

SILVERTOWN TUNNEL

6.1.13 Environmental Statement Chapter 13 – Material Resources and Waste

TR010021

APFP Regulation 5(2)(a)

Revision 1

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

November 2016

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Silvertown Tunnel

ES Chapter 13 – Materials Resources and Waste 6.1.13

Planning Act 2008

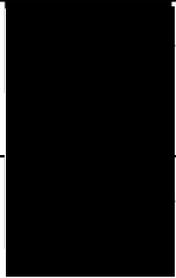
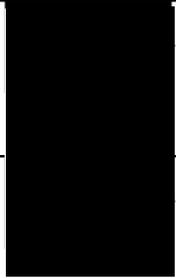
The Infrastructure Planning (Applications: Prescribed Forms and Procedure)
Regulations 2009

Document Reference: 6.1.13

Internal Code: ST150030-PLN-ZZZ-DSD-ZZ-0066

Regulation Number: 5(2)(a)

Author: Transport for London

Rev.	Date	Approved By	Signature	Description
0	29/04/2016	David Rowe (TfL Lead Sponsor)		For DCO Application
1.1	15/11/2016	David Rowe (TfL Lead		Updated for Deadline 1 to include: <ul style="list-style-type: none"> Update Table 13-9

		Sponsor)		<p><i>Example waste facilities within reasonable proximity of the Scheme</i> to make the distinction between the finite capacity of a landfill and the annual throughput of a treatment centre more apparent, in response to FWQ MR6</p> <ul style="list-style-type: none"> • Clarification of study area described in 13.3.32, and updated Table 13-15 Summary of CD&E waste arisings from the Scheme to address Environment Agency's comments in Relevant Representation Letter dated 30th August 2016
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List of Abbreviations

CCMP	Carbon Calculation for Major Projects
CD&E	Construction, demolition and excavation
CMMP	Construction Materials Management Plan
CO ₂	Carbon Dioxide
CPET	Central Point of Expertise in Timber
DoWCoP	Definition of Waste Code of Practice
ELWA	East London Waste Authority
EPR	Environmental Permitting Regulations
FSC	Forestry Stewardship Council
GHGs	Greenhouse gases
HE	Highways England
RSA	Receptor Site Assessment

Glossary of Terms

Carbon	‘Carbon’ is used as short hand to refer to the basket of six greenhouse gases (GHGs) recognised by the Kyoto Protocol. GHGs are converted to carbon dioxide equivalents (CO ₂ e) based on their global warming potential per unit as compared to one unit of CO ₂ .
Embodied Carbon	Embodied carbon dioxide (CO ₂) emissions of a material is the total carbon dioxide equivalent emissions released prior to it leaving the factory gate.
Hazardous waste	Waste which displays one or more of the hazardous properties listed in Annex III of the Waste Framework Directive.
Inert materials	Inert material is defined under Article 2 (e) of the Landfill Directive (1999/31/EC) and is broadly material which is neither chemically or biologically reactive and will not decompose. Examples of this are uncontaminated soil and stones (excluding peat), sand, and concrete. This has particular relevance to landfills as inert materials typically require lower disposal fees than biodegradable waste or hazardous waste.
Material resources	Material resources include primary raw materials, such as aggregates and minerals, and manufactured construction products which include recycled and secondary aggregates.

<p>Non-hazardous waste</p>	<p>Waste that is not covered under Article 2 (c) of the Landfill Directive (1999/31/EC) i.e. neither classed as hazardous nor as inert.</p>
<p>Proximity Principle</p>	<p>Requirement to manage, treat and/or dispose of waste close to the waste source in order to reduce environmental impacts.</p>
<p>Site Waste Management Plan (SWMP)</p>	<p>A live document that outlines how the Scheme will reduce, manage, and dispose of its solid waste in addition to forecasting and monitoring the amounts of waste produced by the Scheme.</p>
<p>Waste</p>	<p>‘Waste’ is defined in Article 3(1) of the Waste Framework Directive (Ref 13-1) and ‘means any substance or object which the holder discards or intends or is required to discard’. The term ‘holder’ is defined under article 3(6) as ‘the waste producer or the natural or legal person who is in possession of the waste’. The waste ‘producer’ is defined under article 3(5) as ‘anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of the waste’.</p>
<p>Waste facility</p>	<p>A facility where the main purpose of the facility is the treatment or disposal of waste.</p>

Waste infrastructure	The structures, systems and facilities for waste management within an area.
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13. MATERIAL RESOURCES AND WASTE

13.1 Introduction

- 13.1.1 This chapter assesses the potential impacts resulting from the use of material resources associated with the works and waste management in the construction, demolition and excavation (CD&E), operational and maintenance phases of the Scheme. It also assesses potential embodied carbon impacts associated with material resources¹ to be used and the management of waste.
- 13.1.2 This assessment does not make reference to impacts associated with the offsite manufacture of products. These stages of the products' or material resources' life-cycles are outside the boundaries of this assessment due to the range of unknown variables associated with extraction and manufacturing processes.
- 13.1.3 In October 2011, Highways England (HE) issued the Interim Advice Note (IAN) 153/11 (Guidance on the Environmental Assessment of Materials Resources) (Ref 13-3). It outlines an approach for the consideration of material resources use and waste as part of statutory and non-statutory Environmental Impact Assessment (EIA) process for new construction, improvement and major maintenance projects. The terms 'material resources' and 'waste' are explained more fully below:
- Material resources include primary raw materials, such as aggregates and minerals, and manufactured construction products which include recycled and secondary aggregates. Many material resources originate offsite, purchased as construction products, and some arise onsite such as excavated soils or recycled road planings; and
 - Waste is defined in Article 3(1) of the European Waste Framework Directive 2008/98/EC (Ref 13-1) as any substance or object which the

¹ The term 'materials' was introduced within the Design Manual for Roads and Bridges ('DMRB') Volume 11 in August 2009 (Ref 13-2) and embraces the main material resources required to construct the Scheme and construction-related waste.

holder discards or intends or is required to discard. The term 'holder' is defined under article 3(6) as 'the waste producer or the natural or legal person who is in possession of the waste'. The waste 'producer' is defined under article 3(5) as 'anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of the waste'. Waste can be further classified as hazardous, non-hazardous or inert.

- 13.1.4 All drawings referenced within this chapter are presented in Volume 2 of the Environmental Statement (ES) and all appendices referenced in this chapter are presented in Volume 3 (Document Reference 6.2 and 6.3).

13.2 Regulatory and policy framework

- 13.2.1 This impact assessment has been undertaken in accordance with current international directives and national legislation, and national, regional and local plans and policies relating to materials resources and waste in the context of the Scheme. A summary of relevant legislation and policies, the requirements of these and the Scheme response has been provided below.
- 13.2.2 Legislation and policy directly related to on site operations during construction have not been included (e.g. Section 34 Environmental Protection Act 1990, Waste Duty of Care Code of Practice).

Table 13-1 Material Resources and Waste regulatory and policy framework

Policy/ Legislation	Summary of requirements	Scheme response
National Road and Rail Networks: National Policy Statement (NN NPS) (Ref 13-4)	<p>5.42:</p> <p>The applicant should set out the arrangements that are proposed for managing any waste produced. The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental outcome.</p>	<p>The delivery of the mitigation measures set out in the mitigation section of this chapter will support adherence to the requirements of the NN NPS through the application of the waste hierarchy (see Figure 13-2). The Scheme will apply the waste hierarchy by moving waste management practices as far up the hierarchy as practicable, and by minimising disposal and maximising reuse and recycling.</p>
National Road and Rail Networks: National Policy Statement (NN NPS) (Ref 13-4)	<p>5.43:</p> <p>The applicant needs to show to the Secretary of State's satisfaction that an effective process for the management of hazardous and non-hazardous waste has been proposed, setting out how:</p> <ul style="list-style-type: none"> • any such waste will be properly managed, both on-site and off-site; • the waste from the proposed facility can 	<p>A Site Waste Management Plan (SWMP) has been developed for the Scheme detailing how all wastes will be managed and will be submitted with the application as an appendix to the CoCP (Document Reference: 6.10). The SWMP will be refined and updated as the design and the Scheme progresses in accordance with the requirements of the CoCP.</p> <p>The delivery of the mitigation measures set out in the mitigation section of this chapter supports adherence to</p>

Policy/ Legislation	Summary of requirements	Scheme response
	<p>be dealt with appropriately by the waste infrastructure which is, or is likely to be, available. Such waste arisings should not have an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area; and</p> <ul style="list-style-type: none"> • adequate steps have been taken to minimise the volume of waste arisings, and of the volume of waste arisings sent to disposal, except where an alternative is the most sustainable outcome overall. 	<p>the requirements of the NN NPS through the application of the waste hierarchy (see Figure 13-2).</p> <p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP, Document Reference: 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (for Excavated Materials) (appended to the CoCP, Document Reference: 6.10) which provides the methodology and evaluation criteria of selecting a receptor site as well as the process to ensure that the excavated material is managed and treated with the least impact to the environment and communities.</p>
<p>National Road and Rail Networks: National Policy Statement (NN NPS) (Ref 13-4)</p>	<p>5.17:</p> <p>Carbon impacts will be considered as part of the appraisal of scheme options (in the business case), prior to the submission of an application for DCO. Where the development is subject to EIA, any Environmental Statement will need to describe an assessment of any likely significant climate factors in accordance with the requirements in the EIA Directive.</p>	<p>The embodied carbon of materials used in the Scheme is presented in Section 13.4.26. An Energy and Carbon Statement (Document Reference: 6.7) also identifies and addresses the carbon emissions relating to the Scheme.</p>

Policy/ Legislation	Summary of requirements	Scheme response
	<p>It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets. However, for road projects applicants should provide evidence of the carbon impact of the project and an assessment against the Government's carbon budgets.</p>	
<p>National Road and Rail Networks: National Policy Statement (NN NPS) (Ref 13-4)</p>	<p>5.18: The Government has an overarching national carbon reduction strategy (as set out in the Carbon Plan 2011) which is a credible plan for meeting carbon budgets. It includes a range of non-planning policies which will, subject to the occurrence of the very unlikely event described above, ensure that any carbon increases from road development do not compromise its overall carbon reduction commitments. The Government is legally required to meet this plan. Therefore, any increase in carbon emissions is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the proposed scheme are so significant that it</p>	<p>The embodied carbon of materials used in the Scheme is presented in Section 13.4.26. An Energy and Carbon Statement (Document Reference: 6.7) also identifies and addresses the carbon emissions relating to the Scheme.</p>

Policy/ Legislation	Summary of requirements	Scheme response
	would have a material impact on the ability of Government to meet its carbon reduction targets.	
National Road and Rail Networks: National Policy Statement (NN NPS) (Ref 13-4)	<p>5.19:</p> <p>Evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) in both design and construction should be presented. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that, in relation to design and construction, the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures relating to design and construction will be a material factor in the decision making process.</p>	The embodied carbon of materials used in the Scheme is presented in Section 13.4.26. An Energy and Carbon Statement (Document Reference: 6.7) also identifies and addresses the carbon emissions relating to the Scheme.
EU Landfill Directive (Directive 1999/31/EC on the landfill of waste) (Ref 13-5) (as amended by 2003/33/EC) (Ref 13-6)	Establishes a framework for the management of waste across the European Community. It also defines certain terms, such as 'waste', 'recovery' and 'disposal', to ensure that a uniform approach is taken across the EU.	<p>The Construction, Demolition and Excavated Materials Commitments (appended to CoCP Document Reference: 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use.</p> <p>A Site Waste Management Plan (SWMP) has been</p>

Policy/ Legislation	Summary of requirements	Scheme response
	<p>The Directive aims to drive the management of waste up the hierarchy through waste minimisation and increased levels of recycling and recovery, and minimise disposal to landfill. The Directive sets out a number of procedures and criteria for the acceptance of construction, excavation and operational waste at landfills. These include ensuring that the waste will not endanger human health and the environment and satisfies the Waste Acceptance Criteria ("WAC"). It also sets strict requirements for the acceptance of certain stable, non-reactive hazardous waste into non-hazardous waste landfills.</p>	<p>developed for the Scheme detailing how all wastes will be managed and will be submitted with the application as an appendix to the CoCP (Document Reference: 6.10). The SWMP will be refined and updated as the design and the Scheme progresses in accordance with the requirements of the CoCP.</p>
<p>EU Waste Framework Directive (Directive 2008/98/EC on waste) (Ref 13-1)</p>	<p>The Waste Framework Directive (WFD; Directive 2008/12/EC on waste) contains the definition of waste. This definition is used to establish whether a material is a waste or not.</p> <p>The Directive introduces the waste hierarchy: waste prevention, recycling and</p>	<p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference: 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (for Excavated Materials) (appended to the CoCP Document Reference: 6.10) which provides the</p>

Policy/ Legislation	Summary of requirements	Scheme response
	recovery, with disposal as the least desirable option. It sets targets for recycling non-hazardous construction and demolition waste (70% by weight by 2020: Article 10).	methodology and evaluation criteria of selecting a receptor site, as well as the process to ensure that excavated material is managed and treated with the least impact to the environment and communities. A SWMP has been developed for the Scheme and will be submitted with the application as an appendix to the CoCP. The SWMP will be refined and updated as the design and the Scheme progresses in accordance with the requirements of the CoCP. The SWMP details how all wastes are to be managed.
The Clean Neighbourhoods and Environment Act 2005, Chapter 16 (Ref 13-6)	It is the responsibility of everyone working in the construction industry to ensure that all waste is disposed of properly. All employees need to be made aware that if they are tasked with waste disposal this must be carried out in accordance with the law, or they risk being fined.	All relevant staff working on the Scheme will received training on the waste management practices on site using methods such as tool box talks. The Scheme will participate in the Considerate Constructors Scheme, aiming to achieve the highest practicable score, monitored against the Code of Considerate Practice, designed to encourage best practice beyond statutory requirements.
Environmental Permitting (England & Wales) Regulations 2010 (SI 2010 No. 675) as amended by The Environmental	The Environmental Permitting (England and Wales) Regulations (EPR) were created to standardise environmental permitting and compliance in England and Wales. Environmental permits are required for industrial and waste activities which	The Scheme will comply with the requirements of the EPR Regulations in the disposal of waste. This will be achieved by the Scheme ensuring all relevant permits and consents are in place prior to construction and that compliance is maintained. The Receptor Site Assessment (RSA) (see paragraph 13.4.9) and SWMP

Policy/ Legislation	Summary of requirements	Scheme response
Permitting (England and Wales) (Amendment) Regulations 2012, 2014 and 2015 (Ref 13-8)	could harm human health or the environment unless they are controlled.	(both appended to the CoCP Document Reference 6.10) will be used to provide confirmation that facilities identified to receive waste from the Scheme are appropriately permitted.
The Hazardous Waste (England and Wales) Regulations 2009 and amendment SI 507 (Ref 13-9)	The Regulations require that a Hazardous Waste Consignment Note is produced for each consignment of hazardous waste removed from site.	A SWMP has been developed for the Scheme and will be submitted with the application as an appendix to the CoCP (Document Reference: 6.10). It will be refined and updated as the design and the Scheme progresses progresses in accordance with the requirements of the CoCP. It includes a classification (inert, non hazardous or hazardous) for all wastes, considers how the waste hierarchy can be applied and details how all wastes (including hazardous wastes) are to be managed. It also incorporates the findings of the Ground Investigation undertaken on site by including contaminated soils.
Waste (England and Wales) Regulations 2011 (Ref 13-10, and 2012 amendment (Ref 13-11)	The Waste Regulations transpose the Waste Framework Directive (Ref 13-1) into English law. The Regulations require businesses to confirm that they have applied the waste management hierarchy, introduce a new waste hierarchy permit condition and a two-tier system for waste carrier and broker registration.	The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference: 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (for Excavated Materials).

Policy/ Legislation	Summary of requirements	Scheme response
<p>National Planning Policy for Waste (Department for Communities and Local Government, 2014) (Ref 13-12)</p>	<p>Sets out detailed waste planning policies and should be read in conjunction with the National Planning Policy Framework. It states that <i>‘when determining planning applications for non waste development, local planning authorities should ensure that</i></p> <ul style="list-style-type: none"> • <i>the likely impact of proposed, non-waste related development on existing waste management facilities, and on sites and areas allocated for waste management, is acceptable and does not prejudice the implementation of the waste hierarchy and/or the efficient operation of such facilities;</i> • <i>the handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal.’</i> 	<p>The assessment applies the waste hierarchy with a focus on resource efficiency. The Scheme aims to reuse as much site won material as possible. Any material that cannot be reused on site will be sent for beneficial use at a suitable receptor site (identified through the Receptor Site Assessment (for Excavated Materials) (appended to the CoCP Document Reference: 6.10) and will only be disposed of at landfill if unsuitable for use elsewhere (e.g. contaminated soils) or no alternatives can be found.</p>
<p>Waste Management Plan for England (DEFRA, Dec 2013) (Ref 13-13)</p>	<p>The plan confirms the UK’s commitment to meet its target under the Waste Framework Directive of recovering at least 70% by weight, of construction and demolition</p>	<p>The assessment has been carried out against all current relevant information and policies. This plan compiles all relevant EU and UK waste information and policies. As detailed throughout this table, the materials</p>

Policy/ Legislation	Summary of requirements	Scheme response
	waste.	<p>and waste assessment addresses the requirements of all applicable information and policies. As such, the assessment outlined in this chapter is consistent with the Waste Management Plan for England.</p> <p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference: 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (for Excavated Materials) (appended to the CoCP Document Reference 6.10) which provides the methodology and evaluation criteria of selecting a receptor site as well as the process to ensure that the excavated material is managed and treated with the least impact to the environment and communities.</p>
National Planning Policy Framework (NPPF) March 2012 (Ref 13-14)	The NPPF does not contain specific waste policies as there are detailed policies contained within the Waste Management Plan for England (Ref 13-12) and the Planning Policy for Waste (Ref 13-11).	No specific waste policies are included within the NPPF. As such the Scheme makes no direct response to the NPPF in terms of waste.
The Definition of Waste: Development Industry Code of Practice,	This Code of Practice (CoP) provides best practice for the development industry to use when assessing if materials are	A SWMP has been developed for the Scheme detailing how all wastes are to be managed and will be submitted with the application as an appendix to the

Policy/ Legislation	Summary of requirements	Scheme response
<p>Contaminated Land: Applications in Real Environments (CL:AIRE), 2011 (Ref 13-15)</p>	<p>classified as waste, or not, and determining when treated waste can cease to be waste for a particular use.</p>	<p>CoCP (Document Reference 6.10). It will be refined and updated as the design and the Scheme progresses in accordance with the requirements of the CoCP.</p> <p>The Definition of Waste Code of Practice (DoWCoP) will be considered when determining the reuse of materials on site.</p>
<p>The London Plan 2015 (Ref 13-15)</p>	<p>The London Plan outlines the Mayor’s commitment to making better use of waste and its management in an attempt to reduce London’s impact on climate change. The London Plan describes waste as a valuable resource that can be exploited for London’s environmental, economic and social benefit.</p> <ul style="list-style-type: none"> • Policy 5.3 Sustainable Design and Construction - states that the highest standard of sustainable design and construction should be achieved in developments to improve the environmental performance of new developments. This should be achieved through a number of sustainable design principles 	<p>The Reference Design has been produced being mindful of waste minimisation and considers elements such as pre-cast concrete primary lining tunnel segments.</p> <p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (appended to the CoCP Document Reference: 6.10).</p> <p>Waste and materials will be transported to and from site by river as far as possible (either by ships or barges). A target of 50% (by weight) transport of waste and materials by river has been set as detailed in the CoCP (Document Reference: 6.10).</p>

Policy/ Legislation	Summary of requirements	Scheme response
	<p>including minimising the generation of waste and maximising reuse and recycling.</p> <ul style="list-style-type: none">• Policy 5.16 Waste self-sufficiency – states that the Mayor will work with various stakeholders and authorities to ensure that by 2031, 100% of London’s waste will be managed within London and zero biodegradable or recyclable waste will be sent to landfill. This target will be achieved through numerous targets including exceeding recycling and reuse levels in construction, excavation and demolition (CE&D) waste of 95 per cent by 2020.• Policy 5.17 Waste capacity – states the need to increase the waste processing capacity in London and that all new developments should have suitable waste and recycling	

Policy/ Legislation	Summary of requirements	Scheme response
	<p>storage facilities.</p> <ul style="list-style-type: none"> • Policy 5.18 Construction Excavation and Demolition Waste – states that waste should be removed from construction sites, and materials should be brought to the site, by water or rail transport wherever that is practicable. 	
<p>The Greater London Authority Sustainable Design and Construction, Supplementary Planning Guidance, Mayor of London, 2014 (Ref 13-17)</p>	<p>The Greater London Authority (GLA) Sustainable Design and Construction Supplementary Planning Guidance (SPG) was published in April 2014. Chapter 2.7 relates to materials and waste and provides guidance on:</p> <ul style="list-style-type: none"> • the design stage, including designing to use pre-fabrication elements, choosing materials that minimise the use of resources, are sustainably sourced, do not cause harm to health 	<p>The Reference Design has been produced being mindful of waste minimisation and considers elements such as pre-cast concrete primary lining tunnel segments.</p> <p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (appended to the CoCP Document Reference: 6.10).</p> <p>A SWMP has been developed for the Scheme detailing how all wastes are to be managed and will be submitted</p>

Policy/ Legislation	Summary of requirements	Scheme response
	<p>and are robust;</p> <ul style="list-style-type: none"> the construction phase, including how to manage materials resulting from demolition through the waste hierarchy. 	<p>with the application as an appendix to the CoCP (Document Reference 6.10). The SWMP and will be refined and updated as the design and the Scheme progresses progresses in accordance with the requirements of the CoCP.</p>
<p>Joint Waste Development Plan for the East London Waste Authority (ELWA) Boroughs, London Borough of Barking & Dagenham, London Borough of Havering, London Borough of Newham, London Borough of Redbridge, 2012 (Ref 13-18)</p>	<p>The purpose of the Joint Waste DPD is to set out a planning strategy to 2021 for sustainable waste management which enables the adequate provision of waste management facilities (including disposal) in appropriate locations for municipal and commercial and industrial waste, having regard to the London Plan Borough level apportionment and construction, excavation and demolition and hazardous wastes. Note this only incorporates the London Borough of Newham (i.e. the northern side of the Scheme).</p>	<p>The Receptor Site Assessment (for Excavated Materials) (appended to the CoCP Document Reference: 6.10) is being produced to identify suitable facilities for wastes produced by the Scheme within reasonable proximity.</p>
<p>Newham 2027: Newham's Local Plan – The Core Strategy, London Borough of</p>	<p>With regards to waste, Policy INF3 Waste and Recycling states that waste produced within the London Borough of Newham should be managed in accordance with the</p>	<p>The Construction, Demolition and Excavated Materials Commitments (appended to the CoCP Document Reference 6.10) has considered the waste hierarchy including a commitment to 80% (by weight) of CD&E</p>

Policy/ Legislation	Summary of requirements	Scheme response
Newham, 2012 (Ref 13-19)	waste hierarchy. Policy INF3 also states that transport of waste materials should first consider rail and waterway options over road transport routes.	materials to schemes for beneficial use. This is supported by the Receptor Site Assessment (appended to the CoCP Document Reference: 6.10). Waste and materials will be transported to and from site by river as far as possible (either by ships or barges). A target of 50% (by weight) transport of waste and materials by river has been set as detailed in the CoCP (Document Reference: 6.10).
Royal Greenwich Local Plan: Core Strategy with Detailed Policies, Royal Borough of Greenwich, 2014 (Ref 13-20)	Sustainability measures will have to be incorporated into new developments to reduce waste, water and energy consumption. Policy DH1: Design requires that all developments demonstrate evidence of waste reduction and use of recycled materials. Policy IM5: Freight, requires that the movement of construction and demolition materials by water is maximised.	Recycled materials will be incorporated into the design whenever feasible with a minimum target of 10% reused and recycled content (by value) in construction materials as detailed in the CoCP (Document Reference: 6.10). There is an aspirational target of 20% of reused and recycled content (by value). Waste and materials will be transported to and from site by river as far as possible (either by ships or barges). A target of 50% (by weight) transport of waste and materials by river has been set as detailed in the CoCP (Document Reference: 6.10).
Core Strategy Development Plan Document 2025, London Borough of Tower Hamlets, 2010 (Ref 13-	The strategic objective is to plan for and manage the borough's waste efficiently, safely and sustainably, by minimising the amount of waste produced, maximising the amount of waste produced, maximising	The assessment applies the waste hierarchy with a focus on resource efficiency. The Scheme aims to reuse as much of the material generated on site as possible. Any material that cannot be reused on site will be sent for beneficial use at a suitable receptor site

Policy/ Legislation	Summary of requirements	Scheme response
21)	recycling, and managing non-recyclable waste using treatment methods other than landfill. Policy SP05 1c requires all developments to reduce and reuse waste from construction and demolition, and 1d states that the borough will be “supporting developments that use recycled materials”.	identified through the Receptor Site Assessment (for Excavated Materials) (appended to the CoCP Document Reference: 6.10) and will only be disposed of at landfill if unsuitable for use elsewhere (e.g. contaminated soils) or no alternatives can be found. Recycled materials will be incorporated into the design whenever feasible with a minimum target of 10% reused and recycled content (by value) in construction materials as detailed in the CoCP (Document Reference 6.10). There is an aspirational target of 20% of reused and recycled content (by value).

13.3 Methodology

General approach

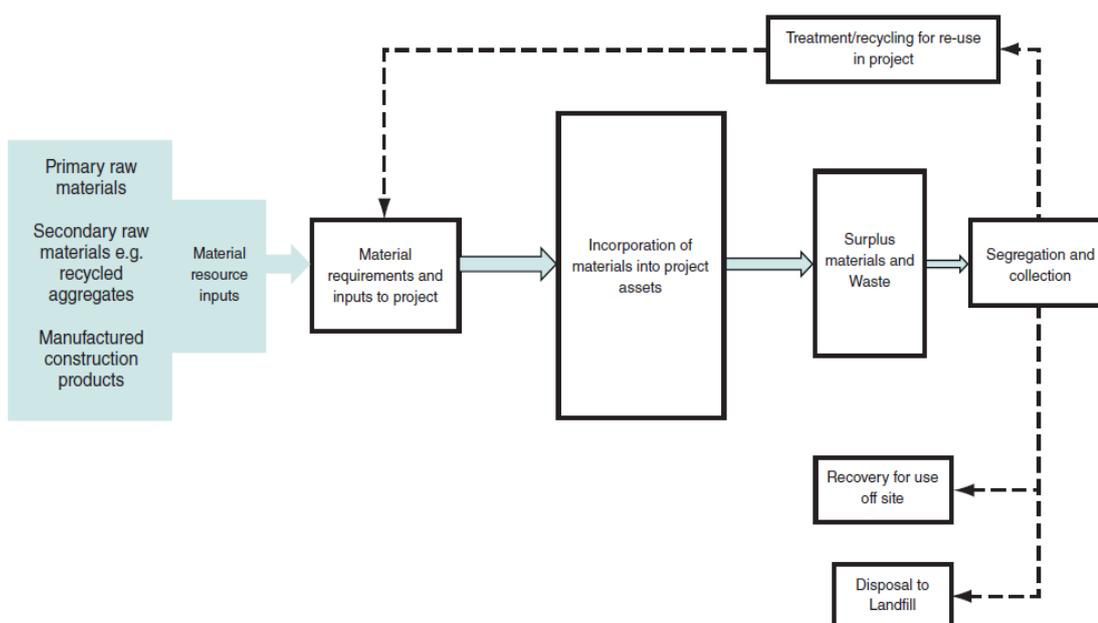
- 13.3.1 This assessment identifies the environmental impacts associated with material resources use and waste, waste arisings from the different phases of the Scheme and the measures which will be implemented to mitigate the impacts.
- 13.3.2 A detailed assessment has been undertaken, as opposed to a simple assessment, in accordance with IAN 153/11 (Ref 13-3) which states that:
- '[a detailed assessment] is most likely to be used for complex capital maintenance, improvement and large new construction projects.'*
- 13.3.3 Professional judgement has been used to determine that the Scheme is a '*large new construction project*', given the projected capital costs of the works.
- 13.3.4 Throughout this chapter, '*material resources*' will be addressed first, followed by '*waste*'.
- 13.3.5 There are no accepted criteria for determining the value (sensitivity) of material resources and waste (including waste infrastructure). In the absence of such guidance, the materials assessment has been undertaken using professional judgement of material resources and waste specialists. The assessment criteria used for assessing environmental value (or sensitivity) and typical descriptors is included in Table 13-3.
- 13.3.6 Professional judgement has been applied to determine the likely significance of effects (Table 13-5).

Material resources

- 13.3.7 Material resources include primary raw materials, such as aggregates and minerals, and manufactured construction products which include recycled and secondary aggregates. Many material resources originate offsite, purchased as construction products, and some arise onsite such as excavated soils or recycled road planings.

13.3.8 The way in which material resources are used throughout the construction process is known as the Material Resource Flow. A simplified flow diagram representing the flow of material resources and the management of waste is shown in Figure 13-1.

Figure 13-1 Scheme material flow diagram



13.3.9 This assessment of materials covers the requirements for construction related material resources and their transportation. It does not include an assessment of the material resources required to produce the construction products used, as these effects will have been addressed as part of the planning and consenting regime for these activities. There are no obvious environmental receptors for material resources in the way that there are for other topic areas. However, it has been possible to quantify the use of typical key material resources required for the Scheme in absolute terms, for example, tonnes of primary aggregate, concrete and steel.

13.3.10 As noted above, there is no standard criteria for determining the value (sensitivity) for material resources, and therefore the material resources assessment has been undertaken using professional judgement. The sensitivity of material resources used has been based on the availability of the material resource and whether its use in the Scheme could result in significant depletion. Full details are contained in Table 13-3. For example, a rare material resource that is not available locally or only available locally in very limited amounts may be assessed as high sensitivity. The scarcity of the required material

resource could therefore lead to it being significantly depleted. Conversely, a material resource that is very common locally or that primarily comprises reused, recycled or recovered material resources such that its use would contribute to meeting waste reduction targets and the avoidance of the use of primary material resources, may be considered to have a low sensitivity.

- 13.3.11 The assessment of key material resources to be used has been made against UK-wide material demand/procurement data. This presents a reasonable worst case scenario for material resources as the Scheme will be applying a market-wide procurement policy, allowing international markets to be accessed if necessary.
- 13.3.12 UK-wide material demand/procurement data has been gathered for the key material resources likely to be required for the Scheme. Data for concrete and aggregates has been taken from the Mineral Products Association (Ref 13-22). Data for steel has been taken from the International Steel Statistics Bureau (ISSB) (Ref 13-23).
- 13.3.13 Potential lorry movements associated with the key material resources have been assessed quantitatively and the subsequent effects on the vehicular capacity of the existing highways network have been assessed in the Transport Assessment (Document Reference: 6.5).
- 13.3.14 The potential barge movements associated with the key material resources have been presented quantitatively and the subsequent effects on the river capacity assessed in the Transport Assessment (Document Reference: 6.5).
- 13.3.15 It has been possible to assign a proxy for the environmental impacts of material resources through the calculation of the embodied carbon dioxide associated with the specific material resources used for the Scheme. This is explained further in the section below.

Embodied carbon content of materials

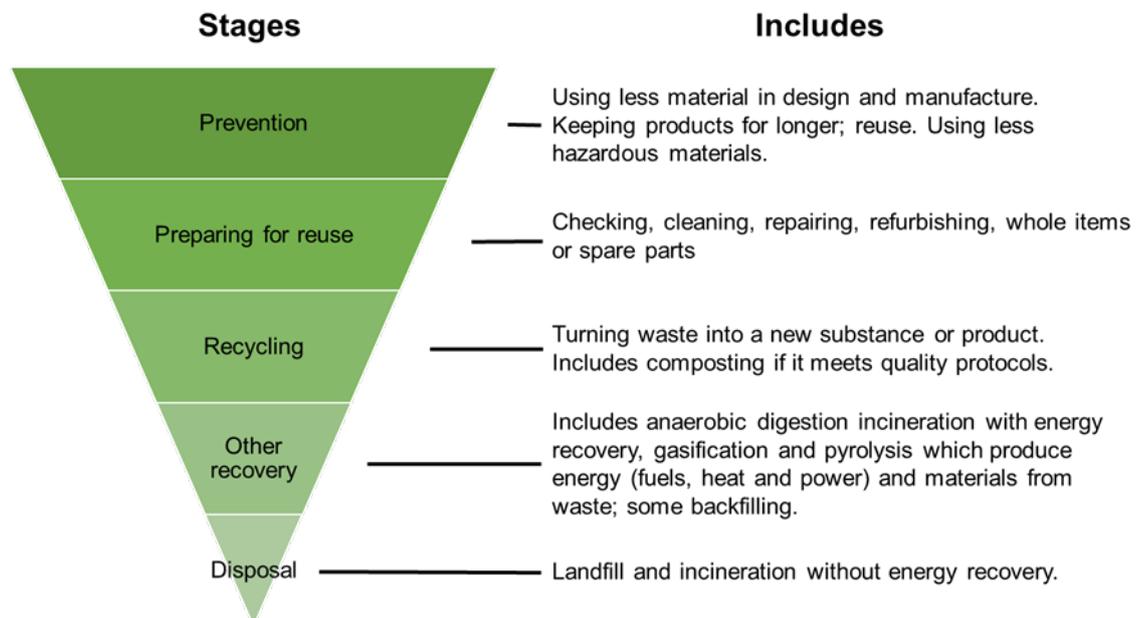
- 13.3.16 For the purposes of this assessment, the embodied carbon dioxide (CO₂) emissions of a material resource are the total carbon dioxide equivalent emissions released prior to it leaving the factory gate. 'Carbon' is used as short hand to refer to the basket of six greenhouse gases (GHGs) recognised by the Kyoto Protocol. GHGs are converted to carbon dioxide equivalents (CO₂e) based on their global warming potential per unit as compared to one unit of CO₂. It does not include

the carbon dioxide emissions associated with transport from the factory gate to site, construction activities, maintenance or decommissioning. The boundary condition used for this assessment is known as 'cradle-to-gate'.

Waste

- 13.3.17 The Scheme will result in the production of waste arising from a number of activities such as the 'cut-and-cover' sections, tunnel boring, damage to materials and products, off-cuts and packaging. The potential environmental impacts for waste are associated with its production, storage, transport, processing and disposal.
- 13.3.18 Waste arisings, primarily from tunnel boring and the 'cut-and-cover' required by the Scheme, have been forecast using design information and are presented in the Site Waste Management Plan as appended to the CoCP (Document Reference: 6.10).
- 13.3.19 As the development of the design continues, the accuracy and extent of the figures for material resources use and waste quantifications will improve, supporting the effective planning and management of any wastes likely to arise from the Scheme. This will be reflected in the SWMP as the design evolves.
- 13.3.20 The sensitivity of waste management infrastructure within the study area (see section 13.4.13) is based on capacity and waste arisings from the Scheme compared to the total waste generation in the Study Area. Assessing the scale and significance of the impacts associated with the production and management of waste has been based on a combination of the waste management methods identified and the effects that forecasted waste arisings will have on available waste management infrastructure. In this way, the assessment reflects both the quantities of waste produced (relative to the capacities of the available waste infrastructure) and the position within the waste hierarchy of the chosen waste management methods.
- 13.3.21 Application of the waste hierarchy (shown in Figure 13-2) provides a protocol to reduce waste generation at source and reduce the volume of material that is 'disposed' of (by promoting reuse and recycling).

Figure 13-2 Waste hierarchy



13.3.22 The waste hierarchy ranks waste management options according to what is best for the environment. It gives priority to prevention, then preparing waste for reuse, then recycling, then recovery, and last of all disposal.

13.3.23 Another consideration has been the 'proximity principle', which advocates that waste should be disposed of (or otherwise managed) close to the point at which it is generated, thus aiming to achieve responsible self-sufficiency at a regional or sub-regional level.

13.3.24 The primary receptor for waste is the available waste management infrastructure within reasonable proximity of the Scheme and the impacts on the capacity of these facilities. The production of large quantities of waste within a short period of time, for example, the production of a large volume of waste concrete could have adverse effects on waste infrastructure by reducing the capacity to manage other waste streams. For some types of waste management infrastructure, such as disposal facilities, this impact can be permanent via a permanent reduction in void capacity. For other types of infrastructure, such as waste transfer stations, material recovery facilities or recycling sites, the impacts would be temporary. Identifying recycling options for wastes produced by the Scheme will be considered to have a lower environmental impact than disposing of waste.

- 13.3.25 Potential lorry movements associated with waste arisings have been assessed quantitatively and the subsequent effects on the vehicular capacity of the existing highways network have been assessed in the Transport Assessment (Document Reference: 6.5).
- 13.3.26 The potential barge movements associated with waste arisings have been assessed quantitatively and the subsequent effects on capacity on the river have been assessed in the Transport Assessment (Document Reference: 6.5).

Consultation

- 13.3.27 Consultation has been undertaken with the London Borough of Tower Hamlets, Royal Borough of Greenwich and London Borough of Newham as part of the assessment to:
- define the targets in the London Borough of Tower Hamlets, Royal Borough of Greenwich and London Borough of Newham waste policies;
 - discuss waste management aspirations for the proposed development and set targets; and
 - understand proposals for any future waste facilities in the boroughs and implications on waste management at the proposed development.
- 13.3.28 No specific requirements or methodologies were identified by the boroughs.
- 13.3.29 The following queries relating to waste and materials were raised during the public consultation on the Preliminary Environmental Information Report (PEIR) in October 2015.

Table 13-2 Summary of consultation responses

Consultee	Date	Comments	Response
Environment Agency	23 November 2015	The Environment Agency were pleased to note that the PEIR Chapter has already considered all the relevant guidance for the assessment of material resources and waste.	N/A
Port of London Authority	23 November 2015	The DCO application needs to be clear what commitment is being made to river use - what materials and waste will be transported and what has been discounted and why. A commitment to maximising river use must be enshrined within the DCO. What investigations have been undertaken to utilise existing river infrastructure (for example the Old Coaling jetty) or to	<p>A 50% target for the transport of materials and waste (by weight) to and from site by river has been identified in the CoCP (Document Reference: 6.10), which will be secured by the DCO. See also paragraph 13.4.35 which details which materials and waste will be transported by river.</p> <p>A review of all commercial wharves and jetties within a 4km</p>

Consultee	Date	Comments	Response
		<p>maximise through the supply chain (for example sourcing material from the numerous safeguarded wharves in Greenwich).</p>	<p>radius of the Scheme’s site at Greenwich has been undertaken and has identified potential opportunities to transport material resources and wastes by river.</p>
<p>Marine Management Organisation (MMO)</p>	<p>25 November 2015</p>	<p>The MMO noted in the consultation response that more detail needs to be included about the proposed amount of material to be dredged, the dredge depth and also the nature of the dredge material. The ES would also need to confirm whether the dredged material will be disposed of to land or at sea. The potential impact of this activity on sensitive marine receptors needs to be assessed clearly.</p>	<p>Details about volumes and dredge depth are included in the Chapter 4 - Scheme Description of the ES (Document Reference: 6.1.4). The dredge material will be disposed of to land and potential receptors sites are considered in Table 13-9 of this chapter and the RSA.</p>
<p>Public Health</p>	<p>27 November</p>	<p>PHE noted that further detail on</p>	<p>Firm commitments to use the</p>

Consultee	Date	Comments	Response
England (PHE)	2015	the transport of excavated waste materials from the site would need to be included in the ES. The River Thames may be used as a disposal route and includes plans to potentially build a jetty to facilitate this, thus reducing the air quality impact from road journeys required to move the very large quantities of excavated waste.	river for the delivery of materials and the transportation of excavated material are detailed in the CoCP (Document Reference: 6.10), and are included in section 13.5.4 of this chapter.
No to Silvertown	November 2015	No to Silvertown expressed concerns that it is not possible to remove construction waste by river, the traffic impact will be significant over a long construction period.	Firm commitments to use the river for the delivery of materials and the transportation of excavated material are detailed in the CoCP (Document Reference: 6.10) and are included in section 13.5.4 of this chapter.
London Borough of	Borough	The river transport commitments were presented	N/A

Consultee	Date	Comments	Response
Newham London Borough of Tower Hamlets Royal Borough of Greenwich	Workshop 4 February 2016	to the host boroughs. Representatives of the boroughs welcomed the efforts made to maximise use of the river to transport materials and minimise lorry movements on the road during construction.	

The study area

- 13.3.30 A specific study area for the material resources assessment has not been identified, as a whole market approach will be used to procure materials required for the scheme. Efforts will be made to source material resources locally whenever possible.
- 13.3.31 Some material resources will originate on-site, such as excavated soil (that is reused on site). Other material resources used within construction will be sourced off-site and their environmental impact will also be taken into account.
- 13.3.32 The study area for waste capacity is defined as Greater London and the study area for waste facilities able to accept the key waste streams from the Scheme is defined as Greater London, Kent and Essex.'

Methodology for establishing baseline conditions

Establishing the existing baseline

- 13.3.33 Baseline conditions for material resources (including construction materials) have been established through desktop research. As a specific study area has not been set for material resources, the quantitative assessment has been based on available material resources data for the UK.
- 13.3.34 Baseline conditions to support the quantitative assessment of waste arisings have been established through desktop research, including the review of key data sources: Future Waste Arisings in London 2010-2031 (Ref 13-24) and the Environment Agency 2012 Waste Data Tables (Ref 13-25).

Forecasting the future baseline ("without scheme" scenario)

- 13.3.35 No future baseline has been forecast for material resources as there are no publicly available sources of information for predictions of material resources production.
- 13.3.36 Data on the future waste arisings in the study area have been sourced from Future Waste Arisings in London 2010-2031 (Ref 13-24).

Defining the importance/sensitivity of resource

13.3.37 The importance or sensitivity of each resource is assessed using the criteria provided in Table 13-3.

Table 13-3 Determining the importance / sensitivity of resource

Importance/ sensitivity of resource or receptor	Criteria
Very High	<ul style="list-style-type: none"> • Very high scarcity of required material resource. • There is no available waste management infrastructure capacity within the study area for any waste arisings from the Scheme. • Very high importance and rarity of resource on a national scale. Very limited materials reuse, recycling and or recovery. • No capacity of existing highways network or river to accommodate any increases in lorry and barge and/or ship movements resulting from the flow of material resources and wastes to and from the Scheme.
High	<ul style="list-style-type: none"> • High scarcity of required material resource. • There is limited waste management infrastructure capacity within the study area in relation to the forecast waste arisings from the Scheme. • High importance and rarity of resource on a regional scale. Limited materials reuse, recycling and or recovery. • Low capacity of existing highways network or river to accommodate any increases in lorry and barge and/or ship movements resulting from the flow of material resources and wastes to and from the Scheme.
Medium	<ul style="list-style-type: none"> • Medium scarcity of required material resource. • There is adequate waste management infrastructure capacity within the study area for the majority of waste arisings from the Scheme. • High or medium importance and rarity of resource on a regional scale. Moderate materials reuse, recycling and or recovery. • Medium capacity of existing highways network or river to accommodate any increases in lorry and barge and/or ship movements resulting from the flow of material resources and wastes to and from the Scheme.

Importance/ sensitivity of resource or receptor	Criteria
Low	<ul style="list-style-type: none"> • Low scarcity of required material resource. • There is adequate available waste management infrastructure capacity within the study area for all waste arising from the Scheme. • Low or medium importance and rarity of resource on a local scale. High materials reuse, recycling and or recovery. • High capacity of existing highways network or river to accommodate any increases in lorry and barge and/or ship movements resulting from the flow of material resources and wastes to and from the Scheme.
Negligible	<ul style="list-style-type: none"> • Negligible scarcity of required material resource. • There is waste management infrastructure capacity within the study area for all waste arisings from the Scheme. • Negligible importance and rarity of resource on a local scale. Very high materials reuse, recycling and or recovery. • Very high capacity of existing highways network or river to accommodate any increases in lorry and barge and/or ship movements resulting from the flow of material resources and wastes to and from the Scheme.

Source: Professional judgement

Methodology for assessing effects

13.3.38 The magnitude of each impact is assessed using the criteria provided in Table 13-4.

Table 13-4 Assessing magnitude of Impact

Magnitude of impact	Criteria
Major	<ul style="list-style-type: none"> • Loss of natural resources and or quality and integrity of natural resources; severe damage to key characteristics, features or elements. • Waste arisings from the Scheme are predominantly disposed of to landfill or to incineration without energy recovery with little or no prior segregation. • Generation of large quantities of hazardous and inert waste which are managed for disposal using methods lower down

Magnitude of impact	Criteria
	<p>the waste hierarchy (e.g. landfill or incineration with energy recovery).</p> <ul style="list-style-type: none"> • The embodied carbon contained within the main material resources is above 40,000 tonnes CO₂e.
Moderate	<ul style="list-style-type: none"> • Loss of natural resources, but not adversely affecting the integrity; partial loss of or damage to key characteristics, features or elements. • Waste arisings from the Scheme are predominantly disposed of by incineration with energy recovery. • Generation of moderate quantities of hazardous and inert waste which are managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery). • The embodied carbon contained within the main material resources is between 20,000 and 40,000 tonnes CO₂e.
Minor	<ul style="list-style-type: none"> • Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements • Waste arisings from the Scheme are predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility. • Generation of small quantities of hazardous and inert waste which is managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery). • The embodied carbon contained within the main material resources is between 5,000 and 20,000 tonnes CO₂e.
Negligible	<ul style="list-style-type: none"> • Very minor loss or detrimental alteration to one or more characteristics, features or elements. • Waste arisings from the Scheme are predominantly reused on site or at an appropriately licensed or registered exempt site elsewhere. • Generation of negligible quantities of hazardous and inert waste which are managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery). • The embodied carbon contained within the main material resources is between 1,000 and 5,000 tonnes CO₂e.

Magnitude of impact	Criteria
No Change	<ul style="list-style-type: none"> • No loss or alteration of characteristics, features or elements; no observable impact in either direction. • All waste arisings from the Scheme are reused on site or at an appropriately licensed or registered exempt site elsewhere. • No generation of hazardous waste. All inert materials reused onsite. • The embodied carbon contained within the main material resources is below 1,000 tonnes CO₂e.

Source: Professional judgement

13.3.39 The significance of each effect is assessed using the criteria provided in Table 13-5.

Table 13-5 Assessing significance of effect

Sensitivity of the receptor	Magnitude of impact				
	No Change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Source: Professional judgement

- 13.3.40 Those effects shaded and in bold are considered to be significant effects in EIA terms. The definition of significance is defined as detailed in Table 13-6.

Table 13-6 Definition significance of effect

Significance	Definitions
Very Large	Significant change in environmental conditions. Impacts are likely to be of a very high magnitude and frequency and will impact on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.
Large	Considerable change in environmental conditions. Impacts are likely to be of a high magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.
Moderate	Noticeable change in environmental conditions. Impacts are likely to be of a high magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.
Slight	Barely perceptible change in environmental conditions. Impacts are likely to be of a low magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a temporary basis.
Neutral	No discernible change in environmental conditions. Impacts are likely to be of a negligible magnitude and frequency and will not have an effect on the existing strategy to deal with material resources and waste. No impact.

Source: Professional judgement

Limitations and Assumptions

- 13.3.41 This chapter, and all waste and recycling assessments, is based on the Reference Design and assumes that the Scheme will be developed in accordance with this information.
- 13.3.42 Whilst considered sufficient to inform the assessment, quantifications of material resources use and waste arisings forecast from the

Scheme have been derived from the Reference Design, the Site Waste Management Plan and professional judgement.

- 13.3.43 Total waste management capacity for inert and contaminated soils has not been presented due to a lack of an available, consistent data-set. As such, it has been assumed for the purposes of this assessment that all waste of this type will be sent to a transfer station or landfill. However, it is anticipated by the project that, where possible, suitable excavated material will be sent to for beneficial use.

13.4 Description of the baseline conditions

Existing baseline

Material resources

- 13.4.1 The quantitative assessment has been based on available material resources data for the UK, as material resources data are not available for the study area. Table 13-7 provides a breakdown of the annual UK demand of key material resources expected to be used by the Scheme:

Table 13-7 Annual UK demand of key material resources

Material resources	Quantities (tonnes)
Aggregates	200,000,000
Pavement	20,000,000
Concrete	52,000,000
Steel	10,700,000

- 13.4.2 Given the high levels of UK supply and demand of these key materials, the sensitivity of this receptor (material resources) is judged to be low.

Waste

- 13.4.3 The Waste Framework Directive has targeted recovery of at least 70% of all CD&E waste by 2020. Table 13-8 outlines the volume of CD&E waste produced in the UK during 2008, 2010 and 2012.

Table 13-8 Current CD&E waste arisings in the UK

Year	CD&E Waste total (tonnes)
2008	100,999,493
2010	102,231,321
2012	100,230,495

Source: Eurostat (Ref 13-26)

Current local waste arisings

- 13.4.4 Greater London produced a total of 9,753,000 tonnes of C,D&E waste in 2010².

Waste capacity

- 13.4.5 Total waste infrastructure capacity for Greater London in 2012 was 19,443,000 tonnes³. Assuming capacity remains stable, this equates to an estimated capacity of 77,732,000 tonnes over the Scheme construction period (2019-2022).
- 13.4.6 An indicative sample of facilities able to accept the key waste streams within reasonable proximity of the Scheme and that are expected to be operational during the construction phase are presented in Table 13-9 to illustrate their location, capacity and ability to accept wastes by barge. This is a non exhaustive list and is included to provide indication

² Future Waste Arisings in London 201-2031: A summary Note, Greater London Authority, 2011

³ 2012 Waste Data Tables, Environment Agency,
<http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/research/library/data/150326.aspx>

of the scale and local of potential waste management facilities in proximity to the site.

- 13.4.7 Indicative capacities in Table 13-9 have been annotated using the Environment Agency (EA) Database “EPR-Waste”. This was supplemented through direct correspondence with some of the potential receiver sites. The database has been created deliberately for the use by waste management professionals for strategic waste assessment and planning. There is a lag in data collection, processing and issue so the latest dataset was issued in 2015. However it is considered robust for the purposes of the Environmental Statement as it is the most recent data available at the time of the assessment.
- 13.4.8 Distances from the Scheme have been calculated using the post code E16 1GB (located at the north east extent of the site) as a standard reference point. The mode of transport to each site may be by lorry, by barge/ship or both, as such ‘as the crow flies’ distances have been used to enable comparison.
- 13.4.9 These, and additional, facilities will be further reviewed as part of the detailed Receptor Site Assessment which will be undertaken by the Contractor to establish a final list of preferred receptor sites. The detailed methodology for this RSA process is appended to, and secured by the CoCP Document Reference 6.10.
- 13.4.10 The RSA has been developed to provide a transparent process and methodology for the evaluation of sites that may receive excavated material or wastes. The RSA provides a standard methodology and evaluation criteria which meets the vision and commitments set forth within the Scheme’s Construction, Demolition and Excavated Materials Commitments. It also provides a transparent process to stakeholders in order to ensure that the excavated material will be managed and treated with the least impact to the environment and communities.
- 13.4.11 The RSA will first identify a long list of potential receptor sites which will be screened in order to create a short list of receptor sites. Subsequently, a detailed assessment will be conducted to assess the short list against a range of criteria. The final outputs are a preferred list of receptor sites as well as a reserve list and their scores against each of the assessment criteria. The assessment criteria consider environmental impacts, the operation of the facilities, the proximity principle, and the impact on the local area.

- 13.4.12 The Contractor will be required to select a receptor site from the preferred list or reserve list of sites. In the event that the receptor sites in the preferred list are no longer operational or have no capacity during the construction phase, the Contractor will be required to follow the RSA methodology to identify an alternative receptor site.
- 13.4.13 The Contractor will be required to select receptor sites from the preferred list or reserve list of sites or to follow the RSA methodology to identify alternative sites.

Table 13-9 Example waste facilities within reasonable proximity of the Scheme

Site address	Type of site	Potential capacity for Scheme wastes **	Wastes accepted	Barge acceptance	Distance from the Scheme (km) based on E16 1GB as the crow flies
Victoria Deep Water Terminal and Bethels Wharf Recycling Centre Tunnel Avenue Greenwich SE10 0QE	Recycling	1,600,000 t	Dredging spoil , Soils and stones, mixtures of concrete, bricks, tiles etc., gypsum based construction materials, road base and road planings, mixed construction wastes .	Yes	2.4
Veolia Landfill Rainham Coldharbour Lane Rainham, Essex RM13 9YB	Landfill	400,000 t	Excavated soils	Yes	10.5
Anchor Bay Wharf Manor Road Erith Kent DA8 2AW	Materials treatment facility	300,000 t	Dredging spoil, Soils and stones, mixtures of concrete, bricks, tiles etc., gypsum based construction materials, road base and road planings .	Yes	11.7

Site address	Type of site	Potential capacity for Scheme wastes **	Wastes accepted	Barge acceptance	Distance from the Scheme (km) based on E16 1GB as the crow flies
Storefield Aggregates Dartford Kent DA9 9DU	Recovery operation	7,000,000 t	Inert excavated soils	No	17.7
Mohawk Wharf Recycling Centre Bradfield Road Silvertown London E16 2AX	Recycling	280,000t	Soils and stones containing dangerous substances (i.e. hazardous waste), dredging spoil containing dangerous substances ((i.e. hazardous waste), mixtures of concrete, bricks, tiles etc.	Yes	1.2
Veolia Landfill Pitsea Pitsea Hall Lane Pitsea, Basildon Essex SS16 4UH	Landfill / restoration	3,200,000 t	Excavated soils	Yes (inert soils only)	33.3

Site address	Type of site	Potential capacity for Scheme wastes **	Wastes accepted	Barge acceptance	Distance from the Scheme (km) based on E16 1GB as the crow flies
RSPB Cliffe Pools East of Thames Estuary Rochester, ME3 7ST	Recovery operation	1,800,000 t	Excavated soils	Yes	31.9
Total capacity of all sites (based on four year construction period 2019-2022).		8,280,000 t			

** Note that this is not the same as total remaining capacity, treatment facilities have an annual permitted throughput and landfills a total finite capacity. The table indicates the capacities that are potentially available however the proportion of that capacity that can be used exclusively by the Scheme will be confirmed as part of the RSA process.

Contaminated soil

- 13.4.14 Chapter 12 - Geology, Soils and Hydrogeology (Document Reference: 6.1.12) details the findings of the Ground Investigation and potential for contaminated soils to be produced during excavation works. All contaminated soils will need to be handled and treated appropriately in line with the requirements and processes set out in Chapter 12 Geology, Soils and Hydrogeology (Document Reference: 6.1.12).

Dredgings

- 13.4.15 Chapter 16 - Surface Water Quality and Flood Risk (Document Reference: 6.1.16) considers potential pollution from dredging activities associated with the proposed jetty and discusses any contamination of dredged material. Although sediment test results show a few samples could potentially be classified as hazardous waste, dredgings from the construction of the proposed jetty are considered to be non hazardous due to the nature of the dredging process. Dredgings will be tested prior to disposal to confirm waste classification.

Future baseline

- 13.4.16 The projected waste arisings (including CD&E waste) for Greater London during the construction period of the Scheme are presented in Table 13-10.

Table 13-10 Projected CD&E waste arisings for Greater London (tonnes)

2019	2020	2021	2022
10,818,000	10,512,000	10,567,000	10,609,000

Source: Future Waste Arisings in London 201-2031: A summary Note (Ref 13-24).

- 13.4.17 A total of 42,506,000 tonnes of CD&E waste are predicted to be produced within the study area during the Scheme's construction period. This represents 55% of capacity over the same period.

Construction material resources and waste forecasts

- 13.4.18 This section summarises the anticipated material resource, use of the Scheme and the anticipated waste arisings generated by the Scheme during the CD&E and operational phases, based on design information

and professional judgement. The residual effects of such use and generation (incorporating proposed mitigation) are assessed in section 13.6.

- 13.4.19 The choice of material resources and opportunities for waste reduction have been considered during the Reference Design phase, and will be considered further during the detailed design phase of the Scheme. The waste hierarchy illustrates that implementing waste minimisation at the reference and detailed design phases are the most effective options for reducing waste.

Material resources

- 13.4.20 CD&E material resources required for the Scheme would largely consist of imported fill, pavement, concrete and steel. Although the reuse of materials within the site will be maximised, raw materials will still be needed for the construction works.
- 13.4.21 Aggregates will be required for earthworks, structures, drainage and road pavement construction. These can be either primary aggregates, such as sand, natural gravels and rocks; secondary aggregates such as incinerator bottom ash aggregate and reclaimed railway ballast; or recycled aggregates, such as recycled concrete and recycled road planings.
- 13.4.22 The extraction of primary aggregates (e.g. sands and gravels) and lime from quarries will deplete finite material resources. Secondary (or recycled) aggregates may not always have the lowest impact on the environment and material resources will be selected based on a consideration of all relevant impacts. The choice of whether to use primary or secondary aggregates (or a combination of both) will be made taking into consideration a combination of factors including the source of material resources, specification, production and transport. These factors will inform the use of secondary or recycled aggregates over primary aggregates having regard to the environmental impact.
- 13.4.23 Using the Reference Design information and professional judgement, the material resources likely to be needed for the construction phase of the Scheme have been forecast. These forecasts are likely to be refined and subject to change as the Scheme design progresses. For that reason, the forecasts have been made on a reasonable worst case scenario basis.

13.4.24 The key material resources presented in Table 13-12 are the estimated quantities required for the construction phase of the Scheme. The information is taken from the description of the principal materials envisaged in Appendix 4.A – CMS of the ES (Document Reference: 6.3.4.1). A more detailed breakdown of the material quantities envisaged in the CMS is provided in Table 13-11 for the purposes of this carbon assessment.

Table 13-11 Estimated key material resources to be used in the construction phase of the Scheme

Material resources	Total (tonnes)
Concrete materials	398,000
Fill materials including granular fill	172,000
Tunnel segments	80,000
Highway / pavement material	30,000
Steel (Reinforcement & Structural)	17,000
Miscellaneous, highway concrete inc. kerbs	1000

Source: Construction Method Statement (Document Reference: 6.3.4.1)

13.4.25 The estimated quantities detailed in Table 13-11 do not account for any other minor construction activities associated with the Scheme such as cabling.

Embodied carbon

13.4.26 The embodied carbon contained within the key material resources has been calculated using the Highways England's Carbon Calculation for Major Projects (CCMP) (Ref 13-27). This has provided a figure of approximately 85,188 tonnes of CO₂e.

13.4.27 Table 13-12 details the embodied carbon contained within the material resources presented in Table 13-11.

Table 13-12 Estimated embodied carbon contained within the key material resources

Material	Tonnes CO2e
Concrete materials	42,586
Fill materials including granular fill	894
Tunnel segments	10,880
Highway / pavement material	3,810
Steel (Reinforcement & Structural)	23,800
Miscellaneous, highway concrete inc. kerbs	107
Total	82,077

13.4.28 Table 13-13 summarises the material resources use during the CD&E phases of the Scheme, following the requirements of IAN 153/11 (Ref 13-3).

Table 13-13 Summary of material resource use

Scheme activity	Material resources required for the Scheme	Estimated quantities of material resources required (tonnes)	Additional information on material resources
Site preparation earthworks	Aggregates will be required for earthworks, structures, drainage and road pavement construction.	171,639	Cut-and-cover balancing will be optimised in order to maximise the reuse of excavated materials for infilling and landscaping and a CMMP (Materials Management Plan) secured through the CoCP (Document Reference 6.10), will be produced to support the optimal reuse of site-won materials (e.g. soils) on the Scheme.
Demolition	N/A	N/A	N/A

Scheme activity	Material resources required for the Scheme	Estimated quantities of material resources required (tonnes)	Additional information on material resources
Construction	Pavement, concrete, aggregate, steel and grout.	526,191	The choice of whether to use primary or secondary aggregates (or a combination of both) will be made taken into consideration, a combination of factors including material resources source, specification, production and transport. These factors will inform the use of secondary or recycled aggregates over primary aggregates having regard to their environmental impact.

Waste

- 13.4.29 The waste arisings forecast from the construction and excavation phases, shown in Table 13-15, include arisings from the demolition, central reserve and verge works, tunnel boring, excavation, signs, lighting, communications, resurfacing and office compounds. These forecasts will be reviewed as the Scheme design progresses.
- 13.4.30 It is anticipated that the Scheme will produce a total of approximately 1,175,000 tonnes of CD&E waste, approximately 130,850 tonnes of which will be classed as inert materials.
- 13.4.31 Table 13-14 summarises the wastes forecast during construction, demolition and excavation activities (including temporary works associated with the proposed jetty to be used for the transport of waste and materials).

Table 13-14 Summary of key CD&E waste arisings

Waste	Estimated Quantities (tonnes)
Bricks	9,444
Mixed waste	24
Wood	255
Gypsum	330
Metals	12,914
Glass	30
Concrete	44,904
Mix concrete, bricks and tiles	5,293
Hazardous demolition waste	524
Inert soils and stones	56,319
Grout	1,274
Soils and stones containing dangerous substances* ⁴	194,965
Bitumous mixtures	508
Packaging	126
Plastic	52
Topsoil (non hazardous)	740,005
Other segregated C&D waste	13,584
Dredgings	94,500
Total	1,175,052

13.4.32 Table 13-15 describes a summary of CD&E waste arisings forecast following the requirements of IAN 153/11 (Ref 13-2).

⁴ Hazardous waste

Table 13-15 Summary of CD&E waste arisings from the Scheme

Scheme activity	Waste arisings from the Scheme	Quantities of waste arisings (tonnes)	Additional information on waste
Site preparation earthworks	Topsoil	56,319	Cut-and-cover balancing will be optimised in order to maximise the reuse of excavated materials for infilling and landscaping and a CMMP will be produced to support the optimal reuse of site-won materials (e.g. soils) on the Scheme. The preference for any materials that cannot be reused on site will be for beneficial use off site.
	Contaminated soils	194,965	
	Excavated natural soils from tunnel bores and cut-and-cover.	740,005	
Demolition	Concrete	38,133	Some demolition materials will be retained / reused onsite (e.g. elements of the drainage are going to be retained and utilised within the current design). Metals and gypsum will be sent off site for recycling as detailed in the SWMP. Hazardous waste will be sent to a suitably permitted waste facility for disposal.
	Metals	12,024	
	Concrete, bricks etc. from existing structures and drainage	14,499	
	Hazardous waste	524	
	Gypsum	318	
	Wood	192	
	Glass	29	
	Construction	Sub base and imported fill	
Concrete	6,613		
Bricks and tiles	220		
Grout	1,274		
Metals	856		
Bitumous mixtures	508		
Packaging	126		
Plastic	52		
Gypsum	12		

Scheme activity	Waste arisings from the Scheme	Quantities of waste arisings (tonnes)	Additional information on waste
	Wood	17	
	Mixed C&D Waste	24	
	Glass	1	
Temporary works	Dredgings	94,500	All wastes will be segregated to facilitate off site reuse and recycling as detailed in the SWMP.
	Concrete	176	
	Iron and steel	34	Metals will be sent off site for recycling as detailed in the SWMP.
	Wood	46	
	Packaging	0.42	
			Wood will be sent off site for recycling as detailed in the SWMP.

Transport of material resources and waste

- 13.4.33 Both the Silvertown and Greenwich worksites will require material resources and will produce waste. As such, the impacts relating to the movement of material resources and waste on the affected transport infrastructure for have been assessed together.
- 13.4.34 The removal of material resources and waste would be made by either river or road from both the Silvertown and Greenwich worksites. The strategic objective as set out in the CoCP is to maximise the proportion of materials and waste transported to and from the sites by river transport.
- 13.4.35 It is considered that there are four principal categories of materials/wastes suitable for river transport: excavated spoil, dredged spoil, concrete materials and fill materials however, not all of the material/waste in each category is suitable. For example excavated spoil with high moisture content may not be suitable for transport by river, or those not meeting the chemical criteria/ acceptance at a designated facility and therefore may need to be transported by road to a facility able to take it. Other reasons for unsuitability of the transport

of materials include small loads, nature of the material, point of loading, accessibility, etc.

13.4.36 The proposed river transport commitments as set out in the CoCP are:

- 100% of suitable excavated material to be transported by river; and
- 50% of all CD&E materials (by weight) associated with the Scheme to be transported by river.

13.4.37 Table 13-16 shows the approximate total number of lorry movements by works element and site, assuming 50% river transport trips.

Table 13-16 Approximate material resource and waste lorry and van movements over the four year construction period (with 50% river transport trips)

Works element	Silvertown (northern) site lorry movements	Greenwich (southern) site lorry movements
Site buildings	852	4,740
Cut-and-Cover Tunnel	22,720	33,180
Bored Tunnel	25,000	-
Highways	4,828	9,480
Mechanical & Electrical	1,000	1,000
Landscaping	800	800
Site Establishment	2,000	1,000
TBM Delivery/Removal	800	-
Van deliveries	50,000	25,000
Short haul HGV trips	-	15,500
Total	108,000	90,700

13.4.38 The conveyor system in the chamber at the Greenwich site (once operational) will be utilised as far as possible to transfer TBM arisings from Greenwich through to Silvertown for disposal using the river logistics solution, once the Tunnel Boring Machine has started on the second drive.

13.4.39 Calculations for road transportation have been based on lorry movements. Further to the river transport commitments, the total number of lorry movements per day required for both the Silvertown

and Greenwich sites is expected to have a negligible effect on the capacity on the highways network as detailed in the Transport Assessment. As such the highways network has been assessed to have a low sensitivity.

- 13.4.40 A Transport Assessment (Document Reference: 6.5) detailing these matters has been prepared as a standalone document and an assessment of the Effects on All Travellers of the Scheme are presented in Chapter 11 of this Environmental Statement (Document Reference: 6.1.11).

13.5 Scheme design and mitigation

Construction mitigation

- 13.5.1 Measures would be implemented to reduce the impacts of material resources use and waste arising from the Scheme.

- 13.5.2 A CoCP (Document Reference: 6.10) has been submitted with the DCO application. The CoCP requires the contractors to:

- promote opportunities for the potential reusing and recycling of all material resources and waste;
- sort and segregate waste into different waste streams (where technically and economically feasible); and
- manage material use to maximise the environmental and Scheme benefits from the use of surplus materials.

- 13.5.3 The CoCP mandates several subsidiary management plans, which form part of the suite of mitigation measures of particular relevance to materials and waste. These include:

- The SWMP which once finalised during detailed design, will be used to record how waste will be reduced, reused, recycled and disposed of by the Scheme;
- The Construction Materials Management Plan which will help to ensure that excavated materials are handled and used in a way that prevents harm to human health and pollution of the environment;
- Receptor Site Assessment which will be used to develop a list of receptor sites for excavated materials; and

- CD&E Materials Commitments which defines TfL's overall vision, aims and commitments for the management of CD&E materials on the Scheme and the proposed measures which will be taken to record and track progress towards achieving these commitments.

Commitments

- 13.5.4 A sustainable design review workshop was held with TfL on 18 June 2015 for the Scheme. The feasibility of setting up targets relevant to material resources and waste were discussed at the workshop and explored further during the PEIR consultation. Following consultation, the targets and commitments below are set up for the Scheme:
- 50% of all CD&E materials and wastes by weight to be transported by river as described in the CoCP;
 - 100% of all suitable excavated material be transported by river;
 - diversion of 80% (by weight) of CD&E materials to schemes where the material can be used for beneficial use;
 - where specification allows, a portion of construction materials to include a reused and recycled content 10% recycled content (by value) in construction materials;
 - use of primary aggregates will be minimised by the selection of secondary materials, where possible;
 - materials specified will have low embodied carbon; and
 - A score of Very Good and ideally Excellent using CEEQUAL, adherence to materials and waste elements.
- 13.5.5 There is an aspiration of 95% (by weight) for recycling, reuse or beneficial use of the Scheme's CD&E materials (where possible and/or technically feasible).
- 13.5.6 The design will continue to apply the five key principles of waste minimisation (Design for: Reuse and Recovery, Off Site Construction, Materials Optimisation, Waste Efficient Procurement and Deconstruction and Flexibility) as detailed in the CoCP in future design phases to support the use of materials in a more efficient manner and to consider how reuse, recycling and recovery of materials can be incorporated into the design and ultimately reduce waste to landfill.

- 13.5.7 Some of the key aspects of waste minimisation that will be considered during future design phases are:
- designing for site conditions: the design will accommodate strategies to manage particular constraints (e.g. contaminated land) which may impact on waste;
 - design complexity: reduce the complexity of the design to standardise the construction process and reduce the quantity of materials required; and
 - specifications: avoid over specification and minimise variation in materials, components and joints; evaluate the reuse and recycling opportunities for the specified materials before specification.

- 13.5.8 The Contractor would register with the Considerate Constructors Scheme.

Material resources

- 13.5.9 The CoCP (Document Reference: 6.10) contains the measures the contractor will implement during construction including those detailed below.
- 13.5.10 The key Scheme sustainability targets will be embedded within all relevant procurement documentation, along with the methodology for monitoring and reporting.
- 13.5.11 Contractors will be encouraged to apply good practice to source construction materials from suppliers with responsible sourcing certification (as far as practicable).
- 13.5.12 Contractors will be encouraged to follow The Mayor of London's Green Procurement Guide.
- 13.5.13 All timber products used will be obtained from sustainable sources. In line with TfL commitments, all timber procured will be obtained from recycled, reclaimed sources or be accredited to meet sustainable forestry standard such as the Forestry Stewardship Council (FSC). Any remaining timber not sourced through the above will target a known temperate source using the Department for Environmental, Food and Rural Affairs (Defra) central point of expertise in timber (CPET).

- 13.5.14 The depletion of finite material resources will occur through extraction of primary aggregates (e.g. sands and gravels). Structures, drainage and signage products will be procured with consideration of the environmental impacts associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long-life performance, visual impacts, durability and cost.
- 13.5.15 The procurement process shall ensure that materials are ordered so that the timing of the delivery (e.g. 'just in time' deliveries), the quantity delivered and the storage are optimised to reduce opportunity for oversupply and damage on site. A logistics hub will be considered to consolidate loads and reduce movements to site.
- 13.5.16 It is anticipated that, wherever possible and where specification allows, construction materials will include a measurable recycled content in their manufacture.
- 13.5.17 Materials will be ordered, where possible, in sizes to prevent wastage e.g. in the form of off cuts and waste to be able to be returned to the original supplier e.g. plastic pipe.
- 13.5.18 Materials will be stored to minimise the potential of damage or wastage. Measures will include off-ground storage e.g. on pallets, remaining in original packaging, protection from rain or collision by plant or vehicles. The materials storage area will be secured during out of hours to prevent unauthorised access.
- 13.5.19 Consideration of the durability of the materials to be utilised by the Scheme (considering the 120 year design life of the tunnel) will be provided at a detailed design stage.
- 13.5.20 Scheme gantries will be manufactured off-site reducing on-site activities and installation time.
- 13.5.21 Wherever possible, standardisation of materials and building elements will be incorporated into the Scheme design in order to minimise required material resources and the production of waste. For example, the use of prefabricated components.
- 13.5.22 Where possible, consideration will be given to the reuse of material (e.g. uncontaminated soils) back into the project as set out in the CoCP. However, the proposed Scheme will require specific materials to be imported to the site (e.g. additional bulk fill materials). Some demolition materials will be retained / reused onsite (e.g. elements of

the drainage will be retained and utilised within the current design where feasible). Maximisation of reuse of site-won materials will be secured through the development and implementation of a CMMP.

- 13.5.23 Local sources for aggregate supplies should be considered whenever possible as set out in the CD&E Commitments.
- 13.5.24 Agreements will be explored with suppliers to reduce the amount of packaging used to protect materials or to participate in a packaging take back scheme.

Waste

- 13.5.25 The CoCP (Document Reference: 6.10) contains the measures the contractor will implement during construction including those detailed below.
- 13.5.26 Excavated material will be targeted for fill and landscaping where this is feasible and the material is suitable. Excavated materials, such as soils, will be carefully stored in segregated piles for subsequent reuse on the site, where possible. If the material is contaminated then it will be kept separate from clean material and sent for either treatment, recycling or recovery, where appropriate, or disposal at appropriately permitted facilities.
- 13.5.27 Surplus inert excavated materials (e.g. soils, stone, bricks, clay, rubble, rock) may be suitable for use in land reclamation projects. This would require compliance with the criteria and thresholds for an exemption or a permit under the Environmental Permitting Regulations 2010 (as amended) (Ref 13-8). The CL:AIRE DoWCoP (Ref 13-15) may also be applicable for the reuse of this material.
- 13.5.28 As with other similar construction projects, where possible, excavated and tunnel boring materials will be sent for beneficial use at a suitable receptor site. The volume of spoil that could be transported by river will depend on the suitability and condition of the excavated material for transport by river and against any waste acceptance criteria/procedures that may be applicable at the receiving facility.
- 13.5.29 The historical use of the area on the Greenwich Peninsula and Silvertown has a legacy of contamination of the Made Ground and River Terrace Gravels that are likely to necessitate treatment to make the materials suitable for reuse off site. This treatment can be undertaken either onsite, potentially reducing its waste classification

(i.e. hazardous to non-hazardous) or removed from site for treatment. The alternative is disposal at a suitable location (i.e. landfill).

- 13.5.30 Materials unsuitable for use on site (e.g. timber off cuts that cannot be used on site) will be collected in receptacles for subsequent separation and considered for recycling at an off-site facility.

Vegetation

- 13.5.31 In order for construction to take place, areas of vegetation, comprising mainly of grass and shrubs will require clearance. This will be managed in accordance with the CoCP. As a minimum all vegetation waste should be diverted from landfill, unless identified as an invasive species and no other options are available. The greatest opportunity for the sustainable management of vegetation waste is through recycling into compost.
- 13.5.32 Waste generated by the clearance of Japanese knotweed from site will be segregated from all other wastes and managed in accordance with the Environment Agency's Code of Practice (Ref 13-28).
- 13.5.33 Any material produced by the enabling works (e.g. good quality topsoil) deemed acceptable, will be stored and re-laid within the project whenever possible in accordance with the CoCP.

Hazardous waste

- 13.5.34 Hazardous wastes, including any contaminated soil will be identified, removed and kept separate from other CD&E wastes as detailed in the CoCP, in order to avoid contaminating 'clean' materials.
- 13.5.35 Asbestos based materials and other contaminants may arise during the excavation for tunnels and portals, especially in areas of previously high industrial use and the historic gas works. Any asbestos encountered on site will be managed by a qualified asbestos removal contractor. All asbestos will be removed off site in accordance with legislation and disposed of at a suitable permitted landfill by a licensed contractor in accordance with all appropriate regulations.

Site practices

- 13.5.36 The Scheme would have a Waste Manager or Champion who would oversee the implementation of the waste control strategy and the handling of any waste material, as set out in the CoCP. The Contractor

will consider setting off-cut/surplus targets for sub-contractors with a positive incentive scheme for on-site waste champions.

- 13.5.37 A waste management compound will be established within the Silvertown (north) site to handle incoming waste from construction activities as set out in the CoCP. This will be designed to facilitate the segregation of key waste streams to maximise the opportunity to reuse, recycle and return wastes generated on site.
- 13.5.38 An area will be established for spoil classification at the Silvertown (north) site with a smaller area at the Greenwich (south) site, as detailed in the CoCP. TBM generated material is envisaged to be transported to the Silvertown (north) area via the spoil conveyor from the TBM launch chamber. Spoil will be inspected, tested (as necessary) and assessed as suitable for removal or remediation prior to removal from site. Material in this area will be stockpiled by type and disposal method.
- 13.5.39 Construction and demolition work will be carried out closely with the waste management contractors, in order to determine the best techniques for managing waste and ensure a high level of recovery of materials for recycling.
- 13.5.40 A specific area will be laid out and labelled within the waste management compound to facilitate the separation of materials, where possible, for potential recycling, salvage, reuse and return as detailed in the CoCP. Recycling and waste bins/skips are to be kept clean and will be clearly marked/colour coded in order to avoid contamination of materials. The following waste streams have been identified for segregation:
- mixed inert (e.g. concrete and rubble);
 - hazardous (e.g. asbestos, polychlorinated biphenyls (PCBs));
 - mixed non-hazardous (biodegradable waste, welfare waste, general waste);
 - metal (e.g. copper and iron);
 - wood (e.g. fencing/hoarding);
 - food (canteen waste);
 - paper and cardboard (office waste);

- Waste Electronic and Electrical Equipment (WEEE) (e.g. cables, disused electrical appliances and equipment); and
- Oils and oily rags.

- 13.5.41 All transport of waste from site will be in accordance with relevant waste legislation as set out in the SWMP.
- 13.5.42 Successful recycling relies upon early planning, clear responsibility and space within a compound for segregation and storage. Shelter will be provided to prevent materials such as cardboard and paper from deteriorating while being sorted or awaiting collection. Space will be provided to accommodate skips and the storage of reusable materials.
- 13.5.43 For all waste management options on the site compound, consideration will need to be given for identifying whether waste exemptions or permits are required to enable for the storage and treatment of waste materials.
- 13.5.44 Waste management options will be supported by the identification of appropriately permitted waste management and recycling facilities in close proximity to the site compound as set out within the SWMP.

Transport of material resources and waste

- 13.5.45 A Construction Traffic Management Plan will be implemented as required by the CoCP to minimise transport movements and a Passage Plan will be produced in consultation with the Port of London Authority to mitigate any effects on river capacity. The plan will be reviewed by the Logistics Manager at regular intervals to ensure relevance to ongoing activities and adjacent developments.

Operational material resources and waste forecasts.

- 13.5.46 It is estimated that 10,800 tonnes of waste will be produced over the 120 year operation of the Scheme. This will comprise mainly concrete, tarmac, silt, steel / metal and packaging wastes. Given the maintenance cycles required for the Scheme, the majority of wastes will be produced every 20 years. Approximately 1,800 tonnes of waste would be produced over the 20 years period.
- 13.5.47 It is anticipated that only minor quantities of operational waste will be produced during the lifetime of the Scheme, therefore no additional measures are envisaged to be put in place

13.5.48 The local infrastructure has the capacity for this waste (as demonstrated in sections 13.4.5-13.4.13 above). This waste will be managed in accordance with the waste hierarchy and applicable legislation.

13.6 Assessment of impacts

Construction impacts

Material resources

13.6.1 A quantitative assessment of estimated key material resources to be used by the Scheme (aggregates, concrete and steel) during the excavation and construction phases has been made against UK wide material production data, presented in Table 13-18.

Table 13-17 Key materials resource UK demand vs Scheme demand

Material resources	Annual UK demand 2013 (tonnes)	UK demand (duration of Scheme, based on 2013 figures) (tonnes)	Scheme demand (total) (tonnes)
Aggregates	200,000,000	8,000,000,000	172,000
Pavement	20,000,000	80,000,000	30,000
Concrete	52,000,000	208,000,000	398,000
Steel	10,700,000	42,800,000	17,000

13.6.2 The Scheme will, where possible, maximise the reuse of site-won materials and procure material resources with recycled content, where specification allows. The sensitivity of the UK supply of the key materials identified for the Scheme is assessed to be low as these materials are not scarce. The total embodied carbon for the key materials identified for the Scheme is 82,077 CO₂e. This is assessed to have a Major Adverse magnitude of impact as this is above 40,000 CO₂e (see Table 13-4). However, due to the plentiful supply and ready availability of these materials the significance of the effect is assessed to be **Slight Adverse**.

Waste

13.6.3 It is anticipated that the Scheme will produce an estimated total of 1,175,000 tonnes of CD&E waste, 890,800 tonnes of which will be

classed as inert/non hazardous soils and stones or non hazardous dredgings. 195,000 tonnes of contaminated soils (hazardous waste) will be produced.

- 13.6.4 The capacity of waste management infrastructure within the Greater London is estimated to be 77,732,000 tonnes (over the four year construction period 2019-2022). A worst case scenario would be all CD&E waste generated by the Scheme being sent for recycling or for disposal. In this scenario, the waste generated by the Scheme would be equal to 1.5% of the current baseline capacity.
- 13.6.5 The capacity of the waste management infrastructure within the study area for all waste arising from the Scheme is deemed adequate and this receptor is assessed as having low sensitivity. As the majority of waste generated by the Scheme will be predominantly segregated and sent for beneficial reuse or off site treatment, the magnitude of the impact is assessed to be Minor Adverse. The significance of the effect is assessed to be **Slight Adverse**.

Transport of material resources and waste

- 13.6.6 As established in the Transport Assessment (Document Reference: 6.5) the existing highways network and river have a high capacity to accommodate the increases in lorry and barge/ship movements associated with the transport of materials and waste, and as such have been assessed to have a low sensitivity. The magnitude of the impact on the highways network and river is assessed to be Minor Adverse due to the available capacity. Therefore the significance of effect is assessed to be **Slight Adverse**.

Operational impacts

- 13.6.7 It is anticipated that only minor quantities of waste (10,704 tonnes) will be produced during the lifetime of the Scheme and it has been assessed that the local waste infrastructure has the capacity for this. As such, it will have a Negligible Adverse impact. The significance of this effect is assessed to be a **Slight Adverse**.

13.7 Cumulative impacts

Construction cumulative impacts

- 13.7.1 The depletion of finite natural resources e.g. aggregate for construction will result from the Scheme and other developments. As identified

above, the sensitivity of the UK supply of key construction is assessed to be low as there is low scarcity of these materials. It is not possible to provide a quantitative assessment of the embodied carbon of the materials required for the Scheme plus other developments however, it is reasonable to assume that it will have a Major Adverse magnitude of impact in line with the assessment undertaken for the scheme alone. Therefore the qualitative assessment of the significance of this effect is **Moderate Adverse**.

- 13.7.2 The requirement to dispose of CD&E waste from the Scheme and other developments will result in a permanent reduction in waste infrastructure capacity within reasonable proximity of the Scheme.
- 13.7.3 A total of approximately 42,506,000 tonnes of waste are predicted to be produced within the study area over the duration of the construction of the Scheme (see Table 13-10) and an estimated 1,175,000 tonnes of waste by the Scheme. The combined total is 43,681,000 tonnes which represents 56% of current capacity within Greater London. There is adequate waste management infrastructure capacity for the waste arisings from the Scheme in conjunction with predicted CD&E waste arisings, therefore this is assessed to be of low sensitivity. The magnitude of the impact is assessed to be Moderate Adverse as it is assumed that all consented schemes within the study area will be required to meet the requirements of relevant legislation and local policies (e.g. London Plan). This will include adherence to the waste hierarchy and a target of at least 70% recovery of wastes generated (as per the Waste Framework Directive Ref 13-1). As such it is assumed that waste arisings from consented schemes will be segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility. The assessment of the significance of this effect is **Slight Adverse**.
- 13.7.4 Transport of material resources and waste cumulative impacts
- 13.7.5 As detailed in Chapter 11 Effects on All Travellers (Document Reference: 6.1.11) the increase in traffic during the construction of the Scheme is assessed to have a **Negligible Adverse** impact on all travellers (and therefore the network). The significance of this effect is assessed to be **Slight Adverse**.

Operational Cumulative Impacts

- 13.7.6 It is assumed that all consented schemes within the study area will be required to meet the requirements of relevant legislation and local policies (e.g. London Plan). This will include adherence to the waste hierarchy and a target of at least 70% recovery of wastes generated (as per the Waste Framework Directive Ref 13-1). As such it is assumed that waste arisings from consented schemes will be segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility. As such this impact is assessed as having a Minor Adverse impact. The significance of this effect is assessed to be a **Slight Adverse**.

13.8 Further work to be done

- 13.8.1 The Receptor Site Assessment (for Excavated Materials) will be completed to provide a detailed list of potential receptor sites after the DCO submission but prior to construction and appointment of contractors.

13.9 NN NPS compliance

- 13.9.1 The NN NPS requires the Scheme to minimise the volume of waste produced and to implement sustainable waste management through the application of the waste hierarchy. The Scheme will apply the waste hierarchy in order to move waste management practices as far up the hierarchy as practicable, minimising disposal and maximising reuse and recycling.
- 13.9.2 NN NPS states that the Secretary of State should set out the arrangements that are proposed for managing any waste produced:
- 13.9.3 ‘The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental outcome.’
- 13.9.4 This chapter presents a forecast of the waste likely to arise from the Scheme and assesses the quantity of waste likely to arise from the Scheme against the capacity of the study area’s waste management facilities.

- 13.9.5 The chapter also presents an assessment of embodied carbon for materials to be used in the Scheme.
- 13.9.6 The delivery of the mitigation measures set out in the mitigation section of this chapter will support adherence to the requirements of the NN NPS by minimising the volume of waste produced and the volume of waste sent for disposal. Mitigation measures for embodied carbon are discussed in the Energy and Carbon Strategy (Document Reference: 6.7).
- 13.9.7 Mitigation measures for embodied carbon have also been considered and incorporated in the commitment to use specified materials with low embodied carbon as set out in the CoCP.
- 13.9.8 In accordance with the requirements of the NN NPS, all material resources used and waste arisings from the Scheme would be managed onsite and offsite in accordance the CoCP, SWMP, CMMP and Construction Traffic Management Plan.

13.10 Summary

- 13.10.1 A tabular summary of the significance of overall effects is provided in Table 13-18.

Table 13-18 Material resources and waste summary table

Impact description	Temporary/ Permanent	Significance of residual effect
Construction		
Depletion of finite material resources e.g. aggregate for construction.	Permanent	Slight Adverse
Depletion of availability of the waste management infrastructure capacity with the study area.	Temporary	Slight Adverse
Transportation of material resources to site.	Permanent	Slight Adverse
Transportation of CD&E waste offsite.	Permanent	Slight Adverse
Depletion of finite material resources e.g. aggregate for construction.	Cumulative	Moderate Adverse

Impact description	Temporary/ Permanent	Significance of residual effect
Construction		
Depletion of availability of the waste management infrastructure capacity with the study area.	Cumulative	Slight Adverse
Operation		
Waste from operational activities	Permanent	Slight Adverse
Waste from cumulative operational activities	Cumulative	Slight Adverse

References

- Ref 13-1 Waste Framework Directive, Directive 2008/98/EC European Waste Framework Directive [2008] OJ L 312/3.
- Ref 13-2 Design Manual for Roads and Bridges ('DMRB') Volume 11, Highways England, August 2009.
- Ref 13-3 Interim Advice Note ('IAN') 153/11 (Guidance on the Environmental Assessment of Materials Resources), Highways England, 2011.
- Ref 13-4 National Policy Statement for National Networks (NN NPS), Department for Transport, 2014.
- Ref 13-5 EU Landfill Directive, Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste [1999] OJ L 182/1.
- Ref 13-6 2003/33/EC: Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
- Ref 13-7 Clean Neighbourhoods and Environment Act 2005, c.16.
- Ref 13-8 Environmental Permitting (England and Wales) Regulations 2010. SI 675.
- Ref 13-9 Hazardous Waste (England and Wales) Regulations 2009, SI 507.
- Ref 13-10 Waste (England and Wales) Regulations 2011, SI 988.
- Ref 13-11 Waste (England and Wales) (Amendment) Regulations 2012, SI 1889.
- Ref 13-12 National Planning Policy for Waste, Department for Communities and Local Government, 2014.
- Ref 13-13 Waste Management Plan for England, DEFRA, 2013.
- Ref 13-14 National Planning Policy Framework, Department of Communities and Local Government, 2012.
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