.

91) Environment Agency Waste information 201737[26] includes information about waste sent to landfills and remaining capacity in the North West and Yorkshire and the Humber. Table 12.4 and Table 12.5 show

[23] Defra (2018) *Code of practice for the sustainable use of soils on construction sites* 2018 [Online] Available from: https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites [Accessed: 15-02-2021]
[24] CL:AIRE *op. cit.*
[25] Environment Agency (2013) *Quality protocol: aggregates from inert waste* [Online] Available from: https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste [Accessed: 15-02-2021]
[26] Environment Agency Waste information (201737), *2018 Waste Summary Tables for England – version 2-2* [Online] Available from: https://data.gov.uk/dataset/312ace0a-ff0a-4f6f-a7ea-f757164cc488/waste-data-interrogator-2018 [Accessed: 15-02-2021]

the available capacity in the relevant sub regions based on mandatory reporting of permitted and licensed sites for waste treatment, which is collated by the Environment Agency. This shows there is currently significant capacity in the sub regions. It should be noted that United Utilities is unable to prescribe which particular landfill(s) the Contractor should use – this is a commercial matter which would be decided at a later stage in the development process.

Table 12.4: North West – Landfill Capacity 2018

Landfill Type	Sub Region (All Figures are Provided in 000s m^3)					North West Region
	Cheshire	Cumbria	Greater Manchester	Lancashire	Merseyside	
Inert	780	1,025	1,497	771	618	4,691
Hazardous Merchant	1,504	–	–	1,745	3,062	6,311
Hazardous Restricted	–	–	–	150	–	150
Non-Hazardous with SNRHW cell*	–	1,755	6,781	1,836	–	10,372
Non-Hazardous	7,846	1,351	5,007	6,720	–	20,924
Non-Hazardous Restricted	–	–	–	–	–	–
Total	**10,130**	**4,131**	**13,285**	**11,222**	**3,680**	**42,448**

* Some non-hazardous sites can accept some Stable Non-Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

Table Notes:
Data for 2018 are classified into Landfill Directive categories.
2018 landfill capacity data set was obtained from environmental monitoring reports required by permits or directly from the operator.

Table 12.5: Yorkshire and the Humber – Landfill Capacity 2018

Landfill Type	Sub Region (All Figures are Provided in 000s m^3)				Yorkshire and the Humber Region
	Former Humberside	North Yorkshire	South Yorkshire	West Yorkshire	
Inert	2,992	986	6,491	2,970	13,439
Hazardous Merchant	837	–	–	1,815	2,652
Hazardous Restricted	–	–	–	–	–
Non-Hazardous with SNRHW cell*	1,243	–	–	–	1,243
Non-Hazardous	26,043	17,003	3,926	6,822	53,794
Non-Hazardous Restricted	–	–	–	–	–
Total	**31,115**	**17,989**	**10,417**	**11,607**	**71,128**

* Some non-hazardous sites can accept some Stable, Non-Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

Table Notes:

Data for 2018 are classified into Landfill Directive categories.

2018 landfill capacity data set was obtained from environmental monitoring reports required by permits or directly from the operator.

12.5.2 Future Baseline

92) Where changes to the environmental conditions may occur over time in the absence of the Proposed Bowland Section and the Proposed Marl Hill Section, this is referred to as the future baseline.

93) The potential changes in baseline conditions that can be reasonably foreseen have been assessed in relation to the likely materials and waste effects from the Proposed Bowland Section and the Proposed Marl Hill Section. The baseline conditions relevant for this assessment were limited to the regions of the North West and Yorkshire and the Humber. Relevant factors to the evolution of the baseline would be waste capacity and waste treatment capacity.

94) Information about waste sent to landfills and remaining capacity in the North West and Yorkshire and the Humber has informed this assessment. Data have been compiled for all areas and regions relevant to the assessment area, including historic data on waste capacity. Data on inert landfill, hazardous landfill, non-hazardous landfill, incineration, and treatment and metal recycling have been compiled.

95) Historic data for areas and regions within the geographic scope relating to Commercial and Industrial (C&I) waste arisings have been identified, alongside the quantities of waste diverted to and from landfill. The same process has been applied to Construction, Demolition and Excavation Waste (CDEW) arisings.

96) The historic data on capacity, waste arisings and diversion were used to extrapolate projected waste trends to inform future capacity estimations.

97) Table 12.6 identifies the location of the data sources used for the future baseline calculations.

Table 12.6: Desk Study Data Sets

Data Set	Information / Data Included to Date
Cumbria Minerals and Waste Local Plan 2015-2030[27]	Construction, Demolition and Excavation Waste (CDEW) arisings Commercial and Industrial (C&I) waste arisings
Joint Lancashire Minerals and Waste Local Plan[28]	CDEW arisings C&I waste arisings
Yorkshire Dales National Park Local Plan 2015-2030[29]	Directed to North Yorkshire Sub Region Waste Arisings and Capacity Requirements document
North Yorkshire Sub Region Waste Arisings and Capacity Requirements [30]	CDEW arisings C&I waste arisings
Greater Manchester Joint Waste Development Plan Document[31]	CDEW arisings C&I waste arisings

98) Table 12.7 shows the estimated future landfill capacity for inert waste in the local areas and regional areas based on mandatory reporting of permitted and licensed sites for waste treatment. This shows there is currently significant capacity in the regions.

Table 12.7: Future Baseline of Inert Landfill Capacity

Inert Landfill Capacity (Tonnes)						
Area		2018	2020	2025	2028	2030
Local Areas	Cumbria	1,537,800	2,168,504	5,120,482	8,574,352	12,090,983
	Greater Manchester	2,245,050	2,467,156	3,123,370	3,598,151	3,954,122
	Lancashire	1,156,200	1,120,759	1,036,835	989,529	959,197
	Yorkshire	14,192,087	16,359,654	23,339,618	28,885,875	33,297,635
Regional Areas	North West	9,111,424	8,532,256	7,240,322	6,561,065	6,144,010
	Yorkshire & the Humber	26,107,235	28,943,971	37,458,570	43,726,734	48,477,954

99) Inert landfill capacity across the North West and Yorkshire and the Humber is expected to increase by 19,403,305 tonnes between the 2018 baseline and 2030.

100) Table 12.8 shows the estimated future landfill capacity for hazardous waste in the Local Areas and Regional Areas based on mandatory reporting of permitted and licensed sites for waste. This shows there is currently significant capacity in the regions.

[27] Cumbria County Council (2017) *Cumbria Minerals and Waste Local Plan (MWLP) 2015-2030* [Online] Available from: https://www.cumbria.gov.uk/planning-environment/policy/minerals_waste/mwlp/home.asp [Accessed: 15-02-2021]
[28] Joint Advisory Committee for Strategic Planning (2013) *Joint Lancashire Minerals and Waste Local Plan* [Online] Available from: https://www.lancashire.gov.uk/media/228119/Local-Plan-Part-One-website-1-.pdf [Accessed: 15-02-2021]
[29] Yorkshire Dales National Park Authority (2016) *Yorkshire Dales National Park Local Plan 2015-2030* [Online] Available from: https://www.yorkshiredales.org.uk/wp-content/uploads/sites/13/2019/06/Yorkshire-Dales-National-Park-Local-Plan-2015-30.pdf [Accessed: 15-02-2021]
[30] Urban Vision (2016) *North Yorkshire Sub Region Waste Arisings and Capacity Requirements: Waste Arisings and Capacity Requirements Update Report* [Online] Available from: https://www.northyorks.gov.uk/sites/default/files/fileroot/About%20the%20council/Partnerships/North_Yorkshire_sub_region_-_waste_arisings_and_capacity_requirements_update_report_%28Sep_2016%29.pdf [Accessed: 15-02-2021]
[31] Association of Greater Manchester Authorities (AGMA) (2012) *Greater Manchester Joint Waste Development Plan Document* [Online] Available from: https://secure.manchester.gov.uk/downloads/download/4804/greater_manchester_joint_waste_development_plan_documents [Accessed: 15-02-2021]

101) Hazardous landfill capacity in Greater Manchester is zero and this is not anticipated to change by 2030. However, across the North West and Yorkshire and the Humber, hazardous landfill capacity is expected to increase by 3,398,333 tonnes between the 2018 baseline and 2030.

Table 12.8: Future Baseline of Hazardous Landfill Capacity

Hazardous Landfill Capacity (Tonnes)						
Area		2018	2020	2025	2028	2030
Local Areas	Cumbria	0	0	0	0	0
	Greater Manchester	0	0	0	0	0
	Lancashire	2,617,050	2,717,220	2,984,743	3,157,738	3,278,604
	Yorkshire	33,036,504	34,301,010	37,678,097	39,861,917	41,387,673
Regional Areas	North West	9,465,900	9,828,217	10,795,849	11,421,575	11,858,748
	Yorkshire & the Humber	3,977,615	4,129,862	4,536,465	4,799,398	4,983,100

102) Table 12.9 shows the future landfill capacity for non-hazardous waste in the Local Areas and Regional Areas based on mandatory reporting of permitted and licensed sites for waste treatment. This shows there is currently significant capacity in the regions.

103) Non-hazardous landfill capacity across the North West and Yorkshire and the Humber is expected to decrease by 31,940,294 tonnes between the 2018 baseline and 2030.

Table 12.9: Future Baseline of Non-hazardous Landfill Capacity

Non-hazardous Landfill Capacity (Tonnes)						
Area		2018	2020	2025	2028	2030
Local Areas	Cumbria	2,577,731	2,465,188	2,204,861	2,062,054	1,972,025
	Greater Manchester	9,784,289	9,395,113	8,488,557	7,987,171	7,669,476
	Lancashire	7,225,814	6,967,385	6,361,030	6,022,850	5,807,445
	Yorkshire	8,920,794	7,345,965	4,520,246	3,377,770	2,781,476
Regional Areas	North West	26,099,931	22,929,783	16,588,281	13,659,735	12,000,597
	Yorkshire & the Humber	45,680,710	42,061,839	34,219,747	30,234,996	27,839,750

104) Table 12.10 shows the estimated future unused incineration capacity in the region based on mandatory reporting of permitted and licensed sites for waste. This shows there is currently significant capacity in the regions.

105) Unused incineration capacity across the North West and Yorkshire and the Humber is expected to increase by 84,688 tonnes between the 2018 baseline and 2030.

Table 12.10: Future Baseline of Incineration Capacity

Incineration Unused Capacity (Tonnes)						
Area		2018	2020	2025	2028	2030
Regional Areas	North West	415,554	414,685	414,204	414,244	414,270
	Yorkshire & the Humber	1,018,177	1,031,909	1,067,388	1,089,445	1,104,149

106) Table 12.11 shows the estimated future treatment and metal recycling capacity in the region based on mandatory reporting of permitted and licensed sites for waste. This shows there is currently significant capacity in the regions.

107) Unused treatment and metal recycling capacity across the North West and Yorkshire and the Humber is expected to increase by 246,144 tonnes between the 2018 baseline and 2030.

Table 12.11: Future Baseline of Treatment and Metal Recycling Capacity

Treatment and Metal Recycling Unused Capacity (Tonnes)						
Area		2018	2020	2025	2028	2030
Regional Areas	North West	3,976,666	3,968,349	3,963,743	3,964,126	3,964,382
	Yorkshire & the Humber	3,060,453	3,101,729	3,208,371	3,274,669	3,318,869

108) The destination of surplus materials and waste for treatment would be determined by the Contractor at a later stage in the development processes.

12.5.3 Future Baseline by Local Area

109) A breakdown of the expected evolution of the baseline over time is detailed in the following section.

Future Baseline by Local Area – Cumbria: Construction, Demolition and Excavation Waste

110) Total CDEW arisings for Cumbria for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from the Cumbria Minerals and Waste Local Plan report.[32]

111) Annual projections have been extrapolated using published CDEW arisings for 2014 (857,474 tonnes), 2015 (870,784 tonnes), 2020 (940,833 tonnes), 2025 (1,176,275 tonnes) and 2030 (1,070,626 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

112) Waste management performance for Cumbria in 2020 and the period 2023 to 2030 (future baseline) is based on the Cumbria Minerals and Waste Local Plan report target to reduce the levels of waste disposed to landfill to no more than 10 % by 2030.

Future Baseline by Local Area – Cumbria: Commercial and Industrial Waste

113) Total C&I waste arisings for Cumbria for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from the Cumbria Minerals and Waste Local Plan report, which states a target of reducing waste sent to landfill to no more than 10 % by 2030.

114) Annual projections have been extrapolated using published C&I waste arisings for 2014 (589,385 tonnes), 2015 (593,330 tonnes), 2020 (613,460 tonnes), 2025 (653,307 tonnes) and 2030 (699,133 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

115) Waste management performance for Cumbria in 2020 and the period 2023 to 2030 (future baseline) is based on the Cumbria Minerals and Waste Local Plan report target to reduce the levels of waste disposed to landfill to no more than 10 % by 2030.

[32] Cumbria County Council (2017) *op. cit.*

Future Baseline by Local Area – Lancashire: Construction, Demolition and Excavation Waste

116) Total CDEW arisings for Lancashire for the year 2020 (baseline) and the period 2023 to 2030 (future baseline) are based on information taken from the *Joint Lancashire Minerals and Waste Local Plan*.[33]

117) Annual projections have been extrapolated using published CDEW arisings for 2011 to 2015 (2,479,000 tonnes annually) and 2016 to 2020 (2,605,000 tonnes annually) to provide arisings data for the period 2023 to 2030 (future baseline).

118) There is no specific target for re-use, recycling, and recovery for CDEW stated in the *Joint Lancashire Minerals and Waste Local Plan*. The plan states that the objective is to maximise the use of recycled and secondary materials in all new development.

Future Baseline by Local Area – Lancashire: Commercial and Industrial Waste

119) Total C&I waste arisings for Lancashire for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from the *Joint Lancashire Minerals and Waste Local Plan*.

120) Annual projections have been extrapolated using published C&I waste arisings for 2011 to 2020 (1,782,000 tonnes annually) to provide arisings data for the year 2020 (baseline) and the period 2023 to 2030 (future baseline).

121) There is no specific target for re-use, recycling and recovery for C&I stated in the *Joint Lancashire Minerals and Waste Local Plan*. The plan aim states that the objective is to maximise the use of recycled and secondary materials in all new development.

Future Baseline by Local Area – Yorkshire: Construction, Demolition and Excavation Waste

122) Total CDEW arisings for Yorkshire for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from *Yorkshire Dales National Park Local Plan 2015-2035*[34] and *North Yorkshire Sub Region Waste Arisings and Capacity Requirements: Waste Arisings and Capacity Requirements*.[35]

123) Annual projections have been extrapolated using published CDEW arisings for 2014 (820,705 tonnes), 2016 (837,201 tonnes), 2020 (871,196 tonnes), 2025 (897,639 tonnes) and 2030 (920,306 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

124) The North Yorkshire Sub Region Waste Arisings and Capacity Requirements report identifies the four recycling scenarios for CDEW by 2020:

- Scenario 1 Baseline Recycling Scenario 60 % recycling – No change from baseline position
- Scenario 2 Maximised Recycling Scenario – By 2020:
  - 75 % recycling
  - 20 % treatment
  - 5 % landfill
- Scenario 3 Alternative Median Recycling Scenario – By 2020:
  - 60 % recycling
  - 20 % treatment
  - 20 % landfill
- Scenario 4[36] Median Recycling Scenario – By 2020:
  - 60 % recycling
  - 20 % treatment

[33] Joint Advisory Committee for Strategic Planning (2013) *op. cit.*
[34] Yorkshire Dales National Park Authority (2016) *op. cit.*
[35] Urban Vision (2016) *op. cit.*
[36] Scenario 3 and Scenario 4 are differentiated by their approach to industrial waste; see Table 12.12.

- 20 % landfill.

125) Scenario 3, Alternative Median Recycling Scenario, has been applied for the purposes of this assessment.

Future Baseline by Local Area – Yorkshire: Commercial and Industrial Waste

126) Total C&I waste arisings for Yorkshire for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from *Yorkshire Dales National Park Local Plan 2015-2030* and *North Yorkshire Sub Region Waste Arisings and Capacity Requirements: Waste Arisings and Capacity Requirements*.

127) Annual projections have been extrapolated using published C&I waste arisings for 2014 (322,872 tonnes), 2016 (327,252 tonnes), 2020 (336,200 tonnes), 2025 (347,759 tonnes) and 2030 (359,736 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

128) The North Yorkshire Sub Region Waste Arisings and Capacity Requirements report identifies the four recycling scenarios for C&I by 2020. Table 12.12 describes the four scenarios.

Table 12.12: North Yorkshire Sub Region Recycling Scenarios

Scenario	Practice Assumption		
	Year	Commercial Waste	Industrial Waste
Scenario 1 Baseline Recycling Scenario	N/A	No change from baseline position	No change from baseline position
Scenario 2 Maximised Recycling Scenario	2020	10 % to landfill. Of the remainder: ▪ 75 % recycling ▪ 25 % Energy from Waste (EfW).	18 % to landfill. Of the remainder: ▪ 75 % Recycling ▪ 25 % EfW.
	2030	10 % to landfill. Of the remainder: ▪ 85 % Recycling ▪ 15 % EfW.	18 % to landfill. Of the remainder: ▪ 85 % Recycling ▪ 15 % EfW.
Scenario 3 Alternative Median Recycling Scenario	2020	10 % to landfill. Of the remainder: ▪ 60 % recycling ▪ 40 % EfW.	18 % to landfill. Of the remainder: ▪ 60 % recycling ▪ 40 % EfW.
	2030	10 % or below to landfill. Of the remainder: ▪ 65 % recycling ▪ 35 % EfW.	18 % or below to landfill. Of the remainder: ▪ 65 % recycling ▪ 35 % EfW.
Scenario 4 Median Recycling Scenario	2020	10 % to Landfill. Of the remainder: ▪ 60 % Recycling ▪ 40 % EfW.	18 % to landfill. Of the remainder: ▪ 60 % recycling ▪ 40 % EfW.

130) Scenario 3, Alternative Median Recycling Scenario, has been applied for the purpose of this assessment.

Future Baseline by Local Area – Greater Manchester: Construction, Demolition and Excavation Waste

131) Total CDEW arisings for Greater Manchester for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from *Greater Manchester Joint Waste Development Plan Document*.[37]

132) Annual projections have been extrapolated using published CDEW arisings for 2011 (910,000 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

[37] Association of Greater Manchester Authorities (AGMA) (2012) *op. cit.*

133) According to the Greater Manchester plan, more than 75 % of Greater Manchester's waste or is projected to get diverted away from landfill by 2030.

Future Baseline by Local Area – Greater Manchester: Commercial and Industrial waste

134) Total C&I waste arisings for Greater Manchester for 2020 and the period 2023 to 2030 (future baseline) are based on information taken from the Greater Manchester Joint Waste Development Plan Document.

135) Annual projections have been extrapolated using published C&I waste arisings for 2012 (2,761,000 tonnes), 2017 (2,761,000 tonnes), 2022 (2,714,000 tonnes) and 2027 (2,669,000 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

136) According to the Greater Manchester plan, more than 75 % of Greater Manchester's waste or is projected to get diverted away from landfill by 2030.

12.5.4 Future Baseline by Region

137) A breakdown of the evolved baseline by Region is detailed in the following sections.

Future Baseline by Region – North West: Construction, Demolition and Excavation Waste

138) Total CDEW arisings for the North West region for 2020 and the period 2023 to 2030 (future baseline) are estimated by combining the information for Cumbria County Council, Lancashire County Council and the Greater Manchester Combined Authority.

139) Annual projections have been calculated using published CDEW arisings for 2016 (4,507,456 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

140) A combined recycling rate for CDEW has been established as 62 % for the 2020 and 63 % for the period 2023 to 2030 (future baseline).

Future Baseline by Region – North West: Commercial and Industrial waste

141) Total C&I arisings for the North West region for 2020 and the period 2023 to 2030 (future baseline) are estimated by combining the information for Cumbria County Council, Lancashire County Council and the Greater Manchester Combined Authority.

142) Annual projections have been calculated using published C&I arisings for 2016 (5,140,356 tonnes) and 2021 (5,126,829 tonnes) to provide arisings data for and the period 2023 to 2030 (future baseline).

143) A combined recycling rate for C&I has been established as 69 % for 2020 and 70 % for the period 2023 to 2030 (future baseline).

Future Baseline by Region – Yorkshire & the Humber: Construction, Demolition and Excavation Waste

144) Total CDEW arisings for the Yorkshire and the Humber region for 2020 and the period 2023 to 2030 (future baseline) are estimated using North Yorkshire County Council Waste Arisings and Capacity data.

145) Annual projections have been calculated using published CDEW arisings for 2016 (837,201 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

146) A combined recycling rate for CDEW has been established as 80 %.

Future Baseline by Region – Yorkshire and the Humber: Commercial and Industrial Waste

147) Total C&I arisings for the Yorkshire and the Humber region for 2020 and the period 2023 to 2030 (future baseline) are estimated using North Yorkshire County Council Waste Arisings and Capacity data.

148) Annual projections have been produced using published C&I arisings for 2016 (327,252 tonnes) and 2021 (338,512 tonnes) to provide arisings data for the period 2023 to 2030 (future baseline).

149) A combined recycling rate for C&I has been established as 86 %.

12.6 Assessment of Likely Significant Effects

150) The following section describes the effects of the Proposed Bowland Section on materials and waste during the construction phases. As the same processes and waste management facilities would be used along the Proposed Bowland Section and the Proposed Marl Hill Section, this assessment discusses the sections holistically and does not assess individual compound locations or tunnel sections.

151) Waddington Fell Quarry has been identified to accommodate all the inert surplus material from both Marl Hill compounds, and from the Newton-in-Bowland. However, a reasonable worst-case scenario has been modelled, where inert surplus material volumes are assessed against forecast regional landfill capacity.

12.6.1 Construction Materials Without Embedded Mitigation

152) This assessment has studied the reasonable worst-case scenario for material and waste arisings, assuming that all excavated materials would be treated as waste that could not be recovered or re-used and would require disposal within the regional landfill capacity. This reasonable worst-case has not been considered elsewhere in the ES or in the Transport Assessments.

153) With a tunnelling operation, it is not possible to avoid the generation of surplus material. It is therefore necessary to minimise volumes and find destinations for the material as high up the waste hierarchy as possible. Construction works would not be scheduled to commence until 2023 at the earliest and it is therefore considered that the Contractor would be best placed to manage the surplus excavations once the contract has been awarded. Given the surrounding transport infrastructure and location of waste disposal and treatment facilities, it is assumed that surplus material would be transported from construction sites to the strategic road network.

154) Construction and demolition (C&D) waste, which is defined as "*a waste stream that is primarily received from construction sites*" by Defra (2018),[38] would be generated in only small volumes by the Proposed Bowland Section and the Proposed Marl Hill Section. C&D waste accounted for 120.3 million tonnes of waste in 2016 according to UK waste statistics, with 91 % of this waste recovered (Defra, 2020[39]). The preference for the Proposed Bowland Section and the Proposed Marl Hill Section would be to re-use inert materials on site for habitat and environmental enhancements, backfill and landscaping. Where this is not possible, recycling via licensed contractors would be the preferred option followed by disposal at appropriate facilities. The contribution to total C&D waste on the waste management infrastructure within the region from the Proposed Bowland Section and the Proposed Marl Hill Section would be likely to be insignificant.

155) The construction of the Proposed Bowland Section and the Proposed Marl Hill Section is expected to generate quantities of inert, hazardous, and non-hazardous materials and waste. This could include quantities of inert materials such as clay, earth, gravel, limestone, marl, quartz, sand, sandstone, shale and stone, which would be re-used on site where practicable as backfill. Where re-use is not possible, the materials would be crushed on site under permit or exemption, as required, and disposed by licensed contractors. Waste is being designed out where possible by the tunnelling methodology, which aims to minimise excavation as much as possible.

156) This assessment has adopted a reasonable worst-case assumption that a very small proportion of the excavated materials could comprise naturally-occurring contaminated materials; on a precautionary basis these materials have been assumed to be classed as 'hazardous' for the purposes of this assessment. The presence of hazardous waste has not been identified at any specific locations within the Proposed Bowland Section or the Proposed Marl Hill Section; therefore, this assessment has assumed

[38] Defra (2018) *Digest of Waste and Resource Statistics 2018* [Online] Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878124/Digest_of_Waste_and_Resource_Statistics_2018_v2_accessible.pdf [Accessed: 19-02-2020]

[39] Defra (2020) *UK Statistics on Waste* [Online] Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/874265/UK_Statistics_on_Waste_statistical_notice_March_2020_accessible_FINAL_rev_v0.5.pdf [Accessed: 25-06-2020]

that 1 % of all excavated materials would be classified as hazardous waste based on initial United Utilities' sampling data.

157) It may be the case that wastes classified as hazardous may, during construction, be treatable to become non-hazardous and this would reduce the effects reported in this chapter. However, at this stage no assumption on treatment options or effectiveness has been included in this assessment.

158) Hazardous waste would be generated in small quantities. This waste would be recycled, recovered, or disposed of as appropriate through licensed contractors.

159) The volume of non-hazardous wastes would be minimised through accurate calculations at the design stage to reduce wastes or improve recycling of excess materials by licensed contractors.

160) Other wastes similar in nature to municipal solid wastes would also be generated by construction staff during construction phases from the site compounds, site offices and welfare facilities. These could include small quantities of food waste, cardboard, metal, paper and plastic food and drinks packaging, cardboard, paper, and plastic office consumables. The impact of this waste would be managed as normal commercial wastes through a licensed contractor.

12.6.2 Excavated Materials from the Proposed Bowland Section and the Proposed Marl Hill Section

161) Table 12.13 provides a breakdown of the excavated material arisings from the Proposed Bowland Section and the Proposed Marl Hill Section, accounting for excavation from tunnels, launch shafts, reception shafts and open-cut pipelines. Table 12.13**Error! Reference source not found.** and Table 1 2.14 provides data in tonnes and m^3. Further details on the different tunnel sections, tunnelling techniques, distances and depth are summarised in Table 3.5 in Chapter 3: Design Evolution and Development Description.

162) Table 12.13 and Table 12.14 represent the reasonable worst-case scenario, where the embedded mitigation measure is not implemented. This assessment is intended to demonstrate the significance of the impact on regional landfill capacity should no action be taken.

Table 12.13: Excavated Materials from Construction – Proposed Bowland Section and Proposed Marl Hill Section

Construction Section Reference	Waste Arisings from Excavation (Tonnes)				Waste Arisings from Excavation (Bulked m^3)			
	Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Total Waste	Non-Hazardous Waste to Landfill	Total Waste to Landfill	Non-Hazardous Waste to Landfill	Total Waste to Landfill
Bowland Tunnel	913,773	9,619	38,475	961,866	471,017	4,958	19,832	495,807
Marl Hill Tunnel	247,197	2,602	10,408	260,207	127,421	1,341	5,365	134,127
Total Waste	**1,160,970**	**12,221**	**48,883**	**1,222,073**	**598,438**	**6,299**	**25,197**	**629,934**

Table 12.14: Waste Arisings from Construction – Proposed Bowland Section and Proposed Marl Hill Section

Section	Waste Arisings from Construction (Tonnes)					Waste Arisings from Construction (Bulked m^3)				
	Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste	Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste
Proposed Bowland Section and Proposed Marl Hill Section	1,160,970	12,221	48,883	393	1,222,466	598,438	6,299	25,197	203	630,137
Total Waste	**1,160,970**	**12,221**	**48,883**	**393**	**1,222,466**	**598,438**	**6,299**	**25,197**	**203**	**630,137**

163) This reasonable worst-case scenario has been assessed whereby it is assumed that no opportunity would exist for on-site usage of excavated materials or nearby use or recovery. Therefore, surplus excavated material would need to be transported by road to final licensed destinations which could accept material of this nature.

164) CDEW and C&I arisings would be removed from site in the form of clay, earth, gravel, limestone, marl, quartz, sand, sandstone, shale and stone. It is anticipated that it would be 99 % inert or non-hazardous. An SWMP would be developed using the BRE SMARTWaste tool to produce a systematic approach to manage waste and associated processing facilities and equipment.

165) Environment Agency and Regional data identify waste disposal capacity in the regions surrounding the site.

12.6.3 All Construction Materials from the Proposed Bowland Section and the Proposed Marl Hill Section

166) As described above, the Proposed Bowland Section and the Proposed Marl Hill Section have been assessed together. The materials and waste arisings created during the construction phase have been calculated and described in Table 12.14. Due to data sources applying contrasting units, Table 12.14 provides data in tonnes and m^3. Wastes similar in nature to municipal solid wastes are represented per section as 'non-hazardous waste diverted from landfill', as it is not possible to calculate this against specific shafts.

12.6.4 The Net Change in Solid Waste Arisings Overall Attributable to the Proposed Bowland Section and the Proposed Marl Hill Section

167) An increase of 1,222,466 tonnes of material and waste arisings is predicted to be attributable to the Proposed Bowland Section and the Proposed Marl Hill Section. It is assumed that 11,163,801 tonnes of waste arisings (C&I and CDEW) would be generated per year in the region by 2030, as a worst-case scenario. If all were treated as waste, the combined annual waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section would represent only an additional 1.56 % waste generated annually during the seven-year construction phase.

168) It is estimated the Proposed Bowland Section and the Proposed Marl Hill Section would produce 393 tonnes of non-hazardous waste that would be diverted from landfill. This would represent 0.005 % of capacity for incineration and treatment and metal recycling in 2030.

12.6.5 The Magnitude of the Quantity of Waste Requiring Landfill Disposal

169) In a reasonable worst-case scenario whereby no solutions are identified for re-use or recovery of the surplus excavated material within the region, it is anticipated that 99.97 % of total waste arisings would require landfill disposal.

170) It is anticipated that all inert and hazardous waste arisings would require disposal in landfill sites, with 99.2 % of non-hazardous waste requiring landfill disposal.

12.6.6 The Availability of Landfill Disposal Capacity in the Local and Regional Area

171) Multiple regions within a reasonable distance have been considered, as United Utilities would not have control over the final destination of the landfill.

172) Regional inert landfill capacity is expected to increase by 19,403,305 tonnes by 2030 to 54,621,964 tonnes in the baseline scenario. The addition of 1,160,970 tonnes of inert materials from the Proposed Bowland Section and the Proposed Marl Hill Section in this timescale means there would be no reduction in landfill void space capacity relative to the baseline. The total inert materials generated from the Proposed Bowland Section and the Proposed Marl Hill Section would account for approximately 2.13 % of the total regional capacity in 2030.

173) Regional hazardous landfill capacity is expected to increase by 3,398,333 tonnes by 2030 to 16,841,848 tonnes in the baseline scenario. The addition of 12,221 tonnes of hazardous waste from the Proposed Bowland Section and the Proposed Marl Hill Section in this timescale means there would be

no reduction in landfill void space capacity for waste relative to the baseline. The inert waste generated would account for less than 0.07 % of the total regional capacity.

174) Regional non-hazardous landfill capacity is expected to decrease by 31,940,294 tonnes by 2030 to 39,840,347 tonnes in the baseline scenario. The addition of 48,883 tonnes of non-hazardous waste from the Proposed Bowland Section and the Proposed Marl Hill Section in this timescale means waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section would contribute to a small net loss of capacity. However, non-hazardous waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section would account for less than 0.12 % of overall regional capacity in 2030.

175) An increase of 1,222,073 tonnes of landfill waste would be generated through the Proposed Bowland Section and the Proposed Marl Hill Section. Regional waste capacity is expected to be 111,304,159 tonnes by 2030. Waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section would therefore account for 1.10 % of regional waste capacity in 2030.

176) Following the reasonable worst-case scenario, the impact of embedded mitigation has been assessed to account for what is deemed a likely scenario.

12.6.7 Construction Materials with Embedded Mitigation

177) Section 12.4.4 identified embedded mitigation whereby all suitable excavated materials from the Proposed Bowland Section would be sent to Waddington Fell Quarry or used in landscaping at Lower Houses Shaft under an MMP, and would therefore not be inert waste. No inert waste would be created from the Proposed Bowland Section or the Proposed Marl Hill Section; therefore, no inert waste would be sent to any regional landfill facilities. With embedded mitigation, hazardous and non-hazardous materials would be still be treated as waste.

178) Table 12.15 details the expected treatment of excavated materials with embedded mitigation for the Proposed Bowland Section and the Proposed Marl Hill Section. Due to data sources applying contrasting units, Table 12.15 provides data in tonnes and m^3. Wastes similar in nature to municipal solid wastes are represented per section as 'non-hazardous waste diverted from landfill', as it is not possible to calculate this against specific shafts.

Table 12.15: Treatment of Material Arisings from Construction by Section

Section	Waste Arisings from Construction (Tonnes)						Waste Arisings from Construction (Bulked m³)					
	Total Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste Diverted from Landfill	Total Waste Diverted to Landfill	Total Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste Diverted from Landfill	Total Waste Diverted to Landfill
Proposed Bowland and Proposed Marl Hill Sections	0	12,221	48,883	393	1,161,363	61,104	0	6,299	25,197	203	598,641	31,496
Total	**0**	**12,221**	**48,883**	**393**	**1,161,363**	**61,104**	**0**	**6,299**	**25,197**	**203**	**598,641**	**31,496**

179) With the embedded mitigation measure, there would be no inert waste from the Proposed Bowland Section or the Proposed Marl Hill Section; therefore, there would be no impact on the regional landfill capacity.

180) All hazardous and non-hazardous materials would be diverted to landfill.

181) In this scenario, 61,104 tonnes of landfill waste would be generated through the Proposed Bowland Section and the Proposed Marl Hill Section. Regional waste capacity is expected to be 111,304,159 tonnes by 2030. Waste arisings from the Proposed Bowland Section and the Proposed Marl Hill Section would account for 0.05 % of regional waste capacity.

12.6.8 Summary of Effects from Construction

182) Given the assessment undertaken and compared against the assessment criteria, the impacts of waste arisings from construction are of negligible or low significance, which is not considered to be significant.

183) The management of materials is predicated on the availability of more than sufficient local capacity at Waddington Fell Quarry. However, in the event that Waddington Fell Quarry is unable to accept surplus materials from Newton-in-Bowland compound and Marl Hill compounds, there is sufficient regional landfill capacity.

184) A summary of construction effects against the assessment criteria is shown in Table 12.16 below.

Table 12.1: Summary of Construction Effects against Assessment Sensitivity Criteria

Proposed Development	Waste Materials	Effect	Significance Value	Description of Significance Value
Proposed Bowland Section and Proposed Marl Hill Section	Inert Waste to Landfill	No reduction in landfill void space capacity for waste, relative to the baseline	Negligible	Given the known types of materials and anticipated quantities, the waste infrastructure within the region would receive no inert waste from construction, due to embedded mitigation. In a scenario where surplus excavated materials became inert waste and were diverted to landfill, the receiving waste infrastructure within the region would have capacity to accommodate waste from the construction phase without compromising the integrity of the infrastructure (design life or capacity).
Proposed Bowland Section and Proposed Marl Hill Section	Hazardous Waste to Landfill	No reduction in landfill void space capacity for waste, relative to the baseline	Negligible	Given the known types of waste and anticipated quantities, the receiving waste infrastructure within the region would have capacity to accommodate waste from construction phase without compromising the integrity of the infrastructure (design life or capacity).
Proposed Bowland Section and Proposed Marl Hill Section	Non-Hazardous Waste to Landfill	Waste could be accommodated in existing infrastructure without additional facilities needed, maybe some inert landfill <500K	Low	Given the known types of waste and anticipated quantities and the anticipated reduction in landfill capacity for non-hazardous waste, construction would result in an overall decrease in landfill capacity. However, existing infrastructure could accommodate the waste, and additional facilities would not be required.
Proposed Bowland Section and Proposed Marl Hill Section	Waste Diverted from Landfill	No reduction in landfill void space capacity for waste, relative to the baseline	Negligible	Given the known types of waste and anticipated quantities, the receiving waste infrastructure within the region would have capacity to accommodate waste from construction phase without compromising the integrity of the infrastructure (design life or capacity).

12.7 Mitigation and Residual Effects

185) Mitigation is most effective if it forms an integral (embedded) part of the design and construction proposals to avoid, reduce or offset any adverse effects on the wider environment.

186) The project would generate waste and materials during the construction phase which would require treatment and / or disposal at third-party materials and waste management facilities.

187) In the reasonable worst-case scenario assessed in Section12.6.1 to 12.6.6, the nature and location of the excavated materials and their quantities are such that re-use, recycling or recovery of materials would be unlikely, and these wastes would require disposal at landfill sites. With embedded mitigation as proposed, however, all inert materials would be sent to Waddington Fell Quarry.

188) In the reasonable worst case scenario, the receiving infrastructure within the region is anticipated to have capacity to accommodate materials from construction of the Proposed Bowland Section and the Proposed Marl Hill Section without compromising the integrity of the infrastructure (design life or capacity).

189) No likely significant effects have been identified in Section 12.6; therefore, no additional essential mitigation would be required. However, it is considered likely that a proportion of the surplus excavated material (inert) would be suitable as backfill for the reinstatement of launch shafts / pits and open-cut pipelines. An estimate of the quantities that could be re-used, based on the embedded mitigation scenario, is shown below in Table 12.17. Due to data sources applying contrasting units, Table 12.17 provides data in tonnes and m^3.

Table 12.17: Potential Re-use of Inert Material Arisings from Construction – Proposed Bowland Section and Proposed Marl Hill Section Breakdown

Construction Section Reference	Surplus Excavated Material (Inert, Tonnes)	Potential Inert Material Re-Use by the Project		Inert Material to Waddington Fell Quarry After Re-Use (Tonnes)	Surplus Excavated Material (Inert, m^3)	Potential Inert Material Re-Use by the Project		Inert Material to Waddington Fell Quarry After Re-Use, (m^3)
		(Tonnes)	(Percentage)			(m^3)	(Percentage)	
Bowland Tunnel	913,773	157,060	17 %	756,713	471,017	80,959	17 %	390,058
Marl Hill Tunnel	247,197	52,669	21 %	194,528	127,421	27,149	21 %	100,272
Total	**1,160,970**	**209,729**	**18 %**	**951,241**	**598,438**	**108,108**	**18 %**	**490,330**

190) The remaining surplus excavated material (inert) would still be expected to go to Waddington Fell Quarry, as per the embedded mitigation in Section 12.4.5. The use of Waddington Fell Quarry in combination with backfill would result in there being no inert waste to landfill .

191) Surplus excavated material would need to be transported by road to Waddington Fell Quarry or final licensed destinations which could accept material of this nature. Actual disposal locations would be identified by the Contractor post award.

12.7.1 Summary of Effects from Construction

192) Given the assessment undertaken and comparison against the assessment criteria, the impact of waste arisings from construction would not be significant in the context of the EIA Regulations. No new additional cumulative effects have been identified from Table 12.16: Summary of Construction Effects against Sensitivity Criteria.

12.7.2 Summary of the Residual Effects

193) Backfill may be required at locations throughout the Proposed Bowland Section and the Proposed Marl Hill Section; re-using surplus excavated material (inert), on site would remove any need to import material for backfill or landscaping. Inert waste sent to landfill would be zero. The overall impact of inert, hazardous, and non-hazardous materials on regional landfill capacity would remain as 0.05 %, an effect of negligible significance.

194) The methodology and level of the assessment is sufficient and proportionate to understand the likely effects of construction of the Proposed Bowland Section and the Proposed Marl Hill Section. Taking into consideration the mitigation methods for the materials and waste, including the lack of suitable and identifiable alternatives, responsible sourcing practices and availability of regional waste infrastructure, there would be no likely significant effects.

195) As explained in sections 12.4.4 to 12.4.6, the assessment of effects in Section 12.6 considers the application of both embedded mitigation and good practice measures. These measures are considered to provide appropriate mitigation for potential effects on materials and waste and no further topic-specific essential mitigation is therefore required. No further mitigation has been identified and the likely significance of effect for all assessed aspects would be negligible–low.

12.8 Cumulative Effects

196) This section provides an overview of the potential inter-project cumulative effects from different developments, in combination with the Proposed Bowland Section and the Proposed Marl Hill Section. For cumulative effects related to the combined action of environmental topics (intra-project effects), see Chapter 19: Cumulative Effects and Figure 19.1.

197) This assessment of inter-project cumulative effects includes consideration of other sections forming part of the overall Proposed Programme of Works. No major infrastructure projects or developments have been identified within the regions discussed in this assessment. Additionally, no other major developments have been identified that would impact on the capacity of the regional waste infrastructure when combined with the Proposed Bowland Section and the Proposed Marl Hill Section. The assessment has not identified any developments that would be likely to result in effects of low significance or above.

12.8.1 Construction Waste Without Embedded Mitigation at the Proposed Bowland Section and Marl Hill Section

198) This assessment has studied a reasonable worst-case scenario for waste arisings, assuming that all excavated surplus materials would be treated as waste that could not be recovered and would require disposal within the regional landfill capacity.

199) The excavated materials created during the construction phase have been calculated and described for the Proposed Programme of Works in Table 12.18. Wastes similar in nature to municipal solid wastes

are represented per section as ‘non-hazardous waste diverted from landfill’, as it is not possible to calculate this against specific shafts.

Table 12.18: Waste Arisings from Construction by Section

Section	Waste Arisings from Construction (Tonnes)					Waste Arisings from Construction (Bulked m^3)				
	Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste	Inert Waste to Landfill	Hazardous Waste to Landfill	Non-Hazardous Waste to Landfill	Non-Hazardous Waste Diverted from Landfill	Total Waste
Proposed Docker Section and Proposed Swarther Section	513,489	5,405	21,621	589	541,104	264,685	2,786	11,145	304	278,920
Proposed Bowland Section and Proposed Marl Hill Section	1,160,970	12,221	48,883	393	1,222,466	598,438	6,299	25,197	203	630,137
Proposed Haslingden and Walmersley Section	1,223,575	12,880	51,519	1,178	1,289,151	630,709	6,639	26,556	607	664,511
Total	**2,898,034**	**30,506**	**122,023**	**2,160**	**3,052,721**	**1,493,832**	**15,724**	**62,898**	**1,114**	**1,573,568**

12.8.2 The Net Change in Solid Waste Arisings Overall Attributable to the Proposed Programme of Works

200) In the reasonable worst-case scenario (without embedded mitigation at the Proposed Bowland Section and the Proposed Marl Hill Section), an increase of 3,052,722 tonnes of waste arisings is predicted across the Proposed Programme of Works. It is anticipated that 11,163,801 tonnes of waste arisings (C&I and CDEW) would be generated per year in the region by 2030. The inter-project cumulative effects would therefore represent an additional 3.91 % waste over the total seven-year construction period.

12.8.3 The Magnitude of the Quantity of Waste Requiring Landfill Disposal from the Proposed Programme of Works

201) Where no solutions have been identified for re-use or recovery of the surplus excavated material within the region, it is anticipated that 99.93 % of total waste arisings would require landfill disposal, with 98.3 % of non-hazardous waste requiring landfill disposal.

12.8.4 The Availability of Landfill Disposal Capacity in the Local and Regional Areas

202) Regional inert landfill capacity is expected to increase by 19,403,305 tonnes by 2030 to 54,621,964 tonnes. Without embedded mitigation, the addition of 2,898,033 tonnes of inert waste from the Proposed Programme of Works in this timescale would mean there would be no reduction in landfill void space capacity for waste relative to the baseline. The inert waste generated would account for approximately 5.31 % of the total future baseline regional capacity.

203) Regional hazardous landfill capacity is expected to increase by 3,398,333 tonnes by 2030 to 16,841,848 tonnes. The addition of 30,506 tonnes of hazardous waste from the Proposed Programme of Works in this timescale means there would be no reduction in landfill void space capacity for waste relative to the baseline. The hazardous waste generated would account for approximately 0.1 % of the total future baseline regional capacity.

204) Regional non-hazardous landfill capacity is expected to decrease by 31,94,294 tonnes by 2030 to 39,840,347 tonnes. The addition of 122,022 tonnes of non-hazardous waste from the Proposed Programme of Works in this timescale would mean waste arisings would contribute to the net loss of capacity. However, non-hazardous waste arisings from Proposed Programme of Works would account for approximately 0.31 % of overall future baseline regional capacity in 2030.

12.8.5 Mitigation

205) The excavated materials created during the construction phase have been calculated and described for the Proposed Programme of Works with Embedded Mitigation in Table 12.19. The Embedded Mitigation considers the measures introduced in Section 12.4.5.

Table 12.19: Treatment of Material Arisings from Construction by Section

	Waste arisings from Construction (Tonnes)						Waste Arisings from Construction (Bulked m^3)					
Section	**Total Inert Waste to Landfill**	**Hazardous Waste to Landfill**	**Non-Hazardous Waste to Landfill**	**Non-Hazardous Waste Diverted from Landfill**	**Total Waste Diverted from Landfill**	**Total Waste Diverted to Landfill**	**Total Inert Waste to Landfill**	**Hazardous Waste to Landfill**	**Non-Hazardous Waste to Landfill**	**Non-Hazardous Waste Diverted from Landfill**	**Total Waste Diverted from Landfill**	**Total Waste Diverted to Landfill**
Proposed Docker Section and Proposed Swarther Section	513,489	5,405	21,621	589	589	540,515	264,685	2,786	11,145	304	304	278,616
Proposed Bowland Section and Proposed Marl Hill Section	0	12,221	48,883	393	1,161,363	61,104	0	6,299	25,197	203	598,641	31,496
Proposed Haslingden and Walmersley Section	1,223,575	12,880	51,519	1,178	1,178	1,287,974	630,709	6,639	26,556	607	607	663,904
Total	**1,737,064**	**30,506**	**122,023**	**2,160**	**1,163,130**	**1,889,593**	**895,394**	**15,724**	**62,898**	**1,114**	**599,552**	**974,016**

206) With embedded mitigation, an increase of 1,889,593 tonnes of waste arisings is predicted across the Proposed Programme of Works. It is anticipated that 11,163,801 tonnes of waste arisings (C&I and CDEW) would be generated per year in the region by 2030. The inter-project cumulative effect would therefore represent an additional 2.42 % waste over the total seven-year construction period.

207) It is estimated that with embedded mitigation the quantity of inert waste landfilled would reduce from 2,898,033 tonnes to 1,737,064, accounting for 3.18 % of future baseline regional capacity in 2030.

208) An increase of 1,889,593 tonnes of landfill waste would be generated through the Proposed Programme of Works. Regional waste capacity is expected to be 111,304,159 tonnes by 2030. Waste arisings from the Proposed Programme of Works would account for 1.70 % of regional waste capacity. It is estimated that 61.90 % of excavated materials from the Proposed Programme of Works would require landfill disposal.

209) The additional mitigation measures, introduced in Section 12.7, identify the opportunity for the re-use of inert material on site that would reduce the quantity of inert waste landfilled from 1,737,064 tonnes to 1,464,128 tonnes. This would reduce the effect on regional inert capacity from 3.18 % to 2.68 % for the Proposed Programme of Works. The effect on overall capacity would reduce from 1.70 % to 1.32 %.

12.8.6 Highways Works

210) The potential for likely significant effects relating materials and waste associated with the off-site highways works is covered in Volume 5. Materials and waste was scoped out of the environmental assessment reported in Volume 5 on the basis that the off-site highways works are anticipated to comprise relatively minor works and excavations, and would seek to achieve a neutral materials balance. As such, it has been concluded that the Proposed Bowland Section off-site highways works have no influence on the assessment of materials and waste reported in this chapter.

12.8.7 Ribble Crossing

211) The potential for likely significant effects relating materials and waste associated with the Proposed Ribble Crossing is addressed in Volume 6. Materials and waste was scoped out of the environmental assessment reported in Volume 6 on the basis that the off-site highways works are anticipated to comprise relatively minor works and excavations, and would seek to achieve a neutral materials balance. As such, it has been concluded that the Proposed Bowland Section Proposed Ribble Crossing have no influence on the assessment of materials and waste reported in this chapter

12.9 Conclusion

212) This chapter of the ES considered the potential materials and waste impacts associated with construction of the Proposed Bowland Section and the Proposed Marl Hill Section.

213) The assessment considers a reasonable worst-case scenario of diverting 99.93 % of waste to landfill for the Proposed Bowland Section and the Proposed Marl Hill Section. Throughout the Contractor's design and construction planning, opportunities to re-use and recover surplus material would be continually reassessed. The same process would occur for materials used during construction. If feasible alternatives were identified, they would be assessed as a potential, improved scenario.

214) The waste hierarchy and United Utilities' policies and standards have been applied throughout the design process and this would continue. This would direct the materials selection as well as waste strategies.

215) Procurement of a specific, specialised concrete would be required and there are no alternatives could be assessed.

216) A reasonable worst-case scenario of diverting 99.97 % of waste to landfill has been identified for the Proposed Programme of Works, yet the effect was assessed to be of negligible to low significance. With embedded mitigation employed, waste to landfill would reduce to 5.00 %. Inter-project cumulative effects were also considered, and no additional cumulative significant effects were identified.

12.10 Glossary and Key Terms

217) Key phrases and terms used within this technical chapter relating to Materials and Waste are defined within Appendix 1.2: Glossary and Key Terms.