Appendix 5.8

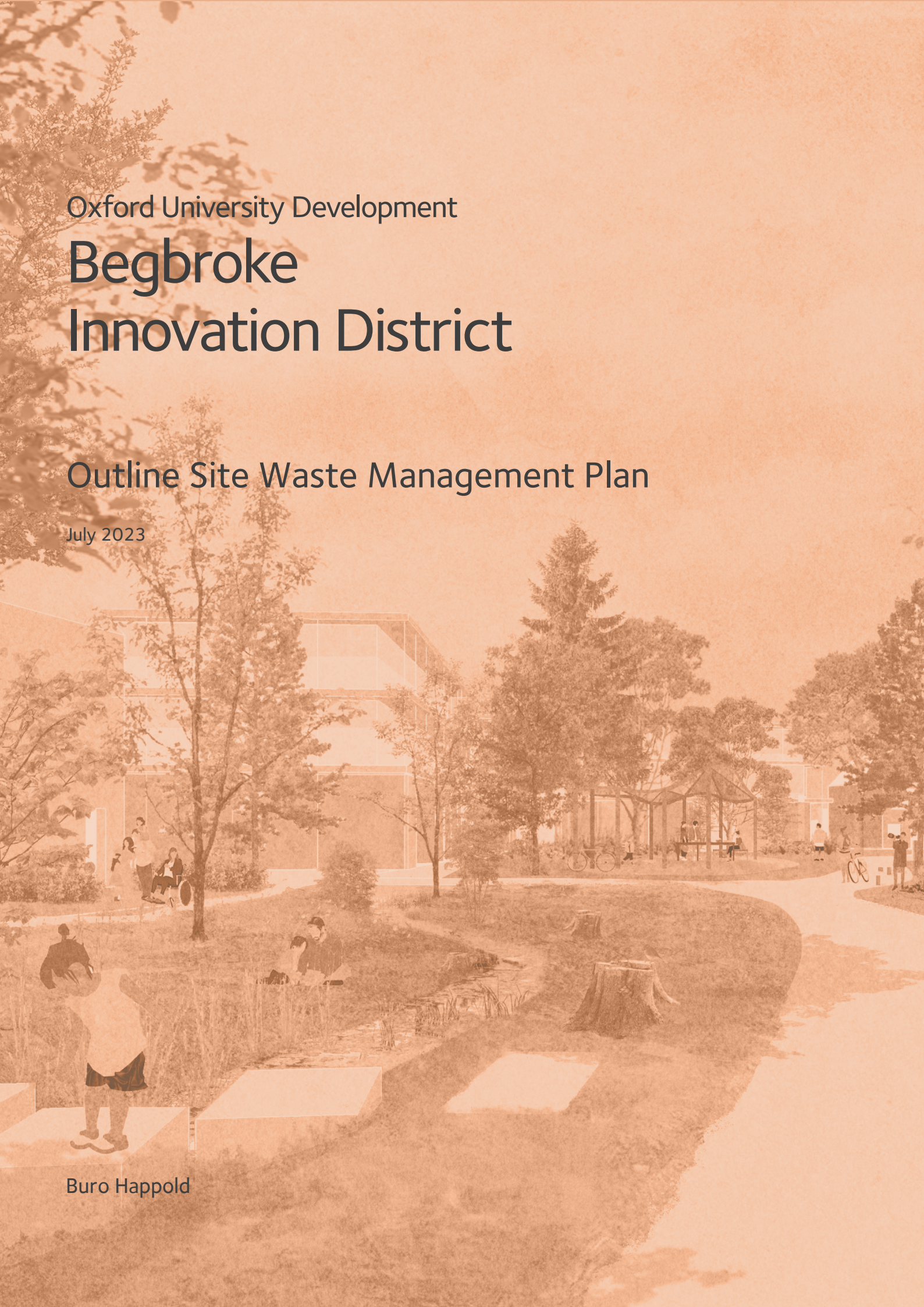
SITE WASTE MANAGEMENT PLAN

Oxford University Development

Begbroke Innovation District

Outline Site Waste Management Plan

July 2023



Buro Happold

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Begbroke Innovation District

Outline Site Waste Management Plan

BEG-BUR-XX-XX-RP-YZ-00002

052188

17 July 2023

Revision 04

Revision	Description	Issued by	Date	Checked
01	1st Issue	NR	11/05/2023	DB
02	2nd Issue	NR	02/06/2023	CP
03	3rd Issue	NR	29/06/2023	DB
04	4th Issue	NR	17/07/2023	DB

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date	**17 July 23**
approved	**Dionne Biddie**
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date	**17 July 23**

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Abbreviations

Abbreviations	
BRE	Building Research Establishment
BSP	Begbroke Science Park
CDC	Cherwell District Council
EWC	European Waste Catalogue
GEA	Gross External Area
MRF	Materials Recycling Facility
OUD	Oxford University Development Ltd
SWMP	Site Waste Management Plan
VOC	Volatile Organic Compounds

1 Introduction

This report has been prepared by Buro Happold on behalf of Oxford University Development Ltd (OUD) ('the Applicant') in support of an outline planning application. OUD is seeking to redevelop Begbroke Science Park into a mixed-use development, referred to as Begbroke Innovation District ('the Proposed Development') within Cherwell District Council (CDC). The phasing of construction is not fixed at this outline stage, however, for the purposes of this report it is expected to be in five phases commencing in February 2025 to January 2033.

This outline Site Waste Management Plan (SWMP) document should not be viewed as one standalone report, but rather as the initial step in the SWMP process documenting early actions and considerations to design out waste and makes recommendations on how waste can be reduced further at the construction stage. These recommendations should be further developed by the principal contractor and designated waste management company at the construction phase, which should be collated into a detailed SWMP.

1.1 Site Context

The project site is located approximately five miles northwest of Oxford, between the villages of Begbroke, Kidlington and Yarnton ('the Site'), illustrated in Figure 1—1 and Figure 1—2. The total Site area is approximately 110ha.

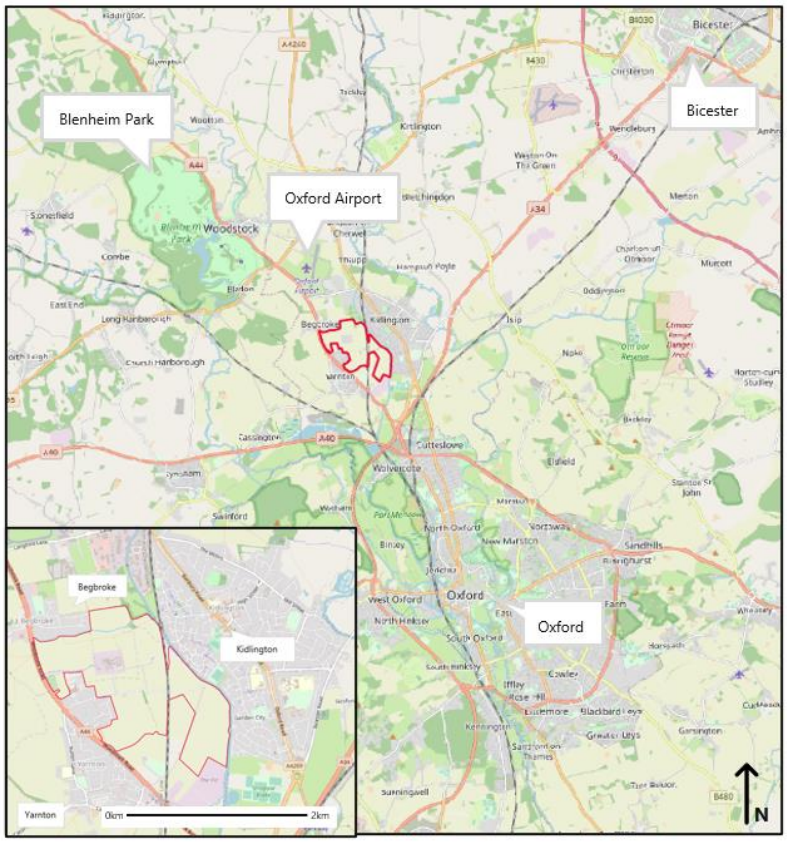

Figure 1—1 Site Location

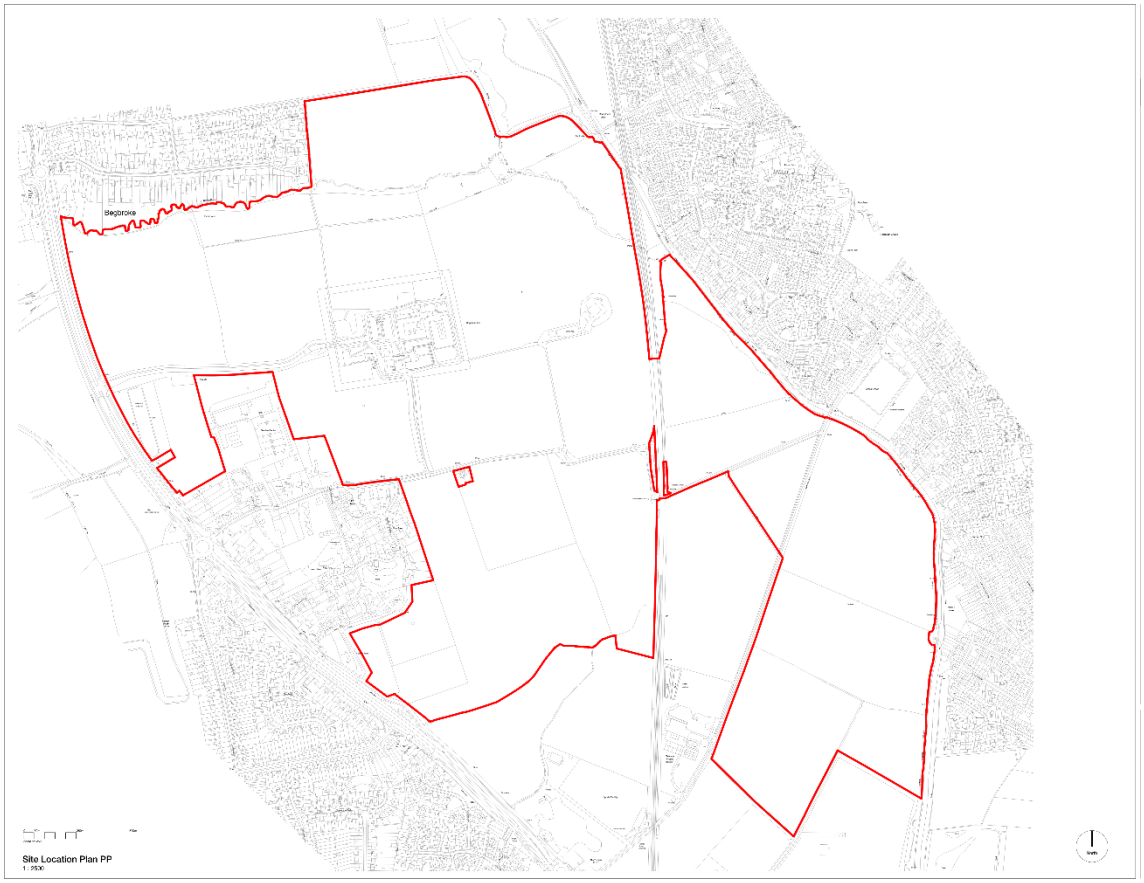

Figure 1—2 Site Boundary

The Site is bound by the A44 Woodstock Road to the west, Rowel Brook to the north and Oxford Canal to the east. The Cherwell Valley railway line intersects the Site from north to south, in the east of the Site. Oxford Airport is located to the north of the Site. The Site mainly comprises open greenfield land used for arable farming, with Begbroke Science Park (BSP) located at the centre. This includes a number of low-rise buildings, some of which may be retained whilst others may be demolished, further details outlined in Section 4.1.

Access to BSP is provided via the Begbroke Hill road connecting with the A44 in the west. A number of roads intersect the Site, providing east/west access, including Begbroke Hill and Sandy Lane.

1.2 Purpose of Document

The main aim of this outline SWMP is to:

- Document any initial waste reduction recommendations during the early design stages;
- To provide information on how waste management initiatives should be implemented throughout the construction of the project;
- To establish an outline strategy for minimising waste generation and increasing the recovery of construction waste; and

- Enable the waste management recommendations within this report to be incorporated into a site-specific plan.

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

- Creation of a framework SWMP at design stage;
- Estimation of baseline construction waste generation;
- Review of actions which have been or should be considered at design stage to design out waste;
- Review of actions which can be taken at construction stage to reduce waste generation and increase segregation; and
- Revises estimates of waste generation based on the waste minimisation actions.

The responsibility for further developing the detailed SWMP should fall with the Principal Contractor(s) who should appoint a waste champion to ensure the commitments in the plan are met. See the chapter descriptions below in Table 1—1.

Table 1—1 SWMP Chapter descriptions

Chapter	Purpose
Waste management policy and guidance	Comply with relevant national, regional, and local waste management policy requirements
Waste types and quantities	Estimation of baseline construction waste generation
Waste reduction through design	Creation of a framework SWMP at design stage Waste reduction recommendations Revised estimates of construction waste generation based on waste minimisation actions
On-site waste reduction	Reduce waste generation Increase waste segregation and the recovery of construction waste
CD&E waste recovery and savings	Potential savings that could be achieved from construction demolition & excavation material
Waste management responsibility	On-site actions needed to 'design out waste'

1.3 Duty of Care

The contractor should take reasonable steps to ensure that all waste from the Site is dealt with in accordance with the Environmental Protection (Duty of Care) Regulations. In line with this, all Site materials should be handled efficiently to minimise wastage and all waste arising from the Site should be managed appropriately.

The Site operator should ensure a registered waste carrier is used to convey any waste material off-site to a suitably permitted facility.

2 Project Description

Client Name: Oxford University Development Ltd

Client Address: 6 Worcester St, Oxford OX1 2BX

Principal Contractor Name: tbc

Principal Contractor Address: tbc

Outline SWMP prepared by: Buro Happold. The plan responsibilities will be passed onto the applicant team after the application has been submitted.

Project Description:

The Proposed Development will expand Begbroke Science Park that will include 215,000sqm gross external area ('GEA') of residential floorspace (anticipated to deliver circa 1,800 residential units) and the following land uses. The illustrative masterplan is shown in Figure 2—1.

Uses	GEA (sqm)
Uses associated with the expansion of Begbroke Science Park	155,000
Retail	3,500
Hotel	10,000
Non-residential and leisure institutions	5,600
Halls and meeting places	1,200
Sui generis uses	700
Secondary school	11,400
Up to 2 primary schools	8,400

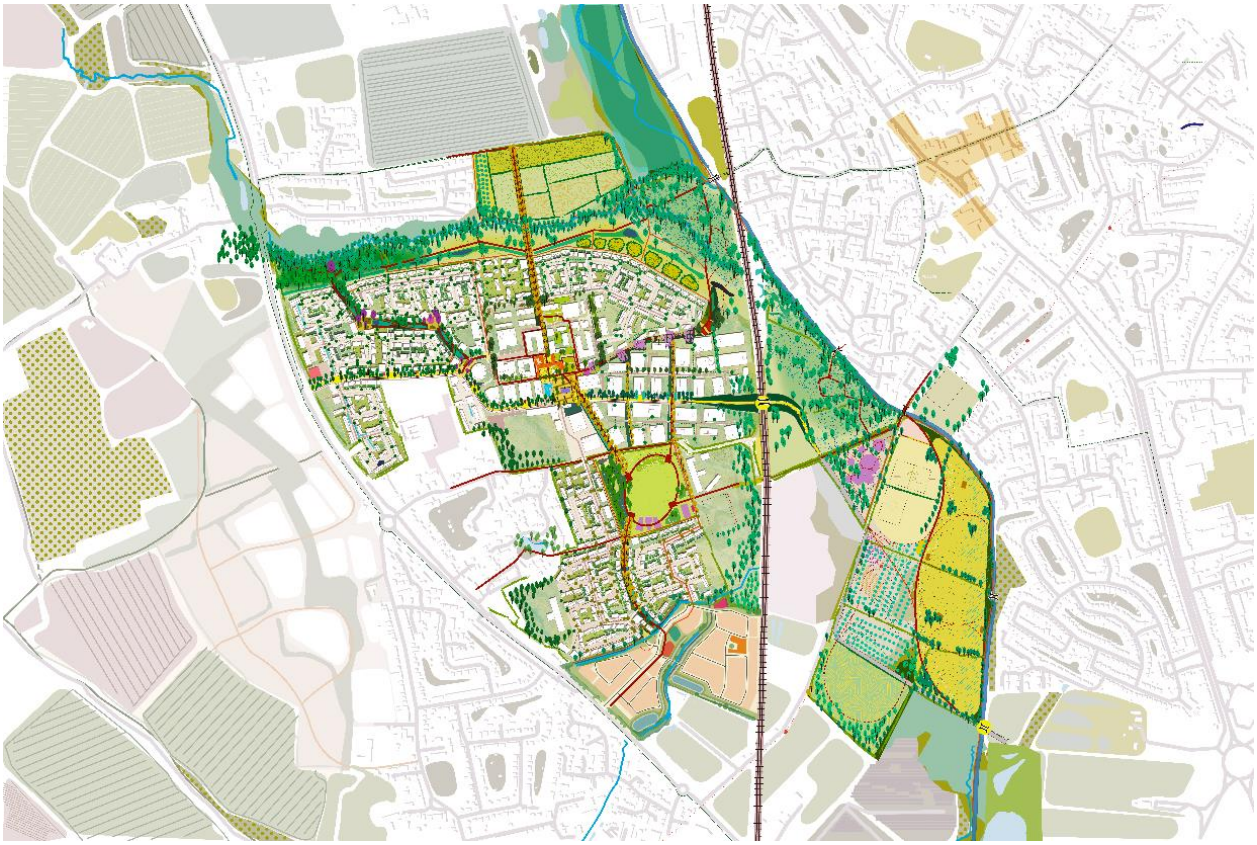

Figure 2—1 Illustrative Masterplan

3 Waste Management Policies and Guidance

This section outlines the national, regional, and local policies related to the management of CD&E that have been considered in the preparation of this outline SWMP. Further detail is provided in Appendix A.

3.1 National policies and guidance:

- The Waste Framework Directive (2008/98/EC);
- The Landfill Directive (1999/31/EC);
- Waste (England and Wales) Regulations 2016 (amended);
- Hazardous Waste (England and Wales) (Amendment) Regulations 2016 SI;
- Environmental Permitting Regulations (England and Wales) 2016;
- The Waste (Circular Economy) (Amendment) Regulations 2020;
- The Circular Economy Package: Policy Statement (Defra, 2020);
- Our Waste, Our Resources: A Strategy for England (Department for Environment, Food and Rural Affairs, 2018);
- National Planning Policy for Waste (Ministry of Housing, Communities and Local Government, 2014);
- Waste Management Plan for England (Department for Environment, Food and Rural Affairs, 2021);
- The Site Waste Management Plans Regulations 2008; and
- Designing out Waste: a design guide for civil engineering (Waste & Resources Action Programme (WRAP), 2010).

3.2 Regional policies and guidance

- Oxfordshire Plan 2050;
- Adopted Oxford Local Plan 2036; and
- Adopted Minerals Waste Core Strategy September 2017.

3.3 Local policies and guidance

- Cherwell Residential Design SPD Adopted July 2018.

4 Waste types and quantities

One purpose of the outline SWMP is to identify the types and quantities of waste that might be generated during the Proposed Development's construction phase. This data should be used to understand the types of waste that need to be managed appropriately.

The expected Site waste quantities are presented below. All quantities have been determined based on the information available at the outline planning stage. It should be noted 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.

4.1 Demolition

There are up to nine buildings that may be retained or demolished illustrated in Figure 4-1, and outlined in Table 4—1. Figure 4—2 and Figure 4— 3 illustrate two of these buildings.

Based on this information, it is estimated that approximately up to 1,900 tonnes of demolition waste would be produced if all nine buildings are demolished. It is noted that some of these buildings may be retained.

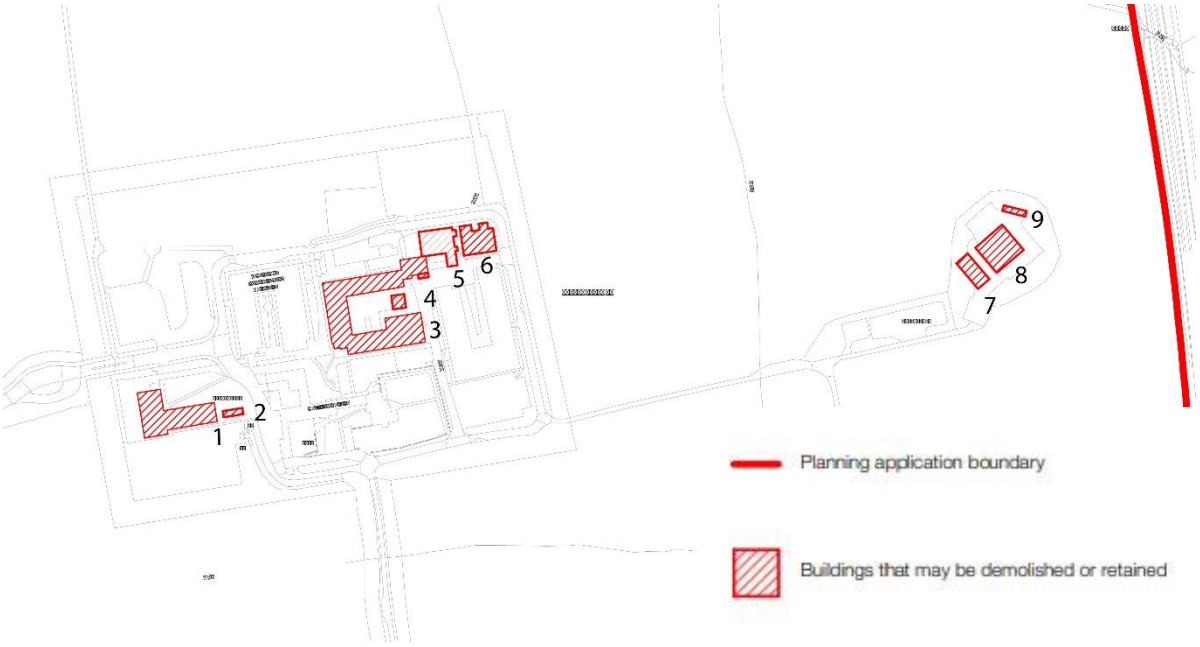

Figure 4—1 Extent of existing buildings that may be demolished or retained

Figure 4—2 Building 1

Figure 4—3 Building 8

Table 4—1 Demolition Areas

Buildings	GFA (sqm)
1	980
2	55
3	4,485
4	84
5	476
6	830
7	239
8	558
9	61
Total	**7,769**

4.2 Excavation

Estimated earthworks analysis quantities are outlined in It is assumed that all uncontaminated excavated material on-site will be used to meet any fill requirements and would therefore not be sent for disposal off-site.

Table 4—2. It is assumed that all uncontaminated excavated material on-site will be used to meet any fill

Clearing/Stripping (m^3)		Excavations (m^3)	Fill to formation level (m^3)	Balance shortfall (-) excess (+) (m^3)
Total volume	Reuse	Total reuse volume	Total volume required	Balance
74,280	37,140	50,310	104,200	-53,890

requirements and would therefore not be sent for disposal off-site.

Table 4—2 Estimated excavation waste

4.3 Construction

During the construction stage, a variety of different types of waste are likely to be generated. The range of wastes associated with the mixed used development described in Table 4—3, along with the associated codes for each waste stream. The classification of materials has been taken from the European Waste Catalogue (EWC)1.

Table 4—3 Possible waste types from construction, with European Waste Catalogue (EWC) codes

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

1 European Commission (2002) European Waste Catalogue

EWC code	EWC description	EWC code	EWC description
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	Copper, 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)

4.4 Construction waste generation

This section outlines estimates of likely construction waste generation. The total construction waste generation is outlined in Table 4—5 and has been estimated based on the following:

- Area schedule and land use plans; and
- Building Research Establishment (BRE) waste benchmarking data (updated June 2012), published based on information obtained using the SMART Waste Plan.

BRE Waste Benchmarking data provides some useful guidance on waste composition and generation expected during the development's construction phase. Maximum Gross External Areas (GEA) have been used to provide an estimate of construction waste generation. Using GEA as a proxy provides an upper estimate of construction waste generation. These GEA have been derived from the latest set of plans for the scheme. The benchmarks from BRE used at this stage provide an estimate figure. It is aspired that the Proposed Development improves on these rates in line with the industry's latest good practice expectations.

It should be noted that the Proposed Development may be subject to 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 75,900 tonnes of construction waste is anticipated to be produced, if conventional construction waste management methods are followed.

Table 4—4 Construction waste generation benchmarks

Project type	Average tonnes / 100 m^2 Gross External Area (GEA)
Residential	16.8
Commercial office	23.8
Commercial retail	27.5
Commercial other	7
Leisure	21.6

Education	23.3

Table 4—5 Estimated construction waste

Construction waste (m^3)	Construction waste (tonnes)
71,860	75,900

4.5 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.

The construction waste generation rates for each of the different materials have been calculated based on Waste Benchmarking Data (BRE, August 2009).

Table 4—6 shows the potential material breakdown and approximate quantities of construction waste that should arise from the Proposed Development. Figure 4—4 shows the likely proportion of construction waste arising from the Proposed Development. It is likely that construction waste would include a substantial amount of materials that can be reused or recycled, such as concrete, timber, and metals.

Table 4—6 Breakdown of estimated waste materials and quantities (rounded)

Material	Construction waste (tonnes)
Bricks	6,759
Tiles and ceramics	295
Concrete	9,822
Inert	14,915
Insulation	1,000
Metals	1,320
Packaging	2,373
Gypsum	1,980
Binders	203
Plastics	609
Timber	3,977
Floor coverings (soft)	33
WEEE	72
Furniture	46
Canteen /office/ad hoc	874
Liquids	50
Oils	0
Soil	24,538
Asphalt and tar	1,161
Hazardous	288
Other	0
Mixed	5,585
Total	**75,900**

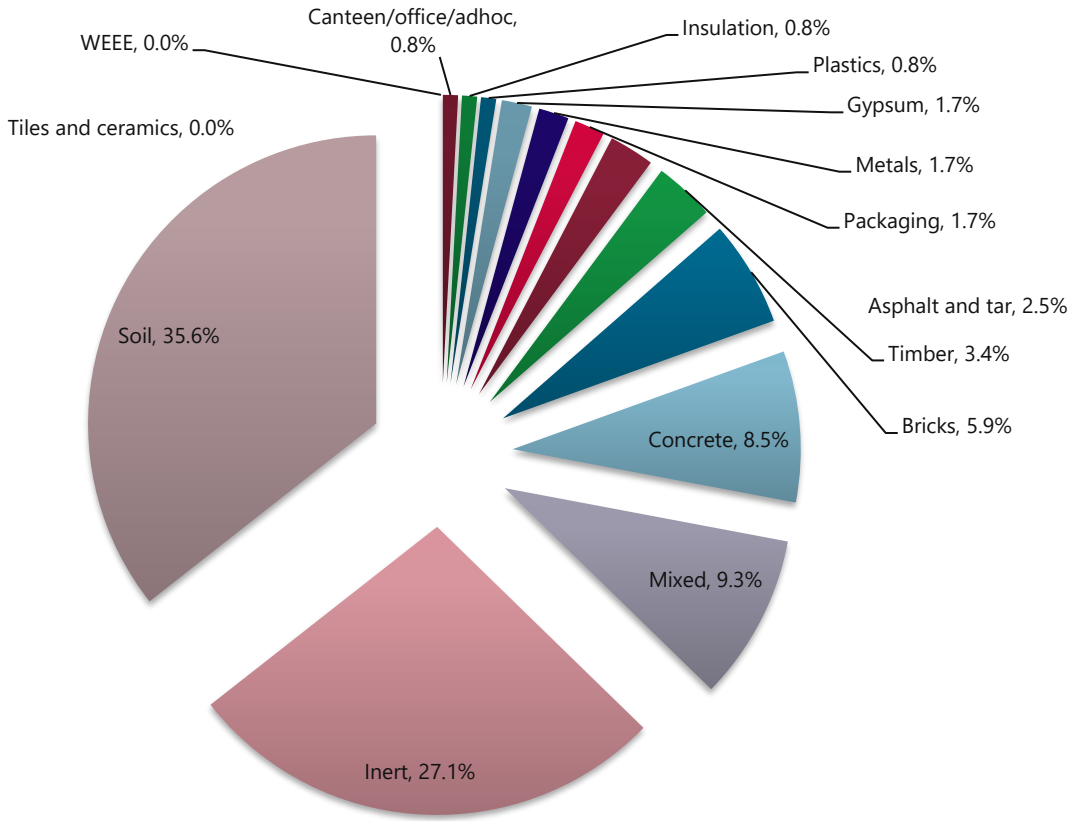

Figure 4—4 Anticipated construction waste composition from the Proposed Development

4.6 Summary

In total, it is estimated that up to 1,900 tonnes of demolition waste and 75,900 tonnes of construction waste should be generated from the Proposed Development. This includes no measures to reduce, re-use and recycle the waste arisings and therefore represents a reasonable 'worst case'. This waste should likely contain high proportions of easily excludable, re-usable and recyclable materials that could be diverted from landfill disposal. There is therefore potential to achieve a high recycling rate for the Proposed Development.

Complete disposal (i.e., to landfill) of waste would result in a significant additional cost to the project. This further justifies the need to reduce waste generation on-site and to maximise landfill diversion techniques.

5 Waste reduction through design

5.1 Introduction

This section outlines waste reduction through design, as early consideration to 'design out waste' can reduce waste generation.

The Proposed Development should look to implement the waste hierarchy, as shown in Figure 5—1. In line with this, it should prioritise measures that look to reduce waste generation through the design process. Opportunities to design out waste will be investigated as the project develops, with several potential options outlined in the section that follows.

Figure 5—1 The waste hierarchy

5.2 Potential Waste Reduction through Design Measures

OUD's sustainability strategy incorporates waste priorities that are outlined in Table 5—1 that have been considered and should be further implemented in later design stages.

There is an aspiration to explore and implement the actions presented in Table 5—2, although a number of these will need to be further explored and confirmed in the next stages of design.

Table 5—1 OUD Sustainability Priorities

OUD Sustainability Priorities	Description
Waste /Resource management	• Segregate waste efficiently to ensure materials are clean and suitable for recycling. • Manage hazardous waste efficiently. • Clear and dispose of existing vegetation in a resourceful way. • Source materials responsibly to reduce the impact on the environment, human health, and social welfare – target of 100% key construction materials. • Aspire to obtain 20% materials from circular sourcing.
Waste/Resource reduction	• Zero waste to landfill with a maximum of 10% incineration throughout construction • Aim to reuse 80% of on-site construction materials.

OUD Sustainability Priorities	Description
Waste/Resource reuse	• Reuse and repurpose construction waste that would otherwise be discarded as waste and sent to landfills. This will minimise the environmental impact of human activities. • Use Waste Transfer Stations to facilitate the separation of waste at a facility to improve recycling performance. • Inert waste and non-hazardous waste do not pose a threat to human health or the environment and should be diverted from landfill where possible. • Waste treatment or reuse on site where possible.

Table 5—2 Potential waste minimisation options to be adopted

WRAP Key Principle	Design team considerations
Design for waste-efficient procurement	• Intend to procure sustainable materials. • Aim to limit materials that contain hazardous materials, substitute hazardous materials with less hazardous materials wherever possible. • Coatings and other treatments aim to have low levels of Volatile Organic Compounds (VOCs) and/or be biodegradable. • Aspiration to use recycled materials and local materials where possible. • Aspiration for zero waste to landfill for construction and operations.
Design for materials optimisation	• Intention to maximise building reuse for all building types. • Cut and fill balance undertaken to ensure optimisation of cut and reduce the quantity of excavated materials. • Create materials exchange hub during construction. • Some structures and materials are proposed to be retained such as roads.
Design for off-site construction	• Intention for some elements of the design to be prefabricated off-site. • Buildings lends itself to standardised materials.
Design for reuse and recovery	• Buildings designed to standard shapes. Lends itself to flexible futureproof design. • Intend to reuse and recover construction materials. • Buildings designed to repurpose if a suitable use is found.
Design for deconstruction and flexibility	• Buildings designed to standard shapes. Lends itself to flexible futureproof design. • Developing material passports, portfolio wide. • Durability and low maintenance of structures and components have been actively considered in the design.

Table 5—3 Potential waste savings due to design mitigation measures

Construction material	Construction waste generated (tonnes)	Potential reduction	Reduction in material waste (tonnes)	Revised construction waste generation (tonnes)
Total	75,900	5%	3,795	72,105

5.3 Other Design Considerations

A construction logistics plan should be developed by the contractor to prepare for material requirements. The purpose of this is for an optimised strategy for the delivery and storage of materials. In addition, it is recommended that the following measures are considered during subsequent design stages and, where possible, incorporated into the project design:

Logistics

- 'Just-in-time' delivery protocols should be adopted to reduce the space required for storage within the Site. This should also minimise the risk of site congestion and material spoiling during bad weather; and
- There is potential to 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.

Materials procurement

- 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;
- Materials storage should be safe, secure and weatherproof to prevent damage or 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;
- It is recommended that agreements are set up 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; and
- Re-use of demolished materials and use of reclaimed or recycled materials should be maximised where possible.

6 On-site Waste Reduction

6.1 Introduction

This section explores options for managing on-site construction waste with an aim to reduce waste generation and increase the waste recovery which will reduce waste disposal costs. A nominated waste champion should oversee the implementation plan and should ensure the Site preparation and construction phases adopt the following waste management principles.

6.2 Materials management on-site

The following recommendations should be considered to minimise the amount of waste produced:

- Establish a system so that the correct quantities of materials are ordered. This should reduce the volume of unused materials going to landfill;
- Material passports may be used to document any construction materials going into the buildings to promote natural construction and reuse long term where possible;
- Create dedicated areas that allow for the correct storage of new building materials. This should reduce the risk of contamination/spoiling;
- Form a materials exchange hub to repurpose materials within the construction phases;
- Reduce the time that materials are stored on Site through timely ordering. This should also reduce the risk of spoiling;
- Provide clearly marked segregated bins/skips for construction materials to avoid cross-contamination and to facilitate recycling; and
- All waste generated should be stored in designated areas that are isolated from surface drainage. Waste containers should be covered to prevent dust and litter being blown out and rainwater accumulating. Containers should be inspected regularly and replaced when full.

6.3 Waste segregation on-site

Any waste which cannot be used on-site should be recycled or disposed of off-site, via a registered waste carrier to a licensed transfer station, licensed recycling facility or, as a last resort, a licensed landfill site.

Any waste sent to landfill must be pre-treated first. This is most easily achieved by segregating waste streams into different containers or sending waste 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:

- Include a designated waste storage area with clear labelling of segregated waste 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 6—1;
- Decrease volumes of waste using compactors to reduce the number of collections;
- Recycling and waste skips should be kept clean and clearly marked to reduce contamination of materials. The labelling shall use 'Waste Stream Colour Codes'; and
- Training should be provided for all Site personnel, informing them of the correct disposal routes for materials. A Site waste champion should be appointed to oversee correct segregation/disposal and keep a record of all resources generated on-site.

Figure 6—1 Examples of segregation skips on site and waste stream segregation colour coded signage

6.4 Site waste management responsibilities

The Principal Contractor should be responsible for waste management upon appointment. The contractor's SWMP should be updated at least every 6 months. 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 should detail total waste produced and actual recycling rate achieved. This should be added to this document and filed in a separate section.

The full detailed SWMP should also include information and copies of data recording forms detailing the information recorded when any waste material leaves the 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);
- Material passport auditing (reporting the material properties and lifespan in the building);

- Site staff awareness of waste management procedures; and
- Prospective waste management companies tendering for waste management work shall be audited and interviewed before any agreement is made between the client and waste management company.

7 CD&E waste recovery and savings

7.1 Introduction

This section outlines the potential savings that could be achieved from construction demolition & excavation material if targets for waste recovery and segregation are met. Buro Happold's goal is to maximise the recovery of materials and resources. In doing so there are significant cost savings and environmental benefits.

7.2 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, we have used estimated average percentages extracted from publications from the BRE and aligned with local reuse and recycling targets. These are indicated in Table 7—1 and have been used to calculate the estimated reduction in demolition waste that could be achieved if best practices are followed. The indicative estimates have assumed all nine buildings will be demolished.

Table 7—1 Typical recovery percentages and quantities2 for demolition waste (rounded)

Measure	Estimated pathway (%)	Estimated total (tonnes)
Reclaiming of demolished material	15%	285
Recycling of demolished material	80%	1,520
Disposal	5%	95

7.3 Excavation

It is assumed that all uncontaminated excavated material on-site will be used to meet any fill requirements and would therefore not be sent for disposal off-site.

Table 4—2 shows that 37,140m^3 excess topsoil excavation waste is anticipated, which will be removed off site. Based on best practice estimated by WRAP[3], if excavated material is non-contaminated soil, then the excavation material recovery could be up to 95%.

7.4 Construction

Further savings could potentially be achieved throughout the construction stage as targets for waste recovery and segregation are set. The potential savings indicated in Table 7—2 have been derived from WRAP guidelines as cited above. The Circular economy in the Oxfordshire Plan 2050, September 2017 policy requests:

- 95% of construction and demolition waste should be diverted from landfill through reuse or recycling;

2 Building Research Establishment (2006) Developing a Strategic Approach to Construction Waste: 20 Year Strategy Draft for Comment

3 WRAP, Practical solutions for sustainable construction: Achieving goods practice Waste Minimisation and Management. Guidance for construction clients, design teams and contractors.

- 95% of excavation waste to be put to beneficial use; and
- OUD target zero waste to landfill, <10% incineration for construction and operations.

In line with policy and client aspirations, waste should be segregated as good practice with an aim to achieve best practice diversion rates. To adhere to best practice the management of waste of the Site needs to be prioritised and the principal contractor must be proactive sharing responsibility to implement the detailed SWMP.

Table 7—2 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%
Binders	Recycled, disposal	0%	0%	0%
Plastics	Recycled, disposal	60%	80%	95%
Timber	Recycled, disposal	57%	90%	95%
Floor coverings (soft)	Recycled, disposal	0%	0%	0%
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%
Soil	Reuse	100%	100%	100%
Asphalt and tar	Recycled, disposal	0%	0%	0%
Mixed	Recycled, disposal	12%	50%	75%

Table 7—3 Potential on-site saving by adopting WRAP best practice guidance (rounded)

Possible recovery weight (tonnes)			
Material	**Standard practice**	**Good practice**	**Best practice**
Bricks	4,815	6,100	6,421
Tiles and ceramic	210	238	280

Possible recovery weight (tonnes)			
Material	**Standard practice**	**Good practice**	**Best practice**
Concrete	6,999	8,865	9,331
Inert	10,627	13,460	14,169
Insulation	114	475	713
Metals	1,190	1,252	1,252
Packaging	1,352	1,916	2,141
Gypsum	1,881	1,881	1,881
Plastics	347	463	550
Timber	2,154	3,400	3,589
WEEE	0	48	65
Furniture	7	11	22
Canteen/office/ad hoc	100	471	640
Liquids	47	47	47
Soil	23,320	23,320	23,320
Mixed	637	2,653	3,979
Total	**53,800**	**64,600**	**68,400**

If good practice methods are used on-site, approximately 64,600 of construction waste could be diverted from landfill. This figure could rise to 68,400 tonnes diverted from landfill if best practice methods were to be used on-site. Table 7—4 summarises the potential reduced waste disposal to landfill that could be achieved if good and best practices are followed.

Table 7—4 Potential reduced waste to landfill estimates after construction waste mitigation measures

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**
72,105	18,305	7,505	3,705

7.5 Total potential waste savings

It is estimated that approximately 77,800 tonnes of waste should be generated from the construction and demolition phases of the project (75,900 tonnes from construction and up to 1,900 tonnes from potentially demolishing nine buildings). This total assumes that no design mitigation measures or waste recovery/diversion from landfill practices have been implemented.

It is intended that 95% of the total demolition waste should be reclaimed or recycled. Incorporating waste recovery and savings measures during the demolition stage would potentially mean that 5% of demolition waste be disposed of in landfill following on- and off-site segregation treatment. This does not include hazardous or contaminated waste.

It is expected that 37,140m³ topsoil excavation waste will be removed off site. It is recommended that contractor finds a local use for it off site.

If waste reduction measures through design are incorporated, then construction waste could be reduced in line with the waste hierarchy. Furthermore, if a best practice approach is taken during the construction phase, then 68,400 tonnes of waste could be diverted from landfill through reclamation and recycling.

8 Waste Management Responsibility

This section outlines the responsibility of the development of the detailed SWMP which is in the hands of the contractor. The detailed SWMP should be developed to guarantee the construction of Begbroke Innovation District is compliant with national, regional, and local policies. Responsibility for the various aspects of construction waste management is set out in Table 8—1. It should be noted that a more detailed SWMP should be developed specific to the works. Therefore, the ownership roles are indicative and may vary as the project develops.

Table 8—1 Site Waste Management Plan responsibility matrix

Title	Responsible owner
Administration and planning	Applicant
Action log	Applicant
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 recycling rate	Principal Contractor
Implementation	Principal Contractor
Final project declarations	Principal Contractor

This outline SWMP has highlighted potential design actions that can help to minimise waste generation during the project construction phase which forms the initial step in the SWMP process. Going forward, the responsibility to action the recommendations set out in this report should be passed on to the principal contractor.

The principal contractor must prepare a detailed SWMP prior to commencing any on-site works. They are in control of training, site inductions, and sharing all relevant information from this document. This should include giving responsibilities to workers on-site who should implement and manage staff to follow the detailed SWMP. Although the Principal Contractor is responsible for updating the detailed SWMP, the client should continue to have a role in ensuring its effective implementation. The client must give reasonable direction to contractors to ensure compliance, for example, in setting contractual obligations. Both the Applicant and the principal contractor are responsible for reviewing, revising, and refining the detailed SWMP as necessary, to ensure that roles and responsibilities are clear as the project progresses. The detailed SWMP should be available in the Site office for inspection at any time.

Table 8—2 outlines measures to create a proactive culture for managing waste efficiently on-site.

Table 8—2 Best practice work practices for managing waste

Action	Description
Engage with all site workers; employees and sub- contractors about the SWMP	• Share the protocols for waste management from the SWMP within the site induction process. Include what, how, and why. • Confirm that any waste management objectives in the SWMP and requirements from the team are understood. • Provide the team with clear roles and responsibilities to guarantee steps are taken to achieve the SWMP objectives. • Understand your team, who is committed to using waste as a resource and to influence others to be proactive. • Remind the team of the SWMP at regular interval throughout the construction period.
Prioritise waste/resource management on site	• Design a logical waste/ resource management system. • Centralise the materials exchange hub.
Implement the SWMP	• Update the SWMP regularly with key people in the team. • Certify compliance and cooperation amongst workers; assist with reasonable direction and set up contractual obligations. • Assure effective implementation. Provide consequences to those who do not act accordingly.

9 Conclusion

At this early stage, this outline SWMP has described how waste generated during the Proposed Development's construction phase should be managed in compliance with the relevant national, regional, and local policy requirements. The recommendations in this report should be further developed by the appointed principal contractor and designated waste management company over subsequent design and construction phases, with a detailed SWMP kept as a working document on-site.

There are further opportunities to reduce CD&E waste generation once construction works are under way, with the recommendations in this report providing several initial options for improving waste management performance.

It should be emphasised, however, that the SWMP is a live document and should therefore be updated throughout the design and construction process. The next steps to take are as follows:

Principal Contractor Responsibilities

- 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;
- When on-site, ensure that the detailed SWMP is incorporated into all relevant aspects of Site management;
- A waste summary should be produced and added to the monthly environmental report. Upon completion of works on-site, a report shall be produced by the principal contractor that should detail total waste produced and actual recycling rate achieved;
- Create a material passport for Begbroke Innovation District;
- During construction retain a copy of this report on-site. All contractors should be made aware of its location. The original should be kept in the client offices. The waste measures stated in this report should be communicated during Site inductions and at regular intervals through the construction phase;
- On completion, the principal contractor shall summarise all waste reports and compare the figures to the initial estimates in this report; and
- Future recommendations to improve Site waste management should be recorded and shared with the client, as well as other design and construction teams working on the development.

Appendix A

National policies and guidance

The Waste Framework Directive (2008/98/EC)

Directive 2008/98/EC provides the legislative framework for the collection, transport, recovery, and disposal of waste. This has been revised through Directive (EU) 2018/851 which, introduced the waste hierarchy (see Figure 5—1), which is widely used as the basis of development for sustainable waste management strategies.

The Landfill Directive (1999/31/EC)

The Directive's overall aim is "to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from the landfilling of waste, during the whole lifecycle of the landfill". This has been revised through Directive (EU) 2018/850 which, emphasises that waste that has been separately collected for re-use and/or recycling cannot be accepted at landfill and promotes a shift to a circular economy.

Waste (England and Wales) Regulations 2016 (amended)

The Waste (England and Wales) Regulations 2016 work towards implementing the revised EU Waste Framework Directive (2008/98) relating to some key components of waste operations; collection, recovery, transport, and disposal of waste materials. They also address the application of additional responsibilities to the contents of transfer notes, the introduction of a two-tier system for the registration of waste carriers and brokers, further amendments to hazardous waste controls and also the omission of certain categories of waste from waste controls.

The Waste (Circular Economy) (Amendment) Regulations 2020

The objective of this regulation is to transpose the 2020 EU Circular Economy Package (CEP) requirements in Wales and England. In addition, EU Directives amendments in the field of waste are reflected in these regulations such as the Landfill Directive and the Waste Framework Directive.

Our Waste, Our Resources: A Strategy for England (Department for Environment, Food and Rural Affairs, 2018)

This document was published in the wake of the Government's 25 Year Environment Plan (Defra, 2018). . The strategy sets out plans to double resource productivity and eliminate avoidable wastes of all kinds by 2050. . It includes details of how waste should be minimised and managed to reduce damage to the environment. The strategy gives a policy direction in line with the 25 Year Environment Plan (Defra, 2018), with a particular focus on moving away from a traditional linear economic model towards a more sustainable and efficient circular model.

The UK Government are working with the Green Construction Board in increasing resource efficiency and minimising waste in the construction sector. A Construction Sector Deal has been established which, includes an investment of up to £420 million between the construction industry and Government to address this transformation.

National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2021)

The National Planning Policy Framework (NPPF) notes that the purpose of the planning system is to contribute to the achievement of sustainable development. The document identifies three dimensions to sustainable development: economic, social, and environmental. As part of its environmental role, the planning system should help to use natural

resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy. The NPPF was revised on 20th July 2021, in response to the government's Building Better, Building Beautiful Commission findings. The revised NPPF puts greater emphasis on place-making, sustainable development, and the need to reflect local design policies and government guidance on developments.

The NPPF should be read in conjunction with the National Planning Policy for Waste and the National Waste Management Plan for England (see both below).

National Planning Policy for Waste (Ministry of Housing, Communities and Local Government, 2014)

The National Planning Policy for Waste states that planning applications should consider their impact on existing and planned waste infrastructure. The document also states that suitable provision should be made for managing waste within new developments.

Waste Management Plan for England (Department for Environment, Food and Rural Affairs, 2021)

This plan sets out a planning framework to help local authorities develop strategies that identify sites and areas suitable for new or enhanced waste management infrastructure/facilities. In addition, the document provides advice for local authorities to better apply the waste hierarchy in their own jurisdiction.

The waste hierarchy ranks waste management options according to what is best for the environment. This goes in the order of 'prevention, reuse, recycling, recovery and disposal', with disposal being the least preferred option. At its core, the plan describes how the government intends to work towards a more efficient and sustainable approach to waste and resource use/management. The plan feeds off other policy documents including the 25 Year Environmental Plan (2018), the Resources and Waste Strategy (2018) and the Waste Prevention Programme for England.

Environmental Permitting Regulations (England and Wales) 2016

The Regulations aims to consolidate the environmental permitting system and compliance regime in England and Wales. This regime streamlines and combines Waste Management Licensing Regulations 1994 (as amended) and The Control of Pollution (Amendment Act) 1989 to create a single environmental permit with a common approach to permit applications, maintenance, surrender and enforcement.

The Site Waste Management Plans Regulations 2008

Site Waste Management Plans (SWMP) are no longer a requirement for construction and demolition projects in England, however it is good practice to produce a SWMP to mitigate construction and demolition waste. Under this regulation, SWMPs must be included for projects in England that are over £300,000.

Hazardous Waste (England and Wales) (Amendment) Regulations 2016 SI

The Hazardous Waste Regulations, which came into force in 2005, provide requirements for controlling and tracking the movement of hazardous waste and bans mixing different types of hazardous waste. . The 2016 Regulations specifically removed the requirements for hazardous waste producers to register with the Environment Agency.

The Circular Economy Package: Policy Statement (Defra, 2020)

The Circular Economy Package identifies steps for the reduction of waste and the establishment of a credible long-term path for waste management and recycling. Many of the themes and provisions covered within the Circular Economy Package relate to areas of resources and waste policy where the UK nations are already actively involved through existing measures or work underway to take forward commitments made in their respective domestic waste

strategies. Furthermore, the bulk of the 2020 Circular Economy Package measures are relatively small technical changes and/or the implementing legislation simply adopts the same wording as that of the Directive. The UK government has also stated that the departure from the EU will not weaken any current or future environmental protections planned.

Designing out Waste: a design guide for civil engineering (Waste & Resources Action Programme (WRAP), 2010)

This document provides design guidance for waste and resource efficiency, specifically on construction waste. The guide outlines drivers for reducing construction waste to landfill and the environmental impacts. The main relevant sections for reference in this assessment include principles of designing out waste, application of these principles and the process of designing out waste.

Regional policies and guidance

Oxfordshire Plan 2050

Circular economy in the Oxfordshire plan 2050 (September 2019) was commissioned by Oxfordshire County Council to inform the Oxfordshire Plan 2050 (OP2050) team and the Oxfordshire County Council (OCC) Strategic Planning Team to outline the case for adopting a more circular economy in Oxfordshire[4].

The report states we should apply a circular economy to the built environment. Construction materials used to build our homes could be more efficiently managed. New housing developments should consider circular economy building principles. The Oxfordshire Plan refers to The London Plan 2021 which shows a strong intent to support these principles:

Relevant targets for reducing waste and supporting the circular economy are outlined in the London Plan in Policy SI7 including:

- Adopting circular economy principles to keep products and materials at their highest use for as long as possible
- 95% of construction and demolition waste should be diverted from landfill through reuse or recycling
- 95% of excavation waste to be put to beneficial use
- Meeting or exceeding the municipal waste recycling target of 65% by 2030

London Plan Policy SI8 targets for waste capacity and net waste self-sufficiency includes the relevant aims:

- The equivalent of 100% of London's waste should be managed within London by 2026
- Existing waste management sites should be safeguarded and optimised

4 Circular-Economy-in-Oxfordshire-FINAL-Report-Copy-2.pdf (oxfordshireplan.org)

- Environmental, social, and economic benefits from waste and secondary materials should be created.

Policy CC1 (climate change mitigation)

Requires all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building

Expects all developments to optimise resource efficiency.

Oxford also mentions 3.1.10 in the London Plan:

- To minimise the use of new materials, the following circular economy principles should be taken into account at the start of the design process:
- Building in layers - ensuring that different parts of the building are accessible and can be maintained and replaced where necessary
- Designing out waste - ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build and re-use of secondary products and materials
- Designing for adaptability
- Designing for disassembly
- Using materials that can be re-used and recycled.

Adopted Oxford Local Plan 2036

- Policy RE1 Sustainable design and construction says that to get planning permission, the builders need to show that they have used sustainable design and construction principles. These principles include using materials that can be recycled and sourcing them responsibly. Also, builders need to minimize waste and recycle as much as possible during construction
- Policy RE7 and M12 states that any permitted development must be managed using a construction waste management plan that should include waste materials[5].

Adopted Minerals Waste Core Strategy September 2017

Section 5.21 Construction Demolition and Excavation states:

'The European Waste Framework Directive sets a target of 70% recycling or recovery of construction and demolition waste by 2020. Hard demolition waste comprises approximately one-third of the waste stream, and most of it (98%) is already processed and re-used as recycled aggregate. On the other hand, construction waste has a more diverse composition, and currently only slightly over one-third of it is recycled. There is potential to improve this recycling rate.'

5 Adopted Oxford Local Plan 2036 | Oxford City Council

Local policies and guidance

Cherwell Residential Design SPD Adopted July 2018

The policies ESD 1 to ESD 17 are guidelines that the Council follows to respond to climate change. These guidelines include using sustainable construction methods. Policy ESD 3 specifically requires all new residential buildings to use sustainable design and construction techniques to achieve zero carbon development, which means that the building produces little to no carbon emissions. This is done by using energy-efficient materials, meeting government regulations for carbon emissions, and implementing solutions that reduce carbon emissions.

In section, 8.2 it states, 'The masterplan layout has a fundamental impact on the sustainability of the scheme.'. To reduce the impact the following should be considered:

- Create flexible spaces for uses to change and places to adapt over time
- Reduce waste arising from construction using modern construction methods. However, it's important to note that some methods, such as modular construction, may limit the available building types and how they can be arranged.

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