

Environmental Product Declaration

BREG EN EPD No.: 000103

Issue: 01

This is to certify that this verified Environmental Product Declaration provided by:

Tarmac

Is in accordance with the requirements of:

EN 15804:2012+A1:2013

This declaration is for:

Asphalt

Company Address

T3 Tarmac,
Ground Floor, T3 Trinity Park,
Bickenhill Lane,
Birmingham, B37 7ES




Signed for BRE Global Ltd

Laura Critien
Operator

11 March 2016
Date of this Issue

11 March 2016
Date of First Issue

10 March 2021
Expiry Date



This verified Environmental Product Declaration is issued subject to terms and conditions (for details visit www.greenbooklive.com/terms).

To check the validity of this EPD please visit www.greenbooklive.com/check or contact us.


BRE Global Ltd., Garston, Watford WD25 9XX.

T: +44 (0)333 32188 11 F: +44 (0)1923 664603 E: Enquiries@breglobal.com

EPD verification and LCA details

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR ^a
Independent verification of the declaration and data according to EN ISO 14025:2010
<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External
Third party verifier ^b : Kim Allbury
<small>a: Product category rules</small> <small>b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)</small>

LCA Consultant	Verifier
Alex Hardwick thinkstep Electric Works, Sheffield Digital Campus Sheffield S1 2BJ thinkstep.com	Kim Allbury BRE Global Bucknalls Lane Watford WD25 9XX www.bre.co.uk

Commissioner of LCA study	
Andrew Swain Tarmac Bickenhill Lane Solihull, B37 7ES sustainability@tarmac.com	

General Information

Summary

This environmental product declaration is for 1 tonne of Asphalt produced by Tarmac at the following manufacturing facilities:

All 74 UK Tarmac asphalt sites
Head Office: T3 Tarmac, Ground Floor,
T3 Trinity Park, Bickenhill Lane,
Birmingham, B37 7ES
UK

This is a Cradle to gate with options EPD. The life cycle stages included are as shown below (X = included, MND = module not declared):

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction - Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water use	Deconstruction	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
X										X	X						

Programme Operator

BRE Global, Watford, Herts, WD25 9XX, United Kingdom.

This declaration is based on the BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013.

Comparability

Environmental declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the product category rules used and the source of the data, e.g. the database. See EN 15804:2012+A1:2013 for further guidance.

Construction Product

Product Description

Asphalt is used for the construction of all kind of roads, pavements, parking areas and play and sport areas. By virtue of how asphalt is used as a construction product, this EPD refers to an 'asset' rather than to 'building fabric' or a building. Asphalt products produced by Tarmac are in accordance with EN 13108 Bituminous mixtures, material specification. The declared unit is 1 tonne (t) of asphalt.

Technical Information

Property	Value	Unit
Typical Stiffness	1500	MPa
Typical Ambient Operational Temperature Range	-10 to 40	°C
Typical Density	2400	kg/m ³
Typical Voids	5	%

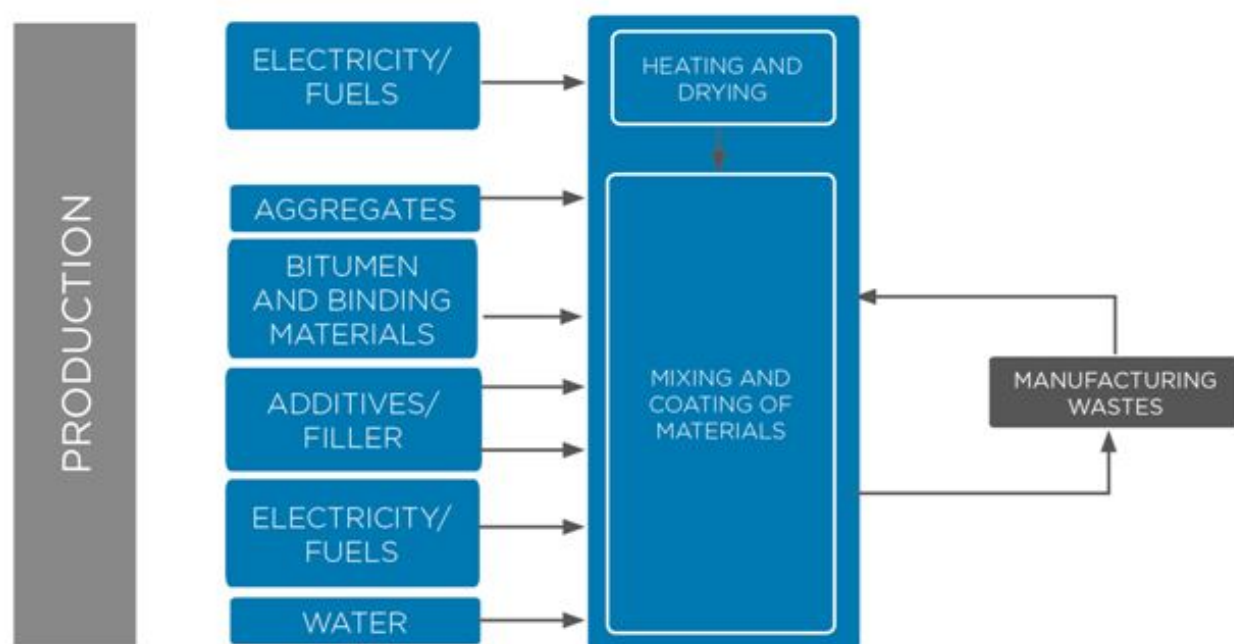
Product Contents

Material/Chemical Input	%
Aggregate	79.2%
RAP	15.0%
Bitumen / Polymer Modified Bitumen (PMB)	4.1%
Additives / Fillers	1.7%

Manufacturing Process

Asphalt is formed primarily of aggregates and bitumen-based binders (bitumen, polymer-modified bitumen etc.) with additives added to modify the properties of the final product. Electricity and fuels are used in the manufacture of asphalt, primarily for heating the asphalt mixture (or maintaining temperature) and mixing/processing constituent materials.

The process flow diagram is shown below:



Construction Installation

Asphalt is transported to site in lorries and then laid using paving machines and rollers. These impacts are based on guidance in the asPECT methodology [asPECT 2011] The on-site asphalt wastage rate is assumed to be 1%.

Use Information

There should also be no impacts associated with the use phase of asphalt surfaces assuming correct design, specification and construction.

Reference Service Life

Guidelines produced by the Mineral Products Association (MPA) and the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) recommend service life figures of 15 years for thin surface course asphalt, 20 years for hot rolled asphalt, 30 years for binder course asphalt and 40 years for base course asphalt. [ADEPT 2015]. The service life for any asphalt surface is subject to correct design, specification and construction. In this study, an “average” service life of 25 years for all asphalt surfaces provided to customers is used based on advice from Tarmac’s technical management team.

End of Life

The impacts of removing of the asphalt surface are based on the use of a 1 metre wide planer with a planing depth of 60 mm. This is combined with the fuel consumption from other equipment used on site. Transport to recycling or landfill and waste processing are also included. It is assumed that 99% of asphalt is sent for recycling with 1% going to inert landfill.

Life Cycle Assessment Calculation Rules

Declared / Functional unit

1 tonne (t) of asphalt.

System boundary

This is a cradle to gate with all options declared EPD covering all modules from A1 to C4 and includes module D. Impacts and aspects related to losses/wastage (i.e. production, transport and waste processing and end-of-life stage of lost waste products and materials) are considered in the modules in which the losses/wastage occur.

Data sources, quality and allocation

Data collected by Tarmac for 74 asphalt production sites for the 2014 calendar year has been used to generate a mass weighted average of asphalt production for this EPD. Data provided covers all asphalt products manufactured by Tarmac at these sites in 2014. Allocation of materials, energy, water, emissions and waste has been calculated according to the provisions of the BRE PCR PN514 and EN 15804. All background LCI datasets used in the generation of this EPD are taken from the ecoinvent 3.1 database contained in the GaBi ts software tool.

Cut-off criteria

All raw materials and energy input into the manufacturing process have been included.

LCA Results

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3
		Raw Material supply	Transport to factory	Manufacturing	Merged A1/A2/A3	Transport to site	Construction - installation	Use	Maintenance	Repair
Environmental impacts per declared/functional unit										
GWP	kg CO ₂ eq.	AGG	AGG	AGG	70.00	6.87	6.04	0.00	0.00	0.00
ODP	kg CFC 11 eq.	AGG	AGG	AGG	3.23E-05	1.22E-06	1.10E-06	0.00	0.00	0.00
AP	kg SO ₂ eq.	AGG	AGG	AGG	0.409	0.0181	0.0455	0.00	0.00	0.00
EP	kg (PO ₄) ³⁻ eq.	AGG	AGG	AGG	0.102	0.00526	0.0118	0.00	0.00	0.00
POCP	kg C ₂ H ₄ eq.	AGG	AGG	AGG	0.0735	0.00316	0.00693	0.00	0.00	0.00
ADPE	kg Sb eq.	AGG	AGG	AGG	0.000236	2.98E-05	2.27E-06	0.00	0.00	0.00
ADPF	MJ eq.	AGG	AGG	AGG	2740	101	87.7	0.00	0.00	0.00
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	AGG	AGG	AGG	100	1.66	0.579	0.00	0.00	0.00
PERM	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	AGG	AGG	AGG	100	1.66	0.579	0.00	0.00	0.00
PENRE	MJ	AGG	AGG	AGG	2790	103	88.6	0.00	0.00	0.00
PENRM	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	AGG	AGG	AGG	2790	103	88.6	0.00	0.00	0.00
SM	kg	AGG	AGG	AGG	163	0.00	0.00	0.00	0.00	0.00
RSF	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	AGG	AGG	AGG	113	0.00	0.00	0.00	0.00	0.00
FW	m ³	AGG	AGG	AGG	0.455	0.0203	0.0148	0.00	0.00	0.00
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water										
Waste to disposal										
HWD	kg	AGG	AGG	AGG	0.00126	0.00	0.00	0.00	0.00	0.00
NHWD	kg	AGG	AGG	AGG	4.31	0.00	10.00	0.00	0.00	0.00
TRWD	kg	AGG	AGG	AGG	0.000439	0.00055	0.000495	0.00	0.00	0.00
RWDHL	kg	AGG	AGG	AGG	1.59E-06	6.93E-08	3.51E-08	0.00	0.00	0.00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

LCA Results (continued)

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	B4	B5	B6	B7	C1	C2	C3	C4	D
		Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste Processing	Disposal	Reuse/ Recovery/ Recycling Potential
Environmental impacts per declared/functional unit										
GWP	kg CO ₂ eq.	0.00	0.00	0.00	0.00	4.54	4.35	4.07	0.0538	-14.6
ODP	kg CFC 11 eq.	0.00	0.00	0.00	0.00	8.20E-07	7.73E-07	7.33E-07	1.80E-08	-5.84E-06
AP	kg SO ₂ eq.	0.00	0.00	0.00	0.00	0.0342	0.0114	0.0308	0.000417	-0.077
EP	kg (PO ₄) ³⁻ eq.	0.00	0.00	0.00	0.00	0.00887	0.00333	0.00794	0.000109	-0.0192
POCP	kg C ₂ H ₄ eq.	0.00	0.00	0.00	0.00	0.00521	0.002	0.00467	6.38E-05	-0.0131
ADPE	kg Sb eq.	0.00	0.00	0.00	0.00	1.66E-06	1.89E-05	1.49E-06	7.21E-08	-4.07E-05
ADPF	MJ eq.	0.00	0.00	0.00	0.00	65.4	64.1	58.6	1.52	-499
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	0.00	0.00	0.00	0.00	0.402	1.05	0.36	0.0491	-17.4
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	0.00	0.00	0.00	0.00	0.402	1.05	0.36	0.0491	-17.4
PENRE	MJ	0.00	0.00	0.00	0.00	66.1	65.3	59.1	1.55	-510
PENRM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	0.00	0.00	0.00	0.00	66.1	65.3	59.1	1.55	-510
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m³	0.00	0.00	0.00	0.00	0.00991	0.0129	0.00891	0.0017	-0.0964
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water										
Waste to disposal										
HWD	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.19E-05
NHWD	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	-0.167
TRWD	kg	0.00	0.00	0.00	0.00	0.000369	0.000348	0.000329	8.13E-06	-0.00267
RWDHL	kg	0.00	0.00	0.00	0.00	2.60E-08	4.39E-08	2.15E-08	8.30E-10	-3.71E-07
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	0.00	0.00	0.00	960	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

Scenarios and Additional Technical Information

Module A4 – Transport to the building site				
Vehicle Type	Fuel Consumption (L/km)	Distance (km)	Capacity Utilisation (%)	Density Of Product (kg/m ³)
Lorry 20 tonne (t) capacity	0.471	31.2	61%	2400

Module A5 - Installation in the building			
Parameter	Description	Unit	Value
Energy Use	On-site fuel consumption	litres/t	1.78
Waste materials from installation wastage		%	1

End-of-life modules – C1, C3, and C4			
Parameter	Description	Unit	Value
Waste for recycling		%	99
Waste for final disposal		%	1
Other assumptions for scenario development, e.g, transportation	Asphalt removal fuel use	litres/t	1.35

Module C2 – Transport to waste processing				
Vehicle Type	Fuel Consumption (L/km)	Distance (km)	Capacity Utilisation (%)	Density Of Product (kg/m ³)
Lorry 20 tonne (t) capacity	0.471	20	100	2400

Module D – Reuse/Recovery/Recycling Potential				
Asphalt sent for recycling can be used either as recycled asphalt pavement or recycled aggregate. The exact proportion of asphalt that can be replaced by RAP is dependent on the specification. It has therefore been assumed that 6.7% of the RAP sent for recycling is used to replace asphalt on a 1:1 basis with the module D credit being equal to the mass of avoided primary asphalt production, while the remaining 93.3% is used as a primary aggregate substitute				

Interpretation

The lifecycle impact of asphalt is dominated by the production phase (module A1-A3). This contributes to at least 73% of the overall impact for each of the indicators covered in the figure below. For global warming potential, A1-A3 accounts for 73% of the lifecycle impact. with the remaining 27% spread between distribution, construction, demolition, EoL transport and waste processing, with each of these stages contributing between 4% and 7%. Further analysis of A1-A3, reveals that the two main contributors to the A1-A3 impact are the upstream production of bitumen, which accounts for 22% of the life cycle impact of asphalt and the impact of the electricity and fuels used to mix and heat the asphalt which account for 36% of the lifecycle impact, the largest contributions coming from natural gas production and combustion and the upstream production of electricity. If polymer modified bitumen is taken into account bitumen-based products account for 25% of the total lifecycle impact. For most other categories the production of bitumen accounts for an even greater proportion of the total impact, contributing more than 35% of the A1 – C4 impact for AP, EP, ODP, POCP and ADP of fossil resources. Bitumen production also accounts for 59% of the non-renewable primary energy demand and 71% of the renewable primary energy demand. Bitumen production accounts for 44% of the freshwater consumption. The energy and fuels consumed on site contribute between 10% and 25% to the overall A1-C4 impacts for AP, EP, ODP, POC and ADP of fossil resources. It also contributes 16% to the non-renewable primary energy demand and 12% to freshwater consumption. ADP of elements is an outlier, with 56% coming from cellulose fibre production. The background dataset for cellulose fibre production has a high elemental ADP due to the consumption of mineral colemanite.

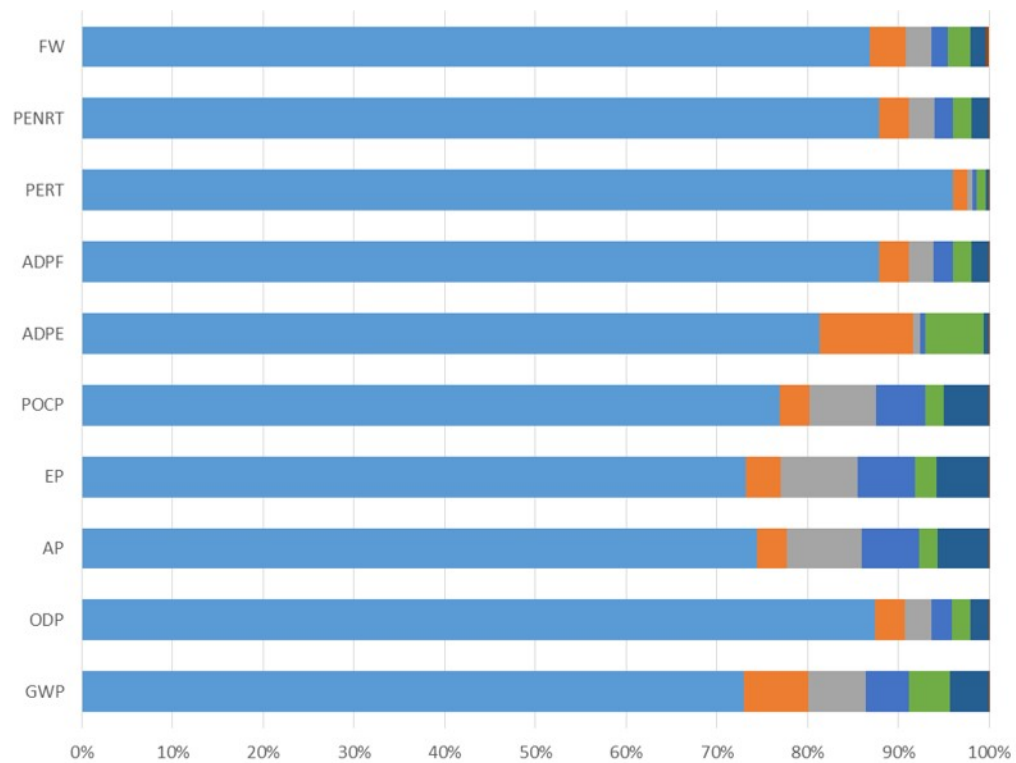


Figure 1

	GWP	ODP	AP	EP	POCP	ADPE	ADPF	PERT	PENRT	FW
A1-A3	73%	87%	74%	73%	77%	81%	88%	96%	88%	87%
A4	7%	3%	3%	4%	3%	10%	3%	2%	3%	4%
A5	6%	3%	8%	8%	7%	1%	3%	1%	3%	3%
B1-B7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
C1	5%	2%	6%	6%	5%	1%	2%	0%	2%	2%
C2	5%	2%	2%	2%	2%	7%	2%	1%	2%	2%
C3	4%	2%	6%	6%	5%	1%	2%	0%	2%	2%
C4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

A1-A3 A4 A5 B1-B7 C1 C2 C3 C4

Figure 2

Sources of additional information

BRE Global. BRE Environmental Profiles 2013: Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013. PN 514. Watford, BRE, 2014.

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.

ADEPT (2015) Service life of Asphalt Materials for Asset Management Purposes. London: MPA

ecoinvent (2013) Weidema, B.P.; Bauer, Ch.; Hischer, R.; Mutel, Ch.; Nemecek, T.; Reinhard, J.; Vadenbo, C.O.; Wernet, G, 2013, The ecoinvent database: Overview and methodology, Data quality guideline for the ecoinvent database version 3. www.ecoinvent.org. Zurich: Ecoinvent

GABI ts (2014) thinkstep AG, 2014. GaBi ts: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen: thinkstep AG

TRL (2011) Transport Research Laboratory. Further guidance on the calculation of whole life cycle greenhouse gas emissions generated by asphalt – Part of the asphalt Pavement Embodied Carbon Tool (aspect). Wokingham: TRL
EN 13108 (2006) EN 13108: Bituminous mixtures. Material Specifications. Brussels: CEN.