Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 110
Material assets and waste

(formerly IAN 153/11)

Revision 0

Summary
This document sets out the requirements for assessing and reporting the effects on material assets and waste from the delivery of motorway and all-purpose trunk road projects.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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Release notes

Version	Date	Details of amendments
0	Aug 2019	LA 110 replaces IAN 153/11. The full document has been re-written to make it compliant with the new Highways England drafting rules.

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Foreword

Publishing information

This document is published by Highways England.

This document supersedes IAN 153/11 which is withdrawn, and makes provision for requirements outlined within EU Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the EIA Directive) [Ref 3.N] and Directive 2008/98/EC on waste (hereafter referred to as the Waste Directive) [Ref 2.N].

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

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Introduction

Background

The construction, improvement and maintenance of motorways and all purpose trunk roads can result in environmental effects associated with the consumption and use of material assets, and the disposal / recovery of waste.

Environmental assessment provides a framework for assessing and managing the effects associated with the use of material assets and disposal / recovery of waste by promoting;

1) reduction in overall impacts and improvements in the efficiency of resource use; and
2) prevention and / or reduction of the adverse effects associated with the generation and management of waste.

This document aligns with Directive 2011/92/EU as amended by 2014/52/EU [Ref 3.N] as well as the requirements of the Waste Directive [Ref 2.N].

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 6.N] apply to this document.

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Abbreviations

Abbreviations

Abbreviation	Definition
CDW	Construction and demolition waste
EMP	Environmental Management Plan

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Terms and definitions

Terms

Term	Definition
Best overall environmental outcome	A departure from the waste hierarchy which delivers better overall environmental outcomes [Ref 2.N].
Construction materials	Primary, recycled / secondary and renewable sources of materials required for constructing a project.
Disposal	Any operation which is not recovery, even where the operation has as a secondary consequence the reclamation of substances or energy.
End of first life	The point at which an asset is no longer useful in the capacity for which it was originally intended.
First study area	The area within which construction materials will be consumed (used / deployed), and waste generated (including temporary compounds and storage areas etc.) NOTE 1: This typically comprises the project / construction footprint. NOTE 2: It is the activities associated with these elements that a project is directly responsible for, and over which it has immediate influence.
Hazardous waste	Any waste that displays one or more of the hazardous properties listed in Annex III of the Waste Directive [Ref 2.N].
Inert waste	Waste: 1) that does not undergo any significant physical, chemical or biological transformations; 2) that does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and 3) where its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater. Please see Directive 1999/31/EC [Ref 9.N].
Key construction material	Construction materials which, by weight, constitute the majority of material required to deliver the scheme. NOTE: Where there are key construction materials of equal quantity both are to be considered.
Landfill capacity	The known, forecast or estimated remaining landfill void space, either regionally or nationally. NOTE: Landfill capacity is generally measured in cubic metres.
Mineral sites	Operational sites or sites identified within strategic planning documents for the extraction of minerals.

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Terms (continued)

Term	Definition
Non-hazardous waste	Waste that is neither classified as inert nor hazardous.
Opening year	The first year of operation.
Peat resource	Existing or potential peat extraction sites.
Preparing for reuse	Checking, cleaning or repairing operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing [Ref 2.N]
Prevention	Measures taken before a substance, material or product has become waste, that reduce [Ref 2.N]: 1) the quantity of waste, including through the re-use of products or the extension of the life span of products; 2) the adverse impacts of the generated waste on the environment and human health; or 3) the content of harmful substances in materials and products.
Primary materials	Materials that are from a non-renewable source (also referred to as virgin materials).
Project boundary	Project footprint (including temporary land take) for which consent is being sought.
Proximity principle	The requirement to treat and/or dispose of wastes in reasonable proximity to their point of generation.
Region	The planning authority / authorities covered by the projects second study area. NOTE: Where a project is located within the boundary of one authority, but close to suitable waste infrastructure located in another authority, it is recommended that the 'region' is extended and allocated appropriately.
Recovery	Any operation, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy [Ref 2.N].
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes [Ref 2.N]. NOTE: Recycling includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for back filling operations.
Re-use	Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived [Ref 2.N].
Secondary materials	Useful by-products from manufacturing or industrial processes.

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Terms (continued)

Term	Definition
Second study area	1) Feasible sources and availability of construction materials required to construct the main elements of a project. 2) Suitable recovery and waste management infrastructure that could accept arisings and/or waste generated by a project.
Site arisings	Construction, demolition, excavation and other arisings generated from within a project boundary, during both construction, and operation and maintenance phases.
Sterilise	Substantially constrain / prevent existing and potential future use and extraction of materials.
Waste (general)	Any substance or object which the holder disposes or intends / is required to dispose.
Waste Infrastructure	Facilities that handle, treat/prepare for reuse, recycle and dispose (landfill) of waste.

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1. Scope

Aspects covered

1.1 The requirements in this document shall be applied to the assessment, reporting and management of environmental effects associated with the consumption/use of material assets, and the disposal and recovery of waste from the delivery of motorway and all-purpose trunk road projects.

1.2 Environmental assessments shall describe impacts on material assets and waste in line with the wider requirements and advice provided in:

1) LA 101 [Ref 5.N] Introduction to environmental assessment;
2) LA 102 [Ref 8.N] Screening projects for Environmental Impact Assessment;
3) LA 103 [Ref 7.N] Scoping projects for environmental assessment; and
4) LA 104 [Ref 4.N] Environmental assessment and monitoring.

1.3 Environmental assessments must, in line with the EIA Directive [Ref 3.N], identify, describe and assess the likely significant effects of proposed projects on the environment resulting from:

1) material assets; and
2) the expected residues and emissions and the production of waste.

1.4 The assessment of material assets and waste shall include:

1) the consumption of materials and products (from primary, recycled or secondary, and renewable sources, the use of materials offering sustainability benefits, and the use of excavated and other arisings that fall within the scope of waste exemption criteria; and
2) the production and disposal of waste.

NOTE *Effects associated with the transportation of materials (carbon emissions, air quality, noise etc) are not covered in this document.*

1.5 The assessment and reporting of material assets and waste shall be used to inform construction management and contract documents.

1.6 The assessment of effects on material assets and waste shall be informed by relevant information collated by other environmental factors, notably geology and soils for sources of hazardous waste.

1.7 The assessment of effects on material assets and waste shall be used to inform other environmental factors, notably climate, for quantifying carbon emissions associated with use of materials.

Implementation

1.8 This document shall be implemented forthwith on all projects on the Overseeing Organisation's motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 6.N].

Use of GG 101

1.9 The requirements contained in GG 101 [Ref 6.N] shall be followed in respect of activities covered by this document.

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2. Principles and purpose

Integration with consent procedures and planning policy

2.1 The environmental assessment of material assets and waste must in accordance with the requirements of the EIA Directive [Ref 3.N] include:

1) a description of the project (including quantities and types of waste produced during the construction and operation phases);
2) a description of the likely significant effects of the project on the environment (including the disposal and recovery of waste);
3) the direct and indirect significant effects of a project (on material assets); and
4) the interaction (of material assets) with other factors.

Assessment and consultation

2.2 The environmental assessment and subsequent management of material assets and waste shall apply the following waste management hierarchy from the Waste Directive [Ref 2.N], in descending order of preference:

1) prevention (no waste produced);
2) preparing for re-use;
3) recycling;
4) other recovery, e.g. energy recovery; and
5) disposal.

2.3 When applying the waste hierarchy, measures shall be implemented to encourage the options that deliver compliance with the Waste Directive [Ref 2.N] and best overall environmental outcome.

NOTE *Application of the waste hierarchy can require specific waste streams departing from the hierarchy where this:*

1) is justified by life-cycle thinking; and
2) delivers the best overall environmental outcome.

2.4 The environmental assessment of material assets and waste shall, in accordance with the Waste Directive, adopt the following:

1) principles of precaution and sustainability;
2) technical feasibility and economic viability;
3) protection of resources; and
4) waste to be disposed of or recovered in one of the nearest appropriate installations (proximity principle).

2.5 The principles of the EC circular economy package EC EEP [Ref 1.N] shall be applied where relevant during assessment and reporting.

2.6 Where potential trans-boundary impacts are predicted, projects shall consult with the relevant planning authorities likely to be concerned.

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3. Assessment methodology

Scoping

3.1 The scoping assessment shall document the initial baseline studies undertaken and make a recommendation on the scope of further assessment.

3.2 The scoping assessment shall address the following questions to gain an understanding of the need to undertake further assessment:

1) is the project likely to recover/reuse little on site material thereby requiring materials to be imported to site?;
2) is the project likely to use little/no recycled/secondary materials thereby requiring the majority of materials used on the project to comprise primary materials?;
3) the project is likely to sterilise (substantially constrain/prevent existing and potential future use of) mineral sites or peat resources?;
4) would the project generate large quantities of waste relative to regional landfill capacity?;
5) will the project have an effect on the ability of waste infrastructure within the region to continue to accommodate waste from other sources?

3.2.1 Consistent units of measurement, either volume or weight, should be used in the scoping assessment.

3.2.2 Where projects are in an early stage of development, assumptions and limitations on data gaps should be reported.

3.3 Where the response to one or more of the scoping assessment questions is 'yes', further assessment shall be undertaken.

NOTE *Scoping assessments can conclude that either of the two elements (materials assets or waste) is outside of the scope of any further assessment.*

3.4 Scoping shall apply established and reliable design, mitigation and best practice measures when reporting against the above points.

Study area(s)

3.5 Where the need for further assessment has been established, two geographically different study areas shall be defined.

3.6 The first study area shall be based on the construction footprint/project boundary (including compounds and temporary land take).

3.7 The second study area shall include waste infrastructure that is suitable (licensed for waste volume and type) to accept arisings and or waste generated by the project.

3.7.1 A balance of the proximity principle and value for money should be applied in establishing the second study area.

3.8 The study area(s) used in the assessment shall be agreed with the Overseeing Organisation.

Baseline scenario

3.9 Where the need for further assessment has been established, for the first study area, the assessment shall describe the current and likely future state (in the absence of the project) of the following:

1) the types and quantity of material use associated with operation of the existing road / site;
2) the types and quantities of waste produced associated with operation of the existing road / site;
3) information on availability of key construction materials required for the project.

3.10 Where the need for further assessment has been established, for the second study area, the assessment shall describe the current and likely future state (in the absence of the project) of the following:

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1) regional (or other relevant geographic scale) presence and capacity of landfill facilities to be utilised by the project;
2) regional (or other relevant geographic scale) presence and capacity of material recovery / recycling facilities to be utilised by the project;
3) location of mineral sites and peat resources in relation to the project.

Data collection

3.11 Where the need for further assessment has been established, the following shall be identified for material assets:

1) types and quantities of materials required to construct the project;
2) information on materials that contain secondary / recycled content;
3) information on any known sustainability credentials of materials to be consumed;
4) the type and volume of materials that will be recovered from off site sources for use on the project;
5) the cut and fill balance;
6) details of on-site storage and stockpiling arrangements, and any supporting logistical details.

3.12 For waste the assessment shall identify the following;

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

3.12.1 Where projects are in an early stage of development, assumptions and limitations on data gaps should be reported.

3.12.2 To minimise the effects from material assets and waste the assessment should identify the location of sensitive receptors (i.e designated sites identified in other environmental topics).

Significance criteria

3.13 The assessment of effects on material assets and waste shall adopt the significance categories in Table 3.13 (significance category descriptions).

Table 3.13 Significance category descriptions

Significance category	Description
Very Large	Material assets 1) no criteria: use criteria for large categories. Waste 1) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2) construction of new (permanent) waste infrastructure is required to accommodate waste from a project.

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Table 3.13 Significance category descriptions (continued)

Large	Material assets 1) project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and 2) aggregates required to be imported to site comprise <1% re-used / recycled content; and 3) project sterilises ≥1 mineral safeguarding site and/or peat resource. Waste 1) >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 2) >50% of project waste for disposal outside of the region.
Moderate	Material assets: 1) project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target. Waste: 1) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2) 1-50% of project waste for disposal outside of the region.
Slight	Material assets: 1) project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target. Waste 1) ≤1% reduction or alteration in the regional capacity of landfill; and 2) waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.

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Table 3.13 Significance category descriptions (continued)

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

3.13.1 Where primary materials are mandated within DMRB, they should be excluded from the material recovery, recycling or re-use calculation.

NOTE *Where applicable, Overseeing Organisation specific requirements for material re-use or recycling are provided in the National Application Annexes.*

3.14 The significance of effects on material assets and waste shall be reported in accordance with Table 3.14.

Table 3.14 Significance criteria

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

NOTE *Where projects have a material surplus, re-use / recycling of material can be achieved by use on other sites in line with sustainability principles and the CL:AIRE Definition of Waste Code of Practice ISBN 978-1-905046-23-2 [Ref 1.I].*

3.15 The environmental assessment shall describe any likely significant effects of the project on the environment from the use of material assets and recovery / disposal of waste.

Design and mitigation

3.16 The environmental assessment shall evidence how project design has adopted the waste management hierarchy, in accordance with the Waste Directive [Ref 2.N].

3.17 At least 70% (by weight) of CDW shall be subjected to material recovery in accordance with the Waste Directive [Ref 2.N].

3.18 The environmental assessment shall evidence the adoption of design and mitigation measures for material assets.

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3.18.1 The evidence should include (list not exhaustive) [Ref 2.I];

1) design for reuse and recovery: identifying, securing and using materials that already exist on site, or can be sourced from other projects;
2) design for materials optimisation: simplifying layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content;
3) design for off site construction: maximising the use of pre-fabricated structure and components, encouraging a process of assembly rather than construction;
4) design for the future (deconstruction and flexibility): identify how materials can be designed to be more easily adapted over an asset lifetime and how deconstructability and demountability of elements can be maximised at end of first life;
5) design for waste efficient procurement: identify and specify materials that can be acquired responsibility, in accordance with a recognised industry standard; and
6) engineering plan configurations and layouts that show how the most effective use of materials and arisings can be achieved.

3.19 The environmental assessment shall evidence the adoption of design and mitigation measures for waste.

3.19.1 The evidence should include (list not exhaustive);

1) engage early with contractors during design to identify possible mitigation and enhancement measures, and to identify opportunities to reduce waste;
2) ensuring arisings generated are handled, stored, managed and re-used or recycled as close as possible to the point of origin;
3) identify areas for stockpiling and storing arisings that will minimise degradation, damage and loss;
4) capture information and data on site arisings recovered / diverted from landfill and waste sent to landfill as part of a 'live' Environmental Management Plan (EMP); and
5) specify management requirements for construction materials, site arisings and waste in a 'live' EMP.

Environmental enhancement

3.20 Enhancement opportunities shall be identified, reported and implemented within the environmental assessment and subsequent stages of the project life cycle.

NOTE Example enhancement opportunities for material assets and waste include:

1) use of surplus recycled or recovered materials in community projects e.g, utilising recycled mulch from tree felling on adjacent community facilities; or
2) recycling suitable material for construction of noise and landscape bunding outside of the highway boundary where need has been previously identified (where land availability allows) to improve environmental outcomes for a wider range of receptors.

Reporting of environmental assessments

3.21 The environmental assessment for material assets and waste shall report on the construction phase and first year of operational activities (opening year).

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4. Monitoring

4.1 The EMP shall be reviewed and updated to report on monitoring of:

1) construction monitoring data on site arisings and waste generated and assumptions on site arisings and waste forecast used in the assessment;
2) equivalent data for comparison with the assessment forecast during the first year of operation; and
3) recording/reporting to ensure all legal documentation (waste carrier registration, landfill licence, waste transfer documentation) associated with the management of construction and operational materials, site arisings and waste is available and retained.

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5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	European Commission . EC EEP, 'Circular Economy Package 2018'
Ref 2.N	'Directive 2008/98/EC on waste and repealing certain Directives (Waste Directive)'
Ref 3.N	'Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014'
Ref 4.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 5.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 6.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 7.N	Highways England. LA 103, 'Scoping projects for environmental assessment'
Ref 8.N	Highways England. LA 102, 'Screening projects for Environmental Impact Assessment'
Ref 9.N	European Commission . Directive 1999/31/EC, 'The Landfill Directive'

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6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	CL:AIRE. ISBN 978-1-905046-23-2, 'Definition of Waste Code of Practice.'
Ref 2.I	WRAP. 'Designing out Waste: A design team guide for buildings'

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Sustainability & Environment
Appraisal

LA 110
England National Application Annex to LA 110 Material assets and waste

Revision 0

Summary
This National Application Annex sets out the Highways England specific requirements on regional and national aggregate recycled content targets for use with LA 110 Material assets and waste.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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Release notes

Version	Date	Details of amendments
0	Dec 2019	Highways England National Application Annex to LA 110.

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Foreword

Publishing information

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Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

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Introduction

Background

This National Application Annex sets out the Highways England specific requirements related to the environmental assessment of material assets and waste under Directive 2011/92/EU as amended by 2014/52/EU EIA Directive [Ref 1.N] (hereafter referred to as the EIA Directive).

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 2.N] apply to this document.

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E/1. Regional and national recycled aggregate targets for England

E/1.1 The relevant regional recycled aggregate target given in Table E/1.2 shall be used in the environmental assessment of material assets and waste.

E/1.2 Where a project is located in more than one region, the higher of the regional aggregate recycling targets shall be adopted.

Table E/1.2 Recycled aggregate targets for England 2005-2020 (National and regional guidelines for aggregate provision published 2009) [see linked reference below]

Region	Recycled content target (alternative materials)	Total aggregate provision (million tonnes)
South East	26%	502
London	48%	197
East	31%	382
East Midlands	14%	784
West Midlands	27%	370
South West	22%	656
North West	30%	392
Yorkshire & the Humber	31%	431
North East	26%	193
England Average	25%	3908

NOTE The linked reference for Table E/1.2 is ISBN 978-1-4098-1589-1 2009 [Ref 3.N]

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E/2. Target for recovery of construction and demolition waste in England

E/2.1 The environmental assessment shall evidence how recovery of construction and demolition waste has been maximised through the design and mitigation process.

E/2.1.1 Projects should aim to achieve at least 90% (by weight) material recovery of non-hazardous construction and demolition waste.

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E/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	EIA Directive, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 2.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 3.N	Ministry of Housing, Communities & Local Government (Gov.UK). Communities and Local Government (2009). ISBN 978-1-4098-1589-1, 'National and regional guidelines for aggregates provision in England 2005-2020' , 2009

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Department for Infrastructure
An Roinn Bonneagair

Sustainability & Environment
Appraisal

LA 110
Northern Ireland National Application Annex to LA 110 Material assets and waste

Revision 0

Summary
Please contact Department for Infrastructure, Northern Ireland for the application of LA 110. The email address is: dcu@infrastructure-ni.gov.uk

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated team in the Department for Infrastructure, Northern Ireland. The email address for all enquiries and feedback is: dcu@infrastructure-ni.gov.uk

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Release notes **2**

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Release notes

Version	Date	Details of amendments
0	Aug 2019	Department for Infrastructure Northern Ireland National Application Annex to LA 110.

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Sustainability & Environment
Appraisal

LA 110
Scotland National Application Annex to LA 110 Material assets and waste

Revision 0

Summary
There are no specific requirements for Transport Scotland supplementary or alternative to those given in LA 110.

Feedback and Enquiries
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Release notes

Version	Date	Details of amendments
0	Aug 2019	Transport Scotland National Application Annex to LA 110.

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Llywodraeth Cymru
Welsh Government

Sustainability & Environment
Appraisal

LA 110
Wales National Application Annex to LA 110 Material assets and waste

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in LA 110.

Feedback and Enquiries
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Release notes

Version	Date	Details of amendments
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