A63 Castle Street Improvements, Hull
Environmental Statement

Volume 3 Appendix 13.1
MATERIALS – HIGHWAYS ENGLAND CARBON EMISSIONS CALCULATION TOOL

TR010016/APP/6.3
HE514508-MMSJV-EGN-S0-RP-LE-000028
31 July 2018

A63 Castle Street Improvements, Hull

Environmental Statement

Appendix 13.1 Highways England Carbon Emissions Calculation Tool

Revision Record

Rev No	Date	Originator	Checker	Approver	Status	Suitability
001	06.03.18	C Bithell	L Cottrell	J McKenna	S3	For review
002	31.07.18	C Bithell	L Cottrell	J McKenna	S4	Shared

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Introduction

A summary of the output from the Highways England Carbon Emissions Calculation Tool[1] (CECT) is provided below. This allows materials use to be quantified in terms of net volumes and carbon. The list of materials given in CECT is not exhaustive and 'best-fit' entries have been used, where necessary.

The embodied carbon values for materials calculated by the CECT are typically from 'cradle to gate' i.e. from the point of extraction / production through to the arrival at a site. For the transportation and removal of waste for re-use/recycling off-site, haulage distances have been assumed based on an estimate of the location of existing handling or disposal facilities.

The quantities of materials are estimates only (based on the Preliminary Design) and will change at the Detailed Design stage. The estimated volumes of waste focus on the key waste stream which shall result from construction of the underpass, soil mixing/grouting activities required as part of the ground improvement works and installation of the diaphragm wall.

Category	Material	Material description	Quantity value and unit	CO_2 e tonnes (embodied)	Estimated distance travelled (km)	CO_2 e tonnes (from haulage)	CO_2 e tonnes (total)	CO_2 e/tonnes (per material category)
Bulk Materials	Asphalt	General asphalt	23,500 tonnes	1,790	40	200	1,990	61,400
	Fill and aggregate	General fill/. aggregate	151,000 tonnes	800	40	1,300	2,100	
	Ready mix concrete	C6/8, C8/10, C12/15, C16/20, C20/25, C25/30, C28/35, C32/40, C40/50	16,000 m3	4,020	40	335	4,355	
	Cement and binders (jet grout)	Portland CEM I cement	49,360 tonnes	47,000	40	430	47,430	
	Reinforcement steel	Steel bar and rod	3,900 tonnes	5,500	40	40	5,590	

[1] https://www.gov.uk/government/publications/carbon-tool

Category	Material	Material description	Quantity value and unit	CO_2 e tonnes (embodied)	Estimated distance travelled (km)	CO_2 e tonnes (from haulage)	CO_2 e tonnes (total)	CO_2 e/tonnes (per material category)
Earthworks	Imported soil	General soil/top soil	2,000 tonnes	50	40	17	57	67
	Geotextiles	Polypropylene geotextile/matting	150 m^2	0.5	40	40	<0.5	
Drainage	Plastic pipe	PVC pipework of varying diameters	615 m	10	40	<0.5	10	340
	Vitrified clay pipework	Pipework of varying diameters	2,015 m	32	40	<1		
	Precast concrete circular pipework	Pipework of varying diameters	1,060 m	67	40	3	70	
	Precast concrete manholes	Various diameter, up to 3 m depth.	120 no	84	40	3	87	
	Plastic inspection chambers	600 mm diameter, up to 1.2 m depth.	110 no	8	40	<0.5	8	
	Gullies	Precast concrete pots	205 no	56	40	1	56	
	Channel and slot drains	Precast concrete channel	2,310 m	62	40	3	65	
	Damp proof course and impermeable membrane	Polyethylene membrane	4,400 m^2	10	40	1	11	
Road Pavements	Kerb	Pre-cast concrete kerb measuring 125x305 mm and 125 x 255 mm.	3,000m	42	40	2	44	55
	Road markings	Thermoplastic road marking	2 tonnes	11	40	<0.5	11	
Street furniture and	Traffic Signs	Aluminium	336 m^2	154	40	<0.5	154	502
	Cabinets	Any type	23 no.	7	40	<0.5	7	
	Road lighting and columns	LED lanterns varying number of	149 no (LED light)	250	40	<0.5	250	

Category	Material	Material description	Quantity value and unit	CO_2 e tonnes (embodied)	Estimated distance travelled (km)	CO_2 e tonnes (from haulage)	CO_2 e tonnes (total)	CO_2 e/tonnes (per material category)
electrical equipment		LEDs and heights of columns.	30 no (Aluminium columns)					
	Cameras	Hard shoulder camera and steel pole	6 no.	10	40	<0.5	10	
	Plastic cable ducting	50mm diameter	9073 m	9	40	<0.5	9	
	Cable	Armoured cable/power cable	8500m	16	40	<0.5	16	
	Handrail	Galvanised steel	38 tonnes	59	40	<0.5	59	
Civils Structure	Formwork/Shuttering	Plywood	105 m^3	63	40	<0.5	63	1,975
	Retaining walls	Steel sheet piles	785 tonnes	1,146	40	7	1,153	
	Pre-cast concrete	General concrete	900 tonnes	130	40	8	138	
	Pre-cast concrete	High strength concrete	100 tonnes	18	40	<1	18	
	Steelwork	General steel	385 tonnes	558	40	3	561	
	Bricks and blockwork	Standard bricks (includes mortar)	63,600 no	41	40	2	43	
Fuel, Energy and Water	Site offices, site vehicles and plant energy	Gas oil (red diesel)	334,000 litres	1175	40	5	1,180	1405
	Site offices, site vehicles and plant energy	Diesel	19,000 litres	60	40	<0.5	60	
	Site offices, site vehicles and plant energy	Fuel Oil	36,000 litres	135	40	<0.5	135	
	Water	Mains	95,500 m^3	33	-	-	33	
			TOTAL (rounded up)	**63,360**		**2,400**		**65,760**
Waste	Hazardous Waste	Landfill	12,400 tonnes	25	60	160	185	**4,240**

Category	Material	Material description	Quantity value and unit	CO_2 e tonnes (embodied)	Estimated distance travelled (km)	CO_2 e tonnes (from haulage)	CO_2 e tonnes (total)	CO_2 e/tonnes (per material category)
	Aggregate and soil exported off-site	Landfill	141,000 tonnes	280	60	1,860	2,140	
	Aggregate and soil exported off-site	Re-use off site	135,000 tonnes	135	60	1,780	1915	

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Volume 3 Appendix 13.2
MATERIALS – OUTINE SITE WASTE MANAGEMENT PLAN

TR010016/APP/6.3
HE514508-MMSJV-EGN-S0-RP-LE-000027
31 July 2018

A63 Castle Street Improvements, Hull

Environmental Statement

Appendix 13.2 Outline Site Waste Management Plan

Revision Record						
Rev No	**Date**	**Originator**	**Checker**	**Approver**	**Status**	**Suitability**
001	06.03.18	H Walton	L Cottrell	J McKenna	S3	For review
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1. Introduction

1.1 Overview

1.1.1 This Outline Site Waste Management Plan (SWMP) supports the submitted Environmental Statement for the A63 Castle Street Improvements (the 'Scheme') to demonstrate how waste generated during the works would be minimised and controlled to reduce impacts during the construction period.

1.1.2 A SWMP is no longer a legal requirement following withdrawal of the Site Waste Management Regulations in December 2013 but their use is regarded as best practice and is adopted on construction projects by Highways England.

1.1.3 This Outline SWMP has been prepared as part of the Preliminary Design stage for the Scheme and outlines how waste materials would be managed.

1.1.4 Preliminary information included in this Outline SWMP would be updated and used by the Principal Contractor to develop their SWMP at the Detailed Design stage. The SWMP would be included as part of the Principal Contractor's Construction Environmental Management Plan (CEMP) for the Scheme.

1.1.5 The SWMP would be prepared in accordance with best practice guidance from the Waste and Resources Action Programme[1] (WRAP) and Contaminated Land: Application in Real Environments[2] (CL:AIRE) and Construction Industry Research and Information Association[3] (CIRIA).

1.2 Aims

1.2.1 The Principal Contractor's SWMP would ensure that material is considered at each stage of the Scheme and that all waste streams are dealt with appropriately and as sustainably as possible.

1.2.2 The Principal Contractor's SWMP would identify the types of material to be produced by the Scheme and forecast the amounts that would be generated. Throughout construction, quantities of waste materials produced would be recorded and the SWMP updated accordingly.

1.2.3 Significant amounts of construction materials are required and large volumes of excavated soil and slurry would be generated from construction of the underpass. Cement for jet grouting is required to stabilise the ground and bentonite is needed for the diaphragm wall construction and piling. The ground improvement works

[1] WRAP templates and user guides available through http://www.wrap.org.uk/sites/files/wrap/GG899.pdf, accessed March 2018

[2] CL:AIRE Definition of Waste Code of Practice, version 2, 2011

[3] CIRIA C741, 2015 : Environmental Good Practice on site (fourth edition), CIRIA C762, 2016 Environmental Good Practice on site pocket book (fourth edition).

would create displaced soils and slurry by-product, which would require treatment prior to removal from site due to high water content and the difficulty in handling saturated excavation material.

1.2.4 Slurry may be either pumped to a material treatment facility within a nearby site compound or transferred by road. Pumping the slurry is the preferred option to minimise vehicle movements, provided controls are in place to minimise the risk of blockage and pipe joint/line failures and prevent uncontrolled discharges to sewer or water courses (e.g. use of drain seals, silt booms/fences, booms).

1.2.5 Treatment options for the slurry waste include rotary drying or lime treatment. Slurry would be treated within a nearby site compound and water recycled, where possible. Lime treatment of slurry would generate solids classed as hazardous waste and is not preferred.

2. Waste management procedures

2.1 Waste hierarchy

2.1.1 In accordance with the European Waste Framework Directive (2008) and the Waste (England and Wales) Regulations (2011), the following hierarchy would be applied in waste prevention and management:

- prevention
- preparing for re-use
- recycling
- other recovery (e.g. energy recovery)
- disposal

2.1.2 The waste hierarchy aims to ensure delivery of the best environmental outcome associated with the Scheme, by gaining the maximum benefits from materials and generating the minimum amount of waste. To achieve this, the techniques detailed in Sections 2.2 to 2.12 would be implemented prior to and during the works.

2.2 SWMP roles and responsibilities

2.2.1 Clear staff responsibilities would be defined for the SWMP. Reference would also be made to the roles and responsibilities defined in the CEMP.

2.2.2 The Environmental Manager appointed by the Principal Contractor would be responsible for updating and distributing the SWMP.

2.2.3 The Environmental Manager would ensure that the SWMP is communicated to project staff through site inductions and tool-box talks to ensure that procedures are implemented.

2.3 Waste prevention methods

2.3.1 Prior to the start of any works, primary aims would be to avoid the creation of waste. Actions taken during the detailed design phase and prior to construction have the potential to reduce waste production.

2.3.2 The Detailed Design team would seek to optimise material efficiency wherever possible. This may include, for example;

- using standardised components
- using pre-fabricated materials
- avoiding the use of any hazardous materials

- specifying materials for design which generate limited wastes
- prioritising the use of secondary or recycled materials (over primary materials)
- considering the life cycle of all materials used

2.3.3 Prevention methods would be in accordance with the Design out Waste principles (in accordance with WRAP best practice guidance[4]).

2.3.4 Waste prevention would also be achieved by minimising/reducing the potential for waste such as:

- ensuring only the correct amounts of materials are delivered
- use of “just in time” deliveries onto site to reduce storage requirements and minimise the potential for accidental damage or weather damage
- employing appropriate design control methods
- maintaining good communication with suppliers and tradesmen (ensuring returns are acceptable and no abortive works are undertaken)
- management of subcontractors to ensure they adhere to appropriate waste minimisation procedures (consider penalties for non-compliance)

2.4 Preparing for reuse

2.4.1 Once waste generation has been prevented or minimised wherever possible, then opportunities for material re-use would be considered. This may include:

- reusing road planings, paving, concrete and rubble in temporary haul roads or as make-up for the new road layout
- procuring secondary materials from sustainable sources
- undertaking appropriate environmental validation to identify if subsoil is suitable for reuse and maximising reuse of excavated materials across site where materials are identified as suitable (in accordance with CL:AIRE Code of Practice)
- using soil improvement techniques and dewatering to improve soil engineering properties of alluvial material to improve the potential that this material can be reused either on or off site

[4] WRAP Designing out Waste : A design team guide for civil engineering ISBN 1-84405-434-9

- seek to reuse geotechnically unsuitable materials offsite by identifying any potential sustainable schemes
- reusing excavated materials locally on other sites (subject to appropriate waste management license exemptions)

2.5 Recycle

2.5.1 Following best endeavours to prevent generation of waste and reuse materials, waste materials are still likely be generated as a result of the Scheme. In this case, reprocessing of waste materials would be considered to allow reuse either on or off site. This would reduce disposal costs and is a more sustainable way to manage waste.

2.5.2 To promote recycling of materials, the following methods would be considered:

- waste segregation (including plastics, timber, steel, general waste etc.) on-site
- waste segregation by selected waste management contractors at waste sorting facilities
- identify potential for reusing recycled materials on-site (e.g. excess timber recycled for use as chipboard)
- recycle points to be clearly identified and conveniently located during the works
- implement penalties for contractors who contaminate segregated skips

2.6 Waste targets

2.6.1 Prior to the start of construction works, measurable targets would be set to reduce the amount of waste generated during construction of the Scheme. These would include, for example, sending 100% steel, metal and timber for recycling where it cannot be reused on site.

2.6.2 Key Performance Indicators (KPIs) would be used to report the progress of the project. In accordance with the procedures set out by WRAP these would include:

- total waste (m^3/tonnes)
- total waste sent to landfill (m^3/tonnes)
- % waste diverted from landfill (m^3/tonnes)
- % waste reused on site (m^3/tonnes)

2.6.3 Prior to the start of the construction works, these KPI would be set based on forecasted amounts. Forecasted amounts and planned management options would be recorded and actual amounts reported periodically throughout the construction of the Scheme. An example site waste data record sheet is given in Appendix A.

2.7 Waste types

2.7.1 "Waste" is defined in the Waste Framework Directive (2008) as:

2.7.2 "...any substance or object which the holder discards or intends or is required to discard"

2.7.3 The following types of waste are anticipated (but is not limited to):

- inert – excavated materials
- non-hazardous – excavated materials
- hazardous – excavated materials
- hazardous – asbestos containing materials
- hazardous – road planings[5]
- cleared vegetation
- metals
- timber
- packaging
- inert – glass
- inert – building rubble
- mixed non-hazardous

2.7.4 Wastes would require segregation on site according to type, stored in different containers/areas and labelled using appropriate waste labels and colour. Containers used must be sufficient to prevent leaks or spills and all waste containers must be kept within a designated waste compound on the Site. Given the linear nature of the Scheme, a number of waste compounds may be required during construction.

[5] Potential for road planings to contain coal tar as a binder (i.e. road surfaces typically constructed pre-1980s)

2.7.5 Waste water will also be generated principally from the dewatering and treatment of excavated soils and slurry, as well as from dewatering and containment of groundwater. Following treatment, water would be discharged to sewer or surface water, with appropriate consents or environmental permits in place. Any non-compliant discharges would be collected and disposed of off-site.

2.8 Hazardous waste

2.8.1 Hazardous waste temporarily stored on site prior to collection and disposal may be carried out under the non-Waste Framework Directive exemption. Waste must be stored in a safe and controlled manner, without causing harmful impacts to human health and the environment.

2.8.2 The generation of volumes of hazardous waste should be minimised whenever possible (e.g. by segregation, treatment and avoiding use of techniques such as lime treatment of slurry waste which may generate volumes of hazardous waste).

2.8.3 All hazardous waste leaving site would be tracked within a Hazardous Waste Disposal Register which would be included within the SWMP. This would include all details including:

- the type of waste
- name of company collecting the waste
- date
- European Waste Classification code (in accordance with WM3[6])
- consignment note number
- volume of material
- name of the licensed disposal facility used (including contact details)

2.9 Materials arising

2.9.1 Material excavated from site would also be recorded and managed within a Materials Management Plan (MMP), which would run in parallel to this SWMP. A MMP is required to demonstrate that any material re-use strategy does not pose any risk to human health and, in accordance with the 'The Definition of Waste: Development Industry Code of Practice' Version 2 CLAIRE March 2011 (CL:AIRE DoW), is not a waste disposal activity.

2.9.2 The MMP would detail the following:

[6] EA/SEPA, Technical Guidance WM3, Guidance on the classification and assessment of waste, 1st Edition 2015

- where material is excavated from
- the volume of material removed
- any treatment/remediation undertaken and storage areas
- contingency arrangements (e.g. with regard to treatment of contaminated soils)
- the validation sampling and analysis undertaken
- mitigation measures implemented to minimise the amount of material removed from site (where relevant)
- protocols to track movements of these materials
- the final placement of this material (including reuse on/offsite, disposal etc.)

2.9.3 Under the CL:AIRE DoW, a Qualified Person would be required to review the relevant MMP documents and provide a Declaration to the Environment Agency prior to the use of materials. The Declaration would be provided to the Environment Agency to demonstrate that the materials have been dealt with in accordance with the MMP and the materials are not waste.

2.10 Waste licenses

2.10.1 Waste generated on site for disposal would be collected by a licensed, registered waste transfer provider and disposed of at an appropriately licensed waste disposal facility. Copies of licenses, registration numbers and/or permit numbers must be obtained from each waste provider and maintained on site.

2.10.2 A register of all named waste carrier and disposal providers would be detailed within the SWMP. A register example is given in Appendix B. No waste haulier or disposal facility must be used unless they are listed in the SWMP and their licensing and documentation checked/verified.

2.10.3 The treatment or re-use of waste materials on-site would require either an environmental permit or a registered exemption under the Environmental Permitting (England and Wales) Regulations 2010.

2.11 Waste documentation and monitoring

2.11.1 The Project and Environmental Manager would need to ensure that all waste management is undertaken in accordance with legislation, following appropriate “duty of care” procedures, in accordance with Section 34 of the Environmental Protection Act 1990. This includes:

- preventing unauthorised or harmful treatment, placement or disposal of waste

- preventing the escape of waste from his control
- ensuring the transfer of waste is only to an authorised person or a person for authorised transport purposes where these is a written description of the waste to avoid a contravention of any environmental permits

2.11.2 Detailed records would be kept on site and reviewed periodically. These records include:

- this SWMP, updated throughout the construction of the Scheme, when required
- copies of relevant licenses/permits, as detailed in Section 2.10.
- waste transfer notes/consignment notes[7] to include all the following details:
  - the type of waste
  - European Waste Classification code (in accordance with WM3)
  - type of container waste is in
  - name of company collecting the waste
  - permit number and vehicle registration
  - date, time and location where the waste was collected
  - consignment note number
  - volume of material
  - name of the licensed disposal facility used (including contact details and licence number)
- copies of any required discharge consents
- Materials Management Plan (MMP) as detailed in Section 2.9
- details of checks/audits carried out on waste management procedures and details of any changes implemented as a result

2.11.3 The Project and Environmental Managers would be responsible for checking all records to ensure that all required information is in place and all waste management subcontractors are operating under the appropriate procedures/licenses.

[7] Note: the Environment Agency's Electronic Duty of Care (edoc) programme is an online waste tracking system replaced the paper-based waste transfer system from January 2014.

2.12 Training and awareness

2.12.1 All subcontractors and project staff would be made aware of this SWMP and their responsibility to ensure compliance with this during their site induction. Copies of the SWMP would be available and displayed in all site offices/compounds.

2.12.2 Additional training/toolbox talks/briefings would be undertaken periodically to inform staff of any updates to the SWMP, current legislation requirements and to provide feedback following reviews/audits, particularly where there has been any issues identified.

2.12.3 Posters detailing specific sections of this SWMP would be on display in all communal areas.

Appendix A – Site waste data sheet (EXAMPLE)

Waste stream	EWC† code	Waste category [Inert / Non Hazardous/ Hazardous]	Forecast amount m^3	Waste minimisation option [Design out, re-use/ recycle, segregate, offsite sorting, landfill]	Actual Amount (Total) m^3	Actual Amount (Breakdown) m^3						
						Re-use onsite	Re-use onsite	Recycled for use onsite	Recycled for use onsite	Sent to transfer facility	Sent to exempt site	Sent to landfill

† European Waste Catalogue Code. * Denotes a hazardous waste stream

Appendix B – Register of waste carrier / disposal provider (EXAMPLE)

Waste details		Waste carrier / broker			Disposal facility This may include more than facility e.g. transfer station, treatment facility, landfill. Include details for each facility.		
Waste stream	EWC code	Contractor name	Registration no	Expiry date of registration	Facility name	Licence / permit no	Conditions of licence checked? [Type & quantity of waste]