The London Resort Development Consent Order

BC080001

Environmental Statement
Volume 2: Appendices

Appendix 19.2 – Outline Construction Waste Management Plan (OCWMP)

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Planning Act 2008
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 12(1)

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Revisions

Revision	Description	Issued by	Date	Approved by
00	Outline Construction Waste Management Plan	HL/AC	24/12/2020	BUR/LRCH

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Executive Summary

The London Resort (henceforth referred to as the Proposed Development) is founded on sustainable and low-carbon principles and is aiming to be one of the most sustainable entertainment resorts in the world. In line with this aspiration, a considered Outline Construction Waste Management Strategy (OCWMS) (Appendix 19.2, this document) has been developed that supports this aim. This report provides an overview of the management and estimations of Construction, Demolition and Excavation (CDE) waste from the Proposed Development. The OCWMS further lays out measures and innovations to incorporate the Circular Economy approach to minimise environmental impact of materials and waste.
The Proposed Development is expected to generate 1,851,500 tonnes of CDE waste before mitigation measures. This consists of 77,200 tonnes from demolition; 1,700,000 tonnes from excavation; 74,300 tonnes from construction.

Approximately 40% of excavation waste is expected to be suitable for re-use on site, leaving 1,020,000 tonnes remaining to be otherwise disposed of. Of total demolition waste, approximately 90% is expected to be suitable for recycling or reclaiming, leaving approximately 7,700 tonnes of waste to be disposed of. To reduce waste generation and material demand at source, a number of design measures are outlined in this report such as off-site fabrication, reuse of excavation material and design for flexible use. If these design measures are implemented, it is expected that construction waste can reduce by approximately 19%, to 60,200 tonnes.

Furthermore, on-site waste segregation and recycling measure can maximise diversion (from landfill/recovery) of remaining material. If a best practice approach is taken, construction waste could potentially reduce to 5,800 tonnes of residual waste, with the rest diverted through recycling and reuse.

In conclusion, this is a live document which should be continually updated as design progresses. This document should be utilised by contractors during the construction phase to implement measures effectively to minimise environmental, social and economic impacts of waste production and material demand.

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Contents

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List of Tables

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List of Figures

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Glossary

Term	Definition
BRE	Building Research Establishment
CD&E	Construction, Demolition and Excavation
EWC	European Waste Catalogue
GFA	Gross Internal Floor Area
KPI	Key Performance Indicator
WRAP	Waste and Resources Action Programme

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1 Introduction

This document forms part of the DCO application for the London Resort (Proposed Development). It aims to ensure that construction and demolition (C&D) waste from the Proposed Development is minimised and handled in an environmentally sustainable manner. To align with good environmental practice and sustainability aspirations of the Proposed Development, it is advised that the recommendations included in this document are adopted, even though this is not a legal requirement.

This report sets out an Outline Construction Waste Management Plan (OCWMP) and a framework for the Proposed Development. The report documents actions taken to design out waste before construction begins and makes recommendations on how waste can be reduced at the construction stage. These recommendations will be further developed by the Principal Contractor and designated Waste Management Company over subsequent design and construction phases. The CWMP accords to the principles set out in the Construction Method Statement.

1.1 Purpose of document

The main aims of this OCWMP are to:

- Document any initial waste reduction recommendations and to provide information on how waste management initiatives will be implemented throughout the construction of the Proposed Development in order to minimise waste generation and increase the recovery of construction waste; and
- Enable the waste management recommendations within this report to be incorporated into a site-specific plan. The responsibility for further developing the OCWMP during construction will fall with the Principal Contractor, who should appoint a waste champion to ensure the commitments in the plan are met.

The following tasks have been completed to enable the production of this OCWMP:

- Estimation of baseline construction and demolition waste generation rates;
- Review of actions which have been or will be considered at design stage in order to design out waste;
- Review of actions which can be taken at construction stage to reduce waste generation and increase segregation; and
- Revised estimates of waste generation based on the waste minimisation actions.

Exemptions

- This report does not cover effects from transport, these effects will be assessed in the Land and River Transport ES chapters (Chapter 9 and 10)
- This report does not include wastewater effects, this will be assessed in the Water Resources and Flood Risk chapter (17)

1.2 Duty of care

The Principal Contractor will take reasonable steps to ensure that all waste from the Project Site is dealt with in accordance with the Environmental Protection (Duty of Care) Regulations (1991). In line with this, all site materials will be handled efficiently to minimise wastage and all waste arisings from the Project Site (see Figure 1.1) will be managed appropriately. The responsible management of waste is reiterated in the Contaminated Land Management Strategy, specifically regarding excavation arisings. The Principal Contractor will also ensure a registered waste carrier is used to convey any waste material off-site to a suitably permitted facility.

1.3 Project Description

The Resort will be a nationally significant visitor attraction and leisure resort, built largely on brownfield land at Swanscombe Peninsula in Kent on the south bank of the River Thames and with supporting transport and visitor reception facilities on the northern side of the river in Essex. A detailed description of the Proposed Development is provided in chapter three of the Project ES. The focus of the Resort will be a 'Leisure Core' containing a range of events spaces, themed rides and attractions, entertainment venues, theatres and cinemas, developed in landscaped settings in two phases known as Gate One and Gate Two ('the Gates'). Outside the Gates will be a range of ancillary retail, dining and entertainment facilities in an area known as the Market. The Resort will also include hotels, a water park connected to one of the hotels, a conference and convention centre known as a 'conferention centre', a Coliseum (capable of hosting e-Sports events), creative spaces, a transport interchange including car parking, 'back of house' service buildings, an energy centre, a wastewater treatment works and utilities required to operate the Resort. Related housing is also proposed to accommodate some of the Resort's employees. Substantial improvements are proposed to transport infrastructure. This will include a new direct road connection from the A2(T) and a dedicated transport link between Ebbsfleet International Station, the Resort and a passenger ferry terminal beyond. The ferry terminal would serve visitors arriving by ferry on the River Thames from central London and Tilbury. A coach station is also proposed. On the northern side of the Thames to the east of the Port of Tilbury, additional coach and car parking and a passenger ferry terminal are proposed to serve the Resort. The Proposed Development would involve an extensive restoration of land used in the past for mineral extraction, waste disposal and industrial activities including cement and paper production, with a comprehensive landscape strategy proposed incorporating the retention and enhancement of wildlife habitats.

Figure 1-1 DCO Order Limits for the Proposed Development

1.4 Waste Management Policies and Guidance

A number of national and local policies and frameworks set out specific targets and objectives for construction, demolition and excavation waste and mineral management. Table 1-1 shows key legislation, policy and best practice guidance to the Proposed Development in relation to construction, demolition and excavation waste. All relevant policies can be found in more detail in the Waste and Materials ES chapter (19).

Table 1-1 National and local policies on CD&E waste relevant for the Proposed Development

National Policies	• National Policy Statements • National Planning Policy Framework 2019, Ministry of Housing, Communities and Local Government, 2019 • National Planning Policy for Waste, Department for Environment, Food and Rural Affairs, 2014 • Government Review of Waste Policy, Department for Environment, Food and Rural Affairs, 2011 • Waste Management Plan for England, Department for Environment, Food and Rural Affairs, 2013 • WRAP Designing out Waste: a design team guide for civil engineering, 2010 • Directive 1999/31/EC on the landfill of waste (Landfill Directive) • Directive 2008/98/EC on Waste (Waste Framework Directive) • Our Waste, our resources: A Strategy for England, Department for Environment, Food and Rural Affairs, 2018 • Hazardous Waste Regulations (England and Wales) 2005 • Waste Duty of Care Regulations (England and Wales) 2005 • EU/UK Packaging and Packaging Waste Directive (94/62/EC)
Local Policies	• Kent Minerals and Waste Local Plan 2013 – 2030 • Kent Minerals and Waste Local Plan 2013 – 2030 (Early Partial Review) • Kent Minerals Sites Plan, 2018 • Kent Waste Disposal Strategy 2017 – 2035, Kent County Council • Local Development Framework: Core Strategy and Policies for Management of Development, Thurrock Council, 2015 • Thurrock Local Plan: Sustainability Appraisal Scoping Report, Thurrock Council, 2016

2 Waste types and quantities

One purpose of the OCWMP is to identify the types and quantities of waste that will be generated before or during the Proposed Development's construction phase. The expected site waste quantities are presented in this section. These have been determined based on the information available at the DCO pre-application stage.

It is important to note that further development of the design and construction methodology through subsequent stages may lead to construction waste implications that are not possible to identify at this stage.

2.1 Demolition

The construction works will commence with site clearance, including demolition of all existing buildings as well as the removal of paved areas. Demolition estimations were calculated based on a desk assessment including measurements of existing buildings and paved areas within the DCO Order Limits. A summary of the areas used for estimations is highlighted in groups illustrated in Figure 2-1. There is expected to be no further demolition in the remainder of the Kent Project Site, as well as at the Essex Project Site, so this has not been included. Demolition of all buildings within the red line boundary have been assessed, which can be considered as a high-level estimation of the worst-case scenario.

Figure 2-1 Existing buildings included in demolition estimations at the Kent Project Site

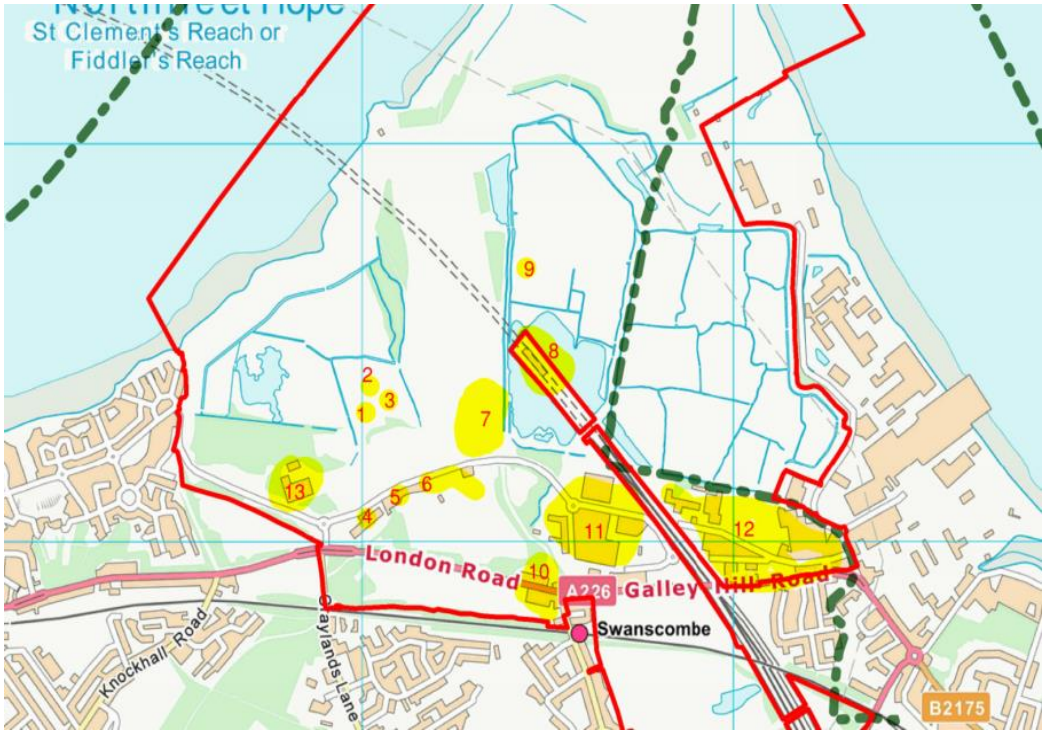


Table 2-1 shows total Gross Floor Areas (GFAs) measured as well as the tonnage of waste expected to be generated from buildings and paved areas. The total expected generation before mitigation is approximately 77,170 tonnes.

Table 2-1 Estimated waste generation from demolition activities of the Proposed Development

Land use	Total GFA (m^2)	Average generation rate (tonnes/100m^2)	Demolition waste generated (tonnes*)
General	78,217	24.4	19,090
Paved areas	238,050	24.4	58,080
Total	**316,267**		**77,170**

**Total has been rounded to nearest 10 tonnes*

2.1.1 Demolition waste composition

Table 2-2 shows the likely average composition of construction waste that will originate from the Proposed Development. The breakdown assumptions are based on the BRE report: *Developing a Strategic Approach to Construction Waste (2007).*

Table 2-2 Breakdown of estimated demolition waste

Material	Demolition waste (tonnes)*
Concrete	39,350
Masonry	6,110
Metals	570
Timber	760
Other	30,380
Total	**77,170**

**Figures have been rounded to the nearest 10 tonnes*

2.2 Excavation

Excavation generation quantities were provided from a preliminary earthwork cut and fill analysis from the Peninsula area. Total excavation from the Proposed Development before mitigation is expected to be approximately 1,700,000 tonnes (assuming a density of 1.6 tonnes/m3) and will include mix of Made Ground / fill materials and the natural geological strata (Alluvium and peat, Gravels, Thanet Sand and Chalk). An approximate breakdown grouped into waste categories, based professional judgement, is shown in Table 2-3. This is considering the uncertainties of existing ground conditions and contaminated land which is explained further in the Contaminated Land Management Strategy.

Table 2-3 Excavation waste breakdown

Waste type	Portion	Tonnage
Suitable for on-site reuse	40%	680,000
Inert	10%	170,000
Non-Hazardous	25%	425,000
Hazardous	25%	425,000

2.3 Construction

This section provides outline estimations of likely construction waste generation. It should be noted that the construction waste calculation excludes areas within Gate One and Gate Two. This is due to the level of detail within the DCO application that has been provided at this stage. The total construction waste generation figure is provided in Table 2-4. and has been estimated based on the following:

- The latest area schedule received from the masterplanners (01/09/20)
- Building Research Establishment (BRE) waste benchmarking data (2009-2012), published based on information obtained through the use of the SMARTWaste Plan1.

BRE Waste Benchmarking data provides some useful guidance on waste composition and the generation of waste expected during the Proposed Development's construction phase. Maximum GFAs have been used to provide an estimate of construction waste generation. These GFAs have been derived from the latest set of plans for the scheme (as of 01/09/20). It should be noted that the current Proposed Development may be subject to minor changes in future planning and design stages, although minor alterations to the area schedule are unlikely to result in significant changes to construction waste generation quantities.
Approximately 74,300 tonnes of construction waste is expected to be produced, if conventional construction waste management methods are followed. A breakdown of waste by land use type is shown in Table 2-4.

Table 2-4 Estimated construction waste generation

Land use	Total GFA (m^2)	Average generation rate (tonnes/100m^2)	Construction waste generated (tonnes*)
Residential	68,438	16.8	8,485
Commercial Office	24,490	23.8	4,162

[1] BRE, 2012. *SMARTWaste: BRE benchmark data*.

Land use	Total GFA (m^2)	Average generation rate (tonnes/100m^2)	Construction waste generated (tonnes*)
Commercial Retail	59,550	27.5	11,020
Commercial Other (Terminals, warehouse, staff canteens etc.)	425,376	7.0	29,404
Leisure (hotels. e-Sports, Conferention Centre, entertainment)	219,820	21.6	21,224
Total	**799,673**		**74,300**

**Total has been rounded to nearest 10 tonnes*

2.3.1 Construction waste composition

In addition to the total construction waste generated, information on waste composition is required to fully ascertain the impacts of construction waste and any opportunities for mitigation. Table 2-5 shows the likely average composition of construction waste that will originate from the Proposed Development, this is also illustrated in Figure 2-2. Construction waste is likely to contain significant quantities of re-usable and recyclable materials that can be segregated (i.e. soil, concrete, bricks), leading to a potential recycling rate of up to 100% for some (specified in Tables 3-1 and 5-3) even without consideration of design minimisation techniques.

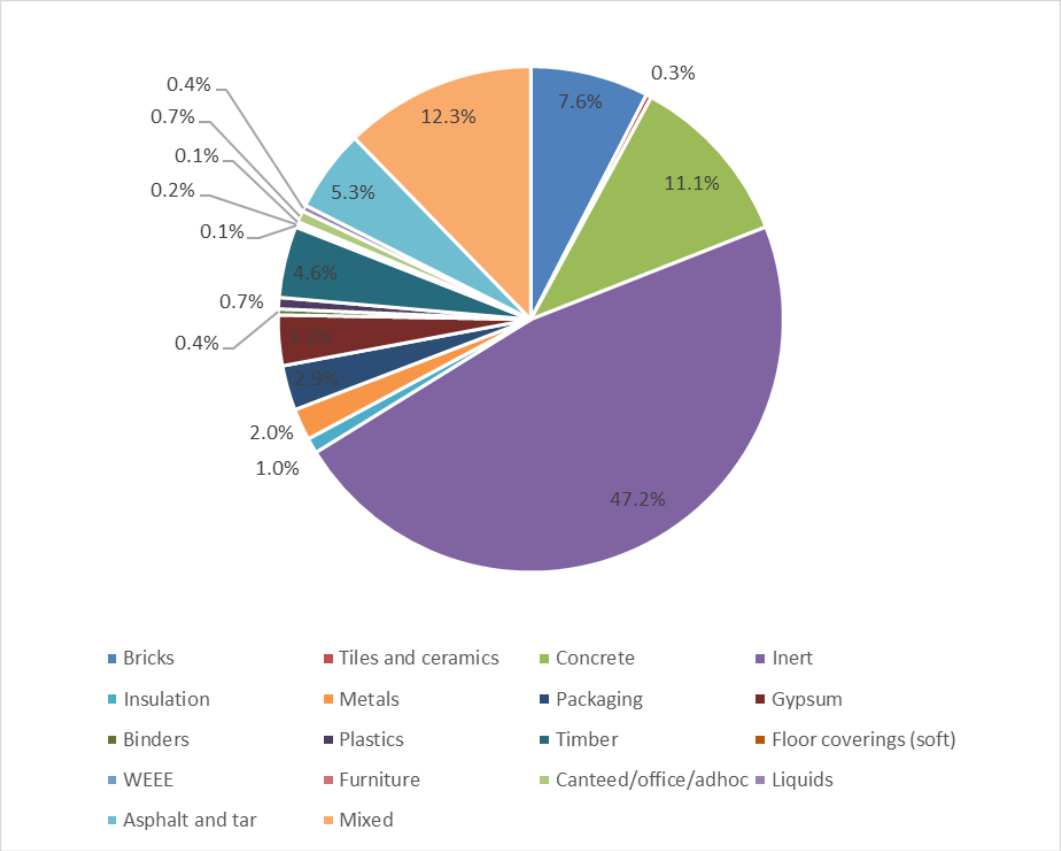
Table 2-5 Construction waste material breakdown

Material	Construction waste (tonnes)
Bricks	5,632
Tiles and ceramics	251
Concrete	8,260
Inert	35,031
Insulation	730
Metals	1,499
Packaging	2,135
Gypsum	2,394
Binders	281
Plastics	543
Timber	3,395
Floor coverings (soft)	72

WEEE	138
Furniture	55
Canteen/office/adhoc	542
Liquids	304
Oils	0
Asphalt and tar	3,909
Mixed	9,124
Total	**74,300**

**Total has been rounded to nearest 10 tonnes*

Figure 2-2 Construction waste material breakdown



2.4 Hazardous Waste

Approximately 2% of construction and demolition waste is expected to be hazardous, based on industry standards and BRE guidance. This results in approximately 3,030 tonnes of hazardous waste generated from construction and demolition stages before mitigation measures. Based on professional judgement, it is assumed that approximately 25% of excavation waste will be hazardous, this results in approximately 425,000 tonnes of hazardous excavation waste from the Proposed Development.

Hazardous waste will be managed by a specialist certified contractor. Waste classified as hazardous will be either processed on-site, or carefully transported off-site for treatment or

disposal. At all times the hazardous waste will be managed separately from other waste streams.

2.5 Summary

In total, it is estimated that 77,170 tonnes of demolition waste, 74,300 tonnes of construction waste and 1,700,000 tonnes of excavation waste will be generated from the Proposed Development. This waste will likely contain high proportions of easily excludable, re-usable and recyclable materials that could be diverted from landfill/other disposal. There is therefore potential to achieve a high construction recycling rate for the Proposed Development. Moreover, complete disposal of waste would result in a significant additional cost to the Proposed Development. This further justifies the need to reduce waste generation on-site and to maximise diversion techniques.

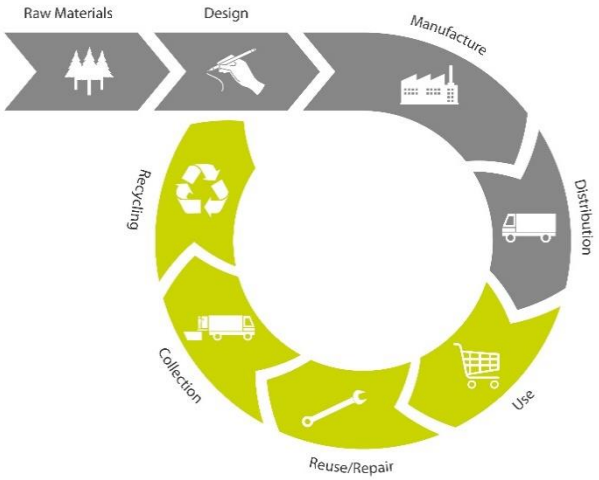
3 Waste reduction through a Circular Economy approach

3.1 Designing out waste

The Proposed Development will look to implement the waste hierarchy (see Figure 3-1) and circular approach (see Figure 3-2). In line with this, it will prioritise measures which look to reduce waste generation through the design process. Opportunities to design out waste have been (and will continue to be) investigated and integrated as the Proposed Development develops, with a number of potential options outlined in this section.

Figure 3-1 Illustration of waste hierarchy

Figure 3-2 Illustration of a circular economy



3.2 Measures considered by designers

The following design aspects will be considered by the building designers to design out waste:

- Where possible, elements of the Proposed Development will be fabricated and constructed off-site and/or modular construction on-site;
- The size and design of new building elements will be optimised in order to eliminate unnecessary elements and reduce off-cuts resulting from the construction process;
- The complexity of the design will be reduced, and the construction process standardised in order to reduce the quantity of materials required;
- Excavated material will be re-used on-site where possible;
- Consider matching design sizes to standard sizes of material supply in order to reduce off-cut waste. Specifically, brickwork and blockwork should be designed to reduce excess waste;
- Maintain high quality control standards and process monitoring to ensure rejected batches of material are kept to a minimum;
- Ensure flexibility in design for future building expansion, adaptation and dismantling; and
- Reduce the complexity of the design to standardise the construction process and reduce the quantity of materials required.

3.3 Other design considerations

3.3.1 Logistics

The following logistics aspects will be considered to enable efficient management and minimise risks of site congestion:

- The development of a logistics plan for the project will ensure that due consideration is given to material requirements throughout the construction phase. This will enable efficient management of the delivery and storage of materials and will ensure that the most effective logistic methods are adopted;
- Adopt 'just-in-time' delivery protocols to reduce the space required for storage within the site. This will also minimise the risk of site congestion and material spoiling during bad weather; and
- Investigate the use of construction consolidation centres that provide effective supply chain management solutions, enabling the safe and efficient flow of construction materials and equipment from supplier to site.

3.3.2 Materials procurement

The following aspects regarding materials procurement will enable the sustainable management of materials and reduce surplus materials:

- All materials and components delivered will be numbered, colour coded and bar-coded based on the intended location. A data base map will track all deliveries for each building against the contract programme;
- Specific information relating to sustainable materials management should be incorporated into tender documents for third party contractors. When appointing a waste management company to handle the transportation, recovery and disposal of waste, contractual obligations should be implemented to ensure that these sustainable waste management measures are carried out;

- Reduce the amount of surplus materials by ordering the correct amount of materials at the right time;
- Material storage areas should be safe, secure and weatherproof to prevent damage and theft;
- Consider assigning the role of supply chain manager so that relationships and partnerships can be developed with suppliers who are able to implement waste minimisation at source;
- Set up agreements with suppliers to take back surplus materials and packaging;
- Engage with the supply chain to source products and materials that use minimal packaging and segregate packaging for re-use;
- Re-use of other demolished material such as steel and timber to avoid disposal of re-usable material and building elements; and
- Aim to maximise the use of reclaimed materials.

3.4 Potential materials and waste reduction through design measures

As outlined in Section 3.1 to 3.3, a number of measures can be explored which will help to reduce excess material and waste generation at the design stage. It is anticipated that some of these measures will be further discussed and agreed upon between the different stakeholders as the design stage advances. Table 3-1 shows the estimated provisional waste reduction savings that each action is likely to bring about, should these be implemented moving forward. These are considered to be conservative and easily achievable in most cases, although there is scope for the percentages to be revised as the Proposed Development advances.

Table 3-1 Potential waste minimisation actions to be adopted at design stage (Assumptions by professional judgement)

Measures	Maximum potential savings	Assumed project-specific savings
Offsite fabrication – Can any of the components and or buildings of the development be made off site? For example, precast concrete, timber frames etc.	10% of specific material	4%
Building form – Has the form and shape of the buildings been considered minimising the use of materials on site (i.e. refurbishment rather than demolition and rebuild)? Was this considered during the design?	5%	2%
Material supply – Attention to standard sizes of material supply matched to design sizes – dimensional coordination. In an effort to reduce off cut waste onsite has the design process considered the standard size of building components?	5%	4%
Training – Has the design team received adequate training by materials suppliers?	5%	4%

Measures	Maximum potential savings	Assumed project-specific savings
Sustainability of materials – Has consideration been given to the sustainability of materials used (i.e. such as timber framework)?	5%	1%
Waste minimisation – Are there any specific waste minimisation key performance indicators (KPI) via tendering contracts for next stage of design process? (such as bonuses for reaching waste minimisation targets, just-in time ordering, requirements to use materials with recyclable packaging etc)	5%	1%
Design management – Have all efforts been made to prevent the major alteration of design at later stages by following a design approval process?	5%	3%

The potential design actions indicated in Table 3-1 have been applied to specific waste materials and used to forecast the maximum achievable amount of construction waste that could be 'designed out' as part of the design stage. This will help guide the design team on what actions would contribute the most towards waste reduction. A summary of the potential waste reduction forecasts is shown in Table 3-2.

Table 3-2 Potential waste savings due to design mitigation measures

Construction waste generated (tonnes*)	**Average % reduction**	**Reduction in material waste (tonnes*)**	**Revised construction waste generation (tonnes*)**
74,300	19%	14,100	60,200

**Rounded to nearest 100 tonnes*

4 On-site waste reduction

4.1 Introduction

Sustainable waste management techniques will be considered throughout the site preparation, demolition and construction phases. A nominated waste champion will oversee the implementation plan and will ensure the project adopts the following sustainable waste management principles.

4.2 Materials management on-site

- A system will be established so that the correct quantities of materials are ordered. This will reduce the volume of unused materials being disposed of;
- Dedicated areas will be created that allow for the correct storage of new building materials. This will reduce the risk of contamination/spoiling;
- Timely ordering of materials will reduce the time that materials are stored on-site. This will also reduce the risk of spoiling;
- Demolition materials should be crushed where possible on-site, particularly the materials such as concrete, brick, blocks etc. to utilise for reuse as temporary hard standings, pile mates and so on;
- Provision of clearly marked segregated bins/skips for construction materials to avoid cross-contamination and to facilitate recycling;
- All waste generated will be stored in designated areas that are isolated from surface drainage. Waste containers will be covered to prevent dust and litter being blown out and rainwater accumulating. Containers will be inspected regularly and replaced when full.

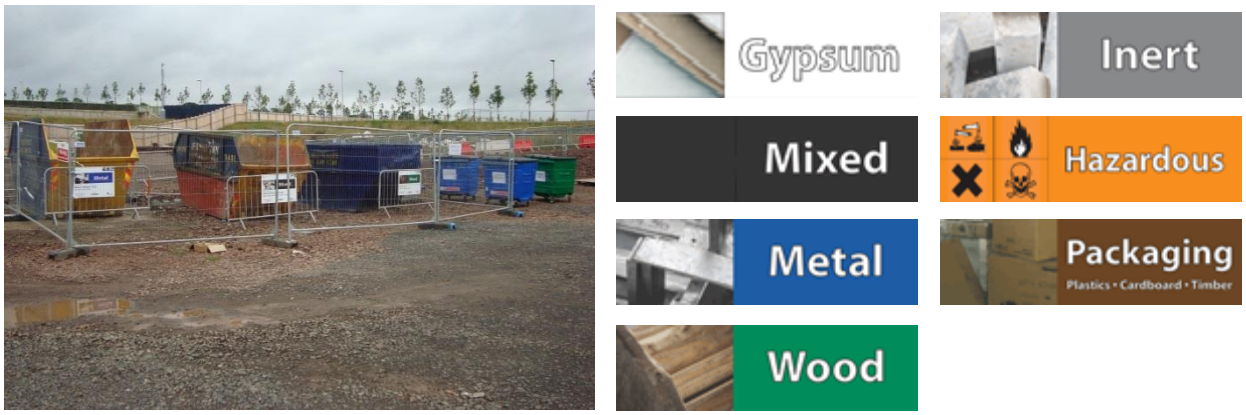
4.3 Waste segregation on-site

Waste will be segregated on-site wherever possible. However, when this is not viable, mixed materials will be stored and sent to a local Materials Recovery Facility (MRF). The following recommendations should be considered to minimise the amount of waste produced and increase the proportion of waste that is segregated:

- Ideally, a specific area should be allocated and labelled to facilitate the segregation of waste materials for potential re-use, recycling and recovery;
- Efforts should be made to recover and recycle packaging waste in accordance with packaging legislation.
- Different waste streams should be segregated. At a minimum, containers/skips for hazardous/non-hazardous waste and plasterboard waste should be provided on-site. Some examples are shown in Figure 4-1;
- Recycling and waste skips will be kept clean and clearly marked to reduce contamination of materials. The labelling shall use ‘Waste Stream Colour Codes’;

- Training will be provided for all site personnel, informing them of the correct disposal routes for materials. A site waste champion will be appointed to oversee correct segregation/disposal and keep a record of all resources generated on-site; and
- Product/material deliveries will likely result in bulky packaging waste such as cardboard. These materials will be compacted to reduce bulk in transportation for recycling/treatment.

Figure 4-1 Examples of segregation skips and waste stream segregation by colour-coded signs



4.4 Site waste management responsibilities

The Principal Contractor will be responsible for waste management upon appointment. The construction waste management plan will be updated on a regular basis, but at least every 6 months, to allow for special considerations of different construction and building stages. The first update should start after the appointment of the Principal Contractor. All waste removal dockets, or consignment notes must be collected and stored on-site. On completion of the development, a report shall be produced by the Principal Contractor that will detail total waste produced and actual recycling rate achieved. This will be added to this document and filed in a separate section.

The full OCWMP will also include information and copies of data recording forms detailing the information recorded when any waste material leaves the Project Site. In addition, the following aspects of site waste management should be audited:

- Delivery recording arrangements.
- Materials handling and storage.
- Use of materials (including surplus materials).
- Auditing of disposal areas (i.e. skip auditing).
- Site staff awareness of waste management procedures.

Prospective waste management companies tendering for waste management work shall be audited and interviewed before any agreement is made between the LRCH and waste management company.

5 Construction, Demolition & Excavation waste recovery and savings

5.1 Introduction

Maximising the recovery of materials and resources from construction works has economic, as well as environmental benefits. This section outlines the potential savings that could be achieved throughout the construction stage if targets for waste recovery and segregation are met.

5.2 Demolition

An assessment of the demolition site would identify potential for recycling or re-use of on-site material. Anticipating the percentage of demolition waste that can be recycled or reclaimed is difficult. Therefore, estimated average percentages have been extracted from publications from BRE 2009 data. These are indicated in Table 5-1 and have been used to calculate the estimated reduction in demolition waste that could be achieved if good practices are followed.

Table 5-1 Typical recovery for demolition waste

	Percentage (%)	Tonnes*
Demolition waste generated	100	77,170
Reclaiming of demolished material	15	11,570
Recycling of demolished material	75	57,880
Disposal of demolished material	10	7,720

**rounded to the nearest 10 tonnes*

5.3 Excavation

It is estimated that approximately 40% of excavation waste will be suitable for reuse on-site. Further detail on potential uses as well as justification for this assumption is provided in the Environmental Statement Chapter 18: *Soils, hydrogeology and ground conditions*. Specifics on the approach to contaminated land is set out in the *Contaminated Land Management Strategy*. The 40% reuse assumption is based on a cautious approach, with potential for a significantly higher or lower value. In the scenario where 40% of excavated waste is able to be reused on-site, this would leave approximately 1,020,000 tonnes to be otherwise disposed of.

5.4 Construction

Further savings could potentially be achieved throughout the construction stage if targets for waste recovery and segregation are set.

The range of wastes associated with the construction of the Proposed Development are described in Table 5-2, along with the associated codes for each waste stream. The classification of materials has been taken from the European Waste Codes (EWC), 2015.

Table 5-2 Possible waste types arising from construction

EWC code	EWC description	EWC code	EWC description
15 01 01	Paper and cardboard packaging	17 09 04	Mixed construction and demolition wastes (non-hazardous)
15 01 02	Plastic packaging	17 02 01	Wood
15 01 03	Wooden packaging	17 02 02	Glass
15 01 04	Metallic packaging	17 02 03	Plastic
15 01 05	Composite packaging	17 03 02	Bituminous mixtures
17 01 01	Concrete	17 04 01	Cooper, bronze, brass
17 01 02	Bricks	17 04 02	Aluminium
17 01 03	Tiles and ceramic	17 04 05	Iron and steel
17 01 07	Mixture of concrete, bricks, tiles and ceramics (non-hazardous)	17 04 07	Mixed metals
17 05 03	Soils and Stones (containing some dangerous substances)	17 04 11	Cables (non-hazardous)
17 05 04	Soils and stones (non-hazardous)	17 06 04	Insulation materials (non-hazardous)

The potential savings indicated in Table 5-3 have been derived from WRAP guidelines[2]. As a minimum, waste should be segregated at a good practice level with an aim to achieve best practice diversion rates. In most cases, good practice methods are easily achievable, cost neutral and do not require a fundamental change in working practice.

Table 5-3 Standard, good and best practice recovery rates by material

Material	Possible disposal route	Possible recovery rate with segregation (standard practice)	Possible recovery rate with segregation (good practice)	Possible recovery rate with segregation (best practice)
Bricks	Recycled, disposal	75%	95%	100%
Tiles and ceramic	Recycled, disposal	75%	85%	100%
Concrete	Recycled, disposal	75%	95%	100%
Inert	Recycled, disposal	75%	95%	100%
Insulation	Recycled, disposal	12%	50%	75%
Metals	Recycled, disposal	95%	100%	100%
Packaging	Recycled, disposal	60%	85%	95%
Gypsum	Recycled, disposal	100%	100%	100%
Plastics	Recycled, disposal	60%	80%	95%
Timber	Recycled, disposal	57%	90%	95%
WEEE	Recycled, disposal	0%	70%	95%
Furniture	Recycled, disposal	15%	25%	50%
Canteen / office / ad-hoc	Recycled, disposal	12%	50%	75%
Liquids	Recycled, disposal	100%	100%	100%
Mixed	Recycled, disposal	12%	50%	75%

[2] WRAP (2010), *Practical solutions for sustainable construction: Achieving goods practice Waste Minimisation and Management. Guidance for construction clients, design teams and contractors.*

Table 5-4 Potential on-site savings adopting WRAP standard to best practice guidance

Possible recovery weight (tonnes)			
Material	**Standard practice***	**Good practice***	**Best practice***
Bricks	3,421	4,334	4,562
Tiles and ceramics	152	173	203
Concrete	5,018	6,356	6,691
Inert	21,281	26,956	28,375
Insulation	71	295	443
Metals	1,153	1,214	1,214
Packaging	1,037	1,470	1,643
Gypsum	1,939	1,939	1,939
Plastics	264	352	418
Timber	1,568	2,475	2,613
WEEE	0	78	106
Furniture	7	11	22
Canteen/office/ad hoc	53	220	329
Liquids	246	246	246
Mixed	887	3,695	5,543
Total	**37,100**	**49,810**	**54,350**

**Totals have been rounded to the nearest 10 tonnes*

If good practice methods are used on-site, as set out in Section 4, a further 49,810 tonnes of construction waste could be diverted from landfill/other disposal. This figure could rise to 54,350 tonnes diverted if best practice methods were to be used on-site. Table 5-5 summarises the potential remaining waste quantities that could be achieved if good and best practices are followed.

Table 5-5 Potential waste savings due to construction waste mitigation measures

**rounded to nearest 100 tonnes*

Construction waste generated after design mitigation measures have been implemented (tonnes)	**Waste disposal quantities after segregation measures have been implemented (tonnes)**		
	Standard practice	**Good practice**	**Best practice**
60,200	23,100	10,400	5,800

5.5 Total potential waste savings

It is estimated that up to 1,851,500* tonnes of waste will be generated from the construction and demolition phases of the Proposed Development (77,200 tonnes from demolition;

1,700,000 tonnes from excavation; 74,300 tonnes from construction). This total assumes that no design mitigation measures, or waste recovery/diversion practices have been implemented. It is estimated that up to 90% of the total demolition waste can be reclaimed or recycled. Incorporating waste recovery and savings measures during the demolition stage would potentially mean that only 7,700 tonnes of demolition waste would be disposed of.

It is estimated that 40% of the total excavation waste can be reused on-site. Incorporating reuse of this material during the construction stages could potentially mean that instead, approximately 1,020,000 tonnes of excavation waste would need to be otherwise disposed of. If waste reduction measures through design are incorporated, then construction waste could be reduced by approximately 19% to 60,200 tonnes.

Furthermore, if a best practice approach is taken on-site during the construction phase then waste for disposal could be reduced to 5,800 tonnes.

6 Waste management responsibility

Responsibility for the various aspects of the OCWMP are set out below in Table 6-1. It should be noted that ownership roles are indicative and may vary as the project develops. These responsibilities are in line with the Construction Method Statement.

Table 6-1 OCWMP responsibility matrix

Title	Responsible owner
Administration and planning	Client
Action log	Client
Design measures	Design Coordinator
Responsibility for waste management	Principal Contractor
Forecasting key waste production	Principal Contractor
Planning re-use and recycling	Principal Contractor
Register of licences, permits and movements	Principal Contractor
Comparison of estimated and actual quantities	Principal Contractor
The costing of site waste management	Principal Contractor
Overall recycled content	Principal Contractor
Implementation	Principal Contractor
Final project declarations	Principal Contractor

Buro Happold has highlighted potential design actions and the need for further refinement of the OCWMP. The responsibility to update and complete this document will be passed on to the Principal Contractor. At a later date, this updated OCWMP will be provided to the client in both digital and hard copies, with the hard copy enclosed in a folder.

The Principal Contractor must update the OCWMP as work progresses and ensure that workers on-site are aware of the OCWMP and co-operate with it. This will include providing suitable site inductions, information and training. Contractors will in turn need to engage their employees and sub-contractors to ensure that any waste management objectives in the OCWMP are understood and achieved.

Although the Principal Contractor is responsible for updating the OCWMP and ensuring compliance and cooperation amongst the workers, the client will continue to have a role in ensuring its effective implementation. The client must give any reasonable direction to

contractors to ensure compliance, for example, in setting contractual obligations. Both the client and the Principal Contractor are responsible for reviewing, revising and refining the OCWMP as necessary, in particular, to ensure that roles and responsibilities are clear as the project progresses.

The OCWMP must be kept at the site office and be available to any contractor carrying out work described in the plan. Once the Proposed Development has finished, the Principal Contractor must keep the OCWMP for two years after completion at their place of business or at the Project Site.

7 Conclusion

There are significant opportunities to reduce construction and demolition waste arising from the Proposed Development. Following a best practice approach, the Proposed Development has the potential to divert up to 90% of construction and demolition waste, which exceeds targets set by the 2008 Waste Framework Directive, the 2011 Waste Regulations and the 2013 Waste Management Plan for England of 70% diversion of construction and demolition waste from landfill. The recommendations in this report should be adhered to, as they have the potential to significantly reduce the waste generated from the baseline estimate. This strategy should be referred to alongside the Construction Method Statement, ES Chapter and the Soils, Hydrogeology and Ground Conditions ES Chapter (18). Operational waste is covered separately in the OOWMS (Appendix 19.1).

This report is a live document and it will be continually updated throughout the design and construction process. The next steps to take are as follows:

- Update the document in response to significant design changes which impact waste management;
- Ensure that ongoing design development refers to this report and integrates measures which look to design out waste;
- Integrate waste management requirements into tender documentation;
- When on-site, ensure that the OCWMP is incorporated into all relevant aspects of site management;
- Retain a copy of this report and any updates to the OCWMP on-site. All contractors should be made aware of its location. The original should be kept in the client offices;
- A waste summary will be produced and added to the record file every quarter;
- On completion, the Principal Contractor shall summarise all waste reports and compare the figures to the initial estimates in this report;
- Future recommendations to improve site waste management will be recorded and shared with the client, as well as other design and construction teams working on the development; and
- When the work is complete, the OCWMP file will be stored in the Principal Contractor's offices for a minimum of two years.

8 References

8.1 Benchmarks

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8.2 Policies

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Institution of Civil Engineers (2010) WRAP Designing out Waste: a design team guide for civil engineering.

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