

SCHEDULE 40

Carbon Model

1. Carbon Model

- 1.1. The Service Provider has produced an agreed form of Carbon Model which is contained in Appendix 1 to this Schedule 40.
- 1.2. This Carbon Model forms the template which will be populated by the Service Provider to produce the Original Populated Carbon Model the Populated Carbon Model the Programmed Populated Carbon Model and the Updated Populated Carbon Model as appropriate.
- 1.3. The Carbon Model has been developed in accordance with the principles set out in paragraphs 2 and 3 below.

2. Carbon Modelling Principles

- 2.1. The Service Provider's Carbon Model shall be based on the principles of the Highways Agency MAC Model.
- 2.2. The current Carbon Emission Factors contained in the Highways Agency MAC Model are contained in Appendix 3 to this Schedule 40.
- 2.3. The Service Provider shall estimate the carbon impact of their proposals in relation to the Programmed Maintenance to be carried out in respect of Carriageways, Footways and Street Lighting as set out in the Investment Programmes, and for energy usage by Powered Apparatus.
- 2.4. This carbon impact is to be stated per square metre for each proposed Treatment Type for Carriageways and Footways, per unit for each type of Lighting Unit and per lamp for each type of energy used by Powered Apparatus.
- 2.5. For Carriageways and Footway Treatment Types and for the Lighting Units, the Service Provider shall:
 - 2.5.1 Identify the quantities required of the various constituent materials of each Treatment Type or type of Lighting Unit and of the operational energy to be used in delivering that Treatment Type or Lighting Unit;

- 2.5.2 For Street Lighting, the carbon value of the Columns shall be calculated on the basis of the individual type of Column and the Carbon Emission Factor for the material it is constructed of, based on the specific weight and height of a particular column type, rather than the Carbon Emission Factor for columns contained in the Appendix 3.
- 2.6 Identify and/or calculate Carbon Emission Factor for each type of material, using the Carbon Emission Factor in Appendix 3 where available, or calculated using the methodology set out in paragraph 3 below where a Carbon Emission Factor is not available in Appendix 2.
- 2.7 In addition, identify and/or calculate the operational energy used, using the Carbon Emission Factors as set out in Appendix 3, or other approved sources where not available:
- 2.7.1 Calculate from the above combined conversion factors for each Treatment Type or Lighting Unit, using, where appropriate, weighted averages of the factors for the constituent materials and operational energy. If a Treatment Type requires an element of processing/formulation at a Depot before delivery to the Site, then the operational energy used at the depot shall be included as well as any at the Site itself.
- 2.7.2 Estimate the total carbon impact of the Programmed Maintenance to be carried out in respect of Carriageways, Footways and Street Lighting for each year of the Core Investment Period and for the Lifecycle Period, by multiplying the combined conversion factors by the quantity of treatments and number of Lighting Units included within the Investment Programmes.
- 2.8 In addition, the Service Provider shall identify, for each Treatment Type and for each type of Lighting Unit, the amounts of material to be disposed of from the area being treated or the area where Lighting Units are being replaced, and the amounts to be reused or recycled. Any reused or recycled materials shall then be identified pursuant to paragraph 2.7.2 above, with a conversion factor of nil.
- 2.9 For Powered Apparatus Energy, the Service Provider shall, for each of Street Lighting, Traffic Signals, Illuminated Signs and Intelligent Transport Systems, identify the forecast energy consumption for each lamp type on an annual basis and multiply this by the appropriate Carbon Emission Factor contained in Appendix 3.

3 Population of Carbon Model to take into account additional materials

- 3.1 Where the Service Provider is using materials which are not contained in Appendix 2 they shall propose appropriate conversion factors for those Materials.
- 3.2 The Service Provider shall demonstrate to the Authorities satisfaction that such factors have been derived following the principles which are consistent with those contained in the Inventory of Carbon and Energy (ICE) version 2.0 produced by the University of Bath as updated from time to time, in particular satisfying the following requirements;

General

- 3.3 The conversion factor shall represent the total primary energy consumed during resource extraction, transportation, manufacturing and fabrication of a product, on the basis of a “Cradle-to-Gate” (factory gate) approach, as opposed to a “Cradle-to-Site” (site of use) or “Cradle-to-Grave” (disposal of material after use) to separate the production of such materials from the transport of and operational impacts of using such materials.
- 3.4 The conversion factor shall take account of the embodied energy of the material rather than the embodied carbon, as per the Highways Agency Carbon Model approach. The Service Provider shall have regard to and demonstrate their application of the five criteria used by the ICE when calculating their conversion factors, namely:
 - 3.4.1 Compliance with Approved Methodologies/Standards;
 - 3.4.2 System Boundaries;
 - 3.4.3 Origin (Country) of Data;
 - 3.4.4 Age of the Data Sources; and
 - 3.4.5 Embodied Carbon.
- 3.5 The Service Provider shall have reference to and regard to the ICE when considering the above criteria, and shall demonstrate the unit to which the conversion factor applies, eg kgCO₂/kg.

Transport

3.6 The Service Provider shall only take into account the transport entailed within the production of the material.

Recycled Content

3.7 The Service Provider shall also set out the extent to which they have included consideration of the recycled content of the material within the conversion factor and shall set out the methodology used for incorporating the recycled content, setting out whether the recycled content or substitution method have been used.

3.8 Where the recycled content of the material to be used will be derived from the Authority's existing Project Network Parts (ie the current road surface or street lighting columns) these shall be included within the conversion factor i.e. a zero factor for the material itself and the appropriate factor for the operational energy required to process such materials.

4 Updates to Carbon Model

The Carbon Model may only be updated in accordance with Clause 20.8 of the Contract.

Appendix 1

Carbon Model

Exempt from disclosure as commercially sensitive

Appendix 2

Carbon Model Instructions

Exempt from disclosure as commercially sensitive

Appendix 3

Carbon Emission Factors

Emission Source	Factor	Unit	Reference
Utilities & Fuel			
UK Grid-Electricity Rolling Average	0.54160	kgCO ₂ /kWh	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Natural Gas	0.20515	kgCO ₂ /kWh	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Domestic Water Consumption	0.43	kgCO ₂ /m ³	Veolia Water UK plc (2008) Corporate Responsibility Review 2008
Gas Oil	3.19	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Petrol	3.135	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Diesel	3.164	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Biodiesel	0.0268	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Fuel Oil	0.28164	kgCO ₂ /kWh	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Burning Oil / Kerosene	3.15	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
LPG	1.4902	kgCO ₂ /litre	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Compressed Natural Gas	2.7122	kgCO ₂ /kg	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Average UK Hotel	40	kgCO ₂ /room/night	Department of Environment (1997). Energy Efficiency in Hotels
Diesel	2.672	kgCO _{2e} /litre	Carbon Trust
Materials			
Cement: general	0.74	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Cement: general - 20% fly ash	0.76	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Cement: general - 35% fly ash	0.62	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Cement: general - 21% blast furnace slag	0.75	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Cement: general - 65% blast furnace slag	0.39	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Fibre Cement	1.09	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Portland Cement (dry kiln)	0.95	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Portland Ash Cement	0.59	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Soil-Cement - 5%	0.061	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Copper: general	2.71	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Recycled Copper	0.84	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: general [Market Average]	1.46	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: general [Recycled]	0.47	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: bar & rod [MA]	1.4	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: bar & rod [R]	0.45	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: pipe (BS1387 Medium) [MA]	1.45	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: pipe (BS1387 Medium) [R]	0.57	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Steel: section	1.53	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: sheet [MA]	1.38	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: sheet [R]	0.44	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Steel: wire	3.02	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Steel: stainless	6.15	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Aluminium: general [MA]	9.16	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Aluminium: general [R]	1.81	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Handrail: galvanised with fittings	1.98	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Sheet Piling	1.77	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Flap Valves	1.77	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Lead: general [MA]	1.67	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Lead: general [R]	0.58	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Damp Proof Course/Membrane	4.2	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Natural rubber	2.85	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Synthetic rubber	4.02	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Standard Paint	2.91	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Mortar (1:3 cement:sand mix)	0.221	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Mortar (1:1/2:4 1/2cement:lime:sand mix)	0.213	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Plastic: general	3.31	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Polyethylene	1.93	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
PVC	3.1	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Quarried aggregate	0.0052	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Recycled aggregate	0.00369	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Asphalt (4%)	0.066	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Bitumen	0.5	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Standard Brick	0.24	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Facing bricks	0.52	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Clay	0.24	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Vitrified clay pipe DN 100 - 200	0.46	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Vitrified clay pipe DN 200 - 300	0.5	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Sand	0.0051	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Soil	0.024	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Stone: general	0.079	kgCO ₂ /kg	Bath Inventory - Version 2.0 (2011)
Stone gravel/chippings	0.0052	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Slate	0.031	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Timber: general	0.46	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Hardboard	0.86	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
MDF	0.59	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Particle Board	0.51	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Plywood	0.81	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Sawn Hardwood	0.47	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Sawn Softwood	0.45	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
General Concrete	0.107	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Prefabricated Concrete (RC 40/50 Mpa)	0.18	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
Concrete Road & Pavement	0.127	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
High Strength	0.206	kgCO _{2e} /kg	Bath Inventory - Version 2.0 (2011)
General Road Salt	0.000002	tCO ₂ /t	Bath Inventory - Version 1.6a (2008)
Steel Columns	0.66	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Aluminium Columns	f	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Luminaire	0.1134	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Main Cable	0.0096	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Feeder Pillar	0.775	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Lightwt Superspan Gantry	32.76	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
2 x MS4 + 8 x Lane ctrl signage (est 4ft)	15.805	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
MS4 post	6.552	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
MS4 Sign (800kg)	3.161	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
10 m piles	4.896	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Power Cable	0.0096	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Cabinets	0.775	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Misc Cable	0.0043	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment

Hard Shoulder cameras & poles	0.6971	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Barrier	0.1049	tCO ₂ /unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Steel (50% recycled)	0.965	kgCO ₂ e/kg	Amey Assumption based on Bath Inventory figures
Transport			
UK Average HGV Freight	0.587	kgCO ₂ / tonne-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Small Bulk Carrier (Shipping)	0.613	kgCO ₂ / tonne-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Rail Freight	0.029	kgCO ₂ / tonne-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Small Petrol Car	0.173	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Medium Petrol Car	0.215	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Large Petrol Car	0.299	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Unknown Petrol Car	0.21	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Small Diesel Car	0.145	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Medium Diesel Car	0.186	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Large Diesel Car	0.245	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Unknown Diesel Car	0.195	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Medium Petrol Hybrid Car	0.119	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Large Petrol Hybrid Car	0.217	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Medium LPG Car	0.193	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Large LPG Car	0.269	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Unknown LPG Car	0.214	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Unknown Fuel Car	0.207	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Small Motorcycle	0.085	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Medium Motorcycle	0.103	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Large Motorcycle	0.137	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Unknown Motorcycle	0.116	kgCO ₂ /km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Local Bus	0.157	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
National Rail	0.053	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
National Coach	0.03	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Underground	0.074	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Tram / Light Rail	0.077	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Regular Taxi	0.152	kgCO ₂ /passenger-km	Defra (2010) Guidelines to Defra's GHG Conversion Factors
Material Density Factors			
Petrol	737.22	kg/m3	www.simetric.co.uk
Diesel	885	kg/m3	www.simetric.co.uk
Biodiesel	0.84	kg/litre	www.simetric.co.uk
Cement: general	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Cement: general - 20% fly ash	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Cement: general - 35% fly ash	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Cement: general - 21% blast furnace slag	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Cement: general - 65% blast furnace slag	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Fibre Cement	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Portland Cement (dry kiln)	1.5	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Portland Ash Cement	1.5	tonnes/m ³	Bath Inventory - Version 1.6a (2008)
Soil-Cement - 5%	1.86	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Copper: general	8.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Recycled Copper	8.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: general	8	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: bar & rod	7.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: pipe (BS1387 Medium)	6.81	kg/m	Bath Inventory - Version 2.0 (2011)
Steel: section	8	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: sheet	8	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: wire	8	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel: stainless	8	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Aluminium: general	2.7	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Handrail: galvanised with fittings	0.012	tonnes/m	Bath Inventory - Version 2.0 (2011)
Sheet Piling	0.13	tonnes/m	Bath Inventory - Version 2.0 (2011)
Flap Valves	0.02	tonnes/valve	Bath Inventory - Version 2.0 (2011)
Lead: general	11.34	t/m ³	Bath Inventory - Version 2.0 (2011)
Damp Proof Course/Membrane	0.9	tonnes/m ²	Bath Inventory - Version 2.0 (2011)
Natural rubber	1.5	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Synthetic rubber	1.5	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Standard Paint	1.2	kg/litre	Bath Inventory - Version 2.0 (2011)
Mortar (cement:sand mix)	1.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Mortar (cement:lime:sand mix)	1.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Plastic: general	0.96	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Polyethylene	0.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
PVC	1.4	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Quarried aggregate	2	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Recycled aggregate	2	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Asphalt	1.7	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Bitumen	1	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Standard Brick	2.4	tonnes/ 1000 bricks	Bath Inventory - Version 2.0 (2011)
Facing bricks	2.4	tonnes/ 1000 bricks	Bath Inventory - Version 2.0 (2011)
Clay	1.9	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Vitrified clay pipe DN 100 - 200	0.01055	kg/m	Bath Inventory - Version 2.0 (2011)
Vitrified clay pipe DN 200 - 300	0.083	kg/m	Bath Inventory - Version 2.0 (2011)
Sand	1.85	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Soil	1.7	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Stone: general	2	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Stone gravel/chippings	2	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Slate	2.7	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Timber: general	0.5	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Hardboard	0.88	kg/m ³	Bath Inventory - Version 2.0 (2011)
MDF	14	kg/m ²	Bath Inventory - Version 2.0 (2011)
Particle Board	6	kg/m ²	Bath Inventory - Version 2.0 (2011)
Plywood	11	kg/m ²	Bath Inventory - Version 2.0 (2011)
Sawn Hardwood	0.6	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Sawn Softwood	0.5	tonnes/m ³	Bath Inventory - Version 2.0 (2011)
Steel Columns	0.361	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Aluminium Columns	0.201	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Luminaire	0.017	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Main Cable	0.003	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Feeder Pillar	2.05	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment

Lightwt Superspan Gantry	18	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
2 x MS4 + 8 x Lane ctrl signage (est 4ft)	4	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
MS4 post	3.6	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
MS4 Sign (800kg)	0.8	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
10 m piles	16	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Power Cable	0.003	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Cabinets	2.053	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Misc Cable	0.0012	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Hard Shoulder cameras & poles	1.204	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
Barrier	0.224	t per unit	Capita Symonds (2008). Carbon Footprint of Motorway Electrical Equipment
General Office Waste Density	0.1	t per m ³	Environment & Heritage Service (2003). Municipal Waste Data Monitoring and Reporting
Average Wheelie Bin Waste Volume	0.11	tonnes	Environment & Heritage Service (2003). Municipal Waste Data Monitoring and Reporting
Average 60 Litre Black Bag (assumes 75% full)	0.045	m ³	Assumption
Average Waste Generation Rate	0.05	m ³ /employee/week	CIBSE (2004). Guide G: Public Health Engineering
Average Waste Generation Rate	0.05	m ³ /10m ² floor area	CIBSE (2004). Guide G: Public Health Engineering
Benchmarks			
Standard Office + Average Energy Efficiency Measures	226	kWh/m ² /annum	CIBSE (2004). Guide F - Energy Efficiency in Buildings
Standard Office Greenhouse Gases (Space / Water Heating)	151	kWh/m ² /annum	CIBSE (2004). Guide F - Energy Efficiency in Buildings
Average Annual Water Consumption per Employee	9.4	m ³ /annum	The Watermark Project