Requirements for use of the Full Carbon Accounting Model (FullCAM) with the Emissions Reduction Fund (ERF) methodology determination:

*Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014*

Version 2.1

(published and in force from 1 September 2020)
Disclaimer

This document has been developed to assist project proponents to calculate abatement in FullCAM as required by the Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014. This document is the ‘FullCAM Guidelines’ incorporated by reference in tabs 1.3, 4.9 and 5.25 of that Methodology Determination. Project proponents should not use this document as a substitute for complying with the requirements in the Methodology Determination.

Before relying on any material contained in this document, project proponents should familiarise themselves with the following legal documents: Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014, Carbon Credits (Carbon Farming Initiative) Act 2011, Carbon Credits (Carbon Farming Initiative) Rule 2015 and the Carbon Credits (Carbon Farming Initiative) Regulations 2011. Further explanation of the method can be found in the explanatory statement to the Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014.

This document does not displace relevant legislative provisions or other laws. All users are encouraged to read this document in conjunction with the relevant legislation, including the Methodology Determinations, referenced throughout this document. Where any inconsistencies are apparent, please be aware that the legislative provisions will take precedence.

Interested parties should make their own independent inquiries and obtain their own independent professional advice prior to relying on, or making any decisions in relation to, the information provided in this document. This document will be updated periodically and users should note that some inputs and values may change over time. It is the user’s responsibility to ensure that they are using the correct option in the latest version of FullCAM, following the most recent version of this document and any tool/s required in association as required by the Determination.

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Content contained herein should be attributed as “The Department of Industry, Science, Energy and Resources FullCAM Guidelines: Requirements for using the Full Carbon Accounting Model (FullCAM) in the Emissions Reduction Fund (ERF) methodology determination Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014”).
3.16 Transferring Outputs into a Spread sheet to Calculate PSACS ............................................. 35
3.17 Alternative Simulations Steps for Coppice Systems ............................................................. 36
4. Calculation of the Root to Shoot Ratio ......................................................................................... 39
5. Outputs generated in FullCAM and used in equations in the Determination .............................. 41
   Table 2 – Relationship between FullCAM outputs and variables defined in the determination . 42
1. Introduction

1.1 Use of FullCAM in the Carbon Farming Initiative Measurement Based Methods for New Farm Forestry Plantations 2014

The calculation of carbon abatement under the *Carbon Credits (Carbon Farming Initiative) (Measurement Based Methods for New Farm Forestry Plantations Methodology Determination 2014* (the Determination) are partially dependent upon the use of the Full Carbon Accounting Model (FullCAM) consistently with the requirements of this document. In particular, section 4.9 of the Determination requires that, for harvest projects, the predicted stratum average carbon stocks for each modelling stratum are estimated in FullCAM in accordance with the requirements in both the Determination and this document. Where content of this document relates to provisions of the Determination, references are given to the location of those provisions.

Project proponents must only change FullCAM default settings as indicated in this document, and all other settings must not be changed. This is to ensure that defaults will apply where relevant.

1.2 Determining which FullCAM option to use

The Department of Industry, Science, Energy and Resources updates the Full Carbon Accounting Model (FullCAM) from time to time to reflect the latest science and improve usability. At the time this document was last updated, the latest version was released for public use in 2020 on the Department’s website (https://www.industry.gov.au/data-and-publications/full-carbon-accounting-model-fullcam). The latest publicly released version of FullCAM is constituted by two options.

1. Default: 2020 FullCAM option
   - **This option is not yet available for use by projects under this Determination.**
     This is currently the 2020 FullCAM option. The year reflects when the latest version was released at the time this document was last updated. However, a reference to the default or 2020 FullCAM option in this document includes any subsequent release or update of FullCAM on the Department’s website.

2. Alternative: 2016 FullCAM option
   - **This is the option that must be used by all projects under this Determination until otherwise advised through an update to these guidelines.** This is identified as the 2016 FullCAM option.

Project proponents must access the latest publicly released version of FullCAM from the Department’s website and then ensure they are using the appropriate FullCAM option for their project (see screenshot below). An exception to the requirement to use the latest publicly released version is for projects with reporting periods that end before 1 September 2020, under a method that specifies to use the version of FullCAM and the associated Guidelines for those periods. If you determine that you must use a version of FullCAM that is unavailable on the website, please contact the Department at erfforests@industry.gov.au to obtain a copy.
Note that FullCAM is not compatible with iOS systems, and must be run in a Windows operating environment.

### Screenshot from download page

**Download options: Full Carbon Accounting Model (FullCAM)**

**FullCAM 2020 public release**

1. ERF projects must use the default option unless they meet requirements for the alternative option that are listed in the relevant method specific FullCAM guideline.
   - Default: 2020 FullCAM option
2. ERF projects that meet specific requirements may use the relevant method specific guidelines for the project may use this alternative option
   - Alternative 2016 FullCAM option

### 1.3 Format of this document

This document provides:

- an overview of the FullCAM relevant to the Determination and important requirements for using this document (section 1);
- an overview of the predicted stratum average carbon stocks (PSACS) scenario simulation that you must run for harvest projects as per the Determination, and the roots: shoots ratio calculation that you may elect to use for biomass sample trees (section 2);
- a step-by-step walkthrough of how you must use FullCAM to run both the simulation (section 3) and the calculation (section 4); and
- an overview of the FullCAM outputs as they relate to equations within the Determination (section 5).

### 1.4 FullCAM background

FullCAM is used in Australia’s National Greenhouse Gas Accounts for the land sector. FullCAM provides fully integrated estimates of carbon pools in forest and agricultural systems for Australia’s land sector reporting. In addition, it accounts for human-induced changes in emission and sequestration of major greenhouse gases. FullCAM was developed under the National Carbon Accounting System (NCAS) at the then Australian Greenhouse Office to provide a dynamic account of the changing stocks of carbon in Australia’s land systems since 1970 by integrating data on land cover change, land use and management, climate, plant productivity, and soil carbon over time. FullCAM estimates carbon stock change and greenhouse gas emissions at fine spatial and temporal scales, and uses a wide range of spatially referenced data.
Users of FullCAM can determine estimates of carbon stock change and greenhouse gas emissions for ERF projects on a similar basis to that used for land use and land use change in Australia’s National Greenhouse Gas Inventory.

1.5 FullCAM plots and running simulations

FullCAM can run simulations on a ‘plot’. A plot, for modelling purposes, is defined as a piece of land for which the event history, when modelled in FullCAM, is the same across that area of land. Separate plot files are created for each modelling stratum.

In FullCAM, there are several types of plots that can be selected. Only ‘forest system’ is relevant to this Determination. This document provides overviews of the simulations that users may be required to run in Section 2, and the steps to run these simulations in Section 3 and 4.

FullCAM uses a single ‘model point’ location. Proponents do not need to define plot boundaries within FullCAM, rather proponents must input the coordinates for a single location within the plot boundaries that is representative of the plot. The latest spatial data for a plot must be downloaded using the ‘Data Builder’ tab each time the software is run. This process is described in section 3.6 of this document.

In order to ensure all settings are correct, including defaults, we recommend creating new plot files each time a new version of FullCAM or these Guidelines, or a different FullCAM option, is used. Plot files created under previous versions may contain different settings that will affect outputs and users are responsible for ensuring they have used the correct FullCAM version and option, and accurately followed the associated FullCAM Guidelines.

For modelling stratum, separate plot files must be created for:

- for projects applying a root: shoot ratio only, obtaining the appropriate root: shoot ratios; and
- for harvest projects only, estimating the carbon stocks using the predicted stratum average carbon stocks (PSACS) scenario.

1.6 Overview of the FullCAM interface

The FullCAM software user interface displays menus and a series of tabs. Each tab has a suite of fields in which information may either be required to complete as instructed through these Guidelines or left unchanged. The program is designed so that certain tabs in a plot file are made available only if required fields have valid information entered in earlier tabs. If the text of a tab or field is red, then FullCAM requires information in that tab or field before a simulation can be run. When all the required fields within a tab have valid information entered, the tab text will become blue.
The below table provides a general overview of each tab selectable within FullCAM once a plot has been created. Help is provided within FullCAM by clicking on the symbol available in most windows. This general overview of the public version of FullCAM is not intended to instruct proponents of ERF projects on how to use FullCAM for this Determination.

<table>
<thead>
<tr>
<th>Tab</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>About</td>
<td>Includes a free text field where users can enter information about the plot file that they have created. This is a good space to keep track of changes that have been made or editing of event parameters.</td>
</tr>
<tr>
<td>Configuration</td>
<td>Users select the system (e.g. forest, agricultural) they want to simulate in the plot.</td>
</tr>
<tr>
<td>Timing</td>
<td>Enter the timing for starting and ending the simulation and the time steps required for output data.</td>
</tr>
<tr>
<td>Data Builder</td>
<td>In this tab users enter the latitude and longitude of the ‘Model Point Location’ where they wish to simulate a plot file. Internet access is required to complete this tab. By choosing to ‘Download Spatial Data’ the associated soil and climate data for that latitude and longitude are automatically loaded into relevant parts of the remaining tabs. In the tab users can then download tree and/or crop species information and management regimes as appropriate. This information is also automatically loaded into relevant parts of the remaining tabs.</td>
</tr>
<tr>
<td>Site</td>
<td>Specific parameters (e.g. water [rainfall], temperature, productivity) are described.</td>
</tr>
<tr>
<td>Trees</td>
<td>Description of the properties of the tree species.</td>
</tr>
<tr>
<td>Crops</td>
<td>Description of the properties of crop or pasture species (only displays if agricultural system selected).</td>
</tr>
<tr>
<td>Soil</td>
<td>Description of soil properties.</td>
</tr>
<tr>
<td>Initial Conditions</td>
<td>In this tab the values for carbon at the start of the simulation are described. Values will automatically be populated by Data Builder using data downloaded from the FullCAM server.</td>
</tr>
<tr>
<td>Events</td>
<td>All of the events for the entire simulation period are listed in this tab. Users can add or remove events. Care must be taken not to violate requirements for modelling ‘management events’ within the Determination. The names on the event list are colour-coded to indicate whether they are ready, whether they are simulating or not, and what system they affect. The colour codes are:</td>
</tr>
</tbody>
</table>
Red: Event not ready (renders event queue not ready);
Grey: Event non-simulating (outside simulation period, will not affect simulation);
Green: Forest;
Yellow: Agricultural; and
Brown: Mixed.

Finally, the events users select with the cursor are coloured in the usual highlight colour.

<table>
<thead>
<tr>
<th>Output Window</th>
<th>Defines what outputs are presented in output windows.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explorer</td>
<td>Display of the parameter settings for each tab.</td>
</tr>
<tr>
<td>Plot Digest - FullCAM 2020 option</td>
<td>This tab only appears when a plot is saved as a ‘plot digest’ by changing the save as type. It allows users to clone and alter the inputs of a given modelling scenario, and combine the results or output them separately.</td>
</tr>
<tr>
<td>Log</td>
<td>This tab records changes made to the file to assist with analysis and error tracking.</td>
</tr>
</tbody>
</table>
2. Simulations Overview

2.1 Predicted Project Average Carbon Stocks (PPACS) and Predicted Stratum Average Carbon Stocks (PSACS)

Projects involving harvest must apply an ‘averaging technique’ to account for average carbon stocks over the project’s life. This forms the basis of abatement calculations.

Users must use FullCAM to generate the predicted carbon stocks of each modelling stratum over 100 years. The average carbon stock for each modelling stratum is the Predicted Stratum Average Carbon Stocks (PSACS). The sum of all PSACS equals the Predicted Project Average Carbon Stocks (PPACS).

When modelling each PSACS:

(i) A rotation length in accordance with the Determination must be used (See Determination Section 4.10(4)).
(ii) Timing between harvest and re-establishment is set at a minimum of 15 months (See Determination Section 4.10(5)).
(iii) Only those management events permitted in the determination (See Determination Section 4.5 and Table 1 of this document) may be added to the event queue for each modelling stratum.

The steps that users must follow to run a PSACS simulation are set out in section 3. Note that there is a variation on the below steps for simulating coppice systems given at subsection 3.17.

2.2 Calculation of the Root to Shoot Ratio

Users electing to apply a root: shoot ratio to estimate below-ground of a biomass sample tree must obtain the appropriate ratios using the process outlined below in section 3. This requirement is set out in section 5.25 of the Determination.
3. Setting up simulations to estimate the Predicted Stratum Average Carbon Stocks (PSACS) over 100 years

Simulations for each modelling stratum are undertaken using Plots. The following steps must be followed for entering data into each tab in a FullCAM plot for each modelling stratum registered under the Determination.

3.1 Downloading FullCAM

The latest publicly-released version of FullCAM is available to download from the Department’s website. It is the user’s responsibility to ensure that they are using the correct FullCAM option in the latest public release of FullCAM.

3.2 Opening a File

Create a new plot under the ‘File’ menu that will represent a modelling stratum, and give this plot file a name that reflects the identifier for the stratum.
3.3 The About Tab

Once created, you will see a window such as this, with the ‘About’ tab in blue text:

You can choose what to enter at ‘Name of Plot’. It is recommended that you use a name for the plot that reflects the identifier for the modelling stratum and model scenario, e.g. ‘Modelling_Stratum1_project_west_2015 offsets report’. This name does not become the file name for the plot. It is a free text box and is editable from within the plot file.

Under ‘Notes’ you may choose to enter information for your own use. This information will not have any bearing on the FullCAM outputs.

3.4 Saving a Plot File

Once you have created a plot file it is best to save immediately to your personal storage. Users are responsible for their own document and records management and FullCAM does not provide this function.

1) Save the plot file using the ‘File’ menu on the FullCAM toolbar.
2) Save the plot file regularly when setting up and running simulations.
You can choose what to enter for the ‘File name’. This is not linked to the ‘Name of plot’ free text box on the plots ‘About’ tab. As per the ‘Name of plot’ text box it is recommended that you use a name for the plot that reflects the identifier for the modelling stratum and scenario, e.g. ‘Modellingstratum1_project_west_2015 offsets report’.

**Note:** Save the plot file regularly when setting up and running simulations (also Ctrl + S).

Now progress to the ‘**Configuration**’ tab.

### 3.5 The Configuration Tab

The **Configuration** tab is where you select the type of system that will be modelled.

1) This Determination concerns a reforestation activity, so you must select *Forest system* from the ‘Plot’ drop down menu.
2) Do not change any other settings on the **Configuration** tab.
The ‘Configuration’ tab settings must appear as below:

![Example.png](image)

Now navigate to the ‘Timing’ tab using the mouse or **Page Down**.

### 3.6 The Timing Tab

The ‘Timing’ tab requires you to define the period you wish to simulate.

Steps required:

2. Under *Simulation Timing*, select Calendar (see below).
3. Under *Start and End of Simulation* enter the start date and end date of the simulation that you will run, in the format ‘1 July 2014’ or ‘1 7 2014’.
   a. The start date will be the project establishment date (which may be the Planting Date for the modelling stratum).
   b. The end date will be 100 years after the establishment date.
5. Do NOT change any other settings.
An example of how the ‘Timing’ Tab should now appear is below:

6) New tabs will appear once all necessary fields in this tab are completed.

Below is an example of how the .plo file will appear after you populate all necessary parts of the ‘Timing’ tab:

Now navigate to the ‘Data Builder’ tab using the mouse or Page Down.
3.7 The Data Builder Tab

The Data Builder tab (see image below) allows you to download the data required by FullCAM from extensive databases maintained by the Department. [Note that the default latitude and longitude location is for Uluru].

Steps required:

1) Click the box to turn on the Data Builder (this requires an internet connection).
2) Enter the latitude and longitude (in decimal degrees) of the model point location central to the modelling stratum being modelled (not in an exclusion area).
3) Click the button to Download Spatial Data, and then click ‘OK’ in the Info Box that pops up.
4) Select the appropriate species for the plot. This is the dominant species to be planted, or where not available, then select ‘Mixed Species Environmental Planting’.

5) Click the ‘Download This Species’ button.

6) A pop-up box will appear asking if you want to make the selected Tree Species the ‘initial tree species’. Click ‘Yes’.

7) Do NOT download regimes for this species.

8) Do NOT change any other setting.
NB: Where the project intends to alter the tree species within a modelling stratum in future rotations, all species used must be documented, and the species with the lowest growth rate must be used for all projected simulations used for estimating the PSACS.

Now navigate to the ‘Initial Conditions’ tab using the mouse or [Page Down].
Do not change any settings on the ‘Site’, ‘Trees’, or ‘Soil’ Tabs

3.8  The Site Tab

Do NOT change any settings.

3.9  The Trees Tab

Do NOT change any settings. [The species on this tab should match the Tree Species on the Data Builder tab].

3.10  The Soil Tab

Do NOT change any settings.

3.11  The Initial Conditions Tab

The Initial Conditions tab will look like this:
Steps required:

1) Under *Forest*, click the button labelled *Trees*.
2) The *species* you selected at the *Data Builder* tab will be showing in the drop-down box under *Species*.
3) Under *Existence* ensure that the box (‘The forest has trees growing in it at the start of the simulation’) is un-checked (see below).

The *Trees* window must have the *Existence* box un-checked:

4) Click OK.
5) In the *Initial Conditions* tab, click the button labelled *Debris*.
6) Change all the default settings for each debris pool to zero (see below).
7) Once all settings are set to zero Click OK.
The Debris window must look like this, with all values set to ‘0’:

8) DO NOT change any other settings on this tab.

Now navigate to the ‘Events’ tab using the mouse or Page Down.

3.12 The Events Tab

All events that are permitted in the methodology are listed in Table 1 below. All nominated management practices (events) can include any combination of those listed, and these must be included in model simulations for each rotation to estimate the PSACS for each modelling stratum. All model settings shown in Table 1 must be used. If tree species differ between rotations, then, for forward projections, the species with the lowest growth rate (i.e. the species with the lowest G value in the Trees tab under growth) must be used for all simulations. Wildfires need only be included as they occur, and the severity of the fire event will be reflected in the effect on the carbon stock. Emissions associated with all fire events must be calculated separately through field measurements and associated equations.
Table 1 – Modelled events permitted in this methodology

<table>
<thead>
<tr>
<th>Management Activity</th>
<th>FullCAM Event Type</th>
<th>FullCAM Standard Event</th>
<th>Parameter values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting trees</td>
<td>Plant trees</td>
<td>Plant trees: seedlings, normal stocking</td>
<td>Use Defaults</td>
</tr>
<tr>
<td>Seeding</td>
<td>Plant trees</td>
<td>Plant trees: natural regeneration</td>
<td>Use Defaults</td>
</tr>
<tr>
<td>Coppice regrowth</td>
<td>Plant trees</td>
<td>Plant trees: seedlings, normal stocking</td>
<td>Use Defaults</td>
</tr>
<tr>
<td>Fertilisation</td>
<td>Forest treatment</td>
<td>Starter fertiliser: normal</td>
<td>Use Defaults</td>
</tr>
<tr>
<td>Weed control</td>
<td>Forest treatment</td>
<td>Weed control - Standard</td>
<td>Use Defaults</td>
</tr>
<tr>
<td>Pruning</td>
<td>Thin</td>
<td>Prune (Selective 33%)</td>
<td>Define the portion of the forest biomass that was pruned (thinned) if different to 33%. Your project report must describe how the portion was estimated. Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td>Non-commercial Thinning (Thinning without harvest)</td>
<td>Thin</td>
<td>Initial Clearing: no product recovery</td>
<td>Define the portion of the forest biomass that was thinned. Your project report must describe how the portion was estimated. Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td>Commercial Thinning (Thinning with harvest)</td>
<td>Thin</td>
<td>Initial Clearing: product recovery</td>
<td>Define the portion of the forest biomass that was thinned. Your project report must describe how the</td>
</tr>
<tr>
<td>Management Activity</td>
<td>FullCAM Event Type</td>
<td>FullCAM Standard Event</td>
<td>Parameter values</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------</td>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>portion was estimated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td>Harvest/Clearfelling</td>
<td>Thin</td>
<td>Initial clearing: product recovery</td>
<td>Define the portion of the forest biomass that was harvested (thinned). Your project report must describe how the portion was estimated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td>Chopper Roller</td>
<td>Chopper Roller</td>
<td>Chopper roller -&gt; 80% (avg)</td>
<td>Use defaults</td>
</tr>
<tr>
<td>Wildfire – trees not killed</td>
<td>Forest fire</td>
<td>Wildfire – trees not killed</td>
<td>Tick the Enable biomass based age adjustments box.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB: Not repeated each rotation.</td>
</tr>
<tr>
<td>Wildfire – trees killed</td>
<td>Forest fire</td>
<td>Wildfire – trees killed</td>
<td>Tick the Enable biomass based age adjustments box.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remainder of parameters – use defaults.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB: Not repeated each rotation.</td>
</tr>
<tr>
<td>Management Activity</td>
<td>FullCAM Event Type</td>
<td>FullCAM Standard Event</td>
<td>Parameter values</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>Forest fire</td>
<td>Prescribed burn</td>
<td>Tick the Enable biomass based age adjustments box. Remainder of parameters – use defaults.</td>
</tr>
</tbody>
</table>

1) To add a new event, click on the ‘New’ button.

This will produce the following pop-up to complete.
2) The event 'Type' is broken down into six categories. For each event to be added, select the appropriate ‘Event Type’ as indicated in Table 1.
3) Select ‘Insert Standard Values’. A pop-up window will open that allows you to ‘Select A Standard Event’. Table 1 defines which ‘Event type’ and which ‘Standard event’ must be selected for each management activity.

4) Once you have selected your event, click ‘OK’. Another pop-up window will open asking whether to insert the name of the standard event, select ‘Yes’. Default settings for the standard events must be used unless defined otherwise in Table 1. An example of the ‘Select A Standard Event’ menu is shown here:
5) Enter the date for each event in the format ‘21 Jan 2001’. Click ‘OK’ and the event will be added to the Event List.

To determine the PSACS, the cycle of management events that occur in each rotation must be repeated for each simulated rotation period within the 100 year modelling period (see Section 2.5.13 of the Determination). For example, if harvesting occurs every thirty years, this event must be repeated at thirty year intervals.

An example of an event queue follows.

3.12.1 Cloning Events

All management events to be included in each rotation can be cloned to cover the 100 year project period. The following steps are required:

1) Determine the time interval between rotations.
2) Ensure that all management events in this period have been added to the events queue.
3) Highlight all the management events (excluding wildfires) in the events queue for the first rotation.
4) Click the ‘Edit’ button on the ‘Regime Editing’ panel.
5) Click ‘OK’ on the pop-up window.
6) Click the ‘Clone’ button on the ‘Regime Editing’ panel.
7) In the ‘Calendar years’ box enter the number calculated in Part (1) of these ‘Cloning Events’ instructions.
8) In the ‘Number of times’ box enter a number higher enough to ensure that the sequence of events is repeated over the full 100 year modelling period.
9) Click ‘OK’.
10) Any cloned events occurring beyond the 100 year modelling period will be highlighted grey. It is not necessary to delete these as they will not affect the simulation.
3.13 The Output Windows Tab

1) Double click on ‘Output1’ listed in the Output Windows.
2) Click on the Select which Outputs to Show icon at the top of the output window:
3) Selected outputs have a tick next to their entry, and on the folders(s) where they are located.

4) Deselect all pools.
5) Select the tree carbon pools by following this sequence in the dropdown tree: Carbon/Forest/Plants/C mass of trees in all circumstances except coppice systems (See Section 9.1 below).
6) Select the debris carbon pools by following this sequence in the dropdown tree: Carbon/Forest/Debris/C mass of forest debris.
7) Click ‘OK’.
3.14 Running Simulations

To run the simulation, press the icon in the top menu bar:

3.15 Viewing Outputs

Outputs can be viewed by clicking the icon (circled) at the top of the Output window as either:

1) Graphs;
2) Or in tabular form.

View the tabular form.

### 3.16 Transferring Outputs into a Spreadsheet to Calculate PSACS

To transfer data into a spreadsheet (Microsoft Excel or equivalent) for analysis:

1) Select all the output data by clicking on the icon (circled) in the top of the Output window.

2) On the highlighted data, right click and select ‘Copy’.

3) Open your spreadsheet software, and ‘Paste’ the data copied from FullCAM into the spreadsheet. For example:

4) For each month, calculate the C mass on site by adding the ‘C-mass of trees’ and ‘C mass of forest debris’.
5) Calculate the Average C mass on site for each Modelling Strata in accordance with the Determination.

3.17 Alternative Simulations Steps for Coppice Systems

Under a coppice system, all tree roots are assumed to remain alive after harvest, but their biomass is assumed to not change after the first harvest. As per Section 6.38 in the Determination, this assumption must be reflected by altering the ‘C mass of belowground tree components’ when calculating the Average C mass on site for a modelling stratum in coppice systems in FullCAM.

1) In the ‘Output’ tab (Section 3.15 above), select:
   a. Carbon/Forest/Plant/C mass of aboveground tree components;
   b. Carbon/Forest/Plant/C mass of belowground tree components;
   c. Carbon/Forest/Debris/C mass of forest debris.
2) Run the simulation (as per Section 3.14 above).

3) Select all the output data by clicking on the icon (circled) in the top of the Output window.
4) On the highlighted data, right click and select ‘Copy’.

5) Open a spreadsheet, and ‘Paste’ the data copied from FullCAM into the spreadsheet.

6) For each month, calculate the ‘C mass on site’ by adding the ‘C mass of forest debris’, ‘C mass of aboveground tree components’ and ‘C mass of below ground tree components’.

7) Adjust the data in the spreadsheet so that the value in the ‘C mass of belowground tree components’ in the month before the first harvest is held constant for the rest of the modelling period. In the example below, for a harvest event in February 2035, the value of ‘C mass of belowground tree components’ in each of the cells of column D from February 2035 onwards, is replaced with the value for January 2035.
8) Calculate the Average C mass on site for each Modelling Strata in accordance with the Determination.

4. Calculation of the Root to Shoot Ratio

To estimate the Root: Shoot ratio, first set up a plot for the modelling stratum as per steps 3.1 – 3.12 above then follow the below steps.

1) In the 'Output' tab (Section 3.15 above), select:
   a) Carbon/Forest/Plant/C mass of aboveground tree components;
   b) Carbon/Forest/Plant/C mass of belowground tree components;
2) Run the simulation (as per Section 3.14 above).

3) Transfer data into a spreadsheet by selecting all of the output, and paste it into the spreadsheet as described in Section 3.16 above.
4) Add a new column for the Root:Shoot ratio, and calculate its value by dividing the ‘C mass of belowground tree components’ by the ‘C mass of aboveground tree components’.

5) Select the month for the reporting period and determine the Root: Shoot ratio recorded for that month. This applies to all plot types in the modelling stratum. This value will need to be inserted into Equation 7.5 in the Determination.

5. Outputs generated in FullCAM and used in equations in the Determination

Table 2 below describes the FullCAM outputs produced by the predicted stratum average carbon stocks (PSACS) simulation and how they correspond to the equations in the Determination. Once these FullCAM outputs have been obtained, users will need to follow the Determination itself to complete the equations.
### Table 2 – Relationship between FullCAM outputs and variables defined in the determination

<table>
<thead>
<tr>
<th>Description</th>
<th>FullCAM Output</th>
<th>Parameter generated in FullCAM as defined in the Determination</th>
<th>Equation in the determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>C stock of trees on-site for a Modelling stratum – including aboveground and belowground components</td>
<td>C mass of trees (t C/ha)</td>
<td>$C_{\text{tree},j,m}$</td>
<td>Equation 2.12</td>
</tr>
<tr>
<td>C stock of debris on-site for a modelling stratum</td>
<td>C mass of forest debris (t C/ha)</td>
<td>$C_{\text{debris},j,m}$</td>
<td>Equation 2.12</td>
</tr>
<tr>
<td>C stock of roots</td>
<td>C mass of below ground tree components (t C/ha)</td>
<td>$R_{R:S}$</td>
<td>Equation 7.5</td>
</tr>
<tr>
<td>C mass of aboveground tree components</td>
<td>C mass of above ground tree components (t C/ha)</td>
<td>$R_{R:S}$</td>
<td>Equation 7.5</td>
</tr>
</tbody>
</table>