13 Material Assets and Waste

This chapter presents an assessment of the potential impacts of constructing the proposed scheme on material assets and waste within the boundary of the proposed scheme, and wider study area delineated by the City of Edinburgh, Clackmannanshire, East Dunbartonshire, East Renfrewshire, Falkirk, Fife, Glasgow City, Midlothian, North Lanarkshire, Perth & Kinross, Renfrewshire, South Lanarkshire, Stirling, West Dunbartonshire, East Lothian, West Lothian and Scottish Borders Council areas.

The construction of the proposed scheme will unavoidably require the use and consumption of material assets including primary raw materials and manufactured construction products, and hence may result in potential impacts on the environment through the depletion of non-renewable natural resources. Conversely, the construction of the proposed scheme will also generate surplus materials and waste, leading to impacts on the available waste management capacity. Impacts to superficial and bedrock deposits, within the working area, will also occur as a result of excavations, piling and other earthworks during the construction of the proposed scheme.

There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme; and there are no minerals safeguarding sites or existing or potential peat extraction sites within or in close proximity to the proposed scheme extents. There is likely to be adequate waste management capacity within the study area to accommodate the majority of wastes arising from the construction of the proposed scheme, and there is unlikely to be any specific constraints with regards to managing inert and non-hazardous waste streams. However, there is limited hazardous landfill capacity in the study area and Scotland's sole hazardous landfill is considered to be highly sensitive to disposing large quantities of hazardous (or special) waste given its limited remaining capacity. Discussions with the site operator confirms that it is the process of applying for a licence / permit for an additional 400,000 m^3 of hazardous landfill capacity at this site.

Throughout the design process, a number of 'embedded mitigation' features have been included in the proposed scheme design with the potential to reduce materials consumption and waste generation. Where potential residual effects have been identified, these will be reduced, where possible, during the construction stage efficiencies and via compliance with relevant legislation, policies and plans relating to the consumption of material assets and the management of waste. With best practice application of responsible sourcing methods, the waste hierarchy, implementation of Site Waste Management Plans and inclusion of targets that support the delivery of the Zero Waste Plan targets, the potential for impacts relating to the consumption of material assets and generation of wastes have been assessed as Slight Adverse after the application of embedded and essential mitigation measures. Based on the application of professional judgement to the DMRB LA 110 simplified assessment framework, this would result in effects which are assessed as not-significant for the purposes of Environmental Impact Assessment (EIA).

13.1 Introduction

13.1.1 This chapter of the Environmental Impact Assessment (EIA) Report presents the results of the material assets and waste assessment undertaken for the A985 Kincardine Bridge Refurbishment: Piled Viaduct Replacement (hereafter referred to as the proposed scheme), as described in Chapter 3 (The Proposed Scheme).

13.1.2 This includes assessment of potential environmental impacts and effects related to the use and consumption of material assets and the production and management of waste, that can reasonably be anticipated with the construction of the proposed scheme (operational impacts have been scoped out of this assessment for the reasons identified in paragraph 13.3.30). It identifies measures for mitigating these impacts and effects, where possible, and describes the significance of the residual effects that remain after both embedded and essential mitigation.

13.1.3 The assessment is supported by the following appendices and figures presented in Volume 2 and Volume 3 respectively of this EIA Report:

- Appendix A13.1: Assessment of Regulatory and Policy Compliance;
- Appendix A13.2: Waste Sites and Capacities within the Study Area; and
- Figure 13.1: Operational Waste Sites.

13.1.4 The assessment of effects on material assets and waste have be informed by relevant information collated in other environmental assessments, notably Chapter 6 (Geology, Soils and Groundwater) for information of superficial mineral resources, coal workings, peat deposits and sources of hazardous (or special) waste. The assessment of effects on material assets and waste will also be used to inform other environmental factors, notably Chapter 15 (Climate), for quantifying embodied carbon emissions associated with use of materials.

13.2 Legislation, Policies and Guidance

13.2.1 The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the Roads EIA Regulations) require the description and assessment in an appropriate manner, of the direct and indirect significant effects of the proposed scheme on material assets; and include, to the extent the information is available, a description of any likely significant effects of the proposed scheme on the environment resulting from, inter alia the:

- use of natural resources, considering the sustainable availability of these resources; and
- expected residues and emissions and the production, recovery and disposal of waste.

13.2.2 The EIA should also include a description of the proposed scheme, including in particular: the nature and quantity of the materials and natural resources to be used; and an estimate, by type and quantity, of waste produced during the construction and operation phases, where relevant.

13.2.3 The use and consumption of material resources and the production and management of waste are also subject to a complex framework of legislative and policy instruments at the European, National, Local and Client level. In addition to material and waste-specific policies, legislation and guidance, there is also the legislative framework for sustainable development which must be considered in assessing the impacts and effects of material assets and waste management.

13.2.4 The key legislative, policy, plans and statutory guidance influencing the design, construction and assessment of the proposed scheme are identified below. This includes any emerging plans, where applicable and appropriate.

<u>European Level</u>[1]

- The EU Sustainable Development Strategy, 2006;
- The EU Circular Economy Package, 2018; and
- The EU Waste Framework Directive 2008/98/EC.

<u>National Level</u>

- Department for International Development Agenda 2030: Delivering the Global Goals, 2017;

[1] The UK left the EU on 31 January 2020. Under the UK-EU withdrawal agreement, a transition period will end on 31 December 2020 unless extended, during which time the UK will be treated for most purposes as if it were still an EU member state, and most EU law will continue to apply to the UK. During the transition period, the UK will, therefore, need to continue applying and implementing EU law that falls within the scope of the withdrawal agreement. It is currently unknown what EU law will be applied any implemented after the end of this period.

- Scottish Government, Climate Change and Land Reform, The Environment Strategy for Scotland: vision and outcomes, 2020;
- Scottish Government, Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3), 2018;
- Scottish Executive, Choosing our Future Scotland's Sustainable Development Strategy, 2005;
- Scottish Government National Planning Framework 3, 2014;
- Scottish Government Scottish Planning Policy, 2014;
- The Climate Change (Scotland) Act 2009 (as amended);
- Scottish Government, Making Things Last A Circular Economy Strategy for Scotland, 2016;
- Scottish Government, Safeguarding Scotland's Resources - Blueprint for a More Resource Efficient and Circular Economy, 2013;
- Scottish Procurement Directorate, Scottish Procurement Policy Note SPPN 09/2004 Procurement of Timber and Timber Products;
- Scottish Government, Scotland's Zero Waste Plan, 2010;
- The Waste (Scotland) Regulations 2012 (as amended);
- The Waste (Scotland) Regulations 2011 (as amended);
- The Waste Management Licensing (Scotland) Regulations 2011 (as amended);
- The Environmental Protection (Duty of Care) (Scotland) Regulations 2014 (as amended);
- The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (as amended);
- Pollution Prevention and Control (Scotland) Regulations 2012 (as amended);
- The Landfill (Scotland) Regulations 2003 (as amended);
- The Environmental Protection Act 1990 (as amended);
- The Special Waste Regulations 1996 (as amended);
- Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 (as amended);
- The Waste Batteries and Accumulators Regulations 2009 (as amended); and
- Landfill Tax (Scotland) Act 2014 (as amended).

Local Level

- The Strategic Development Planning Authority for Edinburgh and South East Scotland, Strategic Development Plan (SESplan), 2013;
- Falkirk Local Development Plan 2 (LDP2), 2020; and
- Fife Council Local Development Plan (FIFEplan), 2017.

Client Level

- Transport Scotland Corporate Plan 2017-20, 2017;
- DMRB GG 103 Introduction and general requirements for sustainable development and design (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure Northern Ireland 2019a);

- DMRB LA 110 Material assets and waste (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure Northern Ireland 2019b) (hereafter referred to as 'DMRB LA 110'); and
- Transport Scotland, Road Asset Management Plan for Scottish Trunk Roads, 2016.

Guidance

- SEPA, Guidance - IS IT WASTE Understanding the definition of waste, 2006;
- SEPA, Northern Ireland Environment Agency (NIEA), Natural Resources Wales and the Environment Agency, Technical Guidance WM3: Waste Classification, 2015;
- SEPA, Guidance - Recycled Aggregates from Inert Waste, 2013;
- SEPA and the Quarry Products Association (QPA), Guidance on the Production of Fully Recovered Asphalt Road Planings, 2008;
- SEPA, Land Remediation and Waste Management Guidelines, 2009;
- SEPA, Regulatory Guidance - Promoting the Sustainable Reuse of Greenfield Soils in Construction, 2010;
- SEPA, Guidance - Asbestos in Demolition Waste, 2015;
- Scottish Government, Duty of Care Code of Practice, 2012;
- SEPA, Technical Guidance on Activities Exempt from Waste Management Licensing, n.d;
- SEPA, NIEA and the Environment Agency, PPG 6: Working at Construction and Demolition Sites, 2012; and
- SEPA, Consigning Special Waste Guidance, n.d.

13.2.5 A summary of the legislative and policy framework, and an assessment of the alignment of the proposed scheme proposals with the regulatory and policy context is provided in Appendix A13.1 (Assessment of Regulatory and Policy Compliance).

13.3 Approach and Methods

Scope and Guidance

13.3.1 This assessment addresses 'material assets and waste' in accordance with DMRB 'LA 101 Introduction to environmental assessment' which identifies 'materials assets and waste' as an EIA factor to be assessed.

13.3.2 Specifically, this assessment has been prepared in accordance with DMRB 'LA 110 Material assets and waste' Environmental Assessment standard which sets out the requirements for assessing and reporting the effects on material assets and waste from the delivery of motorway and all-purpose trunk road projects, and which replaces the draft unpublished HD 212/11 guidance in Scotland.

13.3.3 The material assets and waste assessment considers the following elements:

- The consumption of 'material assets' [Article 3.1 (d) of the EIA Directive 2011/92/EU] – this includes materials and products from primary, secondary, recycled and renewable sources, the use of materials offering sustainability benefits, and the use of excavated and other arisings that fall within the scope of waste exemption criteria; and
- The production and management of 'waste' [Annex IV of the EIA Directive 2011/92/EU] – this includes surplus materials which can become waste during the construction of the proposed scheme, as well as other substances which the holder discards or intends or is required to discard.

Study Area

13.3.4 In accordance with DMRB LA 110, the assessment of material assets and waste has utilised two geographically different study areas to examine the use of primary, secondary and recycled construction materials; and the generation and management of waste:

- The first study area – based on the construction footprint/boundary (including compounds and temporary land take) of the proposed scheme. Within these areas, construction materials will be consumed, and waste will be generated; and
- The second study area – based on the likely provenance of construction materials required to construct the proposed scheme, and waste infrastructure that is likely to be suitable (permitted for waste volume and type) to accept arisings and/or waste generated by the proposed scheme. These include:
  - The Forth Valley and SESplan Scottish Aggregate Survey areas[2] which is likely to be the primary source of material assets (primary, secondary and recycled aggregates) used to construct the proposed scheme; and
  - The City of Edinburgh, Clackmannanshire, East Dunbartonshire, East Renfrewshire, Falkirk, Fife, Glasgow City, Midlothian, North Lanarkshire, Perth & Kinross, Renfrewshire, South Lanarkshire, Stirling, West Dunbartonshire and West Lothian Council areas[3] where the waste management infrastructure, likely to be used in managing the majority of waste generated by the proposed scheme, is located.

13.3.5 Professional judgement (a balance of the proximity principle and value for money principle) has been applied in deriving the second study area. Although the first study area is relatively small, as the proposed scheme's location is within the central belt of Scotland it has access to material assets within 9 local authority areas and waste management facilities within 15 local authority areas.

Baseline Conditions

13.3.6 In reporting this Chapter of the EIA, the following baseline data has been gathered from desk-based reviews of existing information, and through the analysis and review of available stakeholder information (where available):

- a description of the study area, including information about the types and quantity of material use and waste generation associated with operation of the existing road/site;
- an assessment of the key legislative and policy instruments influencing the consideration of the consumption of material assets and generation and management of waste;
- an assessment of the regional availability of construction aggregates, facilitated by a review of the 'Scottish Aggregates Survey Report 2012' (published 2015); and the location of mineral safeguarding sites and peat resources in relation to the proposed scheme; and
- an assessment of the current and likely future state (in the absence of the project) of regional transfer, treatment, recycling, recovery and disposal facilities to be utilised by the project, through a review of the Scottish Environment Protection Agency (SEPA) 'Scottish Waste Sites and Capacity Tool'.

[2] Delineated through the adoption of Forth Valley and SESplan Mineral Survey Areas in the 'Scottish Aggregates Survey Report 2012'. (published 2015). The Forth Valley area includes the Stirling, Falkirk and Clackmannanshire Council areas. The SESplan area includes the City of Edinburgh, East Lothian, Fife, Midlothian, Scottish Borders and West Lothian Council areas. These survey areas aim to support strategic planning policy while recognising the difficulties of defining market areas in a Country like Scotland with considerable variation in population density and geology. Due to the nature of the published aggregates information, it has not been possible to define the study area for material assets using the same method as for the available waste management infrastructure.

[3] Delineated through the use of the SEPA Scottish Waste Sites and Capacity Tool to identify the operational waste management facilities within a 50 km radius of Kincardine bridge. The 50 km buffer was chosen based on the recommended default transport scenario guidance contained in the RICS (2017) Professional Statement 'UK Whole Life Carbon Assessment for the Built Environment 1st Edition'.

13.3.7 No direct consultation in relation to material assets and waste has been undertaken with SEPA, City of Edinburgh, Clackmannanshire, East Dunbartonshire, East Renfrewshire, Falkirk, Fife, Glasgow City, Midlothian, North Lanarkshire, Perth & Kinross, Renfrewshire, South Lanarkshire, Stirling, West Dunbartonshire, East Lothian, West Lothian and Scottish Borders Councils in informing the baseline conditions, as the stakeholder information required to support the assessment is readily available via sources identified above.

Impact Assessment

13.3.8 This Chapter of the EIA focuses primarily on determining the likely significant effects of constructing the proposed scheme on the environment resulting from the consumption of material assets; and the production and management of waste.

13.3.9 The assessment utilises and builds on the information and data gathered as part of the scoping stage as reported in the Scoping Report (Jacobs 2018) and collates additional information to quantify as accurately as possible the required materials, and waste likely to be generated in constructing the proposed scheme.

13.3.10 In accordance with DMRB LA 110, the assessment of material assets and waste is largely a desk-based quantitative study that aims to identify the following information for the construction phase (2021 to 2023) and the first year of operational activities (opening year 2023).

13.3.11 For material assets:

- regulatory and policy requirements;
- types and quantities of materials required to construct the project;
- information on materials that contain secondary/recycled content;
- information on any known sustainability credentials of materials to be consumed;
- the type and volume of materials that will be recovered from on or off-site sources for use on the project; and
- details of on-site storage and stockpiling arrangements, and any supporting logistical details.

13.3.12 For waste management:

- regulatory and policy requirements;
- the amount of waste (by weight) that will be recovered and diverted from landfill either on-site or off-site (i.e. for use on other projects);
- types and quantities of waste arising from the project (demolition, excavation arisings and remediation) requiring disposal to landfill;
- details of on-site storage and segregation arrangement for waste and any supporting logistical arrangements; and
- potential for generation of hazardous waste (type and quantity).

Significance Criteria

13.3.13 DMRB LA 110 sets out how effects associated with material assets and waste should be assessed through the use of a 'simplified assessment framework'.

13.3.14 The descriptors of effect provided in Table 13.1 have been used to assess the likely environmental effects of constructing the proposed scheme on material assets and waste. Professional judgement has been

used to determine which significant effect categories the proposed scheme is likely to fall within with regards to the material assets and waste elements of this factor.

13.3.15 Table 13.1, reproduced from DMRB LA 110, uses very precise and deliberate language, specifically 'OR', 'AND' and 'AND/OR' after each descriptor of effect to denote which significance category should be applied. The descriptors for the material assets element are generally summative (Large, Moderate, Slight and Neutral Effects), and all descriptors need to be met in full to assign a relevant significance category (i.e. with the notable exception of a Large Effect which can be assigned when a project sterilises ≥1 mineral safeguarding site and/or peat resource). Whereas, the descriptors of effect for the waste element are either standalone (Very Large and Neutral Effects) or summative (Large, Moderate and Slight Effects).

Table 13.1: Significance Category Descriptions for Material Assets and Waste (DMRB LA 110)

Significance Category	Description
Very large	Material Assets 1) no criteria: use criteria for large categories. Waste 1) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2) construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material Assets 1) project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste to substitute use of primary materials; and 2) aggregates required to be imported to site comprise <1% re-used / recycled content; and/or[4] 3) project sterilises ≥1 mineral safeguarding site and/or peat resource[5]. Waste 1) >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 2) >50% of project waste for disposal outside of the region.
Moderate	Material Assets: 1) project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target[6]. Waste: 1) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2) 1-50% of project waste for disposal outside of the region.
Slight	Material Assets: 1) project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target[6]. Waste: 1) ≤1% reduction or alteration in the regional capacity of landfill; and 2) waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.

[4] The published version of LA 110 includes ';AND' instead of ';AND/OR'. This has been changed to correct an editorial error in the original guidance that was confirmed in an email from Wilson. S (2020) at Highways England.

[5] Sterilisation is defined by LA 110 to mean *'substantially constrain / prevent existing and potential future use and extraction of materials'*. In the absence of further guidance, this has been interpreted to mean that a project would need to intersect with (sterilises) an entire mineral safeguarding site and/or or existing or potential peat extraction site. This assumption is supported by reference to the IEMA guide to: Materials and Waste in Environmental Impact Assessment which suggests that a likely significant effect would typically only be realised in instances where one or more sites are substantially sterilised (in their entirety) by the development rendering it inaccessible for future use. A peat resources is defined in LA 110 as *'Existing or potential peat extraction sites'*.

[6] In the absence of a Scottish specific target in the Scotland National Application Annex to LA 110 Material assets and waste, the England Average target of 25% (provided in England National Application Annex) has been adopted.

Significance Category	Description
Neutral	Material Assets: 1) project achieves >99% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste to substitute use of primary materials; and 2) aggregates required to be imported to site comprise >99% re-used / recycled content. Waste: 1) no reduction or alteration in the capacity of waste infrastructure within the region.

13.3.16 The potential for likely significant effects on material assets and the receiving waste management infrastructure has been determined in accordance with the criteria set out in Table 13.2 which are aligned to the category descriptions provided in Table 13.1. Consequently, this simplified assessment framework precludes the application of a methodology to derive a measure of the significance of effect based on the value of a resource (or receptor) and the magnitude of impact.

Table 13.2: Significance Criteria for Material Assets and Waste (DMRB LA 110)

Significance Category	Description
Significant (one or more criteria met)	Material Assets: 1) category description met for moderate or large effect. Waste: 1) category description met for moderate, large or very large effect.
Not significant	Material Assets: 1) category description met for neutral or slight effect. Waste: 1) category description met for neutral or slight effect.

13.3.17 DMRB LA 104 'Environmental assessment and monitoring' (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure Northern Ireland 2019c) (hereafter referred to as 'DMRB LA 104') requires that the significance of an effect will be reported including embedded mitigation measures.

13.3.18 A number of embedded mitigation measures have been included as part of the proposed scheme design to minimise certain environmental effects. These include:

- careful designing of the proposed scheme to minimise the consumption of material assets, the generation of waste, and ensure key receptors are avoided where possible; and
- compliance with those regulatory and legislative regimes as required by law that apply irrespective of the EIA process, this includes the statute identified in Section 13.2 (Legislation, Policies and Guidance) and the consents and licences identified in paragraph 13.6.27; and construction adopting best practices techniques.

13.3.19 DMRB LA 104 specifies that residual effects will be reported after the assessment of the effectiveness of essential mitigation measures identified in paragraph 13.5.3 required to reduce and, if possible, offset likely significant adverse environmental effects. Assigning significance of an effect, taking account of embedded mitigation, and again after an assessment of the effectiveness of essential mitigation demonstrates the positive contribution of all committed mitigation.

Limitations of the Assessment

13.3.20 The assessment on material assets and waste receptors presented in this chapter currently has limitations, as it is predominantly based on a review of the baseline information and material quantities estimate, and other supplementary design information available at the time of assessment.

13.3.21 Whilst the baseline data sources used in this assessment represent the most recently available stakeholder information, there is a general lag (in years) materials, waste processing and landfill capacity data in the UK / Scotland and conditions may change since publication of this data. For example, as mineral planning permissions are granted and as existing reserves are worked; and as waste management licences/permits are granted, modified and surrendered, and available capacity is utilised. Although checks are made by stakeholders for anomalies or errors in their data prior to publication, it cannot be guaranteed that these data sets are error free, or whether any commercial decisions have been taken by site operators that may have affected these data. It is recognised that some mineral and landfill operators do not release information for reasons of commercial confidentiality. The resulting data gaps may reduce the value of the data that is made publicly available.

13.3.22 Waste treatment, recycling, recovery and disposal facilities are typically characterised by large annual throughput capacities; consequently, large step changes in capacity (as single facilities are commissioned and decommissioned) can have an exaggerated impact on the historical trend. Baseline waste treatment, recycling, recovery and disposal infrastructure capacity cannot therefore be projected forward to the date of construction with any preciseness. Nevertheless, professional experience shows that waste infrastructure responds to market demands, and historical trends show that infrastructure is added or removed, not least to cope with changes in waste generation.

13.3.23 Given the limitations of the SEPA Waste Sites and Capacity Tool it has not been possible to distinguish between merchant waste management facilities (open to receiving commercial and industrial waste from all sources) and private waste management facilities (restricted to receiving commercial and industrial waste from for the operators' own operations). No direct engagement has been undertaken with waste management facilities.

13.3.24 The availability of material assets and waste management capacity may also be impacted by other buildings and infrastructure projects taking place at the time of construction of the proposed scheme (refer to Chapter 21: Cumulative Impacts). Furthermore, changes to the permitted minerals and waste management capacity of waste facilities during the construction of the proposed scheme cannot be predicted with any preciseness. Policy, strategic and legislative drivers are likely to ensure that sufficient capacity continues to be provided.

13.3.25 Whilst the current materials estimate provides a preliminary estimate of the key materials likely to be required during the construction of the proposed scheme, it does not quantify all material and products types that would be required. Therefore, the estimated quantities presented in this assessment can only be taken as approximate and indicative. The assessment parameters which form the basis of the material assets and waste forecasting, will inevitably be subject to some changes as the proposed scheme evolves through the construction stages.

13.3.26 Given that the estimated material assets required, and waste generated may change between this assessment and eventual construction, a 10% uplift has been applied to all material and waste quantities. This uplift aimed to account for additional materials not accounted for in the current materials estimate and for potential changes between this assessment and construction.

13.3.27 Furthermore, there is also limited information currently available regarding:

<u>For Material Assets:</u>

- the types and quantities of materials used during the operation of the existing piled viaduct;
- provenance of imported materials and products;
- information on materials that contain secondary/recycled content;
- information on any known sustainability credentials of materials to be consumed;
- the type and volume of materials that will be recovered from on-site and off-site sources; and

- details of on-site storage and stockpiling arrangements, and any supporting logistical details.

For Waste Management:

- the types and quantities of waste produced associated with operation of the existing piled viaduct;
- the amount of waste (by weight) that will be recovered and diverted from landfill either on-site or off-site (i.e. for use on other projects);
- types and quantities of waste arising from the project (demolition, excavation arisings and remediation) requiring disposal to landfill;
- details of on-site storage and segregation arrangement for waste and any supporting logistical arrangements;
- the chosen waste management methods (recycling, recovery, disposal) and precise geographical locations for managing each waste stream that cannot be re-used on-site; and
- the types and quantities of any hazardous waste.

13.3.28 The above limitations are not untypical of this stage in the design lifecycle, and the information presented in this chapter is considered of an appropriate level of detail to undertake a proportionate assessment in line with the environmental assessment methodology outlined in DMRB LA 110. Furthermore, the assessment has been supported by the following additional information, which has been used to populate these data gaps and allow the assessment of the material assets and waste factor to be undertaken on a precautionary basis:

- Waste and Resources Action Programme (WRAP) Construction industry benchmarks and key performance indicators;
- WRAP Indicative recycled content and wastage rates for standard materials and products;
- WRAP Net Waste Tool – dataset; and
- Scottish Government waste statistics.

13.3.29 Material assets and waste can affect the full range of environmental media and assessment factors. Where materials are consumed, and waste is generated, it is acknowledged that, depending on how they are managed, indirect adverse effects may arise (from greenhouse gas emissions; water consumption; visual impacts, dust, noise, vibration, vehicle emissions, disruption to traffic and other potential causes of nuisance; and water pollution amongst others). Such effects do not form part of the material assets and waste assessment and are considered as part of the other technical chapters in this EIA Report. This chapter should therefore be read in conjunction with Chapter 6 (Geology, Soils and Groundwater); Chapter 7 (Road Drainage and the Water Environment); Chapter 8 (Marine Ecology); Chapter 9 (Terrestrial Ecology); Chapter 11 (Air Quality); Chapter 12 (Noise and Vibration); Chapter 14 (Human Health); and Chapter 15 (Climate).

13.3.30 As reported in the Scoping Report (Jacobs 2018), operational impacts associated with material assets and waste have not been assessed, as they were considered not to be significant (by quantity) in the context of the proposed scheme. Furthermore, DMRB LA 110 specifies that the environmental assessment should only report on the first year of operational activities (i.e. the opening year). It has been assumed that no significant maintenance activities would occur during the opening year, and therefore no significant materials consumption or waste generation is likely to be realised. Whilst it is appreciated that the first year of operational activities is a time period not necessarily confined to operational effects, any construction phase effects overlapping within this period are captured within the construction phase assessment nonetheless.

13.3.31 It is assumed that the assessment of any environmental impacts and effects associated with material assets and waste during any large-scale future maintenance, renewal, or improvement works, will be

undertaken by the Trunk Road Operating Company in accordance with the requirements of the Overseeing Organisation.

13.4 Baseline Conditions

13.4.1 A desk-based assessment has been undertaken in order to establish, for the first and second study areas, the current and likely future conditions (in the absence of the proposed scheme) for material assets and waste. Baseline data has been collected at national, regional and sub-regional levels, including: availability of construction aggregates; presence of mineral safeguarding sites and/or peat resources; construction, demolition and excavation waste arisings as well as information on regional waste transfer, treatment, recycling, and disposal facilities capacity.

Existing Materials Use and Waste Generation

13.4.2 The key materials resources used in the maintenance of the existing piled viaduct are likely to include primary raw materials such as aggregates and timber, in addition to manufactured construction products such as asphalt, bitumen, concrete, steel and plastics.

13.4.3 Waste produced during the operational maintenance of the existing piled viaduct is likely to include asphalt planings, vegetation, road sweepings, gully arisings, animal by-products (roadkill) and litter.

13.4.4 There are no precise figures available regarding the baseline quantities of materials used and waste generated, across the first study area, in maintaining the existing piled viaduct.

Material Assets

13.4.5 For the purpose of this assessment, material assets are considered to be the physical resources in the environment, which may be of human or natural origin.

13.4.6 Primary aggregates have been chosen to act as a proxy indicator of material assets given that large quantities of aggregates are typically required for road projects, e.g. for direct use in unbound bulk fill and sub-base, and for indirect use in bound applications such as concrete and asphalt.

13.4.7 This was also considered appropriate due to the prominence given to aggregates in the DMRB LA 110 Environmental Assessment standard, and the fact that aggregates are likely to constitute the key construction material (by weight) required to deliver the proposed scheme.

Primary Aggregate Reserves

13.4.8 Aggregates are defined by the British Geological Survey (BGS 2019) as being *'hard, granular materials which are suitable for use either on their own or with the addition of cement, lime or a bituminous binder in construction'*. European Standard (BS EN 12620) further defines aggregates as *'granular material used in construction'*, and BGS (2019) infers that the definition of aggregates is often expanded to include soft and nongranular materials used as constructional fill and other uses. 'Primary aggregate' is defined by the BGS as *'aggregate produced from naturally occurring mineral deposits and used for the first time'*.

13.4.9 The Department for Environment Food and Rural Affairs (Defra 2011) identifies 'primary aggregates' as being at risk of future scarcity for the UK construction and civil engineering sector. Whilst there is no danger of physically running out of such resources, competition for land (frequently with environmental designation) and negative public perceptions towards mineral development can make it increasingly difficult for aggregate companies to secure permits to exploit these resources.

13.4.10 Scottish Planning Policy continues the UK landbank approach to planning for the supply of construction aggregates. This approach is intended to ensure that a stock of reserves, with planning permission, is

maintained to ensure adequate supplies of minerals over a minimum ten-year period, based on current production levels. The ten-year period recognises the likely time scale between an operator deciding that there is a need for a new site and bringing the site into full production.

13.4.11 Table 13.3 shows the production of primary aggregate in both the Forth Valley area and SESplan area. The table provides the latest available data accurate at the end of 2012 for the landbank for hard rock and sand and gravel. These data suggest, whilst there is no publicly known local aggregates supply in the Forth Valley, there is supply from 2012 within the SESplan of primary aggregates for 32 years of hard rock and 32 years of sand and gravel. Altogether these data indicate that the study area has good supplies of primary aggregate resources that could supply the proposed scheme.

Table 13.3: Primary Aggregate Production in Forth Valley and SESplan Areas

Regions	Hard Rock		Sand & Gravel	
	Primary Aggregate Production	Maximum Supply at 2012 Production Levels in Years	Primary Aggregate Production	Maximum Supply at 2012 Production Levels in Years
Forth Valley	0**	0	0**	0
SESplan	1,489,000	32	520,000	34
Total	**1,489,000**	**32**	**520,000**	**34**
**Values "concealed to preserve confidentiality" according to the Scottish Aggregate Survey 2012.				

13.4.12 A review of the British Geological Survey (BGS 2014) 'Directory of Mines and Quarries' suggests that the mines and quarries in the study area are able to supply a wide range of materials, including but not limited to primary aggregate, concrete and asphalt products. The appointed Contractor will be responsible for sourcing materials for the construction of the proposed scheme, and typically they would look to use local suppliers and to re-use materials on site to minimise the attendant environmental impact and cost of waste transport and support the economic well-being of the local communities in line with the proximity principle.

13.4.13 The use of such material would be controlled in accordance with the Specification for Highway Works. Whilst European Union competition regulations mean that it is not possible to prescribe specific materials sources (quarries, manufacturers, suppliers) with known recycled content based on Environmental Product Declaration, it can reasonably be inferred that there is likely to be an adequate supply of construction aggregates available within the study area to construct the proposed scheme; and policy, strategic and legislative drivers are likely to ensure that sufficient capacity is provided.

13.4.14 Both secondary and recycled aggregates can be used as alternatives to primary aggregate and have a number of benefits, including the reuse of secondary and waste materials and reducing the impact of primary extraction. Secondary aggregates are typically by-products of industrial processes. These can be sub-divided into manufactured and natural aggregates, depending on their source and can include materials such as pulverised fuel ash, ground granulated blast furnace slag, incinerator bottom ash and recycled glass. Whereas, recycled aggregates are typically derived from reprocessing inert materials previously used in construction, e.g. road planings or crushed concrete.

13.4.15 Zero Waste Scotland has produced a directory of suppliers of recycled aggregates who have successfully demonstrated their compliance with the WRAP Quality Protocol for the Production of Aggregates from Inert Waste (Zero Waste Scotland 2020). This has been reviewed and there would appear to be suppliers in the study area who could supply a range of recycled aggregate materials.

Minerals Safeguarding Sites and Peat Resources

13.4.16 Scottish Planning Policy requires that planning authorities define Mineral Safeguarding Areas (MSA) and appropriate policies in order that known locations of specific minerals resources of local and national importance are not needlessly sterilised by non-mineral surface development.

13.4.17 Scottish Planning Policy suggests that this should lead to the identification in development plans of mineral Areas of Search (AoS), with a reasoned justification for the safeguarding of such areas or particular sites and the criteria to be satisfied by mineral proposals. Scottish Planning Policy confirms that safeguarding also applies to land allocated for development in development plans which is underlain by minerals and where prior extraction of the mineral would be beneficial.

13.4.18 AoS are areas where knowledge of mineral resources may be less certain than specific mineral extraction site allocations, but within which planning permissions for particular sites could be granted to meet any shortfall in supply if suitable applications are made. AoS are typically located within the much larger MSA designations, which are based on the extent of the mineral resource excluding the urban area. MSAs are based on the known extent of a mineral resource, they are areas of known mineral resources that are of sufficient value to warrant future protection. The purpose of MSAs differs from AoS because the intention is to protect the resource from needless sterilisation and there is no presumption that the resources defined in an MSA will be worked.

13.4.19 Review of the FIFEplan interactive map[7] indicates that the north shore of the Firth of Forth/Kincardine is designated as an AoS for sand and gravel and surface coal. These AoS are outwith the land made available for temporary works and construction of the proposed scheme. Superficial deposits present within the study area have been described as reclaimed intertidal deposits comprising silt and clay and post-glacial raised beach deposits, and associated marine and estuarine alluvium, underlain by glacial till. Bedrock geology is composed of Carboniferous sedimentary rock of the Passage Group and Lower Coal Measures. The closest coal seam is shown to subcrop to the west of the A876 South Approach Road, dipping to the southwest by an unknown amount.

13.4.20 No carbon-rich, deep peat or priority peatland areas have been identified within the study area based on a review of the Scottish Natural Heritage (2016) Carbon and Peatland Map. Whilst peaty soils are present within the land made available for temporary works and construction, no peat resources (existing or potential peat extraction sites) have been identified within the proposed scheme extents, and no peat deposits are recorded on the BGS (n.d.) Minerals Information Online.

13.4.21 Given the indicated superficial and bedrock geology conditions, the potential for further mineral resources to be present in the study area cannot be entirely discounted. However, any mineral resource would be expected to be of no more than local importance given their widespread occurrence in the region and in Scotland.

Waste Generation and Management

Construction and Demolition Waste Generation

13.4.22 The construction of the proposed scheme is likely to produce a range of waste types including inert, non-hazardous and hazardous (or special) wastes.

13.4.23 The majority of wastes are assumed to be inert and non-hazardous construction and demolition (C&D) wastes. However, there will also be Municipal Solid Waste (MSW) generated by construction workers (e.g. canteen, office and staff welfare waste), and small quantities of miscellaneous hazardous waste (e.g. paints and solvents, admixtures, spill absorbent materials, waste lubricants, waste electrical and electronic equipment and batteries).

13.4.24 Scotland's Environment 'Waste Discover Data tool' provides a break-down of all waste types from 2011 to 2018, and the trend for Scottish waste landfilled since 2005. This tool records that Scotland generated approximately 5.81 million tonnes of C&D waste in 2018 (an increase of 3.9% from 2017), the composition of which is detailed in Table 13.4. No further regional breakdown is provided.

[7] Review of the Falkirk Local Development Plan proposal maps/online maps has not identified any MSAs and AoS within or in close proximity to the proposed scheme extents.

13.4.25 The tool also confirmed that 97% of C&D waste was recorded as having been prepared for reuse or recycling in 2018, against the EU Waste Framework Directive target of 70% by 2020. C&D recycling rates are from data provided to Europe for reporting under the Waste Framework Directive. C&D recycling excludes hazardous waste and naturally occurring soil and stones coded under 17 05 04 of the European Waste Catalogue (or List of Wastes).

Table 13.4: Generated C&D Waste from All Sources in 2018

Waste Type	C&D Waste Generated in 2018 (tonnes)	% Composition in 2018
Dredging spoils	94,925	1.63
Glass wastes	378	0.01
Metallic wastes, ferrous	149,731	2.58
Metallic wastes, mixed ferrous and non-ferrous	38,094	0.66
Metallic wastes, non-ferrous	16,969	0.29
Mineral waste from construction and demolition*	1,201,295	20.68
Other mineral wastes	23,784	0.41
Plastic wastes	5,902	0.10
Soils	4,248,335	73.14
Wood wastes	29,268	0.50
Total	**5,808,681**	**100%**
*Includes concrete, bricks and gypsum waste; bituminous and tar bound road-surfacing waste; and mixed construction waste.		

13.4.26 The summary document and commentary text to the tool confirms that the change in C&D waste generated year on year since 2011 has varied considerably, with year on year changes in this waste stream ranging from -26.9% to +26.1%. The generation of C&D waste is therefore sensitive to large regional projects, which accounts for the large annual variation in C&D waste generated.

Current Waste Treatment, Recycling and Recovery Baseline

13.4.27 The available waste treatment and disposal infrastructure within the study area accepting inert, non-hazardous and hazardous commercial and industrial waste (including C&D waste) is summarised in Table 13.5. A number of the waste facilities, identified in Table 13.5, operate more than one waste management activity on-site and includes both merchant and restricted facilities.

13.4.28 The reported tonnages therefore represent the total wastes inputted to each facility type and not tonnages per activity. Similarly, the reported capacities are for the facility type as a whole, not per activity as this data is not currently published by SEPA.

Table 13.5: Permitted and Remaining Capacity in Operational Waste Sites in the Study Area (2018)

Waste Management Facility Type	Annual Waste Capacity (t)	Annual Waste Inputs (in 2018)	Utilised Capacity (%) (in 2018)
Anaerobic digestion	35,000.00	23,453.57	67
Civic amenity	359,041.00	157,356.32	44
Civic amenity / Composting	156,050.00	56,493.48	36
Civic amenity / Transfer station	864,586.00	292,478.77	34
Civic amenity / Transfer station / Landfill (not operational)	7,000.00	6,540.00	93
Co-incineration	685,000.00	361,707.59	53

Waste Management Facility Type	Annual Waste Capacity (t)	Annual Waste Inputs (in 2018)	Utilised Capacity (%) (in 2018)
Composting	261,098.00	167,120.03	64
Composting / Anaerobic digestion	97,620.00	78,778.37	81
Incineration	Not provided	20.51	N/A
Incineration / Other treatment	673,500.00	158,323.39	24
Landfill	877,400.00	506,743.91	58
Landfill / Civic amenity / Composting / Anaerobic digestion / Other treatment	436,500.00	163,217.78	37
Landfill / Civic amenity / Composting / Other treatment	302,500.00	214,152.06	71
Landfill / Composting	254,950.00	80,904.00	32
Landfill / Other treatment	2,773,500.00	1,282,072.00	46
Landfill / Transfer station / Composting / Other treatment	400,000.00	220,138.65	55
Metal recycler	1156337	892,712.97	77
Metal recycler / Transfer station	192,648.00	85,041.51	44
Other treatment	4,359,101.00	2,666,532.24	61
Transfer station	8,284,979.00	1,880,904.13	23
Transfer station / Anaerobic digestion	235,000.00	139,317.73	59
Transfer station / Composting	249,999.00	135,885.56	54
Transfer station / Other treatment	1,169,605.00	359,039.37	31
Total	**23,831,414**	**9,928,934**	**42**

13.4.29 There was a total of 275 operational waste sites in the study area (22 in The City of Edinburgh, 3 in Clackmannanshire, 4 in East Dunbartonshire, 2 in East Renfrewshire, 26 in Falkirk, 41 in Fife, 34 in Glasgow City, 9 in Midlothian, 39 in North Lanarkshire, 21 in Perth & Kinross, 5 in Renfrewshire, 29 in South Lanarkshire, 7 in Stirling, 2 in West Dunbartonshire and 31 in West Lothian Council areas) at the end of 2018.

13.4.30 It can therefore be assumed on the basis of the above facility types, throughputs and capacities, that there will be significant opportunity for appropriate wastes arising during the construction of the proposed scheme to be reused, recycled or otherwise recovered via appropriate means, subject to the waste hierarchy as shown in Diagram 13.1.

Diagram 13.1: The Waste Hierarchy (Scottish Government 2015)

13.4.31 A more detailed summary of the available waste management infrastructure is provided in Appendix A13.2 (Waste Sites and Capacities within the Study Area), contained in Volume 2, including the type, locations and capacities of each facility. The locations of the operational waste management

infrastructure within the study area are identified on Figure 13.1, contained in Volume 3. As described in paragraph 13.3.21, again, this includes both merchant and restricted waste management facilities.

Current Inert, Non-hazardous and Hazardous Landfill Capacity Baseline

13.4.32 For wastes which cannot be reused, recycled or otherwise recovered, disposal to landfill would be required. SEPA (2019) details total remaining inert, non-hazardous and hazardous landfill capacity in the study area in 2018, and is presented in Table 13.6.

Table 13.6: Permitted and Remaining Capacity of Operational Landfills (Inert and Non-Hazardous) in the Study Area

Site Name	Council Area	Capacity on Permit 2018 (t)		Remaining Capacity at the End of 2018 (t)		
		Annual	Total	Total landfilled in 2018 (t)	Remaining Capacity (t)	Estimated Date for Ceasing Landfill
Inert landfill						
Torphin Quarry, Harburn, West Calder	West Lothian	75,000	1,500,000	12,790	41,787.00	01/12/2021
W Hamilton & Sons, Dovesdale Farm LF,Stonehouse	South Lanarkshire	230,000	740,000	60,769	300,000.00	01/01/2025
Carscallan Farm Landfill, Quarter, Hamilton	South Lanarkshire	100,000	400,000	195,286	100,000.00	01/12/2019
Non-hazardous landfill+						
Rigmuir Landfill Site, East Kilbride	South Lanarkshire	250,000	2,250,000	91,755	48,680.53	28/09/2018
West Carron Landfill, Stenhouse Rd, Falkirk	Falkirk	77,400	5,000,000	44,553	350,000.00	31/12/2023
Levenseat Waste Management Site, Lanarkshire	West Lothian	400,000	1,900,000	65,668	475,000.00	01/01/2051
Drummond Moor (No2) L/F, Rosewell, Midlothian	Midlothian	250,000	1,815,000	147,854	1,454,256.00	31/12/2025
Avondale Non-Hazardous Landfill, Polmont	Falkirk	720,000	8,350,000	465,756	1,616,000.00	01/03/2021
Fife Council, Lochhead L/F, By Wellwood, Fife	Fife	382,500	7,946,400	126,120	616,350.00	01/12/2022
Fife Council, Lower Melville Woods, Fife	Fife	282,500	2,701,000	113,842	616,350.00	01/12/2020
Greengairs L/F, Meikle Drumgray Rd, Airdrie	North Lanarkshire	1,300,000	35,000,000	305,017	11,347,718.90	01/05/2038
Patersons Ltd, Greenoakhill Landfill Site	Glasgow City	500,000	1,800,000	235,625	570,000.00	01/10/2022

Site Name	Council Area	Capacity on Permit 2018 (t)		Remaining Capacity at the End of 2018 (t)		
		Annual	Total	Total landfilled in 2018 (t)	Remaining Capacity (t)	Estimated Date for Ceasing Landfill
Hazardous landfill						
Avondale Environmental, Polmont, Falkirk	Falkirk	200,000	800,000	27,293	80,000.00	01/01/2023
Total		**4,767,400**	**70,202,400**	**1,892,328**	**17,616,142**	**N/A**
+These non-hazardous landfills also accept stable non-reactive hazardous waste (e.g. asbestos containing materials).						

13.4.33 The baseline review suggests that there is currently adequate inert and non-hazardous landfill capacity within the study area for the majority of wastes likely to arise from the construction of the proposed scheme, but there is limited hazardous waste landfill capacity. The only operational hazardous waste landfill in Scotland, at the end of 2018, being: Avondale Environmental in Polmont, Falkirk, with 80,000 tonnes of remaining hazardous capacity, and an estimated date for ceasing landfill of 2023.

Future Waste Treatment, Recycling and Recovery Baseline

13.4.34 Waste treatment, recycling and recovery facilities are typically characterised by large annual throughput capacities; consequently, large step changes in capacity (as single facilities are commissioned) have an exaggerated impact on the historical trend. Waste treatment, recycling and recovery capacity cannot therefore be realistically projected forward to the construction phase.

13.4.35 Waste treatment, recycling and recovery infrastructure responds to market demands, and historical trends show that infrastructure is added or removed, not least to cope with changes in waste generation. The waste treatment and recovery infrastructure capacity will therefore be based on the most recent available SEPA capacity / input data that suggests that there is likely to be adequate opportunity for appropriate wastes arising during the construction of the proposed scheme to be recycled or subject to other recovery via appropriate means, subject to the waste hierarchy.

13.4.36 Professional experience has shown that waste markets are flexible and adapt to changing markets within a region. It is expected that whilst the actual waste facilities available may change over the course of construction, the overall capacity is likely to remain similar as the market responds.

Future Forecast Inert, Non-hazardous and Hazardous Landfill Capacity Baseline

13.4.37 Projected future landfill capacity values have been estimated and illustrated in Table 13.7 and Diagram 13.2 respectively based on the average annual percentage change in remaining combined (total) operational inert and non-hazardous landfill capacity for the years for which consistent data is available from SEPA (i.e. 2014 to 2018).

13.4.38 The predicted changes in landfill capacity are derived from the existing SEPA time-based data (remaining landfill capacity at the end of each calendar year). These data have been projected forward to the 2023 opening year for the proposed scheme, using the forecasting function (exponential smoothing algorithm) in Microsoft Excel (Microsoft n.d.)[8], in order to provide a statistical estimate the remaining landfill capacity that may be available during the estimated construction phase (between 2021 and 2023).

[8] DMRB LA 110 doesn't specify a forecasting methodology. However, reference to the IEMA (2020) Materials and Waste in EIA guidance supports the use of the Microsoft Excel 'FORECAST' function in forecasting and trend analysis.

13.4.39 This estimate assumes continuation of a similar trend in the addition and subtraction of operational landfill capacity as that reported by SEPA for the period 2014 to 2018, and it is recommended that the lower confidence bound capacity be used to set the estimated future baseline.

Table 13.7: Permitted and Remaining Capacity of Operational Landfills (Inert and Non-Hazardous) in the Study Area

Timeline	Historic Baseline Capacity (t)	Forecast Future Baseline Capacity (t)	Lower Confidence Bound Capacity (t)	Upper Confidence Bound Capacity (t)
2014	22,926,648	N/A	N/A	N/A
2015	21,887,464	N/A	N/A	N/A
2016	18,738,856	N/A	N/A	N/A
2017	19,206,218	N/A	N/A	N/A
2018	17,536,142	17,536,142	17,536,142	17,536,142
2019	N/A	16,935,500	15,511,663	18,359,336
2020	N/A	14,587,028	12,993,854	16,180,201
2021	N/A	14,351,022	12,603,689	16,098,355
2022	N/A	12,002,550	10,113,598	13,891,502
2023	N/A	11,766,544	9,744,860	13,788,228

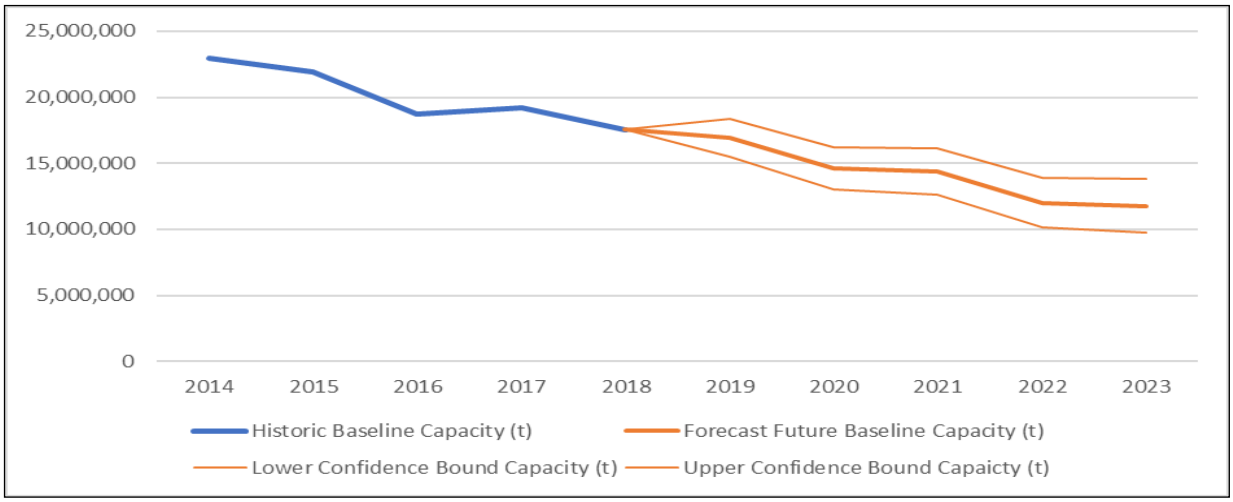

Diagram 13.2: Forecast Future Inert and Non-hazardous Landfill Capacity in the Study Area (2019 to 2023)

13.4.40 Although there is a generally a reducing trend for landfill disposal in Scotland, the forecast future baseline landfill capacity suggests that there is likely to be adequate landfill capacity available in the study area in 2021 to support the construction of the proposed scheme (~14,351,022 tonnes). This means that any inert or non-hazardous waste that is destined for landfill would most likely find available regional capacity in the study area.

13.4.41 It is also of note that even where wastes are accepted at landfill some may, subject to their properties, be used for reuse, recycling or recovery within landfill cover or other engineering rather than subject to and accounted as disposal. Any landfills that have ceased infilling, at the time of construction, and are no longer accepting waste may also still require inert and non-hazardous materials for capping and restoration purposes, and therefore may be amenable to accepting any suitable surplus materials arising from construction subject to waste regulatory controls (e.g. waste management licensing, pollution prevention and control permitting or exemptions).

13.4.42 It is envisaged that the vast majority of the inert and non-hazardous waste arising from constructing the proposed scheme will be re-used, recycled or otherwise recovered in accordance with the legislative and policy regime. This assumption is validated by the available Scottish statistics with 97% of C&D waste having been diverted from landfill in 2018. This will be required in order to demonstrate the proposed scheme's contribution to achieving Scotland's Zero Waste Plan target of recycling 70% of all waste, and landfilling a maximum of 5% by 2025; and to comply with the provisions of 'The Waste (Scotland) Regulations 2011' (e.g. taking all such reasonable measures available to apply the waste hierarchy) and 'The Waste (Scotland) Regulations 2012' (e.g. banning the landfilling of segregated waste).

13.4.43 As reported in paragraph 13.4.33, the only operational site in Scotland is Avondale Environmental Landfill in Polmont, Falkirk, with 80,000 tonnes of remaining hazardous capacity as of 2018, and an estimated date for ceasing landfill of 2023. Applying the additive error, additive trend and additive seasonality (AAA) version of the Exponential Triple Smoothing (ETS) forecasting algorithm suggests that this site could have exhausted all remaining landfill capacity by as early as 2021 (refer to Table 13.8 and respectively)

Table 13.8: Forecast Future Hazardous Landfill Capacity in the Study Area (2019 to 2023)

Timeline	Historic Baseline Capacity (t)	Forecast Future Baseline Capacity (t)	Lower Confidence Bound Capacity (t)	Upper Confidence Bound Capacity (t)
2014	194,626	N/A	N/A	N/A
2015	164,264	N/A	N/A	N/A
2016	133,601	N/A	N/A	N/A
2017	100,000	N/A	N/A	N/A
2018	80,000	80,000	80,000	80,000
2019	N/A	47,875	40,898	54,852
2020	N/A	18,699	11,666	25,732
2021	N/A	**-10,478**	-17,567	-3,388
2022	N/A	**-39,654**	-46,800	-32,507
2023	N/A	**-68,830**	-76,034	-61,626

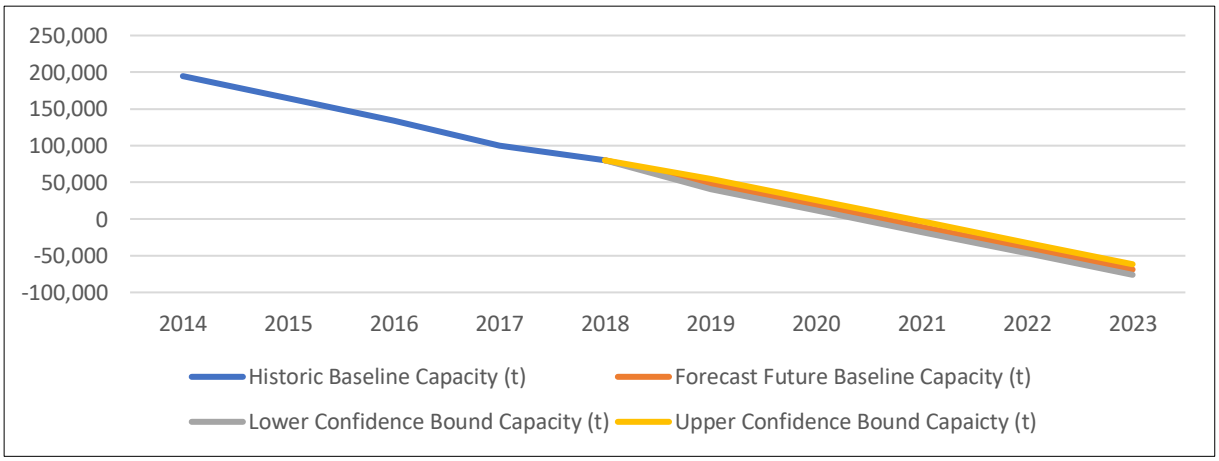

Diagram 13.3: Forecast Future Hazardous Landfill Capacity in the Study Area (2019 to 2023)

13.4.44 Discussions with the site operator (Solczak 2020) confirms that Avondale is in the process of submitting an application to SEPA for the licensing/permitting of an additional 400,000 m^3 of hazardous waste landfill capacity at its Polmont site. It is not known if this application will be approved by SEPA or when

any additional capacity would become available, and therefore this capacity has not been included in the future forecast provided in Table 13.8 and Diagram 13.3.

13.4.45 Failing this, it is likely that Scotland would need to authorise the construction of additional hazardous landfill capacity to replace this deficit, or consign this waste to landfills in located in England. Reference to the Environment Agency (2020) Waste Data Tables 2018 for the North West and North East of England would suggest that these regions had an abundance (6,311,000 m^3 and 6,950,000 m^3 respectively) of merchant hazardous waste landfill capacity at the end of 2018. Existing capacity is located in the Cheshire, Lancashire, Merseyside and Tees Valley Unitary Authorities sub-regions.

13.4.46 Nevertheless, it is expected that the majority of hazardous waste generated during the construction of the proposed scheme will be treated, recycled or otherwise recovered off-site. This will be required to comply with the legislative and policy framework for waste; and to minimise the attendant environmental impact and cost of waste transport and disposal in accordance with the proximity principal. This is also likely given the types of hazardous waste likely to be generated during the construction of the proposed scheme (as described in paragraph 13.4.23).

13.4.47 Under the Landfill (Scotland) Regulations 2003 waste can only be disposed of to landfill after prior treatment unless: (a) it is inert waste for which treatment is not technically feasible; or (b) it is waste other than inert waste and treatment would not reduce its quantity or the hazards which it poses to human health or the environment. Treatment means any physical, thermal, chemical or biological processes (including sorting) that changes the characteristics of waste in order to reduce its volume or hazardous nature, facilitate its handling or enhance recovery.

Sensitivity of the Identified Resources and Receptors

13.4.48 The baseline environment is comprised of receptors which have been defined geographically based on the likely impacts and effects, associated with the use and consumption of material assets and the production and management of waste, as set out in DMRB LA 110.

13.4.49 Whilst these receptors and an indication of their sensitivity have been summarised in Table 13.9, it should be noted that the DMRB LA 110 simplified significance framework precludes the need to assign a sensitivity rating to the identified receptors for the purposes of assessment.

Table 13.9: Sensitivity of Receptors that are Relevant to the Materials Assets and Waste Factor

Receptor	Sensitivity of the Receptor
Primary, secondary and recycled aggregate resources	There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme. Although, there is currently limited information on the availability of secondary aggregates.
Mineral safeguarding sites and peat resources	There are no designated MSAs or AoS within the proposed scheme extents. Superficial deposits where present within the study area are described as intertidal deposits comprising silt and clay and post-glacial raised beach deposits, and associated marine and estuarine alluvium, underlain by glacial till. Bedrock geology is composed of Carboniferous sedimentary rock of the Passage Group and Lower Coal Measures. These deposits are considered to be of local importance given their widespread occurrence in the region and in Scotland. Whilst peaty soils are present within the study area, no existing or potential peat extraction sites have been identified within the proposed scheme extents.
Waste management infrastructure	There is likely to be adequate waste management capacity within the study area to accommodate the majority of wastes arising from the construction of the proposed scheme, and there is unlikely to be any specific constraints with regards to managing inert and non-hazardous waste streams. However, there is limited hazardous waste landfill capacity in the study area and Scotland's sole hazardous waste landfill is considered to be highly sensitive to disposing of large quantities of hazardous waste given its limited remaining capacity.

13.4.50 In addition to the generalised receptors identified in Table 13.9 for material assets and waste, additional receptors are identified in Chapter 6 (Geology, Soils and Groundwater); Chapter 7 (Road Drainage and

the Water Environment); Chapter 8 (Marine Ecology); Chapter 9 (Terrestrial Ecology); Chapter 11 (Air Quality); Chapter 12 (Noise and Vibration); Chapter 14 (Human Health); and Chapter 15 (Climate). Figure 1.2 Main Environmental Constraints also identifies the key designated sites within the study area.

13.5 Potential Impacts

13.5.1 Throughout the design process, a number of 'embedded mitigation' features have been included in the proposed scheme design.

13.5.2 These embedded mitigation features are considered within the context of the impact assessment as providing mitigation to avoid or reduce environmental impacts. These measures are detailed in Chapter 3 (The Proposed Scheme).

13.5.3 Those specific opportunities identified at the time of assessment, with the potential to reduce materials consumption and waste generation, and which have been incorporated into the design include those identified below:

- *Designed for materials optimisation:* Piled viaduct replacement structure designed using latest analysis software to drive design efficiency and reduce the quantity of all materials used in the construction. The concrete mix for the structural members has been specified as containing 40% ground-granulated blast-furnace slag (GGBS) addition. This addition of recycled material is more sustainable than Portland cement (CEM1) and will reduce peak temperatures during curing (hydration) which reduces the effect of Early Thermal Cracking, and hence reduces the volume of steel reinforcement required (larger bars or closer spacings).
- *Designed for the future:* Piled viaduct replacement structure made integral to remove the need for bearings and movement joints. This reduces the maintenance liability and need to replace components over the lifetime of the structure. Use of stainless steel reinforcement in critical areas to improve durability of structure and minimise future maintenance interventions.

13.5.4 The construction of the proposed scheme will require the use and consumption of material assets including primary raw materials and manufactured construction products, and hence will result in potential impacts and effects on the environment. These include both direct and indirect impacts related to the material assets, the depletion of natural resources, and compliance and non-compliance with the legislative and policy framework. Conversely, the construction of the proposed scheme will also result in surplus materials and waste, leading to potential impacts on the available waste management infrastructure (i.e. through the permanent use of landfill void space and/or the short-term use of waste transfer, recycling and recovery capacity), and compliance and non-compliance with the legislative and policy framework.

13.5.5 The nature of the proposed scheme means that substantial structural works will be required (including earthworks and concrete/steel structures) as well as imported aggregates and asphalt. This may also result in potential impacts on mineral resources through partial sterilisation of superficial deposits. Sterilisation may therefore occur through constructing the proposed scheme directly overlying these deposits which may restrict their workability through immediate land take, or through construction on or close to the boundary of these resources. This can indirectly sterilise the mineral resource through closing off the access to a resource, in circumstances where access to the resource is limited, should the resource be worked in future.

Consumption of Material Assets

13.5.6 The quantities of key material assets likely to be consumed during the following activities associated with construction of the proposed scheme are estimated in Table 13.10:

- construction of the raised working platform;
- construction of the temporary bridge structure; and

- construction of the new permanent bridge structure.

13.5.7 Indicative levels of recycled content have been sourced thorough reference to material specific recycled content levels, at good practice levels, provided in the WRAP (2008) 'Net Waste Tool Dataset'. Professional judgment has been used in selecting the recycled content levels, and the levels for general fill, concrete, iron and steel and timber items have been calculated from the average percentage for these items listed in the WRAP dataset.

Table 13.10: Summary of Estimated Material Assets Consumption (Including 10% Contingency) (2022 to 2023)

Material Assets	Approximate Quantity Range (t)	Recycled Content Levels (%)	Estimated Recycled Content Range (t)	Estimated Virgin Content Range (t)
Imported class 1A/B fill*	62,297 - 69,219	68	42,362 - 47,069	19,935 - 22,150
Imported sub base*	403 - 448	100	403 - 448	0 - 0
Imported asphalt (base course)*	569 - 632	55	313 - 348	256 - 284
Imported asphalt (binder course)*	332 - 369	28	93 - 103	239 - 265
Imported asphalt (surface course)*	142 - 158	10	14 - 16	128 - 142
Imported concrete (structures, piles, barrier footings, kerbs, headwalls and catchpits)*	16,715 - 18,572	23	3,844 - 4,272	12,871 - 14,301
Imported iron and steel (structures, reinforcement, safety barriers and catchpits)	8,708 - 9,675	39	3,396 - 3,773	5,312 - 5,902
Imported bituminous tack coat	10 - 11	0	0 - 0	10 - 11
Imported plastics (HDPE drainage pipes, geotextiles and road markings)	19 - 21	10	1.9 - 2.1	17 - 19
Imported timber (formwork)	243 - 270	20	49 - 54	194 - 216
Total (t) and Average (%)	**89,438 - 99,375**	**35**	**50,476 - 56,084**	**38,962 - 43,291**

* Denotes aggregate materials or aggregate containing materials for the purposes of assessment.

13.5.8 The choice of whether to use primary or secondary or recycled aggregates, or a combination of both, will ultimately be made by the appointed Contractor after considering a combination of factors, such as sources, specification, production and transport of available materials. Table 13.10 would indicate that the proposed scheme has the potential to incorporate in the region of 58% recycled aggregate content by weight. However, if the imported aggregate and aggregate containing materials were to be sourced from primary sources within the study area, then the demand on those quarries would be in the region of 4.0% to 4.4% based on the total production levels (2,009,000 tonnes) of crushed rock and sand and gravel in 2012 as reported in paragraph 13.4.11. No more up to date production figures are available.

Sterilisation of Mineral Resources and Peat Resources

13.5.9 Whilst there are no designated mineral safeguarding areas or peat resources within the proposed scheme extents, the proposed scheme requires land for temporary works and construction outside the limits of the existing road boundary, and any superficial and bedrock deposits within the working area may therefore be impacted to some degree by excavations, piling and other earthworks during the construction of the proposed scheme. However, any disturbance and/or reduction in the extent of these deposits as a result of construct the proposed scheme is likely to be negligible given their widespread distribution in the region and country, and therefore represents minimal percentage loss.

Construction and Demolition Waste Generation and Management

13.5.10 The quantities of key C&D waste likely to be generated during the following activities associated with construction of the proposed scheme are estimated in Table 13.11:

- construction of the temporary raised working platform;
- construction of the temporary bridge structure;
- demolition of existing piled viaduct;
- construction of the new permanent piled viaduct replacement structure;
- demolition of the temporary bridge structure; and
- removal of the temporary raised working platform.

13.5.11 Waste arisings have been conservatively estimated through a number of methods, including reference to actual quantities estimated by the design team; and application of material specific wastage rates, at good practice levels provided in the WRAP (2008) 'Net Waste Tool Dataset', to the estimated material quantities reported for the proposed scheme in Table 13.10. Table 13.11 does not include all the wastes that would be generated from the proposed scheme and some wastes, such as estimates for municipal solid waste from construction workers, have not been included.

13.5.12 Indicative waste recovery rates have been sourced from the Scotland's Environment Waste Discover Data tool (SEPA n.d.), which provides a break-down of the quantity of each waste stream recycled or recovered or disposed of in 2018 from all sources in Scotland.

Table 13.11: Estimated C&D Waste Generation, Recovery and Disposal (Including 10% Contingency) (2022 to 2024)

Waste Stream	Indicative Waste Classification	Approx. Quantity Range (t)	WRAP Wastage Rate (%)	Waste Generation Range (t)	Waste Recovery Rate (%)	Waste Recovery Range (t)	Waste Disposal Range (t)
Construction							
Class 1A/B fill	Inert	62,297 - 69,219	5	3,115 - 3,461	97	3,021 - 3,357	93 - 104
Sub base	Inert	403 - 448	5	20 - 22	97	20 - 22	0.60 - 0.67
Asphalt (base course)	Inert / non-hazardous	569 - 632	5	28 - 32	97	28 - 31	0.85 - 0.95
Asphalt (binder course)	Inert / non-hazardous	332 - 369	5	17 - 18	97	16 - 18	0.50 - 0.55
Asphalt (surface course)	Inert / non-hazardous	142 - 158	5	7 - 8	97	7 - 8	0.21 - 0.24
Concrete	Inert	16,715 - 18,572	2.5	418 - 464	97	405 - 450	13 - 14
Iron and steel	Non-hazardous	8,708 - 9,675	5	435 - 484	100	435 - 484	0 - 0
Bituminous tack coat	Non-hazardous	10 - 11	2.5	0.25 - 0.28	97	0.24 - 0.27	0.007 - 0.008
Plastics	Non-hazardous	19 - 21	2	0.38 - 0.42	99	0.38 - 0.42	0.0038 - 0.0042
Timber	Non-hazardous	297 - 330	N/A - actuals	297 - 330	100	297 - 330	0 - 0

Waste Stream	Indicative Waste Classification	Approx. Quantity Range (t)	WRAP Wastage Rate (%)	Waste Generation Range (t)	Waste Recovery Rate (%)	Waste Recovery Range (t)	Waste Disposal Range (t)
Demolition							
Asphalt	Inert / non-hazardous	693 - 770	N/A - actuals	693 - 770	97	672 - 747	21 - 23
Waste Stream	**Indicative Waste Classification**	**Approx. Quantity Range (t)**	**WRAP Wastage Rate (%)**	**Waste Generation Range (t)**	**Waste Recovery Rate (%)**	**Waste Recovery Range (t)**	**Waste Disposal Range (t)**
Iron and steel	Non-hazardous	4,300 - 4,778	N/A - actuals	4,300 - 4,778	100	4,300 - 4,778	0 – 0
Concrete	Inert	14,965 - 16,628	N/A - actuals	14,965 – 16,628	97	14,516 - 16,129	449 - 499
Class 1A/B fill	Inert / non-hazardous	62,297 - 69,219	N/A - actuals	62,297 - 69,219	97	60,428 - 67,142	1,869 - 2,077
HDPE drainage pipes	Non-hazardous	7 - 8	N/A - actuals	7 - 8	99	7 - 8	0.07 - 0.08
Geotextiles	Non-hazardous	11 - 12	N/A - actuals	11 - 12	90	10 - 11	1.1 -1.2
Excavation							
Bored pile excavation arisings	Inert / Non-hazardous	1,881 - 2,090	N/A - actuals	1,881 - 2,090	67	1,260 - 1,400	621 - 690
Total (t) and Average (%)		**173,646 - 192,940**	**4**	**88,493 - 98,325**	**96**	**85,424 - 94,915**	**3,069 - 3,410**

13.5.13 For comparative purposes, the proposed scheme's total estimated C&D waste arisings during construction equates to approximately 1.5% to 1.7% of the total non-hazardous C&D generated in Scotland in 2018 (5,808,681 tonnes). The baseline conditions reported in paragraph 13.4.26 would suggest that the management of C&D waste in Scotland is adaptable to large regional construction projects, with annual changes in the management of this waste stream ranging from -26.9% to +26.1%.

Summary of Significant Impacts Prior to Essential Mitigation

13.5.14 The significance of potential impacts, with embedded mitigation measures and prior to the application of essential mitigation measures, have been assessed and are summarised in Table 13.12. This follows the methodology described in Section 13.3 (Approach and Methods)

Table 13.12: Summary of Significant Effects Prior to Essential Mitigation

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
Material Assets	(1) Project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials.	No / unlikely: Whilst it is currently unknown what percentage of C&D waste will be used to substitute the use of primary materials on site, the nature of the proposed scheme mean that it will inevitably require primary materials to be imported to site. Nevertheless, it is assumed that the proposed scheme would achieve an overall material recovery / recycling rate of ≥70% (by weight) of non-hazardous C&D materials to substitute the use of primary materials within the first or second study area. Scottish Government statistics confirms that the construction industry in Scotland is currently achieving a recovery rate of 97% for non-hazardous C&D waste. Furthermore, it has been estimated that the proposed scheme has the potential to divert in the range of 85,424 - 94,915 tonnes of	• Description of impact: **Adverse, direct, permanent** • Significance of effect: **Slight adverse**

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
		non-hazardous C&D waste from landfill, which represents an estimated waste recovery rate of 97%.	• Significant for the purposes of EIA: **No**
	(2) Aggregates imported to site comprise re-used / recycled / content below the surrogate percentage target of 25%.	No / unlikely: Some degree of re-used / recycled content is anticipated given that this is standard practice in construction, and WRAP (2009) 'Construction Procurement Guidance' suggests that infrastructure projects typically exceed 10% even without explicitly trying to increase recycled content. WRAP (2009) reports that the recycled content as a percentage of the total material cost for an infrastructure project was found to be in the region of 8 - 36% using standard practice products, with this rising to 25 - 49% when applying cost-neutral good practice. Reference to WRAP (2011) 'Resource Efficiency Benchmarks for Construction Projects' reports that the proportion of recycled content (RC) by total aggregates weight, for the completed infrastructure projects within its dataset, was 28% RC / tonne at the 75th percentile level[9]. Reference to the Mineral Products Association (2018) 'Profile of the UK Mineral Products Industry 2018 Edition' confirms that in 2017 the share of recycled and secondary aggregate materials as a proportion of total GB aggregates sales was 30%. Furthermore, it has been estimated that the proposed scheme has the potential to incorporate in the range of 47,029 - 52,255 tonnes of recycled aggregate which equates to approximately 58% recycled aggregate content by weight. These data all support the assumption that reused / recycled aggregate content use on the proposed scheme is unlikely to be less than 25%.	
	(3) Project sterilises ≥1 mineral safeguarding sites and/or peat resources.	No / unlikely: Given the absence of any safeguarded mineral sites or peat resources within the study area, no sterilisation is likely to occur. Whilst there are no designated mineral safeguarding areas or peat resources within the proposed scheme extents, the proposed scheme requires land for temporary works and construction outside the limits of the existing road boundary. Any superficial and bedrock deposits within the working area may therefore be impacted to some degree by excavations, piling and other earthworks during the construction of the proposed scheme. However, any disturbance and/or reduction in the extent of these deposits as a result of construct the proposed scheme is likely to be negligible given their widespread distribution in the region and country, and therefore represents minimal percentage loss.	
Waste	(1) Project leads to a greater than 1% reduction or alteration in regional landfill capacity.	No / unlikely: Whilst the precise quantities of C&D waste generated by the proposed scheme are currently unknown, it has been estimated that the proposed scheme has the potential to generate in the region of 88,493 - 98,325 tonnes of waste. It is estimated that 3,069 - 3,410 tonnes of this could require disposal at inert and non-hazardous landfills within the study area between 2022 and 2024 based on the application of SEPA waste recycling and recovery statistics. A greater than 1% reduction or alteration in regional landfill capacity is therefore unlikely to occur given that the proposed scheme would need to dispose of greater than 143,510 and 120,026 tonnes of C&D waste to landfill in 2021 and 2022 respectively for this to be realised. This is based on estimated forecast levels of combined inert and non-hazardous landfill capacity of 14,351,022 and 12,002,550 tonnes in 2021 and 2022 respectively. Professional judgement and the available Scottish waste management statistics, would suggest that this is unlikely. Furthermore, it has been assumed that the proposed scheme would adopt the Zero Waste Plan target of ensuring that a maximum of 5% of waste is disposed of to landfill in order to support the delivery of the Scottish Government's statutory target.	• Description of impact: **Adverse, direct, permanent** • Significance of effect: **Slight adverse** • Significant for the purposes of EIA: **No**
	(2) Greater than 1% of project waste requiring	No / Unlikely: Given the anticipated types and quantities of waste, the receiving waste infrastructure is likely to have sufficient capacity to accommodate waste from constructing the proposed scheme,	

[9] The 75th percentile means that 75% of infrastructure projects recorded RC/tonne aggregate higher than these values.

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
	disposal outside of the region.	without compromising integrity of the receiving infrastructure (design life or capacity) within the region.	

13.5.15 The construction of the proposed scheme therefore has the potential to realise the following descriptors of effect for material assets and waste, after the application of those embedded mitigation measures detailed in Chapter 3 (The Proposed Scheme) and summarised in paragraph 13.5.3, resulting in effects assessed as not-significant for the purposes of EIA based on the application of the DMRB LA 110 significance criteria.

Material Assets:

- The proposed scheme has the potential to achieve an overall material recovery rate of between 70-99% of non-hazardous C&D waste to substitute use of primary materials in the regional study area (Slight adverse effect).
- The aggregates required to be imported to construct the proposed scheme have the potential to comprise re-used / recycled content in line with the relevant regional percentage target (Slight adverse effect).

Waste:

- Constructing the proposed scheme has the potential to result in a ≤1% reduction or alteration in the regional capacity of landfill (Slight adverse effect).
- The regional waste management infrastructure is likely to have sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region (Slight adverse effect).

13.5.16 Based on professional judgement, it is considered unlikely that the construction of the proposed scheme would meet all of the significance category descriptors for a Moderate or Large effect for the material assets element, or a Moderate, Large or Very Large effect for the waste element, that would be necessary to realise likely significant effects for this factor. This assumption is also supported by those government and industry reporting data identified in paragraph 13.3.28.

13.5.17 Where impacts have been identified these will be addressed through ensuring that the construction of the proposed scheme responds to national regulatory standards and local policy requirements as reported in Section 13.2 (Legislation, Policies and Guidance) and Appendix A13.1 (Assessment of Regulatory and Policy Compliance), and essential mitigation measures reported in Section 13.6 (Mitigation) and Table 13.13.

13.6 Mitigation

13.6.1 Those 'embedded mitigation' measures that have been adopted as part of the evolution of the proposed scheme design, have been recorded in Section 13.5 (Potential Impacts) and Chapter 3 (The Proposed Scheme).

13.6.2 All impacts have been assessed as being not-significant, for the purposes of this assessment, based on the descriptors of the significance of effect categories and significance criteria provided in DMRB LA 110. The objective of this section is therefore to identify any 'essential mitigation' measures envisaged to further prevent, reduce and offset those impacts identified in the Section 13.5 (Potential Impacts) from the consumption of material assets and the generation and management of waste. This is consistent with the DMRB LA 110 guidance which requires that where adverse effects associated with the use and consumption of materials and the production and management of waste have been identified, mitigation measures should consider avoidance, reduction and remediation.

13.6.3 Essential mitigation measures (referenced as **Mitigation Items M&W1**, **M&W2** etc.) have been identified through a review of current legislation, policy and best practice guidance, and have been taken into account in the subsequent identification of likely residual effects in Section 13.7 (Residual Effects).

13.6.4 Such measures focus on influencing the project design and construction through:

- applying Design for Resource Efficient (DfRE) Construction principles in order to minimise the consumption of material assets and the generation of waste over the lifecycle of the proposed scheme's assets (**Mitigation Item M&W1**);
- preparing a responsible sourcing plan to maximise the responsible sourcing of construction materials and products (**Mitigation Item M&W2**);
- taking all such measures available to apply the waste hierarchy of prevention; preparing for re-use; recycling; other recovery, including energy recovery; and disposal in a way which delivers the best overall environmental outcome (**Mitigation Item M&W3**);
- designing out waste and facilitating the prevention, reuse, recycling and recovery of C&D waste through the implementation of a Site Waste Management Plan (SWMP), including setting targets that support the delivery of the Zero Waste Plan Targets (**Mitigation Item M&W4**); and
- ensuring that all waste is stored, transported, treated, reprocessed and disposed of safely without harming human health or the environment (**Mitigation Item M&W5**).

13.6.5 The appointed Contractor will be required to develop a management system to structure the implementation of the essential mitigation measures outlined in this and other chapters of the EIA Report. This will include a Construction Stage CEMP, requirements for which will be established via the Contract Documents.

13.6.6 The Construction Stage CEMP, to be developed by the appointed Contractor prior to the start of construction, will capture and collate all available information relating to the proposed scheme specific environmental objectives, environmental risks, proposed mitigation and commitments that will need to be addressed in the delivery of the proposed scheme; this will be achieved by transposing these requirements into a series of clear environmental actions to ensure that each action is fully considered during construction.

Applying Design for Resource Efficient Construction Principles (M&W1)

13.6.7 The appointed Contractor will aim construct the proposed scheme to be resource efficient, minimising the use of materials, energy and other resources in order to reduce environmental impacts and costs; and reflect a circular approach to the use of materials where products are kept in use for as long as possible, and after they reach the end of their useful life they are recovered or regenerated to retain as much value as possible (refer to Diagram 13.4).

13.6.8 The appointed Contractor will implement Zero Waste Scotland's 'Design for Resource Efficient' (DfRE) construction principles, throughout the construction of the proposed scheme to construct solutions that seek to minimise the consumption of materials and the generation of waste throughout the lifecycle of the proposed scheme.

All opportunities to DfRE are covered by five key principles:

- design for reuse and recovery: identifying, securing and using materials that already exist on-site, or can be sourced from other projects (e.g. by considering reusing the existing parapets and lamp posts where their condition permits);
- design for materials optimisation: simplifying layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content;

- design for off-site construction: maximising the use of pre-fabricated structure and components, encouraging a process of assembly rather than construction (e.g. consider engaging with the temporary bridge structure suppliers to establish the optimal modular design for the site conditions (low bearing capacity));
- design for the future (deconstruction and flexibility): identifying how materials can be designed to be more easily adapted over an asset lifetime and how deconstruction and demounting of elements can be maximised at end of first life; and
- design for waste efficient procurement: identifying and specifying materials that can be acquired responsibility, in accordance with a recognised industry standard (e.g. consider opportunities for elements of the temporary bridge structure to be returned to the supplier for future reuse (e.g. steel bridge structure and concrete kerbs).

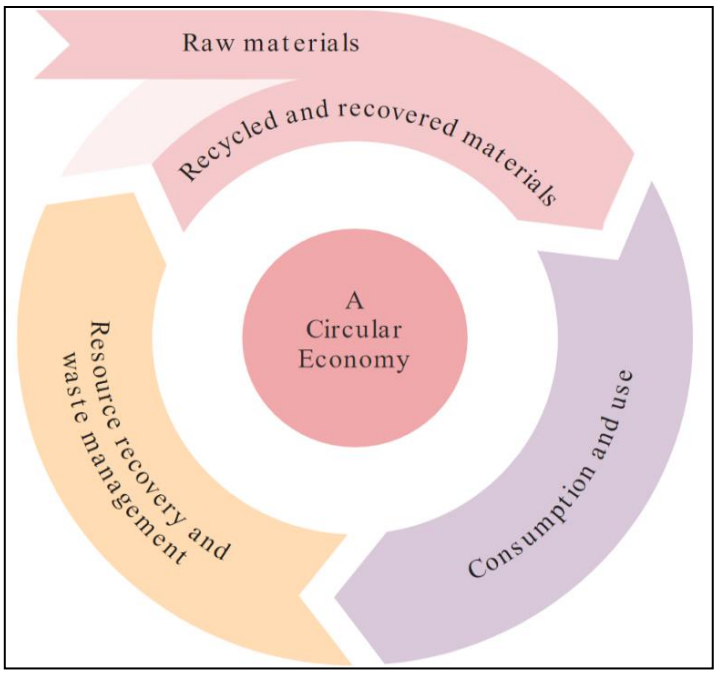

Diagram 13.4: A Circular Economy (Defra 2018)

13.6.9 These DfRE principles will be implemented by applying the three-step process described below:

- identify opportunities for alternative design solutions which improve resource efficiency, and prioritise those which will have the greatest impact and be easiest to implement;
- investigate the prioritised solutions further to fully ascertain their viability, and quantify the potential benefits; and
- implement the agreed solutions, ensuring that they are agreed with Transport Scotland and recorded by way of the Responsible Sourcing Plan and SWMP as appropriate.

Responsibly Sourcing Construction Materials and Products (M&W2)

13.6.10 The appointed Contractor will produce a Responsible Sourcing Plan (or equivalent), which will set out the principles for procurement and specification of materials to prevent waste and maximise the responsible sourcing of construction materials and products with proven sustainability credentials that minimise adverse impacts on people and their environment, whilst taking into the account the social, environmental and economic dimensions of materials and products prior to their use.

13.6.11 The plan will specify, the:

- Use of key material elements (asphalt, concrete, aggregate, steel, aluminium and plastics) responsibly sourced from suppliers with industry recognised responsible sourcing certification for that material (e.g. certification to BRE BES 6001, or membership of a sector specific scheme that complies to BSI BS 8902).
- Use of timber and wood-derived products that are sustainably sourced from independently verifiable legal and sustainable sources (i.e. originating either from independently verified legal and sustainable sources or from a licensed Forest Law Enforcement Governance and Trade partner).
- Use of alternatives to primary materials, where available and permitted by the Specification for Highway Works, during the construction of the proposed scheme. This could include materials that already exist on site, or can be sourced from other projects/suppliers; and ensuring that any aggregates required to be imported to site comprise re-used/recycled content at levels of at least 25% for the proposed scheme overall (i.e. not per product)[10].
- Minimal use of hazardous materials that have the potential to harm human health or the environment; and that might cause problems for future reuse, recycling and recovery.

13.6.12 The Scottish Government (n.d.) 'Sustainable procurement guidance collection', or other suitable resources, will be used to assist with identifying potential sources of sustainably and responsibly sourced materials. For example, Zero Waste Scotland has produced a directory of suppliers of recycled aggregates who have successfully demonstrated their compliance with the WRAP Quality Protocol for the Production of Aggregates from Inert Waste (Zero Waste Scotland 2020). These suppliers could be utilised to provide recycled aggregates or potentially to process suitable inert waste from the proposed scheme.

Applying the Waste Hierarchy as a Priority Order to the Management of Waste (M&W3)

13.6.13 All waste will be managed by the appointed Contractor in accordance with the waste hierarchy, as shown in Diagram 13.5 and as set out in the Waste (Scotland) Regulations 2011, in such a way as to prevent harm to human health, amenity and the environment.

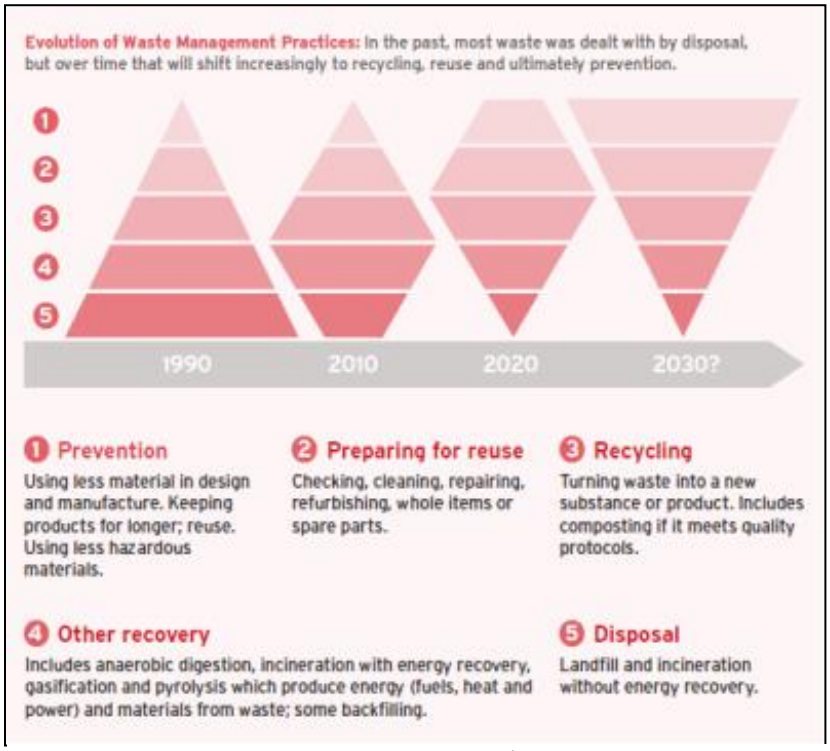

Diagram 13.5: Waste Hierarchy Evolution (Green Construction Board 2020)

[10] LA 110 also states that '*Where primary materials are mandated within the Specification for Highway Works, they should be excluded from any material recovery, recycling or re-use calculations*'.

13.6.14 The primary objective in the construction of the proposed scheme should be at the top of the waste hierarchy on zero avoidable waste, i.e. preventing waste and reusing waste wherever possible. As such the aim should be not to focus on lower value recycling and other recovery, and in any case most construction and demolition waste is already 'recovered' in some form (over 90% in Scotland).

13.6.15 Zero avoidable waste in construction means 'preventing waste being generated at every stage of a project's lifecycle, from the manufacture of materials and products, the design, specification, procurement and assembly of buildings and infrastructure through to deconstruction. At the end of life, products, components and materials should be recovered at the highest possible level of the waste hierarchy, i.e. reused before being recycled, whilst ensuring minimal environmental impact' (Green Construction Board 2020).

13.6.16 The waste hierarchy may be departed from for particular types of waste, where justified, in order to ensure minimal environmental impact'. It is important to understand any potential wider implications and thus any unintended consequences of managing waste. For example, there could be instances whereby avoiding waste could create greater environmental impact. Consideration therefore will need to be given by the appointed Contractor to the relationship with other factors such as materials consumption, energy usage and the emission of carbon emissions.

Implementing a Site Waste Management Plan (M&W4)

13.6.17 A SWMP will be prepared and implemented, in a manner to suit the requirements of the proposed scheme, to ensure that each potential waste stream is evaluated against the waste hierarchy (of prevention, preparing for reuse, recycling, other recovery and disposal) to derive management options that reflect the highest possible level within the hierarchy; and to plan, implement, monitor and review waste minimisation and management throughout the construction programme; and ensure compliance with duty of care requirements.

13.6.18 The SWMP is a live document, updated at varying points within the project cycle, that is used to facilitate the identification and implementation of waste prevention at the design stage and reuse, recycling and other recovery opportunities during construction, reducing the quantities of construction waste sent to landfill.

13.6.19 A Design Stage SWMP will be prepared prior to construction in order to record basic details of the proposed scheme. It will identify the person(s) responsible for the SWMP, set the reporting metrics for the proposed scheme, identify scheme targets, provide an outline estimate of the likely types of waste and quantities that will be generated during the construction of proposed scheme and record any actions taken to prevent waste during the design stage.

13.6.20 Once the Design Stage SWMP has been finalised, it will be passed to the appointed Contractor who will be responsible for discharging the remaining requirements of the SWMP process during construction, including:

- forecasting residual waste arisings before going to site (once this residual waste forecast is completed, waste management and recovery options can be implemented);
- identifying and recording waste management and recovery actions to reduce the quantity of residual waste estimated;
- specifying appropriately registered waste carriers which will be employed to transport waste off site for reuse, recycling, treatment or disposal;
- identifying the sites that the waste will be taken to and confirming that the operators of those sites hold a waste management licence or pollution prevention and control permit with Compliance Assessment Scheme scores of: excellent, good or broadly complaint for the current assessment year; or a registered exemption;

- updating the plan to record actual waste movements as waste is reused, recycled, recovered or disposed of; and
- where relevant, drawing on any lessons learnt, identifying any action to address these for the next scheme.

13.6.21 The SWMP will set out how all construction phase materials will be managed and will reference any specific materials management plans developed under relevant SEPA definition of waste guidance, end-of-waste guidance, special waste guidance, statutory guidance and position statements; and industry regulated codes of practice, including but not limited to those identified in Section 13.2 (Legislation, Policies and Guidance). The SWMP will also contain the following targets applicable to the proposed scheme; that '*At least 70% of all waste to be recycled, and a maximum of 5% of waste sent to landfill*' in order to support the delivery of the Scottish Government's Zero Waste Plan Targets.

Complying with Waste Duty of Care Requirements (M&W5)

13.6.22 The appointed Contractor will comply with all waste 'duty of care' requirements ensuring that all surplus materials and waste are stored, transported, treated, used and disposed of safely without endangering human health or harming the environment.

13.6.23 The appointed Contractor will ensure that they have:

- determined whether a material, substance or object is legally waste in the first place;
- classified and assessed the waste as hazardous or non-hazardous, and assigned the correct six-digit EWC code;
- taken all reasonable steps to apply the waste hierarchy (prevention, preparing for reuse, recycling, other recovery and disposal) as a priority order to the management of the waste;
- segregated the waste, and stored it safely and securely to maximise reuse, recycling and recovery, and prevent harm to human health or pollution of the environment; and stored it in accordance with any quantity and/or time limit conditions;
- presented any glass, metal, plastic, paper and cardboard for separate collection; and taken steps to maintain the quality of dry recyclables presented for separate collection;
- limited any treatment of the waste on-site to make it easier to store and collect for recovery or disposal elsewhere (i.e. unless the treatment is specifically authorised by a waste management licence, pollution prevention and control permit, or a registered exemption);
- checked that any person or business that it transfers the waste to, or who organises the transfer on its behalf, has a valid registration as a carrier, broker or dealer of waste;
- confirmed that the waste facility, that receives the waste, has an appropriate waste management licence, pollution prevention and control permit or exemption to accept and manage this type and quantity of waste;
- ensured that the transfer of the waste to another holder is documented/covered by a waste transfer note, season ticket or consignment note, and that the waste is accurately described;
- pre-notified SEPA before any hazardous waste leaves the site if it is a single movement of waste or the first in a series of movements;
- secured all waste in vehicles leaving site and ensuring that containers are covered where appropriate; and
- retained all duty of care documentation in line with statutory requirements.

13.6.24 All waste materials will need to be assessed in line with the 'Waste Classification: Guidance on the Classification and Assessment of Waste' (Technical Guidance WM3) (SEPA *et al.* 2015) prior to disposal.

This identifies whether the waste is hazardous or not, and which controls apply to the movement of the waste to prevent harm to people and the environment. This will also assist with establishing the most appropriate and cost-effective route for managing these materials.

13.6.25 The appointed Contractor will implement a suitable waste procedure to ensure waste duty of care compliance is maintained, including arrangements for auditing the actions of other parties in their waste management supply chain. The appointed Contractor should also designate a role with the responsibility for maintaining waste duty of care, e.g. waste champion (or equivalent).

13.6.26 To minimise any attendant effects from storing and processing material assets and waste, the appointed Contractor shall ensure that construction site compounds and on-site storage, stockpiling and processing areas are designed to minimise impacts to designated sites and sensitive environmental receptors.

Consents and Licences

13.6.27 The appointed Contractor will be responsible for obtaining, where required, all necessary waste carrier/broker registrations; pollution prevention and control permits; waste management licences, 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 scheme.

13.6.28 The appointed Contractor will also be responsible for and preparing any documentation required of those statutory and industry regulated codes of practice identified in Section 13.2 (Legislation, Policies and Guidance).

Site Documentation

13.6.29 The appointed Contractor will hold copies of the following documents on site:

- responsible sourcing plan, and materials procurement register;
- SWMP and any associated materials management plans;
- waste carrier or broker registrations;
- waste management licences, pollution prevention and control permits, waste exemptions and any regulatory responses from SEPA;
- waste transfer notes, and/or season tickets for non-hazardous waste; and
- special waste consignment notes and quarterly consignee returns for hazardous waste.

Monitoring and Reporting

13.6.30 The mitigation measures will be implemented, measured and monitored during construction using a variety of methods including, but not limited to:

- materials procurement register/invoices/certification records/as-built records; and
- SWMP, including site weighbridge records/waste transfer notes/consignment notes.

13.6.31 The appointed Contractor will undertake regular audit and inspection of material procurement and waste management activities to ensure compliance with the requirements of this factor, statutory controls and other proposed scheme policies and procedures relevant to material assets and wastes.

13.6.32 The appointed Contractor will identify, measure and record the types, quantities and provenance of materials used in constructing the proposed scheme in a Materials Procurement Register (or equivalent). The appointed Contractor will also identify, measure and record the types, quantities and fate of waste generated during construction in the SWMP.

13.6.33 This information will be made available on request by Transport Scotland and will be reported to Transport Scotland on a periodic basis (no less than every six months).

Schedule of Environmental Commitments

13.6.34 A summary of the essential mitigation measures, to be implemented in constructing the proposed scheme, is provided in Table 13.13. Chapter 17 (Schedule of Environmental Commitments) contains the complete schedule of measures for the proposed scheme.

Table 13.13: Schedule of Environmental Commitments - Material Assets and Waste

Mitigation Item	Party Responsible for Implementation	Timing of Measure	Description	Mitigation Purpose / Objective	Specific Consultation or Approval Required	Monitoring / Compliance
M&W1	Contractor	Pre-construction; Construction	Implement ZWS's DfRE Construction Principles, throughout the construction of the proposed scheme.	To minimise material assets consumption and waste generation.	Transport Scotland	Responsible Sourcing Plan and SWMP requirement will be included as an Employer's Requirement in Contract.
M&W2	Contractor	Pre-construction; Construction	Prepare a Responsible Sourcing Plan to maximise the responsible sourcing of materials and products associated with constructing the proposed scheme.	To use responsibly sourced materials that minimise adverse impacts on people and their environment, and reduce the attendant environmental impacts related to the extraction and manufacture of construction materials.	Transport Scotland	Responsible Sourcing Plan requirement will be included as an Employer's Requirement in Contract.
M&W3	Contractor	Pre-construction; Construction	Take all such measures available to it, as are reasonable in the circumstances, to apply the waste hierarchy as a priority order to the management of waste.	To reduce the attendant environmental impacts of managing waste, embed circular economy principles into the proposed scheme decisions, and deliver the best overall environmental outcome.	Transport Scotland	SWMP requirement will be included as an Employer's Requirement in Contract.
M&W4	Contractor	Pre-construction; Construction	Develop a SWMP to identify, prior to the start of construction works, to plan, implement, monitor and review waste minimisation and management throughout the construction programme; and ensure compliance with duty of care requirements.	To set out how all construction phase waste will be managed to support the delivery of the Scottish Government's Zero Waste Plan Targets.	Transport Scotland	SWMP requirement will be included as an Employer's Requirement in Contract.
M&W5	Contractor	Pre-construction; Construction	Comply with all 'Duty of Care' requirements ensuring that all surplus materials and waste are stored, transported, treated, used and disposed of safely without endangering human health or harming the environment.	To ensure compliance with the applicable regulatory and policy framework for waste, and prevent harm to human health and the environment.	Consultation and approval from the Local Authority and/or SEPA as applicable to regulatory requirements	SWMP requirement will be included as an Employer's Requirement in Contract.

13.6.35 In addition to the essential mitigation measures identified with respect to material assets and waste, there are embedded and essential mitigation items from Chapter 6 (Geology, Soils and Groundwater); Chapter 7 (Road Drainage and the Water Environment); Chapter 8 (Marine Ecology); Chapter 9 (Terrestrial Ecology); Chapter 11 (Air Quality); Chapter 12 (Noise and Vibration); Chapter 14 (Human Health); and Chapter 15 (Climate) that will further mitigate the impacts on material assets and waste. These are identified in the Chapter 17 (Schedule of Environmental Commitments).

13.7 Residual Effects

13.7.1 The assessment has indicated that the construction of the proposed scheme is likely to consume large quantities of material assets and hence will result in potential impacts on the environment, through the depletion of natural resources, and non-compliance of the proposed scheme with relevant sustainable development and materials policies and plans. Conversely, this assessment has determined that constructing the proposed scheme is also likely to generate potentially large quantities of C&D waste, leading to potential impacts on the available waste management infrastructure (i.e. through the permanent use of landfill void space and/or the short-term use of waste treatment capacity), and non-compliance of the proposed scheme with relevant policies and plans.

13.7.2 The significance of each residual effect is assessed in Table 13.14 after essential mitigation following the methodology described in Section 13.3 (Approach and Methods). All impacts have been assessed as being non-significant for the purposes of the assessment based on the application of the simplified assessment framework (descriptors of effect categories and significance criteria) provided in DMRB LA 110. Where impacts have been identified these will be addressed through ensuring that the construction of the proposed scheme responds to national regulatory standards and local policy requirements as reported in Section 13.2 (Legislation, Policies and Guidance) and Appendix A13.1 (Assessment of Regulatory and Policy Compliance), and essential mitigation measures reported in Section 13.6 (Mitigation) and Table 13.13.

13.7.3 Following implementation of embedded and essential mitigation and associated monitoring as prescribed in Section 13.6 (Mitigation), potential impacts in relation to material assets and waste for the proposed scheme will be avoided, reduced or offset where practicable. Residual effects are those that remain once the essential mitigation measures have been implemented and are summarised in Table 13.14 following the methodology described in Section 13.3 (Approach and Methods). However, given the nature of the DMRB LA 110 simplified assessment framework criteria all residual impacts and effects are likely to remain unchanged from their pre-essential mitigation levels.

Table 13.14: Summary of Significant Effects After Essential Mitigation

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
Material Assets	(1) Project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials.	No / unlikely: Whilst it is currently unknown what percentage of C&D waste will be used to substitute the use of primary materials on site, the nature of the proposed scheme mean that it will inevitably require primary materials to be imported to site. Nevertheless, it is assumed that the proposed scheme would achieve an overall material recovery / recycling rate of ≥70% (by weight) of non-hazardous C&D materials to substitute the use of primary materials within the first or second study area. Scottish Government statistics confirms that the construction industry in Scotland is currently achieving a recovery rate of 97% for non-hazardous C&D waste. Furthermore, it has been estimated that the proposed scheme has the potential to divert in the range of 85,424 - 94,915 tonnes of	• Description of impact: **Adverse, direct, permanent** • Significance of effect: **Slight adverse** • Significant for the purposes of EIA: **No**

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
		non-hazardous C&D waste from landfill, which represents an estimated waste recovery rate of 97%.	
	(2) Aggregates imported to site comprise re-used / recycled / content below the surrogate percentage target of 25%.	No / unlikely: Some degree of re-used / recycled content is anticipated given that this is standard practice in construction, and WRAP (2009) 'Construction Procurement Guidance' suggests that infrastructure projects typically exceed 10% even without explicitly trying to increase recycled content. WRAP (2009) reports that the recycled content as a percentage of the total material cost for an infrastructure project was found to be in the region of 8 - 36% using standard practice products, with this rising to 25 - 49% when applying cost-neutral good practice. Reference to WRAP (2011) 'Resource Efficiency Benchmarks for Construction Projects' reports that the proportion of recycled content (RC) by total aggregates weight, for the completed infrastructure projects within its dataset, was 28% RC / tonne at the 75th percentile level. Reference to the Mineral Products Association (2018) 'Profile of the UK Mineral Products Industry 2018 Edition' confirms that in 2017 the share of recycled and secondary aggregate materials as a proportion of total GB aggregates sales was 30%. Furthermore, it has been estimated that the proposed scheme has the potential to incorporate in the range of 47,029 - 52,255 tonnes of recycled aggregate which equates to approximately 58% recycled aggregate content by weight. These data all support the assumption that reused / recycled aggregate content use on the proposed scheme is unlikely to be less than 25%.	
	(3) Project sterilises ≥1 mineral safeguarding sites and/or peat resources.	No / unlikely: Given the absence of any safeguarded mineral sites or peat resources within the study area, no sterilisation is likely to occur. Whilst there are no designated mineral safeguarding areas or peat resources within the proposed scheme extents, the proposed scheme requires land for temporary works and construction outside the limits of the existing road boundary. Any superficial and bedrock deposits within the working area may therefore be impacted to some degree by excavations, piling and other earthworks during the construction of the proposed scheme. However, any disturbance and/or reduction in the extent of these deposits as a result of construct the proposed scheme is likely to be negligible given their widespread distribution in the region and country, and therefore represents minimal percentage loss.	
Waste	(1) Project leads to a greater than 1% reduction or alteration in regional landfill capacity.	No / unlikely: Whilst the precise quantities of C&D waste generated by the proposed scheme are currently unknown, it has been estimated that the proposed scheme has the potential to generate in the region of 88,493 – 98,325 tonnes of waste. It is estimated that 3,069 - 3,410 tonnes of this could require disposal at inert and non-hazardous landfills within the study area between 2022 and 2024 based on the application of SEPA waste recycling and recovery statistics. A greater than 1% reduction or alteration in regional landfill capacity is therefore unlikely to occur given that the proposed scheme would need to dispose of greater than 143,510 and 120,026 tonnes of C&D waste to landfill in 2021 and 2022 respectively for this to be	• Description of impact: **Adverse, direct, permanent** • Significance of effect: **Slight adverse** • Significant for the purposes of EIA: **No**

Element	Significance Criteria	Description of Potential Impacts	Assessment Summary
		realised. This is based on estimated forecast levels of combined inert and non-hazardous landfill capacity of 14,351,022 and 12,002,550 tonnes in 2021 and 2022 respectively. Professional judgement and the available Scottish waste management statistics, would suggest that this is unlikely. Furthermore, it has been assumed that the proposed scheme would adopt the Zero Waste Plan target of ensuring that a maximum of 5% of waste is disposed of to landfill in order to support the delivery of the Scottish Government's statutory target.	
	(2) Greater than 1% of project waste requiring disposal outside of the region.	No / unlikely: Given the anticipated types and quantities of waste, the receiving waste infrastructure is likely to have sufficient capacity to accommodate waste from constructing the proposed scheme, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.	

13.7.4 The assessment has concluded that that the impacts on material assets and waste of constructing the proposed scheme are likely to remain at a Slight adverse effect level after the application of those essential mitigation measures outlined in Table 13.13. Based on the DMRB LA 110 significance criteria, this would result in not-significant effects for the purposes of EIA.

13.7.5 Whilst the application of essential mitigation measures has the potential to reduce the impacts from the consumption of material assets and the generation and management of waste to a certain but unspecified degree, it is unlikely that the construction of the proposed scheme would be able to deliver increased material resource efficiency at levels necessary meet the significance category descriptors for a Neutral effect for the material assets and/or waste elements.

13.8 Assessment of Policy Compliance

13.8.1 DMRB LA 104 states that environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation.

13.8.2 Appendix A4.1 (Assessment of Policy Compliance) provides a review of national and local policy documents which are of relevance to the assessment undertaken and reported in this chapter in accordance with DMRB guidance.

13.8.3 Appendix A13.1 (Assessment of Regulation and Policy Compliance) also outlines the relevant national and local policies applicable to this assessment.

13.8.4 National policy objectives (and accompanying best practice guidance) of relevance to this assessment are provided in the National Planning Framework 3 (2014), Scottish Planning Policy (2014) themes *Planning for Zero Waste*, *Placemaking* and *Valuing the Historic Environment* as well as Scotland's Zero Waste Plan (Scottish Government 2010), Planning and Waste Management Advice (Scottish Government 2015), The Environment Strategy for Scotland (Scottish Government 2020), The National Transport Strategy 2 (Transport Scotland 2020) and the Climate Change Plan – The Third Report on Proposals and Policies 2018-2032 (Scottish Government 2018). In addition, Falkirk Local Development Plan 2 Policy IR18 (Waste Management in New Development) (Falkirk Council 2020) is of relevance.

Summary of Policy Compliance

13.8.5 Overall, the design and assessment of the proposed scheme has had regard to, and is compliant with, policy objectives to minimise effects on waste and materials. Subject to appropriate mitigation measures

to promote resource efficiency during the construction of the proposed scheme, it is assessed that the proposed scheme adheres to the requirements of policies relevant to material assets and waste as reported in Section 13.2.

13.8.6 A full policy compliance assessment can be found in Table 8 of Appendix A4.1 (Assessment of Policy Compliance) and Appendix A13.1 (Assessment of Regulation and Policy Compliance).

13.9 Statement of Significance

13.9.1 A summary of any likely adverse or beneficial significant residual effects, with the inclusion of mitigation, are indicated in Table 13.15 and Table 13.16 respectively.

Table 13.15: Summary of Significant Adverse Residual Effects – Material Assets and Waste.

Factor/Element	Summary of Significant Adverse Residual Effects	Significance
Material Assets and Waste		
Material Assets	No significant effects have been recorded	**Not significant**
Waste	No significant effects have been recorded	**Not significant**

Table 13.16: Summary of Significant Beneficial Residual Effects – Material Assets and Waste

Factor/Element	Summary of Significant Beneficial Residual Effects	Significance
Material Assets and Waste		
Material Assets	No significant effects have been recorded	**Not significant**
Waste	No significant effects have been recorded	**Not significant**

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