

Tasks 369(387) and 371(387)

# Carbon Calculation Framework

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## Carbon Calculation Tool Instruction Manual For Design, Build and Finance Operations (DBFO)

Version 5c

December 2009

## Document Control Sheet

**Report Title**

**Highways Agency Carbon Calculation Tool – Instruction Manual – Version 5c**

**Document No.**

**CCP-369-371-Instruction Manual-101209-V5c**

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*First Issue:* Final draft for issue to the Highways Agency, Mar 2008

*Second Revision:* Second draft for issue to Highways Agency, Jul 2008

*Third Revision:* Revised for issue with Version 4a of DBFO Spreadsheet, Nov 2008

*Fourth Revision:* Revised for issue with Version 4b of DBFO Spreadsheet, Jan 2009

*Fifth Revision:* Revised for issue with Version 5 of DBFO Spreadsheet, Jul 2009

*Sixth Revision:* Revised for issue with Version 5b of DBFO Spreadsheet, Sep 2009

*Seventh Revision:* Revised for issue with Version 5c of DBFO Spreadsheet, Dec 2009

This Document has been prepared for the Highways Agency by a team led by Parsons Brinckerhoff drawn from the following organisations:



Gifford



We would also like to thank the following organisations for their input:

- DEFRA
- Department for Transport
- Highways Agency
- Institution of Civil Engineers
- Institution of Highways and Transport

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## GLOSSARY

<b>Carbon Dioxide (CO<sub>2</sub>)</b>	The most important greenhouse gas. CO <sub>2</sub> emissions result from the combustion of fuel, from land use changes and from some industrial processes. CO <sub>2</sub> emissions are limited by the Kyoto Protocol (Carbon Trust 2007).
<b>Carbon dioxide Equivalent (CO<sub>2</sub>e)</b>	There are six main greenhouse gases which cause climate change and are limited by the Kyoto Protocol. Each gas has a different global warming potential. For simplicity of reporting, the mass of each gas emitted is commonly translated into a carbon dioxide equivalent (CO <sub>2</sub> e) amount so that the total impact from all sources can be summed to one figure (Carbon Trust 2007).
<b>Carbon Footprint</b>	The total set of greenhouse gas emissions caused by an individual or organisation, event or product. It should be expressed as CO <sub>2</sub> e.
<b>DBFO</b>	Parts of the motorway and trunk road network are managed under Private Finance Initiative. These contracts are known as DBFO contracts (Highways Agency 2008).
<b>Embodied Carbon</b>	Greenhouse gas emissions associated with the life cycle of a product. This includes all emissions (or portion of emissions) that are released as part of all processes involved in creating, modifying, transporting, storing, disposing of and/or recycling the product (BSI, 2008).
<b>Emissions Factor</b>	Emissions factors enable a conversion to be made from the input measure of energy to the amount of carbon dioxide emissions that will result. UK conversion factors for energy and transport are published by the Department of Environment, Food and Rural Affairs (Defra).
<b>Greenhouse Gas (GHG) Protocol</b>	A widely used standard for emissions reporting. The protocol covers project emissions reporting and corporate emissions reporting. The corporate emissions reporting standard provides a methodology for calculation of a carbon footprint. The protocol was developed by the World Resources Institute and the World Business Council for Sustainable Development. It is available online from <a href="http://www.ghgprotocol.org">www.ghgprotocol.org</a> (Carbon Trust 2007).
<b>ISO 14064</b>	ISO 14064 is an international standard for corporate emissions reporting. It builds on the approach outlined in the Greenhouse Gas Protocol. See <a href="http://www.iso.org">www.iso.org</a> for more information (Carbon Trust 2007).
<b>MAC</b>	Managing Agent Contractor: In order to manage England's strategic network, the Agency has divided the country into fourteen areas. Each of these Areas is assigned an Area team and a contractor, known as a Managing Agent (MA) or Managing Agent Contractor (MAC). Each Area team and corresponding Managing Agent is responsible for the maintenance of the Agency's roads in their area. Area teams are part of Traffic Operations (TO) Directorate (Highways Agency 2008).
<b>Tonne of Carbon</b>	1 tonne of CO <sub>2</sub> emissions occupies 556m <sup>3</sup> of space at 25 degrees Celsius and standard pressure.

## 1 INTRODUCTION

The Highways Agency as a Government Agency is committed to contributing to the Government's targets for greenhouse gas (GHG) emissions reductions. In June 2007, the Highways Agency published its first Sustainable Development Action Plan (SDAP) which established the target to investigate the Highways Agency's carbon footprint from construction, maintenance and network operations.

This Carbon Calculation Tool has been developed to enable the Highways Agency to identify the carbon footprint associated with the Highways Agency's activities. The tool provides a means of capturing the volume of carbon produced through construction, maintenance and operational activities undertaken by the Highways Agency itself, and its main contractors. The tool also provides a reporting mechanism for the ongoing calculation of carbon and GHG emissions as part of an overall Carbon Management Strategy (CMS).

This Instruction Manual has been developed to support the Calculation Tool, and provides guidance on how to both collect the requisite data needed for the tool and how to complete the workbooks after the data has been collected. The Data Collection Strategy (Section 1.1.1) describes the type of data that will need to be collated and reported and how this should be implemented. Section 3 provides specific instructions for Data Co-ordinators to enable them to complete the workbook.

Due to the inherent variability (of availability and reliability) of both the data required to complete the Calculation Tool and of the CO<sub>2</sub> conversion factors themselves, it has been necessary to draw some assumptions within the calculations. These assumptions are detailed in the Highways Agency Carbon Calculation Tool – Explanatory Report (March 2008).

### 1.1 OVERVIEW AND DESCRIPTION

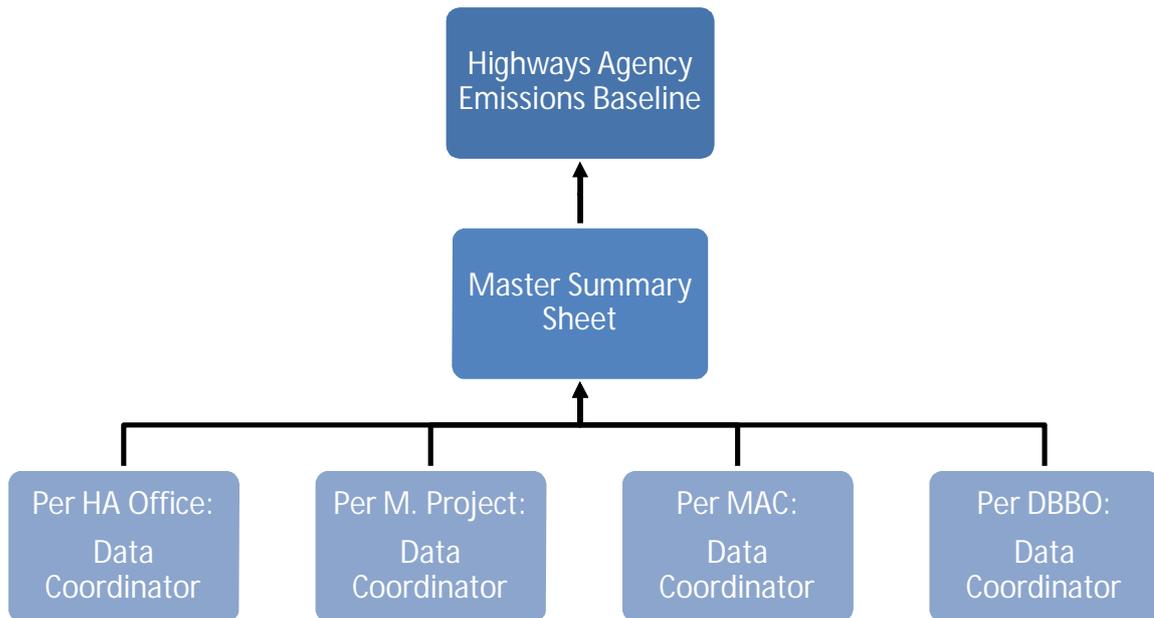
The Calculation Tool is an Excel based tool comprising four work-books. Each work-book addresses the CO<sub>2</sub> emissions produced by the following key operations areas:

- Highways Agency Internal & Network Operations
- Major Projects
- Managing Agent Contractors (MACs)
- Design Build Finance & Operate (DBFO) Contracts

Section 3 of this Instruction Manual provides guidance specific to DBFO, to enable each individual DBFO to operate the Tool.

#### 1.1.1 Data Collection Strategy (DCS)

The Calculation Tool has been designed to enable a large and varied data set to be collected, presented and interpreted at the most appropriate level. To help implement efficient data collection, a DCS has been devised. Figure 1 below illustrates the general structure through which information will be reported back to the Highways Agency. Table 1 is the accompanying key and further describes the reporting lines within each tier.



**Figure 1: CCT Reporting Structure**

### 1.1.2 Highways Agency Data Manager – Tiers 1 and 2

The Highways Agency Data Manager is responsible for co-ordinating the entire data collection process. This includes collating the completed Carbon Calculation Tool workbooks for Highways Agency Internal Offices, Highways Agency Network Consumption, Major Projects, MACs, DBFOs and Tolling Stations. As such, Tiers 1 and 2 of the DCS are the responsibility of the ‘Highways Agency Data Manager’, and are the highest level of reporting for the tool.

When the complete data set has been collected and entered into the workbooks, the workbooks are sent to the Highways Agency Data Manager where they are collated and interpreted. The Highways Agency Data Manager will be responsible for extracting the necessary information from the summary sheets of each workbook for the above Operational Areas, and collating this information into the Highways Agency Emissions Baseline.

### 1.1.3 Data Co-ordinators – Tier 3

Data Co-ordinators are responsible for overseeing primary data collection, and ensuring that ground level data collected from their Reporting Area is recorded correctly. They are also responsible for ensuring workbooks are completed and checked for accuracy. In addition, one of the key priorities for each Data Co-ordinator is to compile the comments sheet within the relevant workbook. Once completed, the workbooks should be forwarded to the Highways Agency Data Manager.

- **Highways Agency Internal Operations** – One Highways Agency Data Co-ordinator will be responsible for inputting data into, and managing the workbooks for each of the Highways Agency’s offices, Regional Control Centres (RCCs) and outstations, and National Control Centre (NTCC). The internal operations will also include emissions in relation to Network Energy and Traffic Officer Operations.
- **Major Projects** - Due to the detail of the information required for Major Projects, it is recommended that a nominated Data Co-ordinator is identified for each individual Major Project.
- **MACs** - Where applicable, a Data Co-ordinator should be appointed in each main MAC Office. They will be responsible for organising collection of data within their office

and also any associated out-stations, operational depots and small projects within their Reporting Area.

- **DBFOs** - Where applicable, a Data Co-ordinator should be appointed to obtain data for each individual DBFO Contract. They will be responsible for organising collection of data within their office and also any out-stations, operational depots and small projects associated with their DBFO Contract.

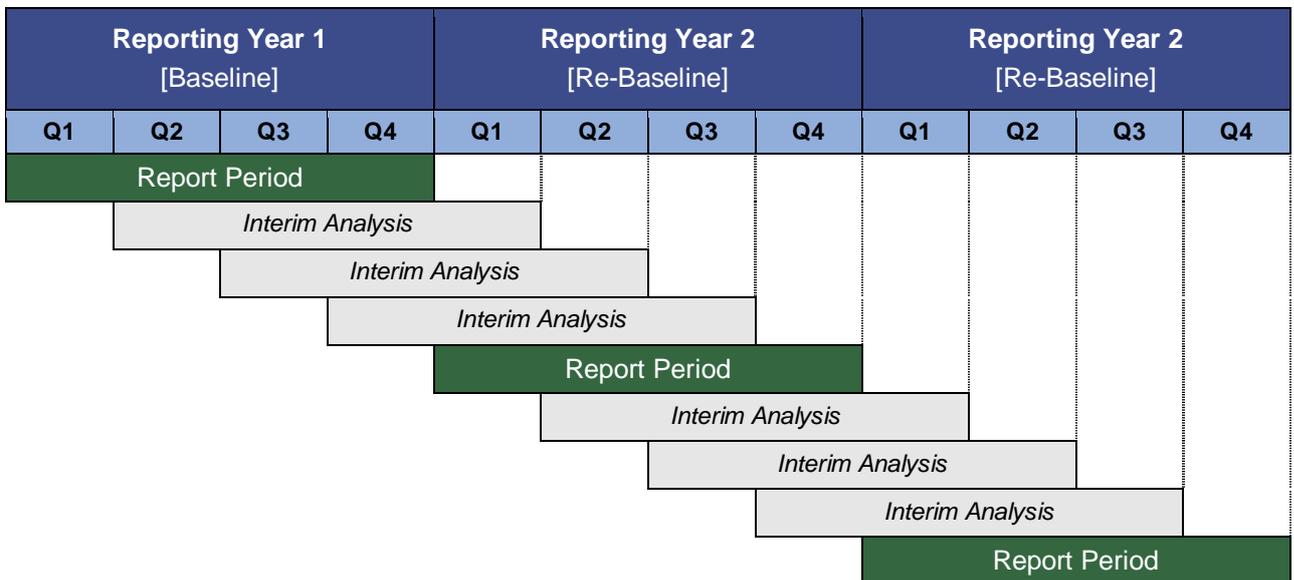
**Section 3 of this Instruction Manual provides the Data Co-ordinator with a step-by-step guide to completing each workbook and the individual spreadsheets within them.**

**1.1.4 Reporting Timescale**

As illustrated within Figure 2, data will be collected on a quarterly basis. An initial twelve months data is required to establish a baseline for future comparison and analysis. Interim assessment will be made at the end of each quarter. For each full twelve months of data, a full analysis of the data will be conducted and a report produced. Information will continue to be collected on a quarterly basis and reported on a rolling twelve month (annual) basis. For clarity, the adopted Quarters are indicated within the workbooks as follows:

- Quarter 1 – April, May June
- Quarter 2 – July, August, September
- Quarter 3 – October, November, December
- Quarter 4 – January, February, March

Further details of how data is collected and reported are provided within the workbook and in Section 3 of this Instruction Manual.



**Figure 2: Rolling Data Collection and Reporting Chart**

## 2 GETTING STARTED – WHAT YOU NEED TO KNOW

### 2.1 INSTRUCTIONS FOR DATA COLLECTORS

**Objectives** - The objective of the Calculation Tool is to provide a robust, reliable means of measuring the Highways Agency's Emissions Baseline. This is to help ensure the Highways Agency meets their management targets year on year, and to enable the Highways Agency to identify areas of their business where CO<sub>2</sub> emissions reductions could be made. Essentially, you will be gathering raw data which will later be converted to provide an estimated volume of CO<sub>2</sub> emissions.

**Your Responsibilities** - The responsibility of the Data Co-ordinator is to research and gather the most accurate, up to date information available to complete the workbooks. You will be required to communicate with a broad range of people within your sector of the business to obtain the appropriate data.

**Reporting Area** – You, as the Data Coordinator, must ensure you know which office(s) and any associated facilities, out-stations, operational depots you are collecting data for.

**Reporting Period** – To keep on top of the large quantity of data you will collect, you will be required to gather information on a quarterly basis. Due to the inherent variability of data within the reporting periods, you may find that there are some sources of data collection that require little or no updating during every quarter.

**Challenges and Issues** - The greatest challenge you are likely to encounter is in obtaining the data itself. To maximise your efficiency, from the outset you should familiarise yourself with the type of data you will need to gather. A set of proformas has been designed to assist you with this exercise (see Appendix 1).

Time and resources during the data collection process are also likely to be a challenge. The sources of data are many and varied, and will involve speaking to a number of internal colleagues and, in some instances, sub-contractors and third party organisations. It is crucial that sufficient time and resources be allocated to the data collection process to execute this stage effectively.

**Further Guidance and Help** - If you require additional support or need clarification on any part of the Calculation Tool, you should contact the Highways Agency Data Manager.

### 2.2 GATHERING THE DATA

#### 2.2.1 What Data is Required?

The information you will be required to gather relates specifically to the main sources of CO<sub>2</sub> emissions produced by the Highways Agency. In broad terms, these sources have been sorted into the following categories (an indication of the type of data required for each is also detailed below):

- 1. Energy e.g. utilities and plant energy consumption
- 2. Materials e.g. quantities of construction materials and office consumables bought within the reporting period; and distances materials have been transported from supplier to site
- 3. Transport e.g. distances or fuel consumption of vehicles used for business and employee commuting, and maintenance and operations activities
- 4. Waste Removal e.g. quantities of office and construction waste; and distances to point of disposal

#### 2.2.2 How to Obtain Required Data

You are likely to need to speak to many different members of staff across a variety of disciplines and out-stations in order to obtain all of the information required to complete the workbooks.

It may also be necessary for you to contact sub-contractors and third party suppliers directly, to acquire aspects of the data which are not available directly from your colleagues e.g. office utilities and construction materials suppliers. Further guidance on how far down your supply chain to go is provided within Section 3.2.

A set of proformas has been developed to assist you with the task of collecting and recording the requisite data, and are provided in Appendix 1. Each proforma has been divided into several sections to reflect the

structure of the workbook it relates to, as indicated in Section 2.2.1 above, which will also help you to input the data into the workbooks during the next stage.

The proformas clearly identify the following:

- The data to be collected (scope).
- Units of measurement (e.g. km / miles, kg / tonnes, kWh)
- Time scale over which data should be collected (e.g. quarterly, annually).

Due to the variability of the emissions sources, the data itself will be collected in several different units e.g. kilowatt hours (kWh), kilometres (km), miles, tonnes, cubic metres (m<sup>3</sup>). Whilst the electronic workbooks themselves will later convert many of these into a consistent unit of measurement (e.g. miles to kilometres), it is **ESSENTIAL** that you accurately record the unit of measurement in which you have collected the raw data. It will be very time-consuming to return and rectify any mistakes made at this stage later on. To assist you with this process, the proformas ask you to select which unit of measurement you are entering your data in.

### **Raising Staff Awareness**

Before beginning the process of data collection, it would be good practice for each Data Co-ordinator to inform their colleagues of their intent. Advance warning should help provide a more co-operative and efficient data collection process.

## **2.3 COMPLETING THE CALCULATION TOOL WORKBOOKS**

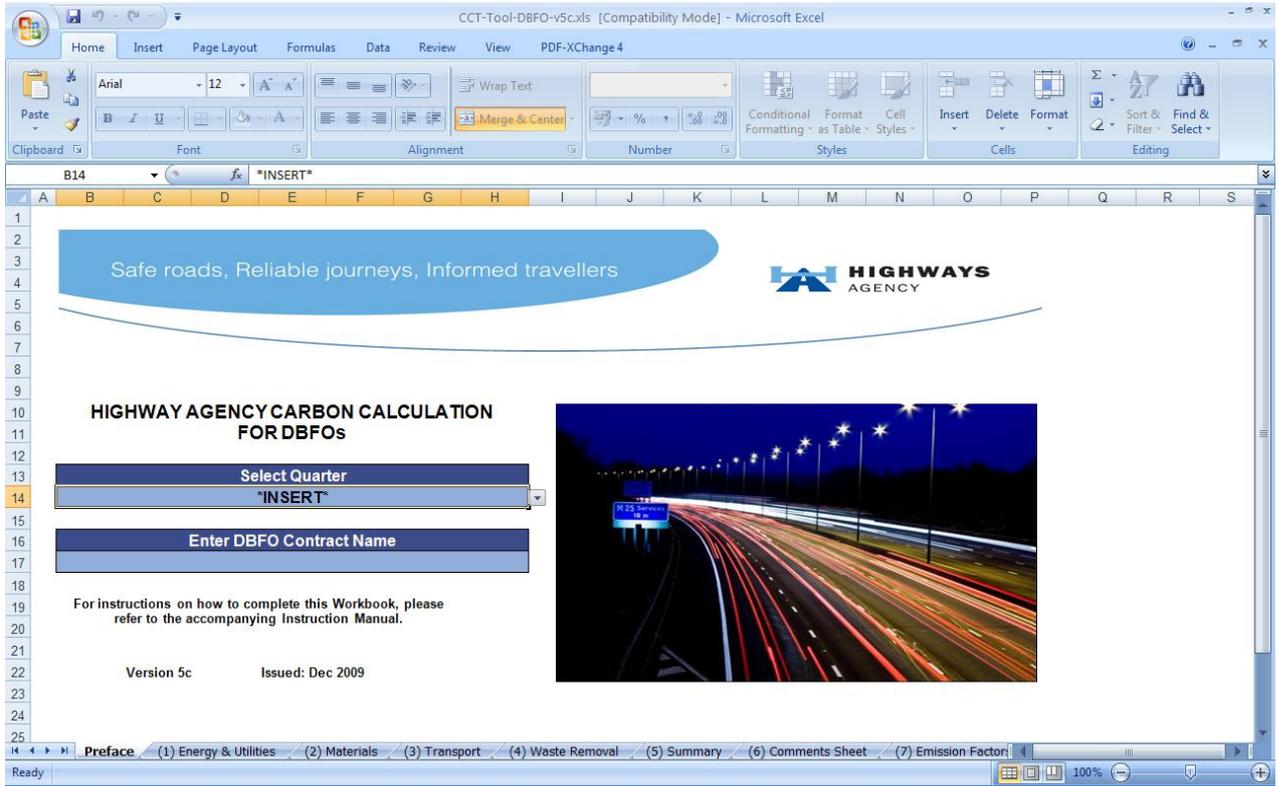
### **2.3.1 Navigating the Workbooks**

As illustrated in Figure 3, the DBFO workbook is divided into spreadsheets, which are set out as follows:

- Preface
- 1. Energy & Utilities
- 2. Materials
- 3. Transport
- 4. Waste Removal
- 5. Summary
- 6. Comments Sheet
- 7. Emission Factors

Simply click on the tab to open the relevant spreadsheet you wish to enter data for.

Although you do not need to complete each part of the workbook in numerical order, you should work through them systematically to ensure all parts are complete.



**Figure 3: Workbook Preface**

**Data Entry**

When you first open the workbook, you will be presented with a Preface Page. This simply tells you what version of the Calculation Tool you are using, and the opportunity to identify your Reporting Area and return quarter.

**Cell Colour Key**

The workbook’s cells have been coloured to clearly indicate the different functions of cells within the workbooks, as indicated in Table 2.

Header	Header
Data / Automatic Calculation	Data / Automatic Calculation
DATA ENTRY	DATA ENTRY

**Table 2: Workbook Cell Colour Key**

For ease of use, the only cells which require you to manually enter data into them are coloured white.

Once you have entered your data, you will notice that there are several sections of the spreadsheets which will automatically update themselves. These cells are coloured blue, and do not require you to enter any further details.

After you have successfully entered your data, the workbooks will calculate the CO<sub>2</sub> emissions produced from the various emissions sources. The total volume of CO<sub>2</sub> emissions are presented in blue cells, highlighted in bold and the end of each section.

## Drop-Down Menus

Throughout the workbooks, you will be asked to make choices about the type of data you are entering. These choices will be presented to you as a series of drop-down menus within the spreadsheets, from which you must choose the most applicable option.

To activate the drop-down menu, click on the cell. A list of options will then appear from which you should select the most relevant option.

## Conversion Calculators

Several sections throughout the workbooks require your data to be converted to a specified unit of measurement. As such, you will be expected to undertake simple conversion calculations (e.g. miles to kilometres). To help you with this, 'conversion calculators' have been built into the spreadsheets in the relevant sections.

## Comments Sheet

Tab 6 (Comments) of the DBFO Workbook provides a space within the workbook for you to record any additional information, data or comments. A number of prompt questions are included, and it is important that you provide supporting information alongside your data return to assist the analysis.

## 2.4 WHAT HAPPENS NEXT?

### 2.4.1 Summary Sheets and Feedback to Highways Agency

After relevant data has been gathered, it should be entered into the workbooks. Full guidance for this process is given in Section 3. As each section of the workbook is completed, the volumes of CO<sub>2</sub> for that section are automatically fed into the summary sheet at the back of the workbook. The summary sheet generates a graphical representation of the volume of CO<sub>2</sub> generated by each emissions source in your Reporting Area, for the reporting period.

Whilst completing the workbook, you should check that the data is accurate and, when satisfied, forward each of the finalised workbooks to the Highways Agency Data Manager. It will then become the Data Manager's responsibility to extract the appropriate information from each of the individual summary sheets (of which there will be many) and collate these in the Highways Agency's Emissions Baseline.

## 2.5 KEY POINTS TO REMEMBER!

- Ensure you know which offices and sub-stations are included in your Reporting Area.
- Forewarn colleagues in your Reporting Area who you are likely to need information from.
- You will need to collect and compile your data on a quarterly basis.
- Ensure you are using the correct unit of measurement.
- Each workbook contains a set of simple step-by-step instructions.
- Wherever you see \*INSERT\*, click on the cell and a drop down menu will appear for you to select an option from.
- The **only** cells which require you to **enter data** into are **white**.

### 3 DESIGN, BUILD, FINANCE & OPERATE (DBFO) CONTRACTS GUIDANCE FOR DATA CO-ORDINATORS

#### 3.1 SCOPE OF REPORTING AREA

“DBFO” relates to the CO<sub>2</sub> emissions associated with the activities and operations carried out in association with each DBFO Contract.

A separate workbook should be completed for each DBFO Contract undertaken.

**You should include CO<sub>2</sub> emissions at the point of purchase.**

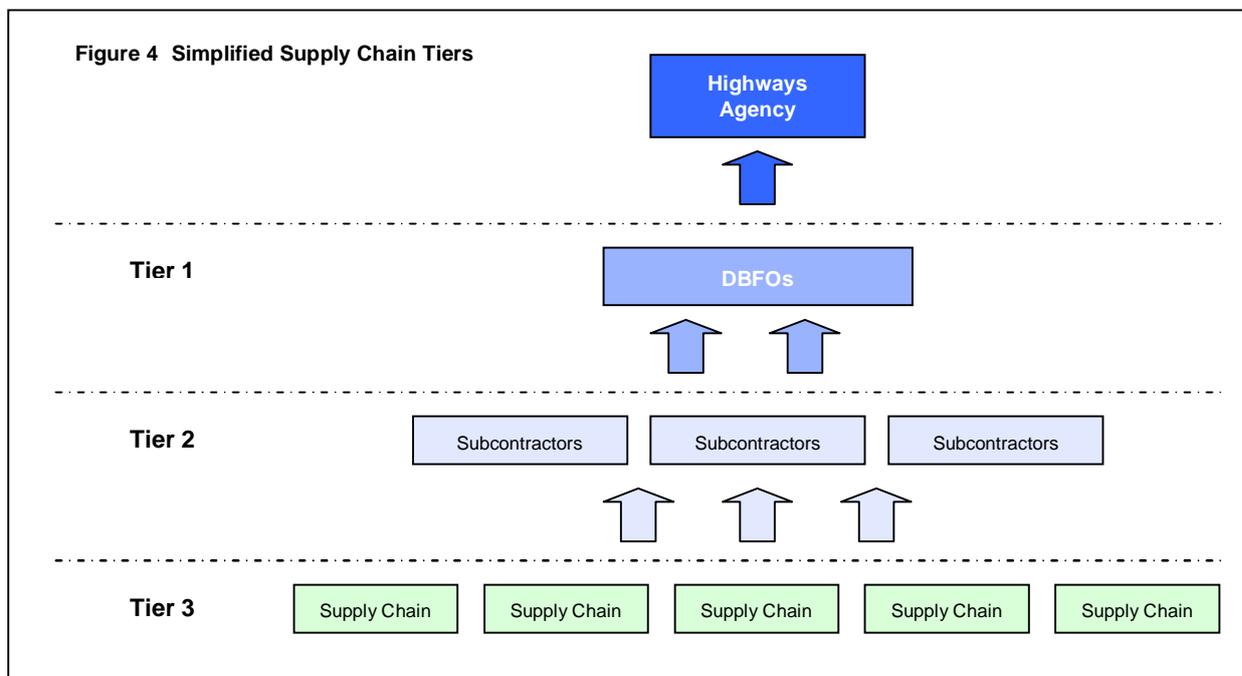
#### 3.2 GUIDANCE ON REPORTING BOUNDARIES

The Highways Agency DBFOs include a wide range of contractors, who are involved in works and projects of varying types, scales, and durations. DBFOs include complex supply chains, undertaking significant activities on behalf of the Highways Agency. Since these activities are considered to be potentially significant in emission terms, they are to be included within the Calculation Tool. However, the Highways Agency will not be ‘responsible’ for all emissions within the supply chain, given that it does not have operational control (for example, of supply chain purchasing decisions).

The need to establish consistent emission reporting boundaries is therefore recognised, in order to incorporate emission sources in a consistent manner. These boundaries may be developed further as data collection within the supply chain progresses.

As illustrated within Figure 4, various supply chain tiers can be identified and the following applies:

- Those emissions arising from the Highways Agency and Tier 1 DBFOs fall within the scope of the Carbon Calculation Tool.
- **Only certain emissions from Tier 2** fall within the scope (as detailed below)
- **No emissions from Tier 3** fall within the scope.



Upon this basis, Figure 5 identifies the various emission categories and sources from within the Calculation Tool, and identifies the key boundaries to be reported on. Emissions are divided into those which are 'direct' to DBFOs, and those which are 'indirect', as summarised below:

#### **Direct**

- DBFO Utilities (i.e. gas / water)
- DFBO Fuel Use e.g. site plant, mobile plant
- DBFO Business Transport

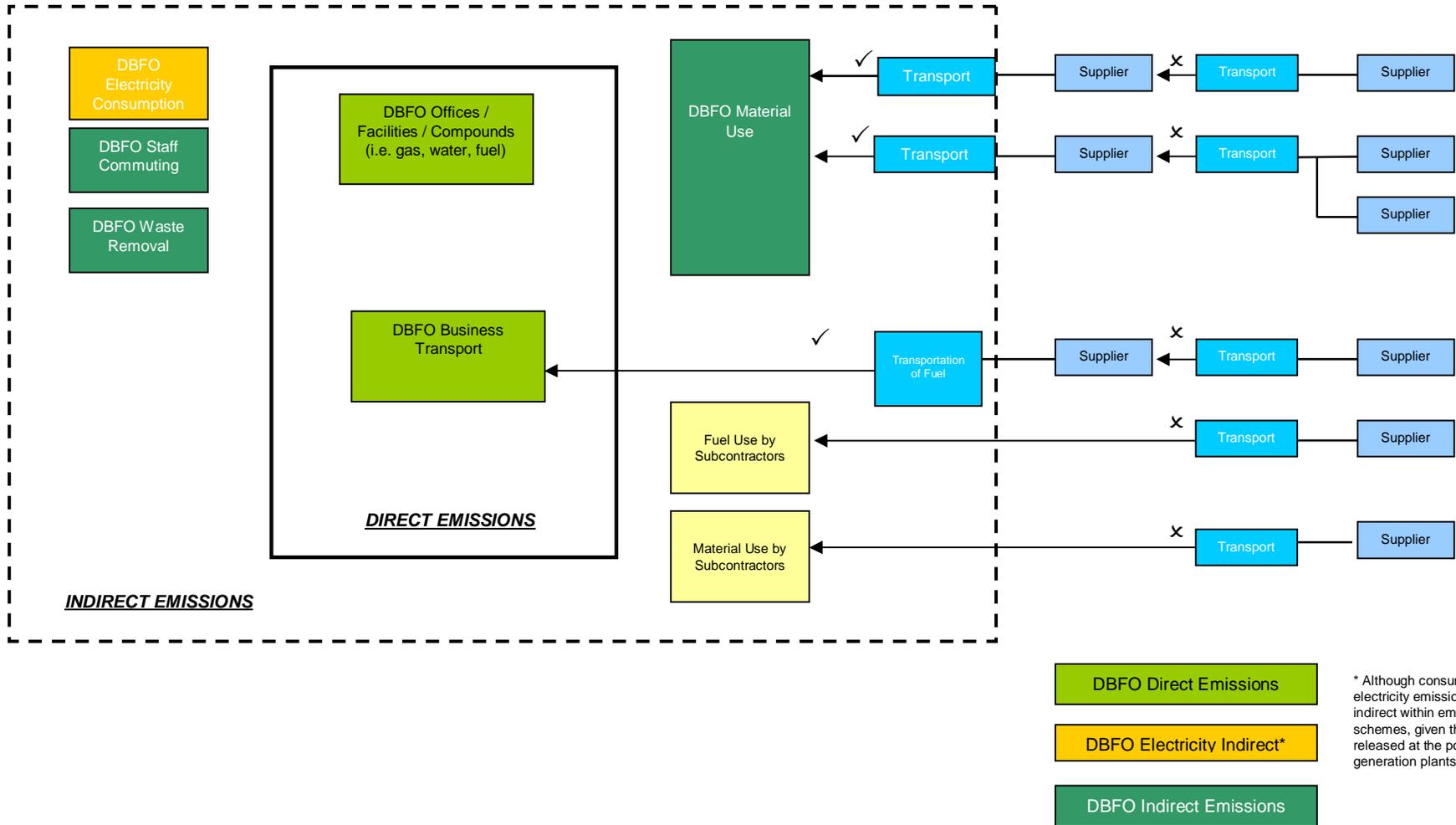
#### **Indirect**

- Electricity
- Other Transport (e.g. taxi's, hire cars, staff commuting)
- Waste Removal
- DBFO Material Consumption and Transport
- Tier 2 Subcontractor Material Consumption (where significant)
- Tier 2 Fuel Consumption

A distinction is to be made between fuel and material usage by DBFOs themselves, and the fuel and material usage by DBFO subcontractors. Within the context of the Calculation Tool, the following applies:

- Fuel and material consumption directly by DBFOs are within the scope of the Calculation Tool, in terms of the embodied carbon (which is based upon a 'cradle-to-gate' approach – i.e. covers all carbon emissions up to point of dispatch from the manufacturers' gate) and also in relation to transportation to site. This is illustrated within Figure 5 – the Carbon Calculation Tool scope does not include for transport further down the supply chain.
- Fuel and material consumption by DBFO subcontractors is included within the scope of the Calculation Tool only in terms of the embodied carbon of materials / fuel. Since the Highways Agency has no control of the transportation element, transport does not fall within the defined scope and should not be reported as part of the Highways Agency's Carbon Calculation.
- There is a question of 'significance' in terms of the Tier 2 Subcontractor materials and fuel consumption, in that only those sources considered to be of potential significance to overall emissions should be considered. Initial tests might be in terms of financial spend or volume consumption – as an initial estimate of significance. It is currently the responsibility of the Data Co-ordinator to determine the relevant significance, although this

**Figure 5 DBFO Reporting Boundaries**



### 3.3 OPENING THE WORK BOOK

Once you have successfully gathered all of the information requested on the proformas (as provided in Appendix 1) for your DBFO, you should follow the instructions below to help you complete the *Highways Calculation Tool*.

The emissions sources have been organised into following main categories

- 1. Energy & Utilities
- 2. Materials
- 3. Transport
- 4. Waste Removal

The following sections of this Instruction Manual provide you with a systematic, step-by-step set of instructions for completing each page of the work book. The instructions reflect the layout of the work book and enable you to quickly and easily find the relevant guidance for the section you require.

**All data should be provided for the reporting period specified by the Highways Agency.**

Upon opening your workbook, you will be presented with the 'Preface', and asked to enter your first piece of information, as illustrated below:

Section	Step	Action / Decision	Cell Ref
<b>PREFACE</b>			
	1	➤ Select the Reporting Period you are entering data for.	B14
	2	➤ Enter the name of the DBFO Contract you are supplying data for.	B17

### 3.4 ENERGY

To select the Energy spreadsheet, click on tab '(1) Materials' at the foot of the workbook.

#### 3.4.1 Scope

**This section relates to** energy which has been consumed carrying out operations and activities by tariff in your DBFO Office, including any out-stations and operational depots associated with it. Energy requirements of site compounds, mobile and fixed plant and fuel powered equipment are also accounted for in this section.

**It does not include:**

- Energy requirements of Highways Agency Offices and staff.
- Energy requirements of the network itself (i.e. network lighting and communications systems);

#### 3.4.2 Instructions for DBFO Contracts– ENERGY

Section	Step	Action / Decision	Cell Ref
<b>(1) ENERGY</b>			
<b>A</b>		<b>OFFICE CONSUMPTION</b>	
	1	➤ Enter the consumption of electricity in kWh, for your Reporting Area during the last quarter.	C12
	<b>Output</b>	The volume of CO <sub>2</sub> (in tonnes) generated by the electricity consumption of your reporting area is shown in the following cell.	D12
	1	➤ Enter the consumption of gas in kWh, for your Reporting Area during the last quarter.	C13
	<b>Output</b>	The volume of CO <sub>2</sub> (in tonnes) produced through the gas consumption of your office is shown in the following cell.	D13

Section	Step	Action / Decision	Cell Ref
	1	➤ Enter the total consumption of water in m <sup>3</sup> , for your Reporting Area during the last quarter.	C14
	<b>Output</b>	The volume of CO <sub>2</sub> (in tonnes) produced through the gas consumption of your Reporting Area is shown in the following cell.	D14
<b>B</b>		<b>OPERATIONAL ENERGY</b>	
		Enter consumption for all operational energy outside of DBFO offices	
	1	➤ Insert consumption in relevant units for reporting period	D26 –D34
	<b>Output</b>	The volume of CO <sub>2</sub> (in tonnes) produced from the operational energy consumption arising from outside of the DBFO offices	E35
<b>C</b>		<b>MOBILE PLANT</b>	
		Two methods have been provided to estimate CO <sub>2</sub> emissions produced by mobile plant on your site. In the first instance, Method A should be used to enter your site's specific fuel consumption data, as this will provide a more accurate estimate. If using Method A, proceed to Step 2. If fuel consumption data is unavailable use Method B and proceed to Step 4. Do not use Methods A and B simultaneously.	
		<i>Method A</i> Step 2 lists the units in which you should enter your data.	
	1	➤ Enter the appropriate number of units of fuel or energy consumed by each fuel type, during the last quarter.	E49 - E52
	2	<i>Method B</i> ➤ From the projects listed in Column B, decide which category best describes your project. In the corresponding cell in Column I, enter the number of weeks that your project has been in development during the reporting period.	E57 - E60
	<b>Output</b>	➤ The volume of CO <sub>2</sub> (in tonnes) generated by the energy requirements of mobile plant on your site is shown at the end of Section C.	F53 & F61

## QUARTERLY CONSUMPTION CALCULATOR

If you are unable to ascertain precise utility's consumption data, use the 'Quarterly Consumption Calculator' provided within each appropriate section of the workbook, to estimate the consumption of **electricity, gas or water** for your Reporting Area.

Quarterly Consumption Estimator		Estimation
Electricity - Floor Area (m <sup>2</sup> )		<b>0.00</b>
Gas - Floor Area (m <sup>2</sup> )		<b>0.00</b>
Water - Number of Employees		<b>0.00</b>

**ACTION:**

- Enter the floor area of your office / facility for which you require an estimate, in the yellow cell.
- The quarterly consumption value for the corresponding utility will be provided in the cell that changes to green. Use this figure to proceed to Step 1 as described in each section below.

**3.5****3.6 MATERIALS**

To select the Materials spreadsheet, click on tab '(2) Materials' at the foot of the workbook.

**3.6.1****Scope**

**This section relates to:** the volume of embodied CO<sub>2</sub> in a selection of materials commonly used in DBFO construction and maintenance projects.

This section also provides a methodology for calculating the CO<sub>2</sub> emissions produced during the transportation of these materials from supplier to DBFO office / site.

**3.6.2 Instructions for DBFO Contracts– MATERIALS**

Section	Step	Action / Decision	Cell Ref
<b>(2) MATERIALS</b>			
<b>A</b>		<b>CONSTRUCTION MATERIALS</b>	
		This table provides a list of construction materials. The materials are listed alphabetically and grouped by category on the left hand side of the spreadsheet. You should only enter data for materials purchased within the last quarter to be used within your Reporting Area.	
	<b>1</b>	➤ First, select the type of unit your materials are measured in e.g. m <sup>3</sup> or tonnes. Click on "Insert".	Column D
	<b>2</b>	➤ Insert the volume / quantity of each material listed, that was purchased during the last quarter by your Reporting Area.	Column E
	<b>2a</b>	➤ Step 2a applies only to Steel and Aluminium used in refurbishment projects. Where appropriate, enter the estimated proportion of recycled steel and aluminium purchased during the reporting period.	Column F
	<b>3</b>	➤ For each material, enter the tonne-km for each material that has been transported from supplier to site by shipping.	Column H
		➤ For each material, enter the tonne-km for each material that has been transported from supplier to site by rail.	<b>4</b> Column I
		➤ For each material, enter the tonne-km for each material that has been transported from supplier to site by road.	Column J
	<b>3a</b>	➤ Where tonne-km distances are not available, an average transport distance to cover all materials should be applied. Enter the average distance materials have been transported from source to site.	
	<b>Output</b>	➤ The volume of CO <sub>2</sub> emissions embodied in each material, and the volume of CO <sub>2</sub> produced through the transportation of materials is shown at the end of Section A.	L41 – L45
<b>B</b>		<b>LIGHTING MATERIALS</b>	
		This section relates to the volume of CO <sub>2</sub> embodied in the content of lighting and communications equipment used across the Network. In addition, the CO <sub>2</sub> emissions produced through the transportation of the equipment from supplier to site are also calculated.	

Section	Step	Action / Decision	Cell Ref
		The input table provides a list of lighting and communication materials. The materials are listed alphabetically and grouped by category on the left hand side of the spreadsheet. You should only enter data for materials purchased within the last quarter to be used within your Reporting Area.	
	1	➤ Enter the number of units e.g. lighting columns, metres of cable, for the DBFO / project.	Column E
	2	➤ Enter the average distance the material has travelled from source to site.	Column G
	2a	➤ Where tonne-km distances are not available, an average transport distance to cover all materials should be applied. Enter the average distance materials have been transported from source to site.	Column H
	Output	➤ The volume of CO <sub>2</sub> emissions embodied in each material, and the volume of CO <sub>2</sub> produced through the transportation of materials is shown at the end of Section B.	I74 - K74

## 4.1 TRANSPORT

To select the Transport spreadsheet, click on tab '(3) Transport' at the foot of the workbook.

### 4.1.1 Scope

**This section relates to:** the volume of CO<sub>2</sub> emissions produced by contractors using vehicles to undertake travel associated with a Highways Agency DBFO. This includes staff business and commuting miles travelled using both private and public transportation.

**This section does not include CO<sub>2</sub> emissions produced by:**

- Highways Agency Staff on business travel;
- Haulage of materials;
- Mobile Plant and Fuel-powered equipment.

### Transport Distance Conversion

A conversion tool is included with Tab (3) – Transport to convert from miles into kilometres. Enter the mileage into the blank cell, and a value will be automatically calculated. Insert this value into the appropriate transport cell.

Distance Conversion	
Enter Mileage	Kilometres
	0.00

### 4.1.2 Instructions for DBFO Contracts – TRANSPORT

Section	Step	Action / Decision	Cell Ref
<b>(3) TRANSPORT</b>			
<b>A BUSINESS TRAVEL</b>			
		This section relates to inter-office / site travel. This does not include maintenance activities which should be accounted for in Section D below	
	<b>1</b>	<ul style="list-style-type: none"> <li>➤ If you know the amount of fuel consumed during DBFO business travel, for your reporting period, proceed to Step 2 and follow the “<i>Fuel-based Method</i>”.</li> </ul>	
		<ul style="list-style-type: none"> <li>➤ If you do not have fuel data available, proceed to Step 2 and follow the “<i>Distance-based Method</i>”.</li> </ul>	
	<b>2</b>	<i>Fuel-based Method</i>	
		<ul style="list-style-type: none"> <li>➤ Enter the number of litres of each type of fuel consumed by your Reporting Area during the last quarter. (NB: You do not need to select the mode of transport used).</li> </ul>	F19-F21
	<b>OR</b>	<i>Distance-based Method</i>	
		This part of the table is divided into several modes of transport.	
		<ul style="list-style-type: none"> <li>➤ Enter the number of km travelled by the corresponding mode of transport within your Reporting Area, during the last quarter.</li> <li>➤ Enter the total number of cars hired by your Reporting Area, during the last quarter.</li> </ul>	F23-F45
	<b>Output</b>	The volume of CO <sub>2</sub> emissions produced through DBFO business travel is shown in the cell at the end of Section A.	G46
<b>B EMPLOYEE COMMUTING</b>			
		<ul style="list-style-type: none"> <li>➤ This section requires you to enter the total distance DBFO staff travel from home to work, over the reporting period, according to their mode of transport.</li> </ul>	
	<b>1</b>	<ul style="list-style-type: none"> <li>➤ Enter the number of km travelled by staff in your Reporting Area by relevant vehicle type and / or transport mode.</li> </ul>	D64 – D86
	<b>Output</b>	<ul style="list-style-type: none"> <li>➤ The volume of CO<sub>2</sub> emissions produced through staff commuting to and from work is shown in the cell at the end of Section B.</li> </ul>	E87
<b>C TRANSPORTATION OF FUEL TO SITE</b>			
	<b>1</b>	<ul style="list-style-type: none"> <li>➤ Enter the TOTAL volume of petrol / diesel / biodiesel delivered to site for your reporting period.</li> </ul>	C211 – C213
	<b>2</b>	<ul style="list-style-type: none"> <li>➤ Insert delivery distance in km where known.</li> </ul>	E211 – E213
	<b>3</b>	<ul style="list-style-type: none"> <li>➤ Estimate delivery distance from drop-down menu where not known. For ease of use, four options are available: less than 25km, 25-50 km, 50-150km, and greater than 150km.</li> </ul>	F211 – F213
	<b>Output</b>	<ul style="list-style-type: none"> <li>➤ The volume of CO<sub>2</sub> (in tonnes) generated by fuel transport is shown in the green cell at the end of the section.</li> </ul>	G214

## 4.2 WASTE REMOVAL

To select the Waste Removal spreadsheet, click on tab ‘(4) Waste Removal’ at the foot of the workbook.

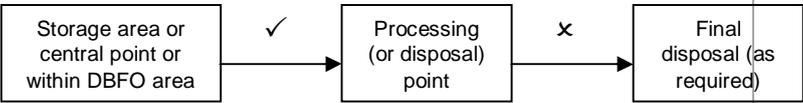
### 4.2.1 Scope

**This section relates to:** the volume of CO<sub>2</sub> emissions produced through the transportation of removing waste. Waste materials include those generated from DBFO site compounds and offices, and waste materials from DBFO construction projects.

**This section does not include:**

- Embodied CO<sub>2</sub> in waste or disposal method.

#### 4.2.2 Instructions for DBFO Contracts – WASTE REMOVAL

Section	Step	Action / Decision	Cell Ref
<b>(4) WASTE REMOVAL</b>			
<b>A</b>		<b>MAINTENANCE/CONSTRUCTION WASTE REMOVAL (BY EURO CODE CLASSIFICATION)</b>	
		This section requires you to record the volume of any maintenance / construction waste materials. Data can be inserted by waste code, and additional wastes are recorded as inert, biodegradable or hazardous	
	<b>1</b>	<ul style="list-style-type: none"> <li>➤ Enter the tonnage of waste disposed of during reporting period for each category</li> </ul>	D17-D32
	<b>2</b>	<ul style="list-style-type: none"> <li>➤ Insert EITHER a known waste removal distance or estimated distances from the drop-down menu.</li> </ul> <p>Please note that it is essential to indicate the <b>average</b> waste removal distance and not the total distance of all journeys added together. Waste pathways are recognised to be complex for DBFO, and therefore certain assumptions must be made.</p> <p>Please indicate the average distance of the journey from the <b>main point of collection</b> within the DBFO area (or a nominated central point if the above does not apply) to the next point of disposal/processing. As illustrated below, this may not be the final point of disposal, but it is this <b>primary journey</b> which falls within the scope of the Calculation Tool.</p> <div style="text-align: center;">  <pre> graph LR     A[Storage area or central point or within DBFO area] -- ✓ --&gt; B[Processing (or disposal) point]     B -- x --&gt; C[Final disposal (as required)]           </pre> </div> <p>See diagram below for clearer explanation: (a ✓ indicates the journey distance you should be recording)</p> <p>To aid you in situations of lack of data there is also a choice to select an estimated distance from a drop down menu. This however should only be used as a last resort and is likely to be phased out in future versions of the Calculation Tool.</p>	E17 – E32 / F17 –F32
		This section requires you to record the volume of any maintenance / construction waste materials. Data can be inserted by waste code, and additional wastes are recorded as inert, biodegradable or hazardous.	
		Either / Or for Step 2	
	<b>Output</b>	The volume of CO <sub>2</sub> emissions produced through maintenance / construction waste with a Euro Waste Code is shown in the cell at the end.	G33
		Additional waste collated that does not fall under a Euro Waste Code category is recorded as inert, biodegradable or hazardous	
	<b>3</b>	<ul style="list-style-type: none"> <li>➤ Enter the tonnage of inert, biodegradable and hazardous waste (not already accounted for) disposed of during reporting period for each category</li> </ul>	C37 – C39
		<ul style="list-style-type: none"> <li>➤ Either /Or for Step 4 (For guidance on waste removal distance please refer to note above)</li> </ul>	
	<b>4</b>	<ul style="list-style-type: none"> <li>➤ Insert EITHER a known waste removal distance <b>OR</b></li> </ul>	D37 – D39
		<ul style="list-style-type: none"> <li>➤ Insert estimated distances from the drop-down menu</li> </ul>	E37 – E39

Section	Step	Action / Decision	Cell Ref
	<b>Output</b>	The volume of CO <sub>2</sub> emissions produced through maintenance / construction waste without a Euro Waste Code is shown in the cell at the end.	F40
		The <b>total</b> volume of CO <sub>2</sub> emissions produced through maintenance / construction waste is shown at the end of Section A	F42

### 4.3 SUMMARY

To select the Summary spreadsheet, click on tab '(5) Summary' of the workbook.

To select the Summary spreadsheet, click on tab '(6) Summary' of the workbook.

As each section of the workbook is completed, the volumes of CO<sub>2</sub> for that section automatically feed into the summary sheet at the back of the workbook. The summary sheet generates a graphical representation of the volume of CO<sub>2</sub> generated by each emissions source in your Reporting Area, for the reporting period.

### 4.4 COMMENTS SHEET

To select the Comments spreadsheet, click on tab '(6) Comments' of the workbook.

#### 4.4.1 Scope

This section has been provided to collate qualitative and supporting information in relation the data entered within the preceding sections. It is important that this section is given due consideration when completing the Calculation Tool. There are also a number of prompt questions to be completed.

This section provides the opportunity to detail any emission reduction activities which have been investigated or implemented.

Section	Step	Action / Decision	Cell Ref
<b>(6) COMMENTS</b>			
<b>CHECKLIST</b>			
	1.	➤ Select 'Yes' or 'No' in answer to the question. If you do answer no, go back to Sheet 1 and select the Reporting Period.	L3
	2.	➤ Select 'Yes' or 'No' in answer to the question. If you do answer no, go back to Sheet 1 and enter the DBFO Contract.	L5
	3.	➤ Select 'Yes' or 'No' in answer to the question.	L8 – L11
	4.	➤ Provide details of any operational areas for which data has not been included and an explanation why.	B14
	5.	➤ Provide details of any specific materials for which data has not been included and an explanation why.	B17
	6.	➤ Provide details of any materials which have been combined and included within material categories	B20
	7.	➤ Any other comments	B23
	8.	➤ Provide details of any emission reduction activities investigated or implemented. In particular, highlight any activities which you feel are not represented through your data return.	B26

### 4.5 COMPLETION OF WORKBOOK

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Upon completion of the workbook, the Data Co-ordinator should check for accuracy and, when satisfied with the data, forward the finalised workbook to the Highways Agency Data Manager.

## 5 REFERENCES

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## **APPENDIX 1: DESIGN, BUILD AND FINANCE (DBFO) PROFORMA**

## HIGHWAYS AGENCY DBFO CONTRACT

### DATA COLLECTION PROFORMA

You will need to collect the following information for your reporting area, for the reporting period. The reporting period will be quarterly unless otherwise stated.

<b>Enter the name of your reporting area:</b>	
<b>Enter the dates of your reporting period:</b>	

### SECTION 1: ENERGY

What You Need To Know:		Unit of Measurement	Enter Data
1	The electricity consumption for your reporting area (main office)	kWh	
2	The gas consumption for your reporting area (main office)	kWh	
3	The water consumption for your reporting area (main office)	Cubic metres (m3)	
4	The number of nights that staff stayed in UK hotels.	No. of Nights	
The operational energy consumption for your depots and compounds outside of the main DBFO offices, from the following energy sources:			
5	Electricity	kWh	
6	Gas	kWh	
7	Gas Oil	Litres	
8	Petrol	Litres	
9	Diesel	Litres	
10	Biodisel	Litres	
11	Fuel Oil	kWh	
12	Burning Oil / Kerosene	Litres	
13	Water	Cubic metres	
The volume of fuels delivered to central storage points:			
14	Petrol	Litres	

15	Diesel	Litres	
16	Biodiesel	Litres	
The transportation distances of fuel from supplier to central storage point:			
17	Petrol	km	
18	Diesel	km	
19	Biodiesel	km	
The amount of fuel / energy consumption of mobile plant used on site, from the following energy sources:-			
20	Petrol	Litres	
21	Diesel	Litres	
22	Biodiesel	Litres	
23	Electricity	kWh	
24	If you do not know the energy consumption of mobile plant on your site, you will need to find out the total cost of your DBFO and the number of staff permanently on site.	Project Cost (£m)	
		No. of Permanent Site Staff	

## SECTION 2: MATERIALS

What You Need To Know:		Unit of Measurement		Enter Data
1	For all construction materials supplied to your reporting area / site, you will need to know the distance between the supplier and site of delivery.	km / miles		
2	There are many different types of construction materials used within DBFO Contracts. You will need to know which materials have been used, the quantity and the distance they have been transported from supplier to site.	Ensure you have recorded the material in the correct unit of measurement.		
The amount of material purchased indicating correct unit, and relevant transport tonne-km's for the following list of materials:				
3	General Cement	m3	tonnes	
	<i>Either</i> Shipping	Tonne/km		
	<i>Or</i> Rail	Tonne/km		
	<i>Or</i> Road	Tonne/km		

What You Need To Know:		Unit of Measurement		Enter Data
4	Copper	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
5	Steel	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
6	Aluminium	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
7	Sheet Piling	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
8	Mortar (cement: sand mix)	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
9	Mortar (cement: lime: sand mix)	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		
	<i>Or Road</i>	Tonne/km		
10	General Plastic	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	<i>Or Rail</i>	Tonne/km		

What You Need To Know:		Unit of Measurement		Enter Data
	Or Road	Tonne/km		
11	Quarried Aggregate	m3	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
12	Recycled Aggregate	m3	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
13	Asphalt	m3	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
14	Bitumen	m3	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
15	Standard Brick	No. of bricks	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
16	Clay	m3	tonnes	
	Either Shipping	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
17	Sand	m3	tonnes	
	Either Shipping	Tonne/km		

What You Need To Know:		Unit of Measurement		Enter Data
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
18	Soil	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
19	Stone: general	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
20	Stone gravel/chippings	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
21	General Timber	m3	tonnes	
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
22	Standard Paint	Litres		
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		
23	Road Salt	Tonnes		
	<i>Either Shipping</i>	Tonne/km		
	Or Rail	Tonne/km		
	Or Road	Tonne/km		

What You Need To Know:		Unit of Measurement		Enter Data
The number of tonnes of concrete purchased and the total road tonne-km				
24	General Concrete	Tonnes		
		Tonne/km		
25	Prefabricated Concrete	Tonnes		
		km	miles	
30	Concrete Road & Pavement	Tonnes		
		Tonne/km		
31	High Strength	Tonnes		
		Tonne/km		
The total number of Lighting, ITS and Vehicle Restraint Systems units purchased:				
66	Steel Columns	No. columns		
		Tonne/km		
67	Aluminium Columns	No. columns		
		Tonne/km		
68	Luminaire	No. lamps		
		Tonne/km		
69	Main Cable	Metres		
		Tonne/km		
70	Feeder Pillar	No. of pillars		
		Tonne/km		
71	Lightwt Superspan Gantry	No. of gantries		
		Tonne/km		
72	2 x MS4 + 8 x Lane ctrl signage (est 4ft)	No. of signs		
		Tonne/km		

What You Need To Know:		Unit of Measurement	Enter Data
73	MS4 post	No. of posts	
		Tonne/km	
74	MS4 Sign (800kg)	No. of signs	
		Tonne/km	
75	10m piles	No. of piles	
		Tonne/km	
76	Power Cable	Metres	
		Tonne/km	
77	Cabinets	No. of cabinets	
		Tonne/km	
78	Misc Cable	Metres	
		Tonne/km	
79	Hard Shoulder cameras & poles	No. of cameras & poles	
		Tonne/km	
80	Barrier	Metres	
		Tonne/km	

### SECTION 3: TRANSPORT

This section requires you to obtain data relating to business and commuter travel. You will need to find out the amount of money spent on fuel, and the type of fuel bought, during your reporting period. Where this data is unobtainable, you will need to find out the number of business miles driven by staff in your reporting area.

What You Need To Know:		Unit of Measurement	Enter Data
		DELETE AS APPROPRIATE	
1	The amount of petrol used for business travel.	£ or Litres	
2	The amount of diesel used for business travel.	£ or Litres	

What You Need To Know:		Unit of Measurement	Enter Data
		DELETE AS APPROPRIATE	
3	The amount of LPG used for business travel.	£ or Litres	
<b>The number of miles / kilometres for business travel:</b>		<b>DELETE AS APPROPRIATE</b>	
4	Small Petrol Car: <1.4 litre engine	km / miles	
5	Medium Petrol Car: 1.4 – 2litre engine	km / miles	
6	Large Petrol Car: >2 litre engine	km / miles	
7	Any other miles driven in petrol vehicle where car size is unknown.	km / miles	
8	Small Diesel Car: <1.7 litre engine	km / miles	
9	Medium Diesel Car: 1.7 – 2litre engine	km / miles	
10	Large Petrol Car: >2 litre engine	km / miles	
11	Any other miles driven in diesel vehicle where car size is unknown.	km / miles	
12	Hybrid Car: Medium engine	km / miles	
13	Hybrid Car: Large engine	km / miles	
14	LPG Car: Medium engine	km / miles	
15	LPG Car: Large engine	km / miles	
16	Any other miles driven in LPG vehicle where car size is unknown	km / miles	
17	Any other miles driven in a car where size and fuel are unknown	km / miles	
18	Small Motorbike: Up to 125cc	km / miles	
19	Medium Motorbike: 125 – 500cc	km / miles	
20	Large Motorbike: >500cc	km / miles	
21	Motorbike: Unknown engine size	km / miles	
22	Bus	km / miles	
23	National Rail	km / miles	
24	Underground	km / miles	

What You Need To Know:		Unit of Measurement	Enter Data
		DELETE AS APPROPRIATE	
25	Tram / Light Rail	km / miles	
<b>The number of miles / kilometres (as applicable) driven whilst COMMUTING to work, for the following vehicle models:</b>		<b>DELETE AS APPROPRIATE</b>	
28	Small Petrol Car: <1.4 litre engine	km / miles	
29	Medium Petrol Car: 1.4 – 2litre engine	km / miles	
30	Large Petrol Car: >2 litre engine	km / miles	
31	Any other miles driven in petrol vehicle where car size is unknown.	km / miles	
32	Small Diesel Car: <1.7 litre engine	km / miles	
33	Medium Diesel Car: 1.7 – 2litre engine	km / miles	
34	Large Petrol Car: >2 litre engine	km / miles	
35	Any other miles driven in diesel vehicle where car size is unknown.	km / miles	
36	Hybrid Car: Medium engine	km / miles	
37	Hybrid Car: Large engine	km / miles	
38	LPG Car: Medium engine	km / miles	
39	LPG Car: Large engine	km / miles	
40	Any other miles driven in LPG vehicle where car size is unknown	km / miles	
41	Any other miles driven in a car where size and fuel are unknown	km / miles	
42	Small Motorbike: Up to 125cc	km / miles	
43	Medium Motorbike: 125 – 500cc	km / miles	
44	Large Motorbike: >500cc	km / miles	
45	Motorbike: Unknown engine size	km / miles	
46	Bus	km / miles	
47	National Rail	km / miles	
48	Underground	km / miles	

What You Need To Know:		Unit of Measurement	Enter Data
		DELETE AS APPROPRIATE	
49	Tram / Light Rail	km / miles	

**SECTION 4: WASTE REMOVAL**

What You Need To Know:		Unit of Measurement	Enter Data
<b>Construction Waste: Indicate value and waste removal distance.</b>			
17	How many tonnes of waste construction material were removed from your site during the reporting period and what was the waste removal distance? You will need to enter these materials by Euro Code Classification as denoted in Section 4C of the Workbook	Tonnes	
		km	
18	Inert Waste	Tonnes	
		km	
19	Biodegradable Waste	Tonnes	
		km	
20	Hazardous	Tonnes	
		km	

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## **APPENDIX 2: MATERIAL TRANSPORT DISTANCE CALCULATION**

## Material Transport Distance Calculations

Within the current version of the Calculation Tool, under Materials Tab (2) there are two ways in which material transportation distances can be included: (i) based upon actual known distances; or (ii) based upon an average distance applied to all materials. The input field for each method is indicated below.

(i) Actual transport distances  
under Step 3

(ii) Average transport  
distances under Step 3a

The screenshot shows the 'Materials' tab in the CCT-Tool-DBFO-v5c.xls spreadsheet. The table below is a simplified version of the data shown in the spreadsheet.

Category	Type of Material	Unit	Step 1	Step 2	Step 2a	Step 3			Step 3a			
			Total Material Purchased	Recycled Proportion (%)	Tonnage	Total Shipping Tonne-km	Total Rail Tonne-km	Total Road Tonne-km	Average Transport Distance (km)	Embodied (CO <sub>2</sub> )	Transport Emissions (CO <sub>2</sub> )	Estimated Road Transport (CO <sub>2</sub> )
Cement	General Cement	"INSERT"		-	0.00					0.00	0.00	0.00
Metals	Copper	"INSERT"		0	0.00					0.00	0.00	0.00
	Steel	"INSERT"		0	0.00					0.00	0.00	0.00
	Aluminium	"INSERT"		0	0.00					0.00	0.00	0.00
	Sheet Piling	"INSERT"		-	0.00					0.00	0.00	0.00

### (i) Known Transport Distances

Where transport distances are known, data is input into the Calculation Tool in the form of tonne-kilometres (tkm). One tonne kilometre is the equivalent to one tonne of material being transported for 1km. Therefore, if you have 25 tonnes of aggregate being transported by road at a distance of 25km, the total tkm value would be calculated as follows:

➤ 25 tonnes x 25 kilometres = **625 tkm**

Using this method you can also account for multiple transport distances and deliveries. For example, if you had 25 tonnes of aggregate being transported by road at a distance of 25km, and a further 15 tonnes from a different supplier at 15km, the total tkm value would be calculated as follows:

➤ 25 tonnes x 25 kilometres = 625 tkm

➤ 15 tonnes x 15 kilometres = 225 tkm

➤ 625 + 225 = **850 tkm**

There is also the option to include materials travelling by rail and ship, or multiple transport modes. For example, this might be significant for road salt supplies which have been transported from Scandinavia via ship, and then by road freight to the point of delivery. Table 1 works through an example of how such data might be collated from two suppliers of aggregate and inserted into the Calculation Tool.

Please note that material volumes and tonne-kilometres is the only aspect that you should provide data for. You do not need to account for any additional factors such as vehicle loading, as this is already accounted for within the applied emission factors and is an accepted assumption as part of the Calculation Tool.

### **(ii) Unknown Transport Distances**

Where the above data is not known or currently available, it is possible to provide an estimated average transport distance to all materials. Please note that this is the least preferred method due to data accuracy and it is not possible to account for different material transport distances within each material type. An average transport distance (in km) should be inserted into the workbook under Step 3a, as indicated above. This will only account for road based transport.

As an example, for the transport of 50 tonnes of aggregate, inserting a value of 50km will assume that each tonne of material has travelled 50km. The total tkm assumed within the calculations will therefore be  $50t \times 50km = 2,500 \text{ tkm}$ .

**Table 1: Worked Example of Tonne-Kilometre Data**

Category	Material Type	Description	Tonnage	Supplier	Supplier Location	Shipping Distance (km)	Shipping t/km	Rail Travel (km)	Rail t/km	Road Travel (km)	Road t/km
Quarry Sourced	Aggregate	Type 1 Sub-base	1000	Aggregate Ltd	Norway	750	750,000	0	0	75	75,000
		Type 1 Sub-base	800	Agg Ltd	Glasgow, Scotland	0	0	350	280,000	50	40,000
	<b>Total</b>		<b>1,800</b>				<b>750,000</b>		<b>280000</b>		<b>115,000</b>

The screenshot shows an Excel spreadsheet with the following data structure:

Category	Type of Material	Unit	Step 1	Step 2	Step 2a	Step 3	Step 3a	Embodied (CO <sub>2</sub> )	Transport Emissions (CO <sub>2</sub> )	Estimated Road Transport (CO <sub>2</sub> )
Cement	General Cement	"INSERT"			-	0.00		0.00	0.00	0.00
Metals	Copper	"INSERT"			-	0.00		0.00	0.00	0.00
	Steel	"INSERT"			0	0.00		0.00	0.00	0.00
	Aluminium	"INSERT"			0	0.00		0.00	0.00	0.00
	Sheet Piling	"INSERT"			-	0.00		0.00	0.00	0.00
Mortars	Mortar (cement:sand mix)	"INSERT"			-	0.00		0.00	0.00	0.00
	Mortar (cement:lime:sand mix)	"INSERT"			-	0.00		0.00	0.00	0.00
Plastics	General Plastic	"INSERT"			-	0.00		0.0	0.0	0.0
	Quarried aggregate	Tonnes	1800.00		-	1800.00	750000	280000	115000	14.40
Quarry Sourced Material	Recycled aggregate	"INSERT"			-	0.00		0.00	0.00	0.00
	Asphalt	"INSERT"			-	0.00		0.00	0.00	0.00
	Bitumen	"INSERT"			-	0.00		0.00	0.00	0.00
	Standard Brick	"INSERT"			-	0.00		0.00	0.00	0.00
	Sand	"INSERT"			-	0.00		0.00	0.00	0.00
	Soil	"INSERT"			-	0.00		0.00	0.00	0.00