Carbon Credits (Carbon Farming Initiative) (Sequestering Carbon in Soils in Grazing Systems) Methodology Determination 2014[1]

Carbon Credits (Carbon Farming Initiative) Act 2011

I, GREG HUNT, Minister for the Environment, make this Methodology Determination under subsection 106(1) of the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

Dated 8:7:2014

Greg Hunt

GREG HUNT

Minister for the Environment

Contents

Part 1 Preliminary

1.1 Name of Determination

This Determination is the *Carbon Credits (Carbon Farming Initiative) (Sequestering Carbon in Soils in Grazing Systems) Methodology Determination 2014*.

1.2 Duration

Note See subsection 122(1) of the Act.

This Determination:

(a) commences on the day after it is registered on the Federal Register of Legislative Instruments; and

(b) unless sooner revoked, expires on the day before it would otherwise be repealed under subsection 50(1) of the *Legislative Instruments Act 2003*.

Note This Determination will expire on the first 31 March or 30 September on or after the tenth anniversary of its registration.

Note This Determination continues to apply after expiry in accordance with section 125 of the Act.

1.3 Definitions

In this Determination:

Act means the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

activity start date means the date from which project management actions may be applied on a carbon estimation area, and which is the later of either:

(a) the first day after the last day of a carbon estimation area baseline sampling round; or

(b) the first day after the Regulator makes a decision under subsection 27(2) of the Act to declare a project to which this Determination applies to be an eligible offsets project.

Note Paragraph (b) refers to the date the decision is made under subsection 27(2) of the Act and not the date when the declaration takes effect under subsection 27(15) of the Act.

bare fallow means land that is not seeded and has less than 40% ground cover for 3 months or longer.

baseline emissions period means the 5 financial years preceding the financial year of the project start date.

bulk density means soil mass per unit volume.

carbon dioxide equivalent (CO_2-e) means the carbon dioxide equivalent mass of carbon or a greenhouse gas.

carbon estimation area means an area of land that is within the project area and that meets the requirements in section 3.3.

carbon estimation area baseline sampling round means the first soil sampling round undertaken in a carbon estimation area to determine the initial soil organic carbon stock value.

carbon estimation area sampling round means a sampling round conducted to develop an estimate of soil organic carbon stock in a carbon estimation area.

CFI Mapping Guidelines means the guidelines of that name, as published and made available on the Department's website and as in force from time to time.

CFI Mapping Tool means the online mapping tool of that name, as published and made available on the Department's website and as in force from time to time.

CFI soil sampling design method means the soil sampling design method that is included in the CFI Soil Sampling Design Method and Guidelines.

CFI Soil Sampling Design Method and Guidelines means the guidelines of that name, as published and made available on the Department's website and includes any amendments to the guidelines uploaded by the Department to its website from time to time.

Note Proponents should check the Department's website and ensure that they have the most current version of the guidelines.

CFI soil sampling and analysis method means the soil sampling and analysis method that is included in the CFI Soil Sampling and Analysis Method and Guidelines.

CFI Soil Sampling and Analysis Method and Guidelines means the guidelines of that name, as published and made available on the Department's website and includes any amendments to the guidelines uploaded by the Department to its website from time to time.

Note Proponents should check the Department's website and ensure that they have the most current version of the guidelines.

composite means a sample created by bulking and mixing individual soil cores collected from different sampling locations.

continuous cropping means a system according to which land is cropped at least once every year, either with crops of the same type or rotations of different crops, and does not include pasture rotations.

critical soil organic carbon change means change in soil organic carbon stock over time with a defined probability of exceedance.

Department means the department that administers the Act.

exclusion area has the meaning given by section 3.4.

fertiliser means any organic or synthetic substance that supplies key chemical elements to plants and soils to enhance plant growth and the fertility of soils.

grazing system means a system of managing grazing by livestock on pasture.

historic management actions means all management practices undertaken in a carbon estimation area between the beginning of the baseline emissions period and the activity start date.

median day means the middle date of a sampling round, or the next calendar date if the sampling round consisted of an even number of days.

National Inventory means the report of that name, as published and made available on the Department's website, and as updated from time to time.

new management action means a project management action that:

(a) is undertaken in a carbon estimation area on or after the activity start date; and

(b) differs from historic management actions.

NGER Measurement Determination means the applicable determination made under subsection 10(3) of the *National Greenhouse and Energy Reporting Act 2007*.

NGER Regulations means the *National Greenhouse and Energy Reporting Regulations 2008*.

nominated sampling depth means a soil sampling depth that is chosen by a project proponent for each carbon estimation area.

organic fertiliser means any solid or liquid organic product that:

(a) is created using waste products of other industries and processes;

(b) may be applied to the surface of, or incorporated into, agricultural soils; and

(c) does not include polymers and non-biodegradable substances such as plastics, rubber or coatings.

pasture cropping means sowing cereal crops directly into permanent pasture to produce both crops and fodder.

permanent pasture means agricultural land that is:

(a) continuously under pasture, including perennials and annual grasses and legumes;

(b) not bare fallowed; and

(c) grazed by production livestock at least once:

a. in each reporting period on or after the activity start date; or

b. every 2 years before the activity start date.

production livestock means livestock managed for production purposes and from which commercial products or services are derived.

project area baseline sampling round means a sampling round conducted to develop an initial soil organic carbon stock value in all carbon estimation areas in the project area.

project area sampling round means a sampling round conducted to develop an estimate of soil organic carbon stock in all carbon estimation areas in the project area.

project duration means the time in years between the baseline sampling round and the most recent sampling round for a carbon estimation area.

project management actions means all management actions undertaken within a carbon estimation area in the period between the activity start date and the end of the final crediting period for the project and includes one or more new management actions.

project mechanism has the meaning given by section 2.2.

project start date means the date when the first reporting period for an eligible offsets project starts under subsection 76(1) of the Act.

Note The project start date is the first day of both the project crediting period and the first reporting period of the project.

Regulations means the *Carbon Credits (Carbon Farming Initiative) Regulations 2011*.

renovation event means the rejuvenation of existing degraded pasture by sowing additional pasture seed.

sample means a representative portion of soil from a discrete layer of soil.

sampling design means instructions regarding:

(a) the spatial layout of sampling locations;

(b) the number of samples;

(c) the timing of sampling; and

(d) if relevant, the compositing or bulking of soil samples.

sampling location means the location, specified by a latitude and a longitude, at which a sample has been, or is to be, taken.

sampling plan means:

(a) the position of the carbon estimation areas and the strata;

(b) the number of composites; and

(c) the sample locations assigned to each composite;

within the project area.

sampling round means soil sampling conducted during a finite period to develop an estimate of soil organic carbon stocks at a particular point in time.

soil core means a discrete portion of soil that has been extracted with a coring device, and includes the gravel and fine fraction.

soil organic carbon means the form of carbon contained within soil organic matter and does not include mineralised carbon.

Standard Parameters and Emissions Factors means the document titled *Standard Parameters and Emissions Factors for Sequestering Carbon in Soils in Grazing*

Systems that is published and made available on the Department's website, and includes any amendments to those parameters and emissions factors based on updated information available to the Department, changes in the National Inventory, or changes in the carbon dioxide equivalence of the gases incorporated into those parameters and emissions factors and uploaded by the Department to its website from time to time.

Note This document is available from the Department's website. Proponents should check the Department's website and ensure that they have the most current version of the document.

stratum means an area in a carbon estimation area.

sub-sample, in relation to a soil sample, means a representative portion of an original soil sample upon which laboratory analyses are conducted.

synthetic fertiliser means any synthetic substance that supplies key chemical elements, particularly nitrogen, phosphorus and potassium, to plants and soils to enhance plant growth and the fertility of soils.

t CO_2-e means a unit of measurement defined as tonnes of carbon dioxide equivalence (within the meaning of the *National Greenhouse and Energy Reporting Act 2007*).

tillage means any form of mechanical preparation of the soil.

Note Other words and expressions used in this Determination have the meaning given by the Act. These include:

baseline

crediting period

eligible offsets project

emission

greenhouse gas

maximum potential relinquishment period

offsets report

project

project area

project proponent

Regulator

reporting period

sequestration offsets project.

1.4 Type of project to which this Determination applies

Note See paragraphs 27(4)(b) and 106(1)(a) of the Act and paragraph 3.28(1)(t) of the Regulations.

This Determination applies to sequestration offsets projects that aim to remove carbon dioxide from the atmosphere by sequestering carbon in soil in a grazing system.

Part 2 Requirements for declaration as eligible project

Note See paragraphs 27(4)(c) and 106(1)(b) of the Act.

2.1 Eligible projects

To be declared an eligible offsets project, a project to which this Determination applies must meet the requirements in this Part.

Note In addition, a project must meet the requirements in section 27 of the Act and in the Regulations, including a requirement to provide, in an application for a declaration of an eligible offsets project, a geospatial map of the project area that meets the requirements of the CFI Mapping Guidelines (regulation 3.1), and that the project is not an excluded offsets project (regulations 3.36 and 3.37).

2.2 Project mechanism

The project must implement project management actions consistent with the requirements in Part 3 that:

(a) increase carbon inputs to the soil in the project area; or

(b) reduce losses of soil organic carbon in the project area; or

(c) achieve both (a) and (b).

2.3 Project management actions

A project proponent must provide, in the form specified by the Regulator, a description of:

(a) the historic management actions that were carried out at any time during the 5 year period immediately before an application for declaration of the project as an eligible offsets project is made;

(b) the project management actions that will be carried out from the start of the activity start date to the end of the final crediting period;

(c) the new management actions that will be implemented as part of the project mechanism;

(d) how the project management actions could achieve the outcomes specified in section 2.2; and

(e) how the project management actions will be consistent with the requirements of Part 3.

Note To demonstrate how the new project management actions could achieve the outcomes specified in section 2.2, a project proponent may provide supporting evidence such as scientific evidence (if available) and other case studies as relevant.

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2.4 Land on which project mechanism is implemented

(1) This section sets out requirements for the land on which the project mechanism is implemented.

(2) The land must be within Australia, excluding external territories.

(3) The land must be made up of areas that were under either:

(a) permanent pasture for the 5 year period immediately before:

(i) an application for declaration of the project as an eligible offsets project is made; or

(ii) the first day of the baseline sampling round;

whichever is the earlier; or

(b) continuous cropping for the 5 year period immediately before:

(i) an application for declaration of the project as an eligible offsets project is made; or

(ii) the first day of the baseline sampling round;

whichever is the earlier.

Note A person may apply to the Regulator for the declaration of an offsets project as an eligible offsets project under section 22 of the Act.

(4) Evidence must be provided to demonstrate, to the satisfaction of the Regulator, that the land was managed in accordance with subsection (3):

(a) as permanent pasture; or

(b) as a continuous cropping system.

Note The evidence referred to in subsection (4) may include:

(a) date-stamped photographic evidence;
(b) invoices for goods received;
(c) invoices for capital works completed;
(d) taxation (and other) records, including of production livestock numbers;
(e) management records.

(5) If any part of the land was subject to continuous cropping as specified in paragraph (3)(b), then the new management actions referred to in paragraph 2.3(c) must include converting that part of the land to permanent pasture.

2.5 Identification of project area

The boundaries of the project area must be delineated in accordance with the CFI Mapping Guidelines.

Part 3 Requirements for operation of eligible projects

Note See paragraphs 27(4)(c), 35(2)(a) and 106(1)(b) of the Act and regulations 1.12 and 3.26 of the Regulations.

Division 3.1 Operation of eligible projects

Subdivision 3.1.1 Operation of eligible projects—general

3.1 Operation of eligible projects

An eligible offsets project to which this Determination applies must be carried out in accordance with this Part.

Subdivision 3.1.2 Division of the project area

3.2 Initial division of project area

(1) Before submitting the first offsets report for the project, the project proponent must divide the project area in accordance with this Division.

(2) The project area must consist of only the following types of areas:

(a) one or more carbon estimation areas; and

(b) if relevant—one or more exclusions areas.

3.3 Carbon estimation area boundaries

(1) This section sets out requirements for the boundaries of carbon estimation areas.

(2) Subject to subsection (3), the boundaries of each carbon estimation area must be defined in accordance with the:

(a) CFI soil sampling design method; and

(b) CFI Mapping Guidelines.

(3) Once the boundaries of a carbon estimation area are defined to undertake a baseline sampling round, the boundaries must not be changed.

3.4 Exclusion areas

Land in the project area on which the project mechanism is not implemented must be defined and mapped as an exclusion area in accordance with the CFI Mapping Guidelines.

Note An example of an exclusion area is land that is not used for primary production, such as a residential building and immediate surrounds.

Subdivision 3.1.3 Carbon estimation area requirements

3.5 Carbon estimation area requirements—general

A carbon estimation area must consist of land on which the project mechanism is implemented.

3.6 Permanent pasture requirements for a carbon estimation area

(1) A carbon estimation area must:

(a) have been under permanent pasture for a period that:

(i) commences at the start of the applicable 5 year period specified in paragraph 2.4(3)(a); and

(ii) continues to the activity start date; or

(b) both:

(i) have been under continuous cropping for a period that:

(A) commences at the start of the applicable 5 year period specified in paragraph 2.4(3)(b); and

(B) continues to the activity start date; and

(ii) be converted to permanent pasture as part of the project mechanism.

(2) Once the project mechanism has been implemented in a carbon estimation area, the carbon estimation area must remain as permanent pasture until the end of the final crediting period.

(3) Permanent pasture in a carbon estimation area must be grazed by production livestock at least once in each reporting period.

Division 3.2 Restricted activities

3.7 Management actions

(1) Management actions must not be undertaken within the project area from the activity start date to the end of the final crediting period unless the actions are project management actions.

Note After the end of the final crediting period, management actions that are not project management actions may be undertaken in the project area. Project proponents are required to notify the Regulator if a 'risk of reversal' event (defined by subsection 7.3(2)) occurs after the end of the final crediting period and before the end of the maximum potential relinquishment period.

(2) Project management actions must include at least one new management action that meets the requirements set out in subsection (3).

(3) One or more new management actions must be undertaken in each carbon estimation area:

(a) on or after the activity start date;

(b) no later than 2 years after the last day of the baseline sampling round for the relevant carbon estimation area; and

(c) before the t_1 sampling round for the relevant carbon estimation area.

(4) New management actions under this Determination include, but are not limited to, the following types of management actions:

(a) converting from continuous cropping to permanent pasture;

(b) undertaking pasture cropping;

(c) managing pasture through:

(i) implementing or changing pasture irrigation;

(ii) subject to this section—applying organic or synthetic fertiliser to pastures;

(iii) rejuvenating pastures, including through seeding; and

(d) managing grazing through:

(i) changing stocking rates;

(ii) altering the timing, duration and intensity of grazing.

(5) The following types of management actions are not project management actions under this Determination:

(a) permanent de-stocking of grazing systems;

(b) bare fallow;

(c) applying organic fertilisers that include crop residue, hay, or straw to the soil of the project area, unless in accordance with section 3.9;

(d) application of biochar, or soil amendments containing coal, to the soil; and

(e) clearing woody vegetation from within the project area.

(6) In this Division:

woody vegetation means trees and shrubs.

3.8 Clearing woody vegetation

Clearing woody vegetation from within the project area may be undertaken only to manage regrowth of invasive woody weeds that:

(a) have grown since the project start date; and

(b) are growing on existing grasslands or open woodlands.

Note Declaration as an eligible offsets project may be dependent on obtaining regulatory approvals, including approvals, licences or permits under State or Territory law (see section 28 of the Act). Failure to obtain regulatory approvals may result in the declaration of the project being revoked (see section 34 of the Act).

3.9 Organic fertiliser

If an organic fertiliser includes crop residue, hay or straw, applying that fertiliser to the soil in a carbon estimation area is a project management action only if the crop residue, hay or straw formed part of a waste-stream from intensive animal production, food processing or manufacturing process before becoming part of the organic fertiliser.

Part 4 Requirements for soil carbon measurements

Division 4.1 Soil carbon measurements—general

4.1 Soil carbon measurements—general

This Part sets out processes that must be conducted when measuring the soil carbon stocks for an eligible offsets project to which this Determination applies.

Division 4.2 Soil carbon measurements—requirements

4.2 Soil carbon measurements—definitions

In this Division:

qualified technician means a technician with qualifications from a nationally accredited course, or formal recognition of trade or prior learning (from a nationally accredited institution), in the competencies prescribed in the CFI Soil Sampling and Analysis Method and Guidelines.

sampling interval means the time between consecutive sampling rounds.

4.3 Strata

(1) At least 3 strata must be defined in each carbon estimation area in the project area.

(2) All strata in a carbon estimation area must be defined in accordance with the CFI Mapping Guidelines and the CFI soil sampling design method.

(3) The strata in a carbon estimation area must be evenly sized within the tolerance specified in the CFI soil sampling design method; and

(4) The same carbon estimation areas and strata in each carbon estimation area established for the baseline sampling round must be maintained for all subsequent sampling rounds.

4.4 Composites

(1) Subject to subsection (2), a project proponent must nominate the number of composites to be included in the sampling plan as required by the CFI soil sampling design method.

(2) At least 3 composites must be included in the sampling plan for each carbon estimation area.

(3) A sample location for each composite must be assigned within each stratum in accordance with the CFI soil sampling design method.

(4) The sampling locations must be located in accordance with the CFI soil sampling design method.

(5) A composite must be created by combining a single soil sample from each stratum in a carbon estimation area.

(6) The soil sample referred to in subsection (5) must be taken from the sampling location that belongs to that composite in accordance with the CFI soil sampling design method.

(7) Composites must be identified in accordance with the CFI soil sampling design method.

(8) Sampling locations in subsequent sampling rounds must be determined in accordance with the CFI soil sampling design method.

Note Subject to subsection 4.4(2), the number of composites taken within a carbon estimation area may vary across sampling rounds.

4.5 Sampling technicians

(1) The soil sampling required under this Determination must be undertaken by a qualified technician or by a laboratory that meets the requirements specified in section 4.7.

(2) The soil sampling referred to in subsection (1) includes:

(a) field-based sample collection; and

(b) preparation of soil samples.

Note Preparation of soil samples includes air-drying, bulking, mixing, sieving, sub-sampling, and handling.

4.6 Sampling, preparation and analysis of soil

(1) Soil samples must be collected in accordance with the CFI soil sampling and analysis method.

(2) The nominated sampling depth must be at least 30 centimetres.

Note The nominated sampling depth may be greater than 30 centimetres.

(3) The nominated sampling depth must be the same depth in the carbon estimation area:

(a) at all sample locations; and

(b) subject to subsection (4), for the baseline sampling round and all subsequent sampling rounds.

(4) If the nominated sampling depth for a carbon estimation area is greater than 30 centimetres for the baseline sampling round, the nominated depth may be reduced to the minimum depth of 30 centimetres at a subsequent sampling round.

(5) If the nominated depth is reduced to 30 centimetres in accordance with subsection (4), all subsequent nominated depths must be 30 centimetres.

(6) Each soil sample must be prepared and a sub-sample taken in accordance with the CFI soil sampling and analysis method.

(7) Each soil sample must be prepared in accordance with the instructions relating to preparation of composite samples in the CFI soil sampling and analysis method.

(8) Each sub-sample must be stored and handled in accordance with the CFI Soil sampling and analysis method.

4.7 Analysis of organic carbon and water content

(1) Analysis of soil sub-samples must be undertaken by a laboratory:

(a) that:

(i) is certified for organic carbon analysis by ASPAC; and

(ii) uses a method certified for organic carbon analysis and gravimetric water content by ASPAC; or

(b) that uses an organic carbon method and gravimetric water content method that has been accredited for that laboratory by NATA under ISO-IEC 17025 (Chemical Testing).

(2) The analysis of the soil sub-samples and the content of the laboratory reports must comply with the CFI soil sampling and analysis method.

(3) In this section:

ASPAC means the Australasian Soil and Plant Analysis Council.

NATA means the National Association of Testing Authorities.

4.8 Commencement of baseline sampling round and project management actions

(1) The baseline sampling round for each carbon estimation area in the project area must not commence until after the project start date.

Note The project start date means the date when the first reporting period for an eligible offsets project starts under subsection 76(1) of the Act, which is generally the date the declaration by the Regulator takes effect under Section 27 of the Act. The project start date may be declared to be a date in the past, provided that the project start date is after the date this Determination commences (see paragraph 1.2(a)). If a project proponent wishes to undertake the baseline sampling round before applying for declaration of an eligible offsets project (but after this Determination commences), the project start date may be back-dated to precede the baseline sampling round.

(2) The baseline sampling round for a carbon estimation area must not take longer than 60 calendar days to complete.

(3) Project management actions must not commence in a carbon estimation area before the activity start date.

4.9 Sampling rounds and reporting periods—timing

(1) A carbon estimation area sampling round must not take longer than 60 calendar days to complete from the first day of sampling to the last day of sampling.

(2) A project area sampling round must be conducted within 6 months from the first day of the first carbon estimation area soil sampling round to the last day of the final carbon estimation area soil sampling round in the project area.

(3) The last calendar day of a reporting period must be not more than 1 month after the last date of a project area sampling round.

Note A reporting period does not need to end after every project area sampling round.

4.10 Sampling rounds—frequency

(1) The median day, month and year of the carbon estimation area baseline sampling round (t_0) must be recorded to the nearest day for each carbon estimation area in the project area.

(2) Subject to section 4.11, all sampling carried out in a carbon estimation area after the carbon estimation area baseline sampling round must occur no more than 30 days before, and no more than 30 days after, the median day and month of the date of the carbon estimation area baseline sampling round.

(3) The following details regarding the timing of each carbon estimation area sampling round after the carbon estimation area baseline sampling round must be recorded:

(a) the day (or days);

(b) the month (or months);

(c) the year (or years); and

(d) the median day.

(4) Subject to subsection (2) and section 4.11, consecutive sampling rounds must not occur:

(a) less than 1 year apart; and

(b) more than 5 years apart.

Note Under section 76 of the Act, a reporting period must not be longer than 5 years. The first reporting period will need to include at least 2 sampling rounds—the baseline sampling round and a subsequent sampling round—in order to calculate net abatement for the project. The baseline sampling round should be undertaken as soon as is practicable after the project start date to enable at least 2 sampling rounds to be undertaken within the first reporting period at the desired sampling interval(s).

(5) The sampling interval must not vary by more than 2 years over the project duration.

4.11 Sampling rounds—extension of time by Regulator

(1) If exceptional circumstances prevent sampling within the timeframes specified in subsection 4.10(2), a project proponent may apply to the Regulator to seek an extension of time to carry out the carbon estimation area sampling round.

(2) If the Regulator extends the time for the carbon estimation area sampling round, the sampling must be carried out within the timeframe specified by the Regulator.

Note Exceptional circumstances may include poor weather conditions that inhibit site assess or where the soil moisture content is unsuitable for sampling at the planned time.

4.12 Sampling rounds—organic fertiliser

(1) Subject to subsection (2), if organic fertiliser has been applied to a carbon estimation area, the area must not be re-sampled until at least 2 years after the day that organic fertiliser was last applied to the area.

(2) The subsequent sampling round may occur up to 30 days before the end of the 2 year period referred to in subsection (1).

Note See subsection 4.10(2) for the general rule applying to the start times of subsequent sampling rounds.

Part 5 The net abatement amount—baseline calculations

Division 5.1 The net abatement amount

5.1 The net abatement amount

Note See paragraph 106(1)(c) of the Act.

For an eligible offsets project to which this Determination applies, the carbon dioxide equivalent net abatement amount in relation to a reporting period for the project is taken to be the change in soil carbon stocks for the total number of carbon estimation areas within the project area when compared to the baseline, less the net change in greenhouse gas emissions from all sources.

Division 5.2 Baseline calculations—preliminary

5.2 General

(1) In this Part if a calculation refers to a factor or parameter prescribed in the NGER Measurement Determination, the NGER Regulations, the Standard Parameters and Emissions Factors, or the National Inventory, the person carrying out the calculations must apply, to the whole reporting period, that factor or parameter from the NGER Measurement Determination, NGER Regulations, the Standard Parameters and Emissions Factors, or the National Inventory in force at the time that the offsets report is submitted or was required to be submitted, whichever is earlier.

(2) To avoid doubt, subsection (1) must apply to all calculations carried out in the reporting period, including calculations relating to baseline emissions.

5.3 Greenhouse gas assessment boundary

When making calculations under this Part:

(a) the carbon pools and emission sources and the corresponding greenhouse gases in Table 1 must be taken into account; and

(b) no other gases, carbon pools or emission sources may be taken into account.

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Table 1: Gases accounted for in the abatement calculations

Carbon pool	**Greenhouse gas**
Soil	Organic carbon (C)
Emission source	**Greenhouse gas**
Livestock—enteric fermentation	Methane (CH_4)
Livestock—dung and urine	Methane (CH_4) Nitrous oxide (N_2O)
Synthetic fertiliser	Nitrous oxide (N_2O) Carbon dioxide (CO_2)
Lime	Carbon dioxide (CO_2)
Tillage	Nitrous oxide (N_2O) Methane (CH_4) Carbon dioxide (CO_2)

Division 5.3 Baseline—general

Note See paragraph 106(4)(f) of the Act.

5.4 Baseline—general

The baseline scenario for a carbon estimation area must be calculated in accordance with this Part.

5.5 Baseline—emissions

(1) The mean annual emissions from each source within the greenhouse gas assessment boundary must be calculated for the baseline emissions period.

(2) If records demonstrating baseline emissions from a particular source and according to the relevant baseline cannot be provided, then it is taken that there were no emissions from that source for the baseline emissions period.

(3) The following must be calculated in relation to the annual emissions for the baseline emissions period:

(a) if livestock baseline B or synthetic fertiliser baseline B is used—the tolerance margin;

(b) in all other cases—the standard deviation.

(4) The material change in greenhouse gas emissions from a given source must be calculated if mean annual emissions for that source in a reporting period fall outside of the bounds of one standard deviation, or outside of the tolerance margin, from the mean annual emissions for that source in the baseline emissions period.

(5) In this section:

material change means a change in emissions from a given source, where the change falls outside of either one standard deviation or the tolerance margin (whichever applies in the circumstances) from the mean annual baseline emissions for that source.

Division 5.4 Baseline—soil carbon

Subdivision 5.4.1 Soil carbon baseline—general

5.6 Soil carbon baseline—general

(1) For the purposes of determining the soil carbon baseline, the soil organic carbon stock must be measured at the baseline sampling round before the commencement of project management actions in a carbon estimation area.

(2) The soil organic carbon stock in each soil layer in a carbon estimation area at the baseline sampling round must be calculated in accordance with this Division.

(3) For the purposes of the soil organic carbon stock calculations specified in this Division:

(a) the stocks must be calculated in up to 2 sequential soil layers in each carbon estimation area;

(b) the first layer (the ***upper layer***) must extend from the soil surface to a depth of 30 centimetres;

(c) if used—the second layer (the ***deeper layer***) must extend from a depth of 30 centimetres (the base of the upper layer) to a nominated sampling depth that is the same depth across that carbon estimation area within the baseline sampling round; and

Note A nominated sampling depth is a soil sampling depth that is chosen by a project proponent. The proponent may choose, for example, a nominated sampling depth of 45 or 60 centimetres. The actual sampling depth is the soil sampling depth achieved at a sampling location. It may be less than the nominated sampling depth in circumstances where, for example, the presence of bedrock prevents sampling to the nominated sampling depth.

(d) for the purposes of the Equations in this Division, the nominated thickness of a soil layer may be denoted by $T_{n\,,l=0-30cm}$ and, if used, $T_{n\,,l=30-xcm}$.

Note The nominated thickness of each soil layer directly relates to the nominated sampling depth. For example, if the nominated sampling depth is 30 centimetres, the value of T_n for the 0–30 centimetres layer is 30 centimetres. If the nominated sampling depth is 45 centimetres, the value of T_n for the 0–30 centimetre upper layer is 30 centimetres and the value for the 30–45 centimetre deeper layer is 15 centimetres.

(4) In this Division:

x centimetres (x cm) means a nominated sampling depth that is greater than 30 centimetres.

Subdivision 5.4.2 Soil carbon baseline—equivalent soil mass calculations

5.7 Soil carbon baseline—equivalent soil mass values

(1) Variations in soil bulk density must be taken into account when measuring soil carbon stock change by undertaking the equivalent soil mass calculations specified in this Subdivision.

(2) The equivalent soil mass calculations must include the following values for the baseline soil sampling round (t_0):

(a) the mass of soil contained in each soil layer, calculated in accordance with section 5.8;

(b) the cumulative mass of soil contained between the soil surface (zero centimetres) and the nominated sampling depth, calculated in accordance with section 5.9; and

(c) the equivalent soil mass contained between the soil surface (zero centimetres) and the lower boundary of each soil layer sampled, calculated in accordance with section 5.10.

(3) For the purpose of calculating each value specified in subsection (2), the nominated thickness (T_n) of each soil layer must be used.

(4) If only the upper layer of soil is sampled, one equivalent soil mass value must be calculated for the carbon estimation area.

(5) If the upper layer and a deeper layer of soil is sampled, the following equivalent soil mass values must be calculated:

(a) the equivalent soil mass from the soil surface to the lower boundary of the upper layer (being 30 centimetres); and

(b) the equivalent soil mass from the soil surface to the lower boundary of the deeper layer (being the nominated sampling depth).

5.8 Soil carbon baseline—mass of soil

The mass of soil contained in the nominated thickness of each soil layer per hectare for each composite sample collected from the carbon estimation area at the time of the baseline soil sampling round (t_0), must be calculated using the following formula:

$$SM_{t_0\,i,l} = T_{n\,,l} \times BD_{t_0\,i,l} \times 100$$ **Equation SC1**

Where:

$SM_{t_0\ i,l}$ = mass of soil present within the entire nominated thickness of the l^{th} soil layer for the i^{th} composite sample at the baseline sampling round (t_0); t soil/ha.

$T_{n\ ,l}$ = nominated thickness of the l^{th} soil layer; cm.

$BD_{t_0 i,l}$ = bulk density of the l^{th} soil layer for the i^{th} composite soil sample at the baseline sampling round (t_0), calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g/cm^3.

100 = conversion factor required to provide the soil mass in units of t soil/ha.

5.9 Soil carbon baseline—cumulative mass of soil

The cumulative mass of soil (t soil/ha) contained between the soil surface and the nominated sampling depth for each composite sample, or samples if the upper and deeper layers were sampled, collected from the carbon estimation area at the baseline soil sampling round (t_0) must be calculated using the following formula:

$$CSM_{t_0\ i,d} = \sum_{i=1}^{n} SM_{t_0\ i,l}$$ **Equation SC2**

Where:

$CSM_{t_0\ i,d}$ = cumulative mass of soil collected between the soil surface and a nominated sampling depth (either 30 or x cm) using the data collected for the l^{th} soil layers for the i^{th} composite sample at the baseline sampling round (t_0); t soil/ha.

$SM_{t_0\ i,l}$ = mass of soil present within in the entire nominated thickness of the l^{th} soil layer for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC1; t soil/ha.

n = (a) 1, if the 0–30 cm soil layer was the only layer sampled; or

(b) 2, if the upper (0–30 cm) and deeper (30–x cm,) soil layers were sampled.

Note If only one soil layer was sampled, $CSM_{t_0\ i,d} = SM_{t_0\ i,l}$.

5.10 Soil carbon baseline—equivalent soil mass

(1) The equivalent soil mass (ESM_d) that is contained between the surface and the lower boundary of each soil layer sampled must be:

(a) calculated once from the baseline soil sampling round (t_0) data for each carbon estimation area;

(b) calculated as the tenth percentile of the values obtained for each composite sample from a carbon estimation area using Equation SC2; and

(c) used as the equivalent soil mass in all subsequent soil organic carbon stock calculations.

(2) The equivalent soil mass (ESM_d) associated with the tenth percentile must be calculated in accordance with this section.

(3) The values obtained for the cumulative mass of soil for each of the composite samples ($CSM_{t_0\ i,d}$) collected from a carbon estimation area must be sorted from lowest to highest.

(4) A rank (k) must be assigned to each value of $CSM_{t_0\ i,d}$:

(a) starting with $k = 1$ (integer) for the lowest value; and

(b) progressing to $k = N$ for the largest value, where N is the number of composite samples.

(5) The percentile (P) associated with each value of k must be calculated using the following formula:

$$P = 100 \times \frac{(k-1)}{(N-1)} \qquad \textbf{Equation SC3}$$

(6) If one of the calculated values for P is exactly 10, then ESM_d is taken to be the equivalent to the value of $CSM_{t_0\ i,d}$ associated with $P = 10$.

(7) If no value of P is exactly 10, the value of the tenth percentile must be calculated by interpolation in accordance with section 5.11.

5.11 Soil carbon baseline—calculating the tenth percentile by interpolation

(1) The 2 rank values associated with the percentiles that bound the tenth percentile must be determined.

(2) The lower bound rank must be labelled as *kLB*.

(3) The upper bound rank must be labelled as *kUB*.

(4) ESM_d must be calculated using the following formula:

$$ESM_d = CSM_{kLB,d} + \left(CSM_{kUB,d} - CSM_{kLB,d}\right) \times \left(\frac{10 - P_{kLB}}{P_{kUB} - P_{kLB}}\right) \qquad \textbf{Equation SC4}$$

Where:

ESM_d = equivalent soil mass from the soil surface to a specified depth (eg $d = 30$ cm, or $d = x$ cm) for the carbon estimation area.

$CSM_{kLB,d}$ = cumulative soil mass associated with the lower bound rank (*kLB*).

$CSM_{kUB,d}$ = cumulative soil mass associated with the upper bound rank (*kUB*).

P_{kLB} = percentile associated with the lower bound rank (*kLB*).

P_{kUB} = percentile associated with the upper bound rank (*kUB*)

Subdivision 5.4.3 Baseline soil organic carbon stocks

5.12 Baseline soil organic carbon stocks—general

(1) The soil organic carbon stock for each soil layer for each composite sample at the time of the baseline sampling round must be calculated in accordance with this Subdivision.

(2) The mean soil organic carbon stock for each soil layer from each carbon estimation area at the time of the baseline sampling round must be calculated in accordance with this Subdivision.

(3) Equations SC5 to SC11 in this Subdivision assume that the nominated thickness (T_n) has been attained.

(4) In this Subdivision:

laboratory means the laboratory specified in section 4.7.

Walkley and Black analysis means the wet oxidation technique used to determine the organic carbon content of soil described in the CFI Soil Sampling and Analysis Method and Guidelines.

5.13 Baseline soil organic carbon stocks—single soil layer

(1) Soil organic carbon stock in the 0–30 centimetre layer for each composite sample collected from the carbon estimation area at the time of the baseline sampling round (t_0) must be calculated using the following formula:

$$SOC_{t_0\ i,l=0-30cm} = OC_{OD\ t_0\ i,l=0-30cm} \times BD_{t_0\ i,l=0-30cm} \times T_{n\ ,l=0-30cm} \times (1 - P_{gravel\ t_0\ i,l=0-30cm}) \quad \textbf{Equation SC5}$$

Where:

$SOC_{t_0\ i,l=0-30cm}$ = soil organic carbon stock in the 0–30 cm layer (l = 0–30 cm) for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$OC_{OD\ t_0\ i,l=0-30cm}$ = organic carbon content of the 0–30 cm soil layer for the i^{th} oven-dry composite sample at the baseline sampling round (t_0) expressed as a percentage; % of oven dry soil mass.

$BD_{t_0\ i,l=0-30cm}$ = bulk density of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g/cm^3.

$T_{n\,,l=0-30cm}$ = nominated thickness of the 0–30 cm soil layer = 30 cm.

$P_{gravel\ t_0\ i,l=0-30cm}$= gravimetric gravel content of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; fraction of oven dry soil mass.

(2) For the purposes of determining $OC_{OD\ t_0\ i,l=0-30cm}$, if:

(a) the laboratory reported:

(i) the air-dry organic carbon content of the sub-sample; or

(ii) the grams per kilogram organic carbon content of the sub-sample; or

(b) the Walkley and Black analysis is used and not converted to total organic carbon by the laboratory;

then the value must be converted to a total oven-dry organic carbon content using the CFI Soil Sampling and Analysis Method and Guidelines; % of oven dry soil mass.

5.14 Baseline soil organic carbon stocks in equivalent soil mass for single soil layer

The soil organic carbon stock in the equivalent soil mass for the 0–30 centimetre layer in each composite sample collected from the carbon estimation area at the baseline sampling round (t_0) must be calculated using the following formula:

$$SOC\_esm_{t_0\ i,d=30cm} = SOC_{t_0\ i,l=0-30cm} \times \frac{ESM_{d=30cm}}{SM_{t_0\ i,l=0-30cm}} \qquad \textbf{Equation SC6}$$

Where:

$SOC\_esm_{t_0\ i,d=30cm}$= soil organic carbon stock in the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$SOC_{t_0\ i,l=0-30cm}$= soil organic carbon stock in the 0–30 cm soil layer (l = 0–30 cm) for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC5; t C/ha.

$ESM_{d=30cm}$= equivalent soil mass to a depth of 30 cm for the carbon estimation area, calculated using Equation SC4; t soil/ha.

$SM_{t_0\ i,l=0-30cm}$ = mass of soil present within the entire nominated thickness of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated using Equation SC1; t soil/ha.

5.15 Baseline soil organic carbon stocks—corrected stock in equivalent soil mass for single soil layer

(1) If it is not possible to collect soil from the entire nominated soil layer thickness of 0–30 centimetres, the value of $SOC\_esm_{t_0 i,d=30cm}$ must be corrected in accordance with this section.

(2) The thickness associated with the equivalent soil mass of each composite sample (T_{esm}) must be calculated using the following formula:

$$T_{esm\ t_0\ i,d=30cm} = \frac{ESM_{d=30cm}}{BD_{t_0\ i,l=0-30cm} \times 100}$$ **Equation SC7**

Where:

$T_{esm\ t_0\ i,d=30cm}$ = thickness of the soil layer required to obtain the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0); cm.

$ESM_{d=30cm}$ = equivalent soil mass to a depth of 30 cm for the carbon estimation area, calculated using Equation SC4; t soil/ha.

$BD_{t_0\ i,l=0-30cm}$ = bulk density of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g/cm^3.

100 = conversion factor required to provide the soil mass in units of t soil/ha.

(3) The corrected soil organic carbon stock for the baseline sampling round (t_0) must be derived using the values of T_{esm}, T_n and T_a, where T_a = the actual average thickness of the soil layer sampled for a composite.

(4) If $T_{a\ i,l=0-30cm}$ is greater than or equal to $T_{n\ ,l=0-30cm}$, then:

$$SOC\_cor_{t_0\ i,d=30cm} = SOC\_esm_{t_0\ i,d=30cm}$$ **Equation SC8a**

(5) If $T_{a\ i,l=0-30cm}$ is less than $T_{n\ ,l=0-30cm}$ and $T_{esm\ i,d=30cm}$ is less than $T_{a\ i,l=0-30cm}$, then:

$$SOC\_cor_{t_0\ i,d=30} = SOC\_esm_{t_0\ i,d=30cm}$$ **Equation SC8b**

(6) If $T_{a\ i,l=0-30cm}$ is less than $T_{n\ ,l=0-30cm}$ and $T_{esm\ i,d=30cm}$ is greater than $T_{a\ i,l=0-30cm}$, then:

$$SOC\_cor_{t_0\ i,d=30} = SOC\_esm_{t_0\ i,d=30cm} \times \frac{T_{a\ t_0\ i,l=0-30cm}}{T_{esm\ t_0\ i,d=30cm}}$$ **Equation SC8c**

(7) The following values apply to Equations SC8a–SC8c:

$SOC\_cor_{t_0\ i,d=30cm}$= corrected soil organic carbon stock in the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$SOC\_esm_{t_0\ i,d=30cm}$ = soil organic carbon stock in the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0); t soil/ha.

$T_{a\ t_0\ i,l=0-30cm}$ = average actual thickness of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0), calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; cm.

$T_{esm\ t_0\ i,d=30cm}$ = thickness of the 0–30 cm soil layer required to obtain the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC7; cm.

(8) The corrected soil organic carbon stock in the equivalent soil mass in the 0–30 centimetre layer ($SOC\_cor_{t_0\ i,l=0-30cm}$) is taken to be the corrected soil organic carbon stock in the equivalent soil mass to a depth of 30 centimetres ($SOC\_cor_{t_0\ i,d=30cm}$), as specified in the following formula:

$$SOC\_cor_{t_0\ i,l=0-30cm} = SOC\_cor_{t_0\ i,d=30}$$ **Equation SC9**

(9) The value for $SOC\_cor_{t_0\ i,l=0-30cm}$ must be used in all subsequent calculations to determine the extent of change in soil organic carbon stock within the soil layer over time.

5.16 Baseline organic soil carbon stocks—2 soil layers

(1) If 2 sequential soil layers are sampled, the soil organic carbon stock in the deeper soil layer (30–*x* centimetres) must be:

(a) calculated as the difference between:

(i) soil organic carbon stock to a depth of *x* centimetres; and

(ii) soil organic carbon stock to a depth of 30 centimetres; and

(b) expressed on an equivalent soil mass basis.

(2) The soil organic carbon stock to the depth of *x* centimetres must be corrected for circumstances where it was not possible to attain the nominated sampling depth of *x* centimetres.

(3) The soil organic carbon stock in the equivalent soil mass to a depth of *x* centimetres for each composite sample collected from the carbon estimation area at the baseline sampling round (t_0) must be calculated using the following formula:

$$SOC_{t_0\ i,l=30-xcm} = OC_{OD\ t_0\ i,l=30-xcm} \times BD_{t_0\ i,l=30-xcm} \times T_{n\ l=30-xcm} \times (1 - P_{gravel\ t_0\ i,l=30-xcm})$$

Equation SC10

Where:

$SOC_{t_0\ i,l=30-xcm}$ = soil organic carbon stock in the 30–*x* cm layer (*l* = 30–*x* cm) for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$OC_{OD\ t_0\ i,l=30-xcm}$ = organic carbon content of the 30–*x* cm soil layer for the i^{th} oven-dry composite sample at the baseline sampling round (t_0); % of oven dry soil mass.

$BD_{t_0\ i,l=30-xcm}$ = bulk density of the 30–*x* cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g/cm^3.

$T_{n\ ,l=30-xcm}$ = nominated thickness of the 30–*x* cm soil layer; cm.

$P_{gravel\ t_0\ i,l=30-xcm}$ = gravimetric gravel content of the 30–*x* cm soil layer for the i^{th} composite sample calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g.

(4) For the purposes of determining $OC_{OD\ t_0\ i,l=30-xcm}$, if:

(a) the laboratory reported:

(i) the air-dry organic carbon content of the sub-sample; or

(ii) the grams per kilogram organic carbon content of the sub-sample; or

(b) the Walkley and Black analysis is used and not converted to total organic carbon by the laboratory;

then the value must be converted to a total oven-dry organic carbon content using the CFI Soil Sampling and Analysis Method and Guidelines.

5.17 Baseline soil organic carbon stocks in equivalent soil mass for 2 soil layers

(1) The soil organic carbon stock in the equivalent soil mass to the nominated sampling depth of x centimetres must be calculated by adding the soil organic carbon contained in the nominated thickness of the 0–30 centimetre soil layer ($SOC_{t_0\ i,l=0-30cm}$) to the amount of organic carbon contained in the mass of 30–x centimetre soil required to give the total equivalent soil mass to a depth of x centimetres ($ESM_{d=x}$).

(2) The calculation specified in subsection (1) must be undertaken using the following formula:

$$SOC\_esm_{t_0\ i,d=xcm} = SOC_{t_0\ i,l=0-30cm} + (SOC_{t_0\ i,l=30-xcm} \times \frac{ESM_{d=xcm} - SM_{t_0\ i,l=0-30cm}}{SM_{t_0\ i,l=30-xcm}})$$ **Equation SC11**

Where:

$SOC\_esm_{t_0\ i,d=xcm}$= soil organic carbon stock in the equivalent soil mass to a depth of x cm for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$SOC_{t_0\ i,l=0-30cm}$= soil organic carbon stock in the 0–30 cm soil layer (l = 0–30 cm) for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC5; t C/ha.

$SOC_{t_0\ i,l=30-xcm}$ = soil organic carbon stock in the x cm soil layer (l = 30–x cm) for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC10; t C/ha.

$ESM_{d=xcm}$= equivalent soil mass to a depth of x cm for the carbon estimation area, calculated using Equation SC4; t soil/ha.

$SM_{t_0\ i,l=0-30cm}$ = mass of soil present within the entire nominated thickness of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC1; t soil/ha.

$SM_{t_0\ i,l=30-xcm}$ = mass of soil present within the entire nominated thickness of the 30–x cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC1; t soil/ha.

5.18 Baseline soil organic carbon stocks—corrected stock in equivalent soil mass for 2 soil layers

(1) If it is not possible to collect soil from the entire nominated soil layer thickness of 0–x centimetres, the value of $SOC\_esm_{t_0 i,d=xcm}$ must be corrected in accordance with this section.

(2) The thickness associated with the equivalent soil mass of each composite sample (T_{esm}) must be calculated using the following formula:

$$T_{esm\ t_0\ i,d=xcm} = T_{a\ t_0\ i,l=0-30cm} + \left(\frac{ESM_{d=xcm} - SM_{t_0\ i,l=0-30cm}}{BD_{t_0\ i,l=30-x} \times 100}\right) \qquad \textbf{Equation SC12}$$

Where:

$T_{esm\ t_0\ i,d=xcm}$ = thickness of the soil layer required to obtain the equivalent soil mass to a depth of x cm for the i^{th} composite sample at the baseline sampling round (t_0); cm.

$T_{a\ t_0\ i,l=0-30cm}$ = average actual thickness of the 0–30 cm soil layer for the i^{th} composite sample which should always be equal to 30 cm if 2 sequential soil layers are being sampled; cm.

$ESM_{d=xcm}$ = equivalent soil mass to a depth of x cm for the carbon estimation area, calculated using Equation SC4; t soil/ha.

$SM_{t_0\ i,l=0-30cm}$ = mass of soil collected within the entire nominated thickness of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC1; t soil/ha.

$BD_{t_0\ i,l=30-xcm}$ = bulk density of the 30–x cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; g/cm^3.

100 = conversion factor required to provide the soil mass in units of t soil/ha.

Note The average actual thickness of the 0–30 centimetre soil layer for the i^{th} composite sample ($T_{a\ i,l=0-30cm}$) should always be equal to 30 centimetres if 2 sequential soil layers are sampled.

(3) The corrected soil organic carbon stock for the 0–x cm layer for the baseline sampling round (t_0) must be derived using the values of:

(a) $T_{esm\ t_0\ i,d=xcm}$ for the 0–x centimetre layer; and

(b) $T_{n,l=30-xcm}$ and $T_{a\ t_0\ i,l=30-xcm}$ for the 30–x centimetre layer.

(4) If $T_{a\ t_0\ i,l=30-xcm}$ is greater than or equal to $T_{n,l=30-xcm}$, then:

$$SOC\_cor_{t_0\ i,d=x} = SOC\_esm_{t_0\ i,d=xcm}$$ **Equation SC13a**

(5) If $T_{a\ t_0\ i,l=30-xcm}$ is less than $T_{n\ ,l=30-xcm}$ and $T_{esm\ t_0\ i,d=xcm}$ is less than $T_{a\ t_0\ i,l=30-xcm}$, then:

$$SOC\_cor_{t_0\ i,d=x} = SOC\_esm_{t_0\ i,d=xcm}$$ **Equation SC13b**

(6) If $T_{a\ t_0\ i,l=30-xcm}$ is less than $T_{n\ ,l=30-xcm}$ and $T_{esm\ t_0\ i,d=xcm}$ is greater than $T_{a\ t_0\ i,l=30-xcm}$, then:

$$SOC\_cor_{t_0\ i,d=x} = SOC_{t_0\ i,l=0-30cm} + \left(SOC\_esm_{t_0\ i,d=xcm} - SOC_{t_0\ i,l=0-30cm}\right) \times \frac{T_{a\ t_0\ i,l=30-xcm}}{T_{esm\ t_0\ i,d=xcm} - T_{a\ t_0\ i,l=0-30cm}}$$ **Equation SC13c**

(7) The following values apply to Equations SC13a–SC13c:

$SOC\_cor_{t_0\ i,d=xcm}$= corrected soil organic carbon stock in the equivalent soil mass to a depth of *x* cm for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$SOC_{t_0\ i,l=0-30cm}$= soil organic carbon stock in the 0–30 cm layer (*l* = 0–30 cm) for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC5.

$SOC\_esm_{t_0\ i,d=xcm}$ = soil organic carbon stock in the equivalent soil mass to a depth of *x* cm for the i^{th} composite sample at the baseline sampling round (t_0); t soil/ha.

$T_{a\ t_0\ i,l=30-xcm}$ = average actual thickness of the 30–*x* cm soil layer for the i^{th} composite sample at the baseline sampling round (t_0) calculated in accordance with the CFI Soil Sampling and Analysis Method and Guidelines; cm.

$T_{esm\ t_0\ i,d=xcm}$ = thickness of the 0–*x* cm soil layer required to obtain the equivalent soil mass to a depth of *x* cm for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC12; cm.

$T_{a\ t_0\ i,l=0-30cm}$ = average actual thickness of the 0–30 cm soil layer for the i^{th} composite sample at the baseline sampling round

(t_0) which should always be equal to 30 cm if the nominated sampling depth is greater than 30cm; cm.

Note The average actual thickness of the 0–30 centimetre soil layer for the i^{th} composite sample ($T_{a\ i,l=0-30cm}$) should always be equal to 30 centimetres if sampling to a depth greater than 30 centimetres.

(8) The soil organic carbon stock in the equivalent soil mass of the 30–x centimetre soil layer for each composite sample collected from the carbon estimation area at the baseline sampling round (t_0) must be calculated using the following formula:

$$SOC\_cor_{t_0 i,l=30-xcm} = SOC\_cor_{t_0 i,d=xcm} - SOC\_cor_{t_0 i,d=30cm}$$ **Equation SC14**

Where:

$SOC\_cor_{t_0 i,l=30-xcm}$ = corrected soil organic carbon stock in the equivalent soil mass calculated in the 30–x cm layer for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$SOC\_cor_{t_0 i,d=xcm}$ = corrected soil organic carbon stock in the equivalent soil mass to a depth of x cm for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC13a, SC13b, or SC13c; t C/ha.

$SOC\_cor_{t_0\ i,d=30cm}$ = corrected soil organic carbon stock in the equivalent soil mass to a depth of 30 cm for the i^{th} composite sample at the baseline sampling round (t_0), calculated using Equation SC8a, SC8b, or SC8c; t C/ha.

(9) The values for $SOC\_cor_{t_0\ i,l=0-30cm}$ and $SOC\_cor_{t_0 i,l=30-xcm}$, as determined in accordance with Equations SC9 and SC14, must be used in all subsequent calculations to determine the extent of change in soil organic carbon stock within each soil layer over time.

Note In the following Equations the subscript l is used to denote the layers. Since all calculations are completed for one soil layer at a time, the reference to a particulate depth layer has been removed from the subscript to simplify the presentation of the Equations.

5.19 Baseline soil organic carbon stocks—mean corrected stock in equivalent soil mass for carbon estimation area soil layer

The mean baseline corrected soil organic stock in the equivalent soil mass for each soil layer from each carbon estimation area at the baseline sampling round (t_0) must be calculated using the following formula:

$$\overline{SOC\_cor}_{t_0\ l} = \frac{\sum_{i=1}^{n} SOC\_cor_{t_0\ i,l}}{n_{t_0\ l}}$$ **Equation SC15**

Where:

$\overline{SOC\_cor}_{t_0\ l}$ = mean corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at the baseline soil sampling round (t_0); t C/ha.

$SOC\_cor_{t_0\ i,l}$ = corrected soil organic carbon stock in the equivalent soil mass calculated in the l^{th} soil layer for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$n_{t_0 l}$ = number of composite samples collected for the l^{th} soil layer of the carbon estimation area at the baseline sampling round (t_0).

i = each composite sample and varies from 3 to n.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

5.20 Baseline soil organic carbon stocks—standard deviation of corrected stock in equivalent soil mass for carbon estimation area soil layer

The standard deviation of the corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area at the baseline sampling round (t_0) must be calculated using the following formula:

$$SD_{SOC\_cor_{t_0 l}} = \sqrt{\frac{\sum_{i=1}^{n}(SOC\_cor_{t_0 i,l} - \overline{SOC\_cor}_{t_0 l})^2}{n_{t_0 l-1}}}$$ **Equation SC16**

Where:

$SD_{SOC\_cor_{t_0 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at the baseline sampling round (t_0); t C/ha.

$SOC\_cor_{t_0 i,l}$ = corrected soil organic carbon stock in the equivalent soil mass calculated in the l^{th} soil layer for the i^{th} composite sample at the baseline sampling round (t_0); t C/ha.

$\overline{SOC\_cor}_{t_0 l}$ = mean corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at the baseline sampling round (t_0); t C/ha.

$n_{t_0 l}$ = number of composite samples collected from the l^{th} soil layer of the carbon estimation area at the baseline sampling round (t_0).

i = each composite sample; varies from 3 to n.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

Subdivision 5.4.4 Soil organic carbon baseline—additional calculations

5.21 Baseline soil organic carbon stocks—additional calculations

(1) The purpose of the calculations specified in this Subdivision is to assist project proponents to calculate the total baseline soil organic carbon stocks for:

(a) each carbon estimation area soil layer;

(b) each carbon estimation area; and

(c) the project area.

(2) To avoid doubt, the values derived from Equations SC17, SC18 and SC19 are not required to calculate changes in soil organic carbon stocks over time.

5.22 Baseline soil organic carbon stocks—total corrected stock for carbon estimation area soil layer

The baseline corrected soil organic stock in the equivalent soil mass for each soil layer across each carbon estimation area must be calculated using the following formula:

$$SOC\text{-}CEA\_cor_{t_0 l} = \overline{SOC\_cor}_{t_0 l} \times Area\text{-}CEA \qquad \textbf{Equation SC17}$$

Where:

$SOC\text{-}CEA\_cor_{t_0 l}$ = total corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer across the entire area of each carbon estimation area at the baseline sampling round (t_0); t C.

$\overline{SOC\_cor}_{t_0 l}$ = mean corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at the baseline sampling round (t_0); t C/ha.

$Area\text{-}CEA$ = area of the carbon estimation area; ha.

5.23 Baseline soil organic carbon stocks—total corrected soil organic carbon stock for carbon estimation area

The baseline corrected soil organic stock in the equivalent soil mass for each carbon estimation area must be calculated using the following formula:

$$SOC\text{-}CEA\_cor_{t_0 c} = \sum_{l=1}^{n} SOC\text{-}CEA\_cor_{t_0 l} \qquad \textbf{Equation SC18}$$

Where:

$SOC\text{-}CEA\_cor_{t_0 c}$ = total corrected soil organic carbon stock in the equivalent

soil mass for the carbon estimation area at the baseline sampling round (t_0); t C.

$SOC\text{-}CEA\_cor_{t_0 l}$ = total corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer across the entire area of the carbon estimation area at the baseline sampling round (t_0); t C.

n = number of soil layers within the carbon estimation area, being one (0–30 cm only) or 2 (0–30 cm and 30–x cm).

l = each soil layer within the carbon estimation area.

5.24 Baseline soil organic carbon stocks—total corrected stock for project area

The total baseline corrected soil organic carbon stock for the project area:

(a) is the sum of the organic carbon stocks for each carbon estimation area within the project area; and

(b) must be calculated using the following formula:

$$SOC\text{-}PA\_cor_{t_0} = \sum_{c=1}^{n} SOC\text{-}CEA\_cor_{t_0 c} \qquad \textbf{Equation SC19}$$

Where:

$SOC\text{-}PA\_cor_{t_0}$ = total corrected soil organic carbon stock in the equivalent soil mass across the project area at the baseline sampling round (t_0); t C.

$SOC\text{-}CEA\_cor_{t_0 c}$ = total corrected soil organic carbon stock in the equivalent soil mass for the carbon estimation area at the baseline sampling round (t_0); t C.

n = number of carbon estimation areas within the project area.

c = each carbon estimation area within the project area; varies from 1 to n.

Division 5.5 Baseline—production livestock

Subdivision 5.5.1 Livestock baselines—general

5.25 Livestock baselines—general

(1) A livestock baseline set out in this Division must be used for the purposes of calculating livestock emissions for the baseline emissions period.

(2) If a project proponent cannot provide property specific data on historic stocking rates to the Regulator for the purposes of verifying calculation of livestock baseline A, the proponent may use livestock baseline B to calculate livestock emissions for the baseline emissions period.

(3) A livestock group is defined by species (*g*), state or region (*i*), livestock class (*j*), and season (*k*).

Subdivision 5.5.2 Livestock baseline A

5.26 Livestock baseline A—general

For the purposes of determining the livestock baseline A, the following must be calculated in accordance with this Subdivision:

(a) the mean annual livestock emissions; and

(b) the standard deviation of the annual livestock emissions;

during the baseline emissions period.

5.27 Livestock baseline A—total emissions

(1) For the purposes of determining livestock baseline A, the following must be calculated for each year of the baseline emissions period in accordance with this section:

(a) the amount of time that each livestock group was within the project area;

(b) the emissions for each livestock group;

(c) the total livestock emissions; and

(d) the mean annual livestock emissions.

(2) The amount of time that each livestock group was within the project area must be calculated in accordance with the following formula:

$$G_{gijk,B} = LS_{gijk,B} \times D_{gijk,B}$$ **Equation LS1**

Where:

$G_{gijk,B}$ = livestock head days for each livestock group in year *B* of the baseline emissions period; livestock head days.

$LS_{gijk,B}$ = number of animals in the livestock group that were within the project area in year *B* of the baseline emissions period; livestock head.

$D_{gijk,B}$ = number of days in B of the baseline emissions period that the livestock group was within the project area; d.

(3) The emissions for each livestock group must be calculated using the following formula:

$$E_{LS,gijk,B} = G_{gijk,B} \times EF_{LS,gijk}/1000$$ **Equation LS2**

Where:

$E_{LS,gijk,B}$ = emissions for each livestock group for year *B* of the baseline emissions period; t CO_2-e/y.

$G_{gijk,B}$ = livestock head days for each livestock group in year *B* of the baseline emissions period; livestock head days.

$EF_{LS,gijk}$ = default emission factor for the livestock group as set out in the Standard Parameters and Emissions Factors; kg CO_2-e/livestock head/d.

1000 = conversion from kilograms to tonnes.

(4) The total livestock emissions must be calculated using the following formula:

$$E_{LS,B} = \sum_{gijk=1}^{n} E_{LS,gijk,B} \qquad \textbf{Equation LS3}$$

Where:

$E_{LS,B}$ = total livestock emissions for all livestock groups for year *B* of the baseline emissions period; t CO_2-e/y.

$E_{LS,gijk,B}$ = emissions for each livestock group for year *B* of the baseline emissions period; t CO_2-e/y.

n = number of livestock groups.

(5) The mean annual livestock emissions must be calculated using the following formula:

$$\bar{E}_{LS,BEP} = \frac{1}{5}\sum_{B=1}^{5} E_{LS,B} \qquad \textbf{Equation LS4}$$

Where:

$\bar{E}_{LS,BEP}$ = mean annual livestock emissions in the baseline emissions period; t CO_2-e/y.

$E_{LS,B}$ = total livestock emissions for all livestock groups for year *B* of the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period being year 1, 2, 3, 4, or 5.

5.28 Livestock baseline A—standard deviation

The standard deviation of the annual livestock emissions for the baseline emissions period for livestock baseline A must be calculated using the following formula:

$$S_{E_{LS,BEP}} = \sqrt{\frac{\sum_{B=1}^{5}\left(E_{LS,B} - \bar{E}_{LS,BEP}\right)^2}{4}}$$ **Equation LS5**

Where:

$S_{E_{LS,BEP}}$ = standard deviation of the annual livestock emissions for the baseline emissions period; t CO_2-e/y.

$E_{LS,B}$ = total livestock emissions for year B of the baseline emissions period; t CO_2-e/y.

$\bar{E}_{LS,BEP}$ = mean annual livestock emissions in the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

Subdivision 5.5.3 Livestock baseline B

5.29 Livestock baseline B—general

(1) For the purposes of determining livestock baseline B, the following must be calculated in accordance with this Subdivision:

(a) the annual livestock emissions; and

(b) the tolerance margin of the annual livestock emissions;

during the baseline emissions period.

(2) In this Subdivision:

AU_a = assessed annual carrying capacity of the project area; animal units.

Note AU_a only applies to carbon estimation areas that were under permanent pasture for the 5 year period determined in accordance with paragraph 2.4(3)(a).

5.30 Livestock baseline B—assessed carrying capacity

(1) An assessment of carrying capacity for the project area must be:

(a) obtained from the relevant government authority; and

(b) expressed as a total number of animal units.

(2) The assessment referred to in subsection (1) must:

(a) have regard to any available property-specific data; and

(b) derive the sustainable carrying capacity based on the long-term average rainfall for the relevant area.

5.31 Livestock baseline B—emissions from each livestock group in first year of project

The emissions from each livestock group within the project area must be calculated for the first year after the activity start date using the following formula:

$$E_{LS,gijk,P} = LS_{gijk,P} \times D_{gijk,P} \times EF_{LS,gijk}/1000$$ **Equation LS6**

Where:

$E_{LS,gijk,P}$ = emissions for each livestock group for the first year after the activity start date; t CO_2-e/y.

$LS_{gijk,P}$ = number of animals in the livestock group that were within the project area for the first year after the activity start date; livestock head.

$D_{gijk,P}$ = number of days that the livestock group was within the project area; d.

$EF_{LS,gijk}$ = default emission factor for the relevant livestock group as set out in the Standard Parameters and Emissions Factors; kg CO_2-e/livestock head/d.

1000 = conversion from kilograms to tonnes.

5.32 Livestock baseline B—stocking rate

The actual stocking rate of the project area for the first year of the project must be calculated:

(a) in accordance with the process for establishing carrying capacity set out in section 5.30; and

(b) expressed as the following value:

AU_P = stocking rate of the project area for the first year after the activity start date; animal units.

5.33 Livestock baseline B—annual emissions

The annual emissions for the baseline emissions period must be calculated using the following formula:

$$\bar{E}_{LS,BEP} = \left(\frac{AU_a}{AU_P}\right) \sum_{gijk=1}^{n} E_{LS,gijk,P}$$ **Equation LS7**

Where:

$\bar{E}_{LS,BEP}$ = mean (assumed) annual livestock emissions in the baseline emissions period; t CO_2-e/y.

AU_a = assessed annual carrying capacity of the project area; animal units.

AU_P = stocking rate of the project area for the first year after the activity start date; animal units.

$E_{LS,gijk,P}$ = emissions for each livestock group for the first year of the project; t CO_2-e/y.

5.34 Livestock baseline B—tolerance margin

The tolerance margin for the annual livestock emissions for the baseline emissions period must be calculated using the following formula:

$$T_{LS} = \bar{E}_{LS,BEP} \times 0.1$$ **Equation LS8**

Where:

T_{LS} = livestock tolerance margin for the baseline emissions period; t CO_2-e/y.

$\bar{E}_{LS,BEP}$ = mean (assumed) annual livestock emissions in the baseline emissions period; t CO_2-e/y.

0.1 = factor for deriving tolerance margin.

Division 5.6 Baseline—synthetic fertiliser

5.35 Synthetic fertiliser baselines—general

(1) Baseline emissions from synthetic fertiliser must be calculated using a combination of the synthetic fertiliser baselines outlined in this section.

(2) Synthetic fertiliser baseline A must be applied to the project area unless subsection (3) or (4) applies to the land.

(3) If the project area includes land:

(a) that was under pasture for dairy cattle during the baseline emissions period; and

(b) to which nitrogenous fertiliser has been applied;

then baseline emissions from each hectare of the project area must be calculated in accordance with synthetic fertiliser B.

(4) If the project area includes land that is converting from continuous cropping to permanent pasture, then baseline emissions from the land under continuous cropping must be calculated in accordance with synthetic fertiliser baseline C.

(5) A project proponent must provide evidence to the satisfaction of the Regulator that the requirements in subsection (3) are met.

(6) The evidence may include:

(a) fertiliser invoices;

(b) tax records;

(c) land assessments or approvals;

(d) management records indicating the type of industry historically carried out within the project area.

(7) A synthetic fertiliser group is defined by fertiliser type (*f*), state or region (*i*), and production system (*j*).

Note Fertiliser type is defined by percentage content of nitrogen. That is, all fertilisers with the same percentage content of nitrogen are considered to be the same type.

5.36 Synthetic fertiliser baseline A

The quantity of emissions released from synthetic fertiliser application for the baseline emissions period for synthetic fertiliser baseline A must be calculated using the following formula:

$$\bar{E}_{SF,BEP_{Pasture}} = 0 \qquad \textbf{Equation SF1}$$

Where:

$\bar{E}_{SF,BEP_{Pasture}}$ = mean (assumed) annual emissions from synthetic fertiliser application in the baseline emissions period; t CO_2-e/y.

5.37 Synthetic fertiliser baseline B—general

For the purposes of determining the synthetic fertiliser baseline B, the following must be calculated in accordance with section 5.38:

(a) the mean (assumed) annual emissions from synthetic fertiliser; and

(b) the tolerance margin of the annual synthetic fertiliser emissions;

during the baseline emissions period.

5.38 Synthetic fertiliser baseline B—calculations

(1) The mean annual emissions released from synthetic fertiliser applied to pasture for dairy cattle for synthetic fertiliser baseline B must be calculated using the following formula:

$$\bar{E}_{SF,BEP_{Dairy}} = E_{SF,B} \times Area\text{-}P.A. \qquad \textbf{Equation SF2}$$

Where:

$\bar{E}_{SF,BEP_{Dairy}}$ = mean (assumed) annual emissions from synthetic fertiliser applied to pasture for dairy cattle in the baseline emissions

period; t CO_2-e/y.

$E_{SF,B}$ = total (assumed) emissions from synthetic fertiliser applied to pasture for dairy cattle (including urea) per hectare for year *B* of the baseline emissions period as set out in the Standard Parameters and Emissions Factors; t CO_2-e/ha.

$Area\text{-}P.A.$ = number of hectares of the project area that was under pasture for dairy cattle during the baseline emissions period; ha.

(2) The tolerance margin of the mean annual emissions released from synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period must be calculated using the following formula:

$$T_{SF_{Dairy}} = \bar{E}_{SF,BEP_{Dairy}} \times 0.1 \qquad \textbf{Equation SF3}$$

Where:

$T_{SF_{Dairy}}$ = tolerance margin for synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Dairy}}$ = mean (assumed) annual emissions from synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

0.1 = factor for deriving tolerance margin.

5.39 Synthetic fertiliser baseline C—general

For the purposes of determining the synthetic fertiliser baseline C:

(a) the mean annual emissions from synthetic fertiliser application to cropped land for the baseline emissions period must be calculated using verifiable data; and

(b) the following must be calculated in accordance with sections 5.40–5.45:

(i) the mean annual emissions from synthetic fertiliser; and

(ii) the standard deviation of the annual synthetic fertiliser emissions;

during the baseline emissions period.

5.40 Synthetic fertiliser baseline C—quantity of nitrogen

The quantity of nitrogen (N) applied, for each year of the baseline emissions period, to parts of the project area that were under continuous cropping must be calculated for each fertiliser group using the following formula:

$$SFN_{fij,B} = SF_{fij,B} \times P_f \qquad \textbf{Equation SF4}$$

Where:

$SFN_{fij,B}$ = quantity of nitrogen applied to cropped land for each synthetic

fertiliser group for year *B* of the baseline emissions period; t.

$SF_{fij,B}$ = quantity of each synthetic fertiliser group applied to cropped land in year *B* of the baseline emissions period; t.

P_f = percentage nitrogen content of fertiliser type *f*.

Note Project proponents provide P_f with reference to the chemical information or Material Safety Data Sheet of the fertiliser.

5.41 Synthetic fertiliser baseline C—nitrous oxide emissions

The total quantity of nitrous oxide emissions released from the application of all types of synthetic fertiliser, including urea, to cropped land must be calculated for each year of the baseline emissions period using the following formula:

$$E_{SFN,B} = \sum_{fij=1}^{n} (SFN_{fij,B} \times EF_{SF,fij}) \qquad \textbf{Equation SF5}$$

Where:

$E_{SFN,B}$= total nitrous oxide emissions from synthetic fertiliser applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

$SFN_{fij,B}$ = quantity of nitrogen applied to cropped land by each synthetic fertiliser group for year *B* of the baseline emissions period; t.

$EF_{SF,fij}$ = default emission factor for synthetic fertiliser (*SF*) as set out in the Standard Parameters and Emissions Factors; t CO_2-e/t N.

5.42 Synthetic fertiliser baseline C—urea emissions

The total quantity of emissions released as carbon dioxide from urea applied to cropped land must be calculated for each year of the baseline emissions period using the following formula:

$$E_{U,B} = U_B \times EF_U \qquad \textbf{Equation SF6}$$

Where:

$E_{U,B}$ = carbon dioxide emissions from urea applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

U_B = quantity of urea applied to cropped land in year *B* of the baseline emissions period; t.

EF_U = National Inventory emission factor for carbon dioxide emissions from urea; t CO_2-e/t urea.

5.43 Synthetic fertiliser baseline C—total emissions

The total emissions from synthetic fertiliser application for each year of the baseline emissions period must be calculated using the following formula:

$$E_{SF,B_{Crop}} = E_{SFN,B} + E_{U,B} \qquad \textbf{Equation SF7}$$

Where:

$E_{SF,B_{Crop}}$= total emissions from synthetic fertiliser applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

$E_{SFN,B}$= total nitrous oxide emissions from synthetic fertiliser applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

$E_{U,B}$ = total carbon dioxide emissions from urea applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

5.44 Synthetic fertiliser baseline C—mean annual emissions

The mean annual emissions from synthetic fertiliser applied to cropped land for the baseline emissions period must be calculated using the following formula:

$$\bar{E}_{SF,BEP_{Crop}} = \frac{1}{5}\sum_{B=1}^{5} E_{SF,B_{Crop}} \qquad \textbf{Equation SF8}$$

Where:

$\bar{E}_{SF,BEP_{Crop}}$= mean annual emissions from synthetic fertiliser applied to cropped land in the baseline emissions period; t CO_2-e/y.

$E_{SF,B_{Crop}}$= total emissions from synthetic fertiliser applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

5.45 Synthetic fertiliser baseline C—standard deviation

The standard deviation of the annual emissions from synthetic fertiliser applied to cropped land for the baseline emissions period must be calculated using the following formula:

$$S_{E_{SF,BEP_{Crop}}} = \sqrt{\frac{\sum_{B=1}^{5}\left(E_{SF,B_{Crop}} - \bar{E}_{SF,BEP_{Crop}}\right)^2}{4}} \qquad \textbf{Equation SF9}$$

Where:

$S_{E_{SF,BEP_{Crop}}}$= standard deviation of the annual emissions from synthetic

fertiliser applied to cropped land for the baseline emissions period; t CO_2-e/y.

$E_{SF,B_{Crop}}$ = total emissions from synthetic fertiliser applied to cropped land for year *B* of the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Crop}}$ = mean annual emissions from synthetic fertiliser applied to cropped land in the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

5.46 Synthetic fertiliser baseline—total mean annual emissions

The total mean annual emissions from synthetic fertiliser applied in the project area for the baseline emissions period must be calculated using the following formula:

$$\bar{E}_{SF,BEP} = \bar{E}_{SF,BEP_{Dairy}} + \bar{E}_{SF,BEP_{Crop}}$$ **Equation SF10**

Where:

$\bar{E}_{SF,BEP}$= total mean annual emissions from synthetic fertiliser applied in the project area for the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Dairy}}$= mean (assumed) annual emissions from synthetic fertiliser applied to pasture for dairy cattle in the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Crop}}$ = mean annual emissions from synthetic fertiliser applied to cropped land for the baseline emissions period; t CO_2-e/y.

Division 5.7 Baseline—lime

5.47 Lime baseline—general

For the purposes of determining emissions from lime application for the baseline emissions period, the following must be calculated in accordance with this Division:

(a) the mean annual emissions from lime application; and

(b) the standard deviation of the annual emissions from lime;

during the baseline emissions period.

5.48 Lime baseline—carbonates per application

The quantity of carbonates for each application of lime for each year of the baseline emissions period must be calculated using the following formula:

$$LQ_{l,B} = L_{l,B} \times P_l$$ **Equation L1**

Where:

$LQ_{l,B}$ = quantity of carbonates applied from lime type *l* for year *B* of the baseline emissions period; t.

$L_{l,B}$ = quantity of lime type *l* applied in year *B* of the baseline emissions period; t.

P_l = percentage carbonate content for lime type *l*.

Note Lime type is defined by percentage content of carbonates. That is, all lime products with the same percentage content of carbonate are considered to be the same type.

5.49 Lime baseline—total carbonates

The total quantity of carbonates applied to the project area for all lime types for each year of the baseline emissions period must be calculated using the following formula:

$$LQ_B = \sum_{l=1}^{n} LQ_{l,B}$$ **Equation L2**

Where:

LQ_B= total carbonates for all lime types applied during year *B* of the baseline emissions period; t.

$LQ_{l,B}$ = quantity of carbonates applied from lime type *l* for year *B* of the baseline emissions period; t.

l = each type of lime as defined by the percent carbonate content.

n = number of types of lime applied in year *B* of the baseline emissions period.

5.50 Lime baseline—carbon dioxide emissions

The total quantity of carbon dioxide emissions released from applications of lime must be calculated for each year of the baseline emissions period using the following formula:

$$E_{L,B} = LQ_B \times EF_L$$ **Equation L3**

Where:

$E_{L,B}$ = total emissions from lime applications for year *B* of the baseline emissions period; t CO_2-e/y.

LQ_B = total carbonates for all lime types applied during year *B* of the baseline emissions period; t.

EF_L = National Inventory dolomite emission factor for carbon dioxide emissions from agricultural lime application; t CO_2-e/t carbonate.

5.51 Lime baseline—mean annual emissions

The mean annual emissions from lime application for the baseline emissions period must be calculated using the following formula:

$$\bar{E}_{L,BEP} = \frac{1}{5}\sum_{B=1}^{5} E_{L,B}$$ **Equation L4**

Where:

$\bar{E}_{L,BEP}$= mean annual emissions from lime application in the baseline emissions period; t CO_2-e/y.

$E_{L,B}$= total emissions from lime application for year *B* of the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

5.52 Lime baseline—standard deviation

The standard deviation of the annual emissions from lime for the baseline emissions period must be calculated using the following formula:

$$S_{E_{L,BEP}} = \sqrt{\frac{\sum_{B=1}^{5}\left(E_{L,B} - \bar{E}_{L,BEP}\right)^2}{4}}$$ **Equation L5**

Where:

$S_{E_{L,BEP}}$= standard deviation of the annual emissions from lime for the baseline emissions period; t CO_2-e/y.

$E_{L,B}$= total emissions from lime application for year *B* of the baseline emissions period; t CO_2-e/y.

$\bar{E}_{L,BEP}$ = mean annual emissions from lime application in the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

Division 5.8 Baseline—tillage events

5.53 Tillage baseline emissions—general

(1) For an eligible offsets project to which this Determination applies, emissions from tillage events must include:

(a) nitrous oxide releases from soil and crop residue; and

(b) greenhouse gases emitted from fuel use.

(2) For the purposes of paragraph (1)(b), a default amount of 12 litres of diesel fuel per hectare is taken to be used for each tillage event.

(3) For the purposes of determining emissions from tillage events for the baseline emissions period, the following must be calculated in accordance with this Division:

(a) the mean annual emissions from tillage events; and

(b) the standard deviation of the annual emissions from tillage events;

during the baseline emissions period.

5.54 Tillage baseline emissions—crop residues

The quantity of emissions released from the residues of each crop or pasture crop that:

(a) follows a tillage event; and

(b) is grown in each year of the baseline emissions period;

must be calculated for each year of the period using the following formula:

$$E_{R,v,B} = VQ_{v,B} \times Z_v \times (1 - RF_{v,B}) \times O_v \times XF_v \times RN_v \times EF_R \quad \textbf{Equation T1}$$

Where:

$E_{R,v,B}$ = emissions from residues of crop type *v* in year *B* of the baseline emissions period; t CO_2-e.

$VQ_{v,B}$ = quantity of harvested crop by crop type *v* in year *B* of the baseline emissions period; t.

Z_v = residue to crop ratio as set out in the Standard Parameters and Emissions Factors; t residue/t crop.

$RF_{v,B}$ = fraction of crop residue of crop type *v* removed in year *B* of the baseline emissions period.

O_v = dry matter content of crop residue of crop type *v* as set out in the Standard Parameters and Emissions Factors; dry weight / t crop residue.

XF_v = carbon mass fraction in dry matter in crop residue of crop type *v* as

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set out in the Standard Parameters and Emissions Factors.

RN_v = nitrogen to carbon ratio in crop residue of crop type *v* as set out in the Standard Parameters and Emissions Factors; t N/t C.

EF_R = National Inventory emission factor for residues; t CO_2-e/t N.

v = crop type.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

5.55 Tillage baseline emissions—residues of all crop types

The total quantity of emissions released from residues applied to the project area must be calculated for each year of the baseline emissions period using the following formula:

$$E_{R,B} = \sum_{v=1}^{n} E_{R,v,B} \qquad \textbf{Equation T2}$$

Where:

$E_{R,B}$ = emissions released from residues of all crop types for year *B* of the baseline emissions period; t CO_2-e/y.

$E_{R,v,B}$ = emissions released from residues of crop type *v* in year *B* of the baseline emissions period; t CO_2-e/y.

n = total number of crops grown.

v = crop type.

5.56 Tillage baseline emissions—pasture renewal

The total quantity of emissions released from residues of each pasture renewal or renovation event in the project area must be calculated for each year of the baseline emissions period using the following formula:

$$E_{P,B} = EF_R \times O_p \times (1 - RF_{p,B}) \times RN_p \times Area\text{-}T_B \qquad \textbf{Equation T3}$$

Where:

$E_{P,B}$= emissions from each pasture renewal or renovation event in year *B* of the baseline emissions period; t CO_2-e.

EF_R = National Inventory emission factor for pasture residues; t CO_2-e/t N.

O_p = annual dry matter yield for pasture as set out in the Standard Parameters and Emissions Factors; t/ha.

$RF_{p,B}$ = fraction of residues of pasture removed in year *B* of the baseline emissions period.

RN_p = nitrogen content of pasture residues as set out in the Standard Parameters and Emissions Factors; t N/t residue.

$Area\text{-}T_B$ = tilled area for pasture renewal or renovation in year *B* of the baseline emissions period; ha.

5.57 Tillage baseline emissions—fuel use

Emissions released from fuel use associated with tillage events in the project area must be calculated for each year of the baseline emissions period using the following formula:

$$E_{Fg,B} = \sum_{Fg=1}^{n} Area\text{-}T_B \left(\frac{0.012 \times EC_F \times EF_{Fg}}{1000}\right) \qquad \textbf{Equation T4}$$

Where:

$E_{Fg,B}$ = emissions of gas type *g* (being carbon dioxide, methane or nitrous oxide) released from the use of fuel type *F* associated with tillage events in year *B* of the baseline emissions period; t CO_2-e/y.

n = number of gas and fuel groups.

$Area\text{-}T_B$ = tilled area for cropping, pasture cropping, pasture renewal or pasture renovation in year *B* of the baseline emissions period; ha.

EC_F = energy content factor for fuel type *F* as set out in the NGER Measurement Determination; GJ/kL.

EF_{Fg} = emission factor for each gas type *g* for fuel type *F* as set out in the NGER Measurement Determination; kg CO_2-e/GJ.

0.012 = fuel use per hectare; kL/ha.

1000 = conversion factor from kg to t CO_2-e.

Note Values for EC_F and EF_{Fg} are specified in Part 4 of Schedule 1 to the NGER Measurement Determination.

5.58 Tillage baseline emissions—total emissions

The total quantity of emissions released from all tillage events and fuel use in the project area must be calculated for each year of the baseline emissions period using the following formula:

$$E_{T,B} = E_{Fg,B} + E_{P,B} + E_{R,B} \qquad \textbf{Equation T5}$$

Where:

$E_{T,B}$ = emissions from all tillage events in year *B* of the baseline emissions period; t CO_2-e/y.

$E_{Fg,B}$ = emissions from fuel use associated with tillage events in year *B* of the baseline emissions period; t CO_2-e/y.

$E_{P,B}$ = emissions from each pasture renewal or renovation event in year *B* of the baseline emissions period; t CO_2-e/y.

$E_{R,B}$ = emissions from all crop types in year *B* of the baseline emissions period; t CO_2-e/y.

5.59 Tillage baseline emissions—mean annual emissions

The mean annual emissions from tillage events for the baseline emissions period must be calculated using the following formula:

$$\bar{E}_{T,BEP} = \frac{1}{5}\sum_{B=1}^{5} E_{T,B} \qquad \textbf{Equation T6}$$

Where:

$\bar{E}_{T,BEP}$= mean annual emissions from all tillage events in the baseline emissions period; t CO_2-e/y.

$E_{T,B}$ = emissions from all tillage events in year *B* of the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

5.60 Tillage baseline emissions—standard deviation

The standard deviation of the annual emissions from tillage events for the baseline emissions period must be calculated using the following formula:

$$S_{E_{T,BEP}} = \sqrt{\frac{\sum_{B=1}^{5}\left(E_{T,B} - \bar{E}_{T,BEP}\right)^2}{4}} \qquad \textbf{Equation T7}$$

Where:

$S_{E_{T,BEP}}$ = standard deviation of the annual emissions from tillage events for the baseline emissions period; t CO_2-e/y.

$E_{T,B}$ = emissions from all tillage events in year *B* of the baseline emissions period; t CO_2-e/y.

$\bar{E}_{T,BEP}$ = mean annual emissions from all tillage events in the baseline emissions period; t CO_2-e/y.

B = each year of the baseline emissions period, being year 1, 2, 3, 4, or 5.

Part 6 The net abatement amount—project calculations

Division 6.1 Calculation of soil organic carbon stocks

Subdivision 6.1.1 Soil organic carbon stock calculations—general

6.1 Soil organic carbon stock calculations—general

(1) This Division sets out formulas that must be used when calculating the soil organic carbon stock change for an eligible offsets project to which this Determination applies.

(2) In this Division:

x centimetres (x cm) means a nominated sampling depth that is greater than 30 centimetres.

t_0 means the baseline sampling round.

t_1 means the first sampling round after the baseline sampling round.

t_x means any sampling round after the t_1 sampling round.

Subdivision 6.1.2 Soil organic carbon stock calculations—t_1 sampling round

6.2 Soil organic carbon stock at t_1—corrected stocks

(1) For projects with a single soil layer (0–30 centimetres), values for $SOC\_cor_{t_1\ i,l=0-30cm}$ must be calculated for the t_1 sampling round:

(a) in accordance with sections 5.8 and 5.13–5.15; and

(b) substituting t_1 values for t_0 values.

(2) For projects with 2 soil layers (such as 0–30 centimetres and 30–*x* centimetres), values for $SOC\_cor_{t_1\ i,l=0-30cm}$ and $SOC\_cor_{t_1\ i,l=30-xcm}$ must be calculated for the t_1 sampling round:

(a) in accordance with sections 5.8 and 5.16–5.18; and

(b) substituting t_1 values for t_0 values.

6.3 Soil organic carbon stock at t_1—mean corrected stock in equivalent soil mass for carbon estimation area soil layer

The mean corrected soil organic carbon stock in the equivalent soil mass for each soil layer from each carbon estimation area at the t_1 sampling round must be calculated using the following formula:

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$$\overline{SOC\_cor}_{t_1 l} = \frac{\sum_{i=1}^{n} SOC\_cor_{t_1 i,l}}{n_{t_1 l}}$$ **Equation SC20**

Where:

$\overline{SOC\_cor}_{t_1 l}$ = mean corrected soil organic carbon stock for the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at t_1; t C/ha.

$SOC\_cor_{t_1 i,l}$ = corrected soil organic carbon stock in the equivalent soil mass calculated in the l^{th} soil layer for the i^{th} composite sample of the carbon estimation area at t_1—see Equation SC9 for the 0–30 cm layer and Equation SC14 for the 30–*x* cm layer; t C/ha.

$n_{t_1 l}$= number of composite samples collected for the l^{th} soil layer of the carbon estimation area at t_1.

i = each composite sample; varies from 3 to n_{t_1}.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

6.4 Soil organic carbon stock at t_1—standard deviation

The standard deviation of the corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area at the t_1 sampling round must be calculated using the following formula:

$$SD_{SOC\_cor\ t_1 l} = \sqrt{\frac{\sum_{i=1}^{n} (SOC\_cor_{t_1 i,l} - \overline{SOC\_cor}_{t_1 l})^2}{n_{t_1 l} - 1}}$$ **Equation SC21**

Where:

$SD_{SOC\_cor_{t_1 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at t_1; t C/ha.

$\overline{SOC\_cor}_{t_1 l}$ = mean corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at t_1—see Equation SC20; t C/ha.

$SOC\_cor_{t_1 i,l}$ = corrected soil organic carbon stock in the equivalent soil mass calculated in the l^{th} soil layer for the i^{th} composite sample of the carbon estimation area at t_1—see Equation SC9 for the 0–30 cm layer and Equation SC14 for the 30–*x* cm layer; t C/ha.

$n_{t_1 l}$ = number of composite samples collected for the l^{th} soil layer of

the carbon estimation area at t_1.

i = each composite sample; varies from 3 to $n_{t_1 l}$.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

Subdivision 6.1.3 Soil organic carbon stock change calculations—between t_0 and t_1

6.5 Calculation of soil organic carbon stock change between t_0 to t_1—general

(1) If the first reporting period includes only 2 sampling rounds then the calculations in this Subdivision must be used to calculate the change in soil organic carbon stock between t_0 and t_1.

(2) If the first reporting period includes more than 2 sampling rounds then Subdivision 6.1.4 must be used to calculate the change in soil organic carbon stock.

6.6 Change in mean corrected soil organic carbon stock in equivalent soil mass between t_0 to t_1

The change in mean corrected soil organic carbon stock within each soil layer of each carbon estimation area from the baseline sampling round (t_0) to the subsequent sampling round (t_1) must be calculated by:

(a) subtracting the mean corrected soil organic carbon stock at t_0 from the mean corrected soil organic carbon stock at t_1; and

(b) using the following formula:

$$\Delta\overline{SOC\_cor}_{(t_0 - t_1)l} = \overline{SOC\_cor}_{t_1 l} - \overline{SOC\_cor}_{t_0 l} \qquad \textbf{Equation SC22}$$

Where:

$\Delta\overline{SOC\_cor}_{(t_0 - t_1)l}$ = change in mean corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_1; t C/ha.

$\overline{SOC\_cor}_{t_1 l}$ = mean corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_1—see Equation SC20; t C/ha.

$\overline{SOC\_cor}_{t_0 l}$ = mean corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_0—see Equation SC15; t C/ha.

6.7 Standard deviation of difference between means from t_0 to t_1

The standard deviation of the difference between means must be calculated using:

(a) the standard deviation of the corrected soil organic carbon stock and number of composite samples from:

(i) the baseline sampling round (t_0); and

(ii) the subsequent sampling round (t_1); and

(b) the following formula:

$$SD_{\Delta\overline{SOC\_cor}_{(t_0-t_1)l}} = \sqrt{\frac{(SD_{SOC\_cor_{t_0 l}})^2}{n_{t_0 l}} + \frac{(SD_{SOC\_cor_{t_1 l}})^2}{n_{t_1 l}}} \qquad \textbf{Equation SC23}$$

Where:

$SD_{\Delta\overline{SOC\_cor}_{(t_0-t_1)l}}$ = standard deviation of the change in mean corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area from t_0 to t_1; t C/ha.

$SD_{SOC\_cor_{t_0 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area at t_0—see Equation SC16.

$SD_{SOC\_cor_{t_1 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass in the l^{th} soil layer of the carbon estimation area at t_1—see Equation SC21.

$n_{t_0 l}$ = number of composite samples collected from the l^{th} soil layer of the carbon estimation area at t_0.

$n_{t_1 l}$ = number of composite samples collected from the l^{th} soil layer of the carbon estimation area at t_1.

6.8 Critical soil organic carbon stock change in each soil layer from t_0 to t_1

(1) The critical soil organic carbon stock change between the baseline sampling round (t_0) and the subsequent sampling round (t_1) for each soil layer of each carbon estimation area must be:

(a) the mean change in soil organic carbon stock that would be exceeded 60% of the time; and

(b) calculated using the following formula:

$$Critical\Delta\overline{SOC\_cor}_{(t_0-t_1)l} = \Delta\overline{SOC\_cor}_{(t_0-t_1)l} - SD_{\Delta\overline{SOC\_cor}_{(t_0-t_1)l}} \times t_{\alpha(df)} \qquad \textbf{Equation SC24}$$

Where:

$Critical\Delta\overline{SOC\_cor}_{(t_0-t_1)l}$ = critical corrected soil organic carbon stock change in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_1 with a 60% probability of exceedance; t C/ha.

$\Delta\overline{SOC\_cor}_{(t_0-t_1)l}$ = change in mean corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_1—see Equation SC22; t C/ha.

$SD_{\Delta\overline{SOC\_cor}_{(t_0-t_1)l}}$ = standard deviation of the change in mean corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area from t_0 to t_1—see Equation SC23; t C/ha.

$t_{\alpha(df)}$ = t value derived from a one-tailed student t-distribution with a probability of α calculated using Equation SC25 and a degrees of freedom (df) calculated using Equation SC26.

(2) In this section:

$$\alpha = \frac{(100-60)}{100} \qquad \textbf{Equation SC25}$$

Where:

60 = defined probability of exceedance; %.

(3) In this section:

$$df = \frac{\left[(SD_{SOC\_cor_{t_0 l}})^2/n_{t_0 l} + (SD_{SOC\_cor_{t_1 l}})^2/n_{t_1 l}\right]^2}{\left[(SD_{SOC\_cor_{t_0 l}})^2/n_{t_0 l}\right]^2/(n_{t_0 l}-1) + \left[(SD_{SOC\_cor_{t_1 l}})^2/n_{t_1 l}\right]^2/(n_{t_1 l}-1)} \qquad \textbf{Equation SC26}$$

Where:

$SD_{SOC\_cor_{t_0 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_0—see Equation SC16; t C/ha.

$SD_{SOC\_cor_{t_1 l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_1—see Equation SC21;

t C/ha.

$n_{t_0 l}$ = number of composite samples collected from the l^{th} soil layer of the carbon estimation area during t_0.

$n_{t_1 l}$ = number of composite samples collected from the l^{th} soil layer of the carbon estimation area at t_1.

6.9 Total critical soil organic carbon stock change in each soil layer between t_0 and t_1

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for each soil layer across the entire area of the carbon estimation area between the baseline sampling round (t_0) and sampling round t_1 must be calculated using the following formula:

$$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)l} = Critical\Delta\overline{SOC\_cor}_{(t_0-t_1)l} \times Area\text{-}CEA$$ **Equation SC27**

Where:

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)l}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer across the entire area of the carbon estimation area over the period t_0 to t_1 with a 60% probability of exceedance; t C.

$Critical\Delta\overline{SOC}\_cor_{(t_0-t_1)l}$ = critical corrected soil organic carbon stock change in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_1 with a 60% probability of exceedance—see Equation SC24; t C/ha.

$Area\text{-}CEA$ = area of the carbon estimation area; ha.

6.10 Total critical change in corrected soil organic carbon stock in carbon estimation area between t_0 and t_1

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for all soil layers in each carbon estimation area between the baseline sampling round (t_0) and the sampling round t_1 must be calculated using the following formula:

$$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)} = \sum_{l=1}^{n} Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)l}$$ **Equation SC28**

Where:

$\text{Critical}\Delta\text{SOC-CEA\_cor}_{(t_0-t_1)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the carbon estimation area over the period t_0 to t_1 with a 60% probability of exceedance; t C.

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)l}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer across the entire area of the carbon estimation area over the period t_0 to t_1 with a 60% probability of exceedance; t C.

n = number of soil layers within the carbon estimation area, being one (0–30 cm) or 2 (0–30 cm and x cm).

l = each soil layer within the carbon estimation area.

6.11 Total critical change in corrected soil organic carbon stock in project area between t_0 and t_1

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for all carbon estimation areas in the project area between the baseline sampling round (t_0) and sampling round t_1 must be calculated using the following formula:

$$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_1)} = \sum_{c=1}^{n} Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_1)c}$$ **Equation SC29**

Where:

$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_1)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_1 with a 60% probability of exceedance; t C.

$Critical\Delta SOC\text{-}CEA_{ESM(t_0-t_1)c}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the carbon estimation area over the period t_0 to t_1 with a 60% probability

of exceedance—see Equation SC28; t C.

n = number of carbon estimation areas in the project area.

c = each carbon estimation area in the project area; varies from 1 to n.

6.12 Total critical change in corrected soil organic carbon stock between t_0 and t_1—carbon dioxide equivalents

The total critical change in corrected soil organic carbon stock between the baseline sampling round (t_0) and sampling round t_1 in the equivalent soil mass for the project area must be converted to carbon dioxide equivalents using the following formula:

$$Critical\text{-}\Delta C0_2e\text{-}PA\_cor_{(t_0-t_1)} = Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_1)} \times \frac{44}{12}$$ **Equation SC30**

Where:

$Critical\text{-}\Delta C0_2e\text{-}PA\_cor_{(t_0-t_1)}$ = carbon dioxide equivalents corresponding to the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_1 with a 60% probability of exceedance; t CO_2-e.

$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_1)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_1 with a 60% probability of exceedance—see Equation SC29; t C.

$\frac{44}{12}$ = conversion factor to change carbon to carbon dioxide equivalents.

6.13 Total critical change in soil organic carbon stock between t_0 and t_1—discount

A discount must be applied to the total critical change in soil organic carbon stock for the project area over the period t_0 to t_1 using the following formula:

$$Discounted\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)} = Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)} \times 0.5$$ **Equation SC31**

Where:

$Discounted\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)}$ = discounted change in corrected soil

	organic carbon stock in CO_2-e for the project area over the period t_0 to t_1; t CO_2-e.
$Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)}$ =	carbon dioxide equivalents corresponding to the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_1 with a 60% probability of exceedance—see Equation SC30; t CO_2-e.
0.5 =	discount factor.

Subdivision 6.1.4 Soil organic carbon stock calculations—after 3 or more sampling rounds (t_x)

6.14 Soil organic carbon stock at t_x—corrected stock

(1) For projects with a single soil layer (0–30 centimetres), values for $SOC\_cor_{t_x\ i,l=0-30cm}$ must be calculated for the t_x sampling round:

(a) in accordance with sections 5.8 and 5.13–5.15; and

(b) substituting t_x values for t_0 values.

(2) For projects with 2 soil layers (such as 0–30 centimetres and 30–*x* centimetres), values for $SOC\_cor_{t_x\ i,l=0-30cm}$ and $SOC\_cor_{t_x\ i,l=30-xcm}$ must be calculated for the t_x sampling round:

(a) in accordance with sections 5.8 and 5.16–5.18; and

(b) substituting t_x values for t_0 values.

6.15 Soil organic carbon stock at t_x—mean corrected stock in equivalent soil mass for carbon estimation area soil layer

The mean corrected soil organic carbon stock in the equivalent soil mass for each soil layer from each carbon estimation area at sampling round t_x must be calculated using the following formula:

$$\overline{SOC\_cor}_{t_xl} = \frac{\sum_{i=1}^{n} SOC\_cor_{t_x\ i,l}}{n_{t_xl}} \qquad \textbf{Equation SC32}$$

Where:

$\overline{SOC\_cor}_{t_xl}$ =	mean corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_x; t C/ha.
$SOC\_cor_{t_xi,l}$ =	corrected soil organic carbon stock in the equivalent soil mass calculated in the l^{th} soil layer for the i^{th} composite sample of the carbon estimation area at t_x—see Equation SC9 for the 0–

30 cm layer and Equation SC14 for the *x* cm layer; t C/ha.

$n_{t_x l}$ = number of composite samples collected for the l^{th} soil layer of the carbon estimation area at t_x.

i = each composite sample; varies from 3 to n_{t_x}.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

6.16 Soil organic carbon stock at t_x—standard deviation

The standard deviation of the corrected soil organic carbon stock in the corrected equivalent soil mass for each soil layer of each carbon estimation area at the t_x sampling round must be calculated using the following formula:

$$SD_{SOC\_cor\ t_1 l} = \sqrt{\frac{\sum_{i=1}^{n}(SOC\_cor_{t_1 i,l} - \overline{SOC\_cor}_{t_1 l})^2}{n_{t_1 l} - 1}} \qquad \textbf{Equation SC33}$$

Where:

$SD_{SOC\_cor_{t_x l}}$ = standard deviation of the corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_x; t C/ha.

$\overline{SOC\_cor}_{t_x l}$ = mean corrected soil organic carbon stock in the equivalent soil mass within the l^{th} soil layer of the carbon estimation area at t_x; t C/ha.

$SOC\_cor_{t_x i,l}$ = corrected soil organic carbon stock in the equivalent soil mass for each individual composite sample from the l^{th} soil layer of the carbon estimation area at t_x; t C/ha.

$n_{t_x l}$ = number of composite samples collected for the l^{th} soil layer of the carbon estimation area at t_x.

i = each composite sample; varies from 3 to n_{t_x}.

Note Each carbon estimation area must include a minimum of 3 composite samples—see section 4.4.

Subdivision 6.1.5 Soil organic carbon stock calculations—between baseline (t_0) and subsequent (t_x) sampling rounds

6.17 Change in mean soil organic carbon stock in equivalent soil mass between t_0 and t_x

(1) For each soil layer in a carbon estimation area, the mean corrected soil organic carbon stock in the equivalent soil mass determined for each soil sampling round using the following Equations:

(a) $\overline{SOC\_cor}_{t_0\,l}$, Equation SC15;

(b) $\overline{SOC\_cor}_{t_1\,l}$, Equation SC20; and

(c) all $\overline{SOC\_cor}_{t_x l}$, Equation SC32;

must be plotted as a function of the durations of the project when the soil sampling rounds occurred.

(2) The values of $\overline{SOC\_cor}_{t_x l}$ from all completed soil sampling rounds must be included in the plot referred to in subsection (1).

(3) The soil sampling rounds specified in subsection (2) must include sampling rounds t_0, t_1 and all values of t_x.

Example After the baseline and 3 subsequent sampling rounds, the values of $\overline{SOC\_cor}_{t_x l}$ for t_0, t_1, t_2 and t_3 must all be included.

(4) If a carbon estimation area sampling round is conducted over more than 1 day, the values of $\overline{SOC\_cor}_{t_x l}$ at t_0, t_1, and t_x must be plotted against the median day of the sampling round which must be used to define the project duration in accordance with subsection (5).

(5) The duration of the project associated with each sampling round must be expressed in decimal years that have elapsed since the baseline sampling round.

(6) The decimal year values associated with all sampling rounds must be calculated and the decimal year value associated with the baseline sampling round must be subtracted from all others.

Example For a baseline sampling round conducted on 3 March 2014, the decimal year is 2014.170. For a t_1 sampling round conducted on 24 March 2016, the decimal year is 2016.230. The project duration at t_1 is 2.060 years (t_1–t_0). The project duration of the baseline sampling round is 0 years.

(7) A linear regression line of best fit must be derived:

(a) by the method of least squares in accordance with the general form of a linear relationship describing the variations in $\overline{SOC\_cor}_{t_x l}$ with project duration; and

(b) using the following formula:

$$\hat{y} = b_0 + b_1 x \qquad \textbf{Equation SC34}$$

Where:

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$\hat{y}$ = $SOC\_cor_{t_x l}$, being the predicted corrected soil organic carbon stock at a project duration of x years; t C/ha.

x = duration of project associated with the sampling rounds expressed as the decimal years since the baseline sampling round was completed; y.

b_0 = *y* intercept of the linear regression equation; t/ha.

b_1 = slope of the linear regression equation which equates to the average rate of change of the corrected soil organic carbon stock in the equivalent soil mass of the l^{th} soil layer of the carbon estimation area; t C/ha/y.

(8) The average rate of change of corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area over the time period t_0 to t_x must be:

(a) the slope of the linear regression (b_1); and

(b) calculated using the following formula:

$$b_1 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$ **Equation SC35**

Where:

b_1= slope of the linear regression derived by the method of least squares; t C/ha/y.

x_i = duration of project associated with the i^{th} sampling round; y.

$\bar{x}$ = average project duration of all sampling rounds including the baseline and all subsequent (t_1 and t_x) sampling rounds ($\bar{x} = \frac{\sum x_i}{n}$); y.

y_i = $\overline{SOC\_cor}_{t_0\, l}$, Equation SC15; $\overline{SOC\_cor}_{t_1\, l}$, Equation SC20 and all $\overline{SOC\_cor}_{t_x l}$, Equation SC32, measured for the i^{th} sampling round; t C/ha.

$\bar{y}$ = average corrected soil organic carbon stock in the equivalent soil mass across all sampling rounds including the baseline and all subsequent sampling rounds ($\bar{y} = \frac{\sum y_i}{n}$); t C/ha.

n = number of sampling rounds including the baseline and all subsequent (t_1 and t_x) sampling rounds.

i = each sampling round.

(9) The value of the y-intercept of the linear regression line of best fit must be calculated using the following formula:

$$b_0 = \bar{y} - b_1\bar{x}$$ **Equation SC36**

Where:

b_0 = y-intercept of the linear regression line of best fit; t C/ha.

$\bar{y}$ = average corrected soil organic carbon stock across in the equivalent soil mass across all sampling rounds including the baseline and all subsequent sampling rounds ($\bar{y} = \frac{\sum y_i}{n}$); t C/ha.

b_1 = slope of the linear regression calculated in accordance with Equation SC35; t C/ha/y.

$\bar{x}$ = average project duration of all sampling rounds including the baseline and all subsequent (t_1 and t_x) sampling rounds ($\bar{x} = \frac{\sum x_i}{n}$); y.

6.18 Critical average soil organic carbon stock change in each soil layer from t_0 to t_x

(1) The critical average rate of the corrected soil organic carbon stock change between the baseline sampling round (t_0) to sampling round t_x for each soil layer of each carbon estimation area must be:

(a) the average rate of corrected soil organic carbon stock change that would be exceeded 60% of the time; and

(b) calculated using the following formula:

$$Critical\Delta\overline{SOC\_cor}_{(t_0-t_x)l} = b_1 - SE_{b_1} \times t_{\alpha(df)} \qquad \textbf{Equation SC37}$$

Where:

$Critical\Delta\overline{SOC\_cor}_{(t_0-t_x)l}$ = critical average rate of corrected soil organic carbon stock change in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_x with a 60% probability of exceedance; t C/ha/y.

b_1 = slope of the linear regression line of best fit derived by the method of least squares between t_0 and t_x and calculated in accordance with Equation SC35; t C/ha/y.

SE_{b_1} = standard error of the slope of the linear regression of $\overline{SOC}\_cor_{t_x l}$ as a function of project duration, calculated using Equation SC38; t C/ha/y.

$t_{\alpha(df)}$ = t value derived from a one-tailed student t-distribution with a probability of α calculated using Equation SC39a and a degrees of freedom (df), calculated using Equation SC39b.

(2) The standard error of the slope of the linear regression of the mean corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area ($\overline{SOC}\_cor_{t_x l}$) as a function of project duration must be calculated using the following formula:

$$SE_{b_1} = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n-2}} \Big/ \sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad \textbf{Equation SC38}$$

Where:

SE_{b_1} = standard error of the slope of the linear regression of $\overline{SOC\_cor}_{t_x l}$ as a function of project duration; t C/ha/y.

x_i = duration of project associated with the i^{th} sampling round; y.

$\bar{x}$ = average project duration of all sampling rounds including the baseline and all subsequent (t_1 and t_x) sampling rounds ($\bar{x} = \frac{\sum x_i}{n}$); y.

y_i = $\overline{SOC}\_cor_{t_x l}$ measured for the i^{th} sampling round—see Equation SC32; t C/ha/y.

$\hat{y}_i$ = value of $SOC\_cor_{t_x l}$ predicted by the regression equation for each i^{th} project duration when sampling rounds were conducted, calculated using Equation SC34 with the values of b_1 and b_0 calculated using Equations SC35 and SC36 respectively; t C/ha.

$n_{(t_0 - t_x)}$ = number of project durations included in the linear regression analysis including the baseline.

i = each sampling round and the associated values of $\overline{SOC\_cor}_{t_x l}$ (i.e. $\overline{SOC\_cor}_{t_0\, l}$, Equation SC15; $\overline{SOC\_cor}_{t_1\, l}$, Equation SC20 and all $\overline{SOC\_cor}_{t_x l}$, Equation SC32) and varies from a minimum of 3 to $n_{(t_0 - t_x)}$.

(3) The value of α used to define the one-tail t-value must be calculated using the following formula:

$$\alpha = \frac{(100 - 60)}{100} \qquad \textbf{Equation SC39a}$$

Where:

60 = defined probability of exceedance; %.

(4) The degrees of freedom (df) used to define the one-tail t-value must be calculated using the following formula:

$$df = n_{(t_0 - t_x)} - 2 \qquad \textbf{Equation SC39b}$$

Where:

$n_{(t_0-t_x)}$ = number of project durations included in the linear regression analysis including the baseline.

6.19 Total critical soil organic carbon stock change in each soil layer between t_0 and t_x

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for each soil layer across the entire area of the carbon estimation area between the baseline sampling round (t_0) and the t_x sampling round must be calculated using the following formula:

$$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_x)l} = Critical\Delta\overline{SOC\_cor}_{(t_0-t_x)l} \times Area\text{-}CEA \times Project\text{-}D$$ **Equation SC40**

Where:

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_x)l}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer across the entire carbon estimation area over the period t_0 to t_x with a 60% probability of exceedance; t C.

$Critical\Delta\overline{SOC\_cor}_{(t_0-t_x)l}$ = critical average rate of change of the corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer of the carbon estimation area over the period t_0 to t_x with a 60% probability of exceedance, derived using Equation SC37; t C/ha/y.

$Area\text{-}CEA$ = area of the carbon estimation area; ha.

$Project\text{-}D$ = number of years between t_0 and t_x; y.

6.20 Total critical change in corrected soil organic carbon stock in carbon estimation area between t_0 and t_x

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for all soil layers in each carbon estimation area between the baseline sampling round (t_0) and the t_x sampling round must be calculated using the following formula:

$$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_X)} = \sum_{l=1}^{n} Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_X)l}$$ **Equation SC41**

Where:

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_x)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the carbon estimation area over the period t_0 to t_x with a 60% probability of exceedance; t C.

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_X)l}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the l^{th} soil layer across the entire carbon estimation area over the periods t_0 to t_x with a 60% probability of exceedance; t C.

n = number of soil layers within the carbon estimation area, being one (0–30 cm only) or 2 (0–30 cm and x cm).

l = each soil layer within the carbon estimation area.

6.21 Total critical change in corrected soil organic carbon stock in project area between t_0 and t_x

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for all carbon estimation areas in the project area between the baseline sampling round (t_0) and the t_x sampling round must be calculated using the following formula:

$$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_x)} = \sum_{c=1}^{n} Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_x)c}$$ **Equation SC42**

Where:

$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_x)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a 60% probability of exceedance; t C.

$Critical\Delta SOC\text{-}CEA\_cor_{(t_0-t_x)c}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the carbon estimation area over the period t_0 to t_x with a 60% probability of exceedance—see Equation SC41; t C.

n = number of carbon estimation areas in the project area.

c = each carbon estimation area in the project area; varies from 1 to n.

6.22 Total critical change in corrected soil organic carbon stock between t_0 and t_x—carbon dioxide equivalents

The total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area between the baseline sampling round (t_0) and the t_x sampling round must be converted to carbon dioxide equivalents using the following formula:

$$Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)} = Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_x)} \times \frac{44}{12}$$

Equation SC43

Where:

$Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)}$ = carbon dioxide equivalents corresponding to the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a 60% probability of exceedance; t CO_2-e.

$Critical\Delta SOC\text{-}PA\_cor_{(t_0-t_x)}$ = total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a 60% probability of exceedance; t C.

$\frac{44}{12}$ = conversion factor to change carbon to carbon dioxide equivalents.

Subdivision 6.1.6 Soil organic carbon stock change over a reporting period

6.23 Soil organic carbon stock change over a reporting period—general

(1) The change in soil organic carbon stock for the project area in CO_2-e must be calculated for each reporting period.

(2) The last calendar day of a reporting period must be not more than 1 month after the last date of a project area sampling round.

Note As a reporting period does not need to end after every project area sampling round, a reporting period may include several sampling rounds.

6.24 Soil organic carbon stock change over a reporting period—first reporting period

(1) If the baseline sampling round (t_0) and one subsequent sampling round (t_1) have been completed within the first reporting period, the change in corrected soil organic carbon stock for the project area in CO_2-e over the reporting period, $\Delta CO_2e\text{-}PA_{Rc}$ equals $Discounted\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)}$, as calculated using Equation SC31.

(2) If 3 or more sampling rounds have been completed within the first reporting period, the change in corrected soil organic carbon stock for the project area in CO_2-e over the reporting period, $\Delta CO_2e\text{-}PA_{Rc}$, equals $Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)}$ as calculated using Equation SC43.

6.25 Soil organic carbon stock change over a reporting period—subsequent reporting periods

(1) The change in soil organic carbon stock for the project area in CO_2-e for each reporting period after the first reporting period must be:

(a) the total critical change in corrected soil organic carbon stock for the project area in CO_2-e over the project duration minus any previously reported increase in soil organic carbon stock for the project area in CO_2-e; and

(b) calculated using the following formula:

$$\Delta CO_2e\text{-}PA_{Rc} = Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)} - \sum_{Rp=1}^{n} \Delta CO_2e\text{-}PA_{Rp}$$

Equation SC44

Where:

$\Delta CO_2e\text{-}PA_{Rc}$ = change in corrected soil organic carbon stock for the project area in CO_2-e for the current reporting period (*Rc*); t CO_2-e.

$Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)}$ = carbon dioxide equivalents corresponding to the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a 60% probability of exceedance—see Equation SC43.

$\Delta CO_2e\text{-}PA_{Rp}$ = change in corrected soil organic carbon stock for the project area in CO_2-e for a previous reporting period *(Rp)*; t CO_2-e.

Rc = current reporting period.

Rp = each reporting period prior to the current reporting period and varies from 1 to *n*.

n =	number of reporting periods before the current reporting period where $\Delta CO_2e\text{-}PA_{Rp}$ was greater than zero.

(2) Only $\Delta CO_2e\text{-}PA_{Rp}$ values greater than zero must be included in the calculation of Equation SC44.

(3) In Equation SC44, $\Delta CO_2e\text{-}PA_{Rp}$ must use all previously calculated values for $\Delta CO_2e^{-}PA_{Rc}$ that were greater than zero.

Note Because negative values of ΔCO_2ePA_{Rp} do not count towards the calculation of ΔCO_2ePA_{Rc} the term "ΔCO_2ePA_{Rc}" is an expression of the difference between $Critical\Delta CO_2ePA\_cor_{(t_0-t_x)}$ and the previous highest value of the critical change in SOC stocks for the project area.

Division 6.2 Calculation of project emissions

Subdivision 6.2.1 Calculation of project emissions—general

6.26 Calculation of emissions from sources—general

(1) The mean annual emissions from each source within the greenhouse gas assessment boundary must be assessed for a reporting period.

(2) The mean annual reporting period emissions must be compared against the mean annual baseline emissions for each source.

(3) If the mean annual emissions for the reporting period fall outside:

(a) the bounds of one standard deviation of the annual emissions for the baseline period; or

(b) if livestock baseline B is used—the tolerance margin of the annual baseline;

then the difference in emissions between the baseline and reporting period emissions must be calculated.

(4) The outcome of the calculation in subsection (3) must be used to derive the change in greenhouse gas emissions from each source.

Subdivision 6.2.2 Calculation of project emissions—production livestock

6.27 Production livestock project emissions—general

(1) Production livestock emissions must be determined for a reporting period by calculating:

(a) the mean annual livestock emissions during the reporting period;

(b) the material difference, if any, between mean baseline period emissions and mean reporting period emissions; and

(c) the change in livestock emissions for the reporting period.

(2) For the purposes of calculating production livestock project emissions, a livestock group is defined by species (g), state/region (i), livestock class (j), and season (k).

6.28 Production livestock project emissions—animal days

The amount of time that each livestock group was within the project area must be calculated using the following formula:

$$G_{gijk,Y} = LS_{gijk,Y} \times D_{gijk,Y}$$ **Equation LS9**

Where:

$G_{gijk,Y}$ = livestock head days for each livestock group in year Y; livestock head days.

$LS_{gijk,Y}$ = number of animals in each livestock group that were within the project area in year Y; livestock head.

$D_{gijk,Y}$ = number of days in year Y that the livestock group was within the project area; d.

Y = year in a reporting period.

6.29 Production livestock project emissions—livestock groups

The emissions for each livestock group for each year of the reporting period must be calculated using the following formula:

$$E_{LS,gijk,Y} = G_{gijk,Y} \times EF_{LS,gijk}/1000$$ **Equation LS10**

Where:

$E_{LS,gijk,Y}$ = emissions for each livestock group for year Y; t CO_2-e/y.

$G_{gijk,Y}$ = livestock head days for each livestock group in year Y; livestock head days.

$EF_{LS,gijk}$ = default emission factor for the livestock group as set out in the Standard Parameters and Emissions Factors; kg CO_2-e/livestock head/day.

Y = year in a reporting period.

6.30 Production livestock project emissions—total emissions

The total emissions from all livestock groups for each year of the reporting period must be calculated by using the following formula:

$$E_{LS,Y} = \sum_{gijk=1}^{n} E_{LS,gijk,Y}$$ **Equation LS11**

Where:

$E_{LS,Y}$ = total livestock emissions for all livestock groups for year *Y*; t CO_2-e/y.

$E_{LS,gijk,Y}$ = emissions for each livestock group for year *Y*; t CO_2-e/y.

Y = year in a reporting period.

n = number of livestock groups.

6.31 Production livestock project emissions—mean annual emissions

The mean annual livestock emissions for a reporting period must be calculated using the following formula:

$$\bar{E}_{LS,Rc} = \frac{1}{n_{Rc}} \sum_{Y=1}^{n_{Rc}} E_{LS,Y}$$ **Equation LS12**

Where:

$\bar{E}_{LS,Rc}$ = mean annual livestock emissions in the reporting period *Rc*; t CO_2-e/y.

$E_{LS,Y}$ = total livestock emissions for all livestock groups for year *Y*; t CO_2-e/y.

Y = year in a reporting period.

n_{Rc} = number of years in a reporting period.

6.32 Production livestock project emissions—material difference between baseline and reporting periods

(1) The material difference between mean annual livestock emissions for the baseline emissions period and the reporting period must be calculated in accordance with this section.

(2) If the mean annual livestock emissions for the reporting period are greater than the mean annual livestock emissions for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{LS,Rc} = \bar{E}_{LS,Rc} - (\bar{E}_{LS,BEP} + S_{E_{LS,BEP}})$$ **Equation LS13**

Where:

$\Delta\bar{E}_{LS,Rc}$ = material difference in mean annual livestock emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{LS,Rc}$ = mean annual livestock emissions in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{LS,BEP}$= mean annual livestock emissions in the baseline emissions period; t CO_2-e/y.

$S_{E_{LS,BEP}}$ = standard deviation of the annual livestock emissions for the baseline emissions period; t CO_2-e/y.

(3) For a baseline scenario using livestock baseline B, T_{LS} must be used in place of $S_{E_{LS,BEP}}$ in Equation LS13.

Note T_{LS} = livestock tolerance margin; t CO_2-e/y.

(4) If the material difference calculated in accordance with Equation LS13 is less than zero, then the material difference is taken to be zero.

(5) If the mean annual livestock emissions for the reporting period are less than the mean annual livestock emissions for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{LS,Rc} = \bar{E}_{LS,Rc} - (\bar{E}_{LS,BEP} - S_{E_{LS,BEP}})$$ **Equation LS14**

Where:

$\Delta\bar{E}_{LS,Rc}$ = material difference in mean annual livestock emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{LS,Rc}$ = mean annual livestock emissions in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{LS,BEP}$= mean annual livestock emissions in the baseline emissions period; t CO_2-e/y.

$S_{E_{LS,BEP}}$ = standard deviation of the annual livestock emissions for the baseline emissions period; t CO_2-e/y.

(6) For a baseline scenario using livestock baseline B, T_{LS} must be used in place of $S_{E_{LS,BEP}}$ in Equation LS14.

Note T_{LS} = livestock tolerance margin; t CO_2-e/y.

(7) If the material difference calculated in accordance with Equation LS14 is greater than zero, then the material difference is taken to be zero.

6.33 Production livestock project emissions—total change

The total change in livestock emissions for the reporting period must be calculated using the following formula:

$$\Delta E_{LS,Rc} = \Delta \bar{E}_{LS,Rc} \times n_{Rc}$$ **Equation LS15**

Where:

$\Delta E_{LS,Rc}$ = total change in livestock emissions for the reporting period *Rc*; t CO_2-e.

$\Delta \bar{E}_{LS,Rc}$ = material difference in mean annual livestock emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

n_{Rc} = number of years in the reporting period; y.

Subdivision 6.2.3 Calculation of emissions from synthetic fertiliser

6.34 Synthetic fertiliser project emissions—general

(1) Emissions from synthetic fertiliser must be determined for a reporting period by calculating:

(a) the mean annual synthetic fertiliser emissions during the reporting period;

(b) the material difference, if any, between mean baseline period emissions and mean reporting period emissions; and

(c) the change in synthetic fertiliser emissions for the reporting period.

(2) For the purposes of calculating synthetic fertiliser emissions, a synthetic fertiliser group is defined by fertiliser type (*f*), state (*i*), and production system (*j*).

Note Fertiliser type is defined by percentage content of nitrogen. That is, all fertilisers with the same percentage content of nitrogen are considered to be the same type.

6.35 Synthetic fertiliser project emissions—quantity of nitrogen

The total quantity of each fertiliser group applied for each year of the reporting period must be calculated using the following formula:

$$SFN_{fij,Y} = SF_{fij,Y} \times P_f$$ **Equation SF12**

Where:

$SFN_{fij,Y}$ = quantity of nitrogen applied for each synthetic fertiliser group for year *Y*; t CO_2-e.

$SF_{fij,Y}$ = quantity of synthetic fertiliser group applied in year *Y*; t.

Y = year in a reporting period.

P_f = percentage nitrogen content of fertiliser type *f*.

6.36 Synthetic fertiliser project emissions—nitrous oxide emissions

The total nitrous oxide emissions released from synthetic fertiliser must be calculated for each year of the reporting period using the following formula:

$$E_{SFN,Y} = \sum_{fij=1}^{n} (SFN_{fij,Y} \times EF_{SF,ij}) \qquad \textbf{Equation SF13}$$

Where:

$E_{SFN,Y}$ = total nitrous oxide emissions from synthetic fertiliser for year Y; t CO_2-e.

$SFN_{fij,Y}$ = quantity of nitrogen applied by each synthetic fertiliser group for year Y; t.

$EF_{SF,ij}$ = default emission factor for synthetic fertiliser group as set out in the Standard Parameters and Emissions Factors; t CO_2-e/t N.

Y = year in a reporting period.

n = number of groups of synthetic fertiliser applied in the project area.

6.37 Synthetic fertiliser project emissions—urea emissions

The total quantity of emissions released from urea as carbon dioxide must be calculated for each year of the reporting period using the following formula:

$$E_{U,Y} = U_Y \times EF_U \qquad \textbf{Equation SF14}$$

Where:

$E_{U,Y}$ = carbon dioxide emissions from urea for year Y; t CO_2-e/y.

U_Y = quantity of urea applied in year Y; t.

EF_U = National Inventory emission factor for carbon dioxide emissions from urea; t CO_2-e/t urea.

Y = year in a reporting period.

6.38 Synthetic fertiliser project emissions—total emissions

The total emissions from synthetic fertiliser for each year of the reporting period must be calculated using the following formula:

$$E_{SF,Y} = E_{SFN,Y} + E_{U,Y} \qquad \textbf{Equation SF15}$$

Where:

$E_{SF,Y}$= total emissions from synthetic fertiliser for year Y; t CO_2-e/y.

$E_{SFN,Y}$= total nitrous oxide emissions from synthetic fertiliser for year *Y*; t CO_2-e/y.

$E_{U,Y}$ = total carbon dioxide emissions from urea for year *Y*; t CO_2-e/y.

Y = year in a reporting period.

6.39 Synthetic fertiliser project emissions—mean annual emissions

The mean annual emissions from synthetic fertiliser for the reporting period must be calculated using the following formula:

$$\bar{E}_{SF,Rc} = \frac{1}{n_{Rc}} \sum_{Y=1}^{n_{Rc}} E_{SF,Y}$$ **Equation SF16**

Where:

$\bar{E}_{SF,Rc}$ = mean annual emissions from synthetic fertiliser application in the reporting period; t CO_2-e/y.

$E_{SF,Y}$ = total emissions from synthetic fertiliser for year *Y*; t CO_2-e/y.

Y = each year of the reporting period.

n_{Rc} = number of years in the reporting period; y.

6.40 Synthetic fertiliser project emissions—material difference between baseline and reporting periods

(1) The material difference between the total mean annual synthetic fertiliser emissions for the baseline emissions period and the mean annual synthetic fertiliser emissions for the reporting period must be calculated in accordance with this section.

(2) If the mean annual synthetic fertiliser emissions for the reporting period are greater than the total mean annual synthetic fertiliser emissions for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{SF,Rc} = \bar{E}_{SF,Rc} - \left(\bar{E}_{SF,BEP_{Crop}} + S_{E_{SF,BEP_{Crop}}}\right) - \left(\bar{E}_{SF,BEP_{Dairy}} + T_{SF_{Dairy}}\right)$$ **Equation SF17**

Where:

$\Delta\bar{E}_{SF,Rc}$ = material difference in mean annual synthetic fertiliser emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{SF,Rc}$ = mean annual synthetic fertiliser emissions for the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{SF,BEP}$ = total mean annual synthetic fertiliser emissions for the baseline emissions period; t CO_2-e/y.

$S_{E_{SF,BEP_{Crop}}}$ = standard deviation of the annual emissions from synthetic fertiliser applied to cropped land for the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Dairy}}$ = mean (assumed) emissions from annual synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

$T_{SF_{Dairy}}$ = tolerance margin for synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

(3) If the material difference calculated in accordance with Equation SF17 is less than zero, then the material difference is taken to be zero.

(4) If the mean annual synthetic fertiliser emissions for the reporting period are less than the total mean annual synthetic fertiliser emissions for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{SF,Rc} = \bar{E}_{SF,Rc} - (\bar{E}_{SF,BEP_{Crop}} - S_{E_{SF,BEP_{Crop}}}) - (\bar{E}_{SF,BEP_{Dairy}} - T_{SF_{Dairy}})$$

Equation SF18

Where:

$\Delta\bar{E}_{SF,Rc}$ = material difference in mean annual synthetic fertiliser emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{SF,Rc}$ = mean annual synthetic fertiliser emissions for the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Crop}}$ = mean annual emissions for synthetic fertiliser applied to cropped land for the baseline emissions period; t CO_2-e/y.

$S_{E_{SF,BEP_{Crop}}}$ = standard deviation of the annual emissions from synthetic fertiliser applied to cropped land for the baseline emissions period; t CO_2-e/y.

$\bar{E}_{SF,BEP_{Dairy}}$ = mean (assumed) emissions from annual synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

$T_{SF_{Dairy}}$ = tolerance margin for synthetic fertiliser applied to pasture for dairy cattle for the baseline emissions period; t CO_2-e/y.

(5) If the material difference calculated in accordance with Equation SF18 is greater than zero, then the material difference is taken to be zero.

6.41 Synthetic fertiliser project emissions—total change

The total change in synthetic fertiliser emissions for the reporting period must be calculated using the following formula:

$$\Delta E_{SF,Rc} = \Delta \bar{E}_{SF,Rc} \times n_{Rc}$$ **Equation SF19**

Where:

$\Delta E_{SF,Rc}$ = total change in synthetic fertiliser emissions for the reporting period; t CO_2-e.

$\Delta \bar{E}_{SF,Rc}$ = material difference in mean annual synthetic fertiliser emissions between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

n_{Rc} = number of years in the reporting period; y.

Subdivision 6.2.4 Calculation of emissions from lime

6.42 Lime project emissions—general

Emissions from lime must be determined for a reporting period by calculating:

(a) the mean annual emissions from lime during the reporting period;

(b) the material difference, if any, between mean baseline period emissions and mean reporting period emissions; and

(c) the net emissions from lime for the reporting period.

Note Lime type is defined by percentage content of carbonates. That is, all lime products with the same percentage content of carbonates are considered to be the same type.

6.43 Lime project emissions—carbonates per application

The quantity of carbonates for each application of lime for each year of the reporting period must be calculated using the following formula:

$$LQ_{l,Y} = L_{l,Y} \times P_l$$ **Equation L6**

Where:

$LQ_{l,Y}$ = quantity of carbonates applied from lime type *l* for year *Y*; t.

$L_{l,Y}$ = quantity of lime type *l* applied in year *Y*; t.

Y = year in a reporting period.

P_l = percentage carbonate content of lime type l.

6.44 Lime project emissions—total carbonates

The total quantity of carbonates applied to the project area for all lime types for each year of the reporting period must be calculated using the following formula:

$$LQ_Y = \sum_{l=1}^{n} LQ_{l,Y} \qquad \textbf{Equation L7}$$

Where:

LQ_Y = total carbonates for all lime types applied during year Y; t.

$LQ_{l,Y}$ = quantity of carbonates applied from lime type l for year Y; t.

Y = year in a reporting period.

l = each type of lime as defined by the percent carbonate content.

n = number of types of lime applied in year Y.

6.45 Lime project emissions—carbon dioxide emissions

The total quantity of carbon dioxide emissions released from applications of lime must be calculated for each year of the reporting period using the following formula:

$$E_{L,Y} = LQ_Y \times EF_L \qquad \textbf{Equation L8}$$

Where:

$E_{L,Y}$ = total emissions from lime applications for year Y; t CO_2-e.

LQ_Y = total carbonates for all lime types applied during year Y; t.

EF_L = National Inventory dolomite emission factor for carbon dioxide emissions from agricultural lime application; t CO_2-e/t carbonate.

Y = year in a reporting period.

6.46 Lime project emissions—mean annual emissions

The mean annual emissions from lime for the reporting period must be calculated using the following formula:

$$\bar{E}_{L,Rc} = \frac{1}{n_{Rc}} \sum_{Y=1}^{n_{Rc}} E_{L,Y}$$ **Equation L9**

Where:

$\bar{E}_{L,Rc}$ = mean annual emissions from lime application in the reporting period *Rc*; t CO_2-e/y.

$E_{L,Y}$ = total emissions from lime applications for year *Y*; t CO_2-e.

Y = each year of the reporting period.

n_{Rc} = number of years in the reporting period; y.

6.47 Lime project emissions—material difference between baseline and reporting periods

(1) The material difference between mean annual emissions from lime for the baseline emissions period and the reporting period must be calculated in accordance with this section.

(2) If the mean annual emissions from lime for the reporting period are greater than the mean annual emissions from lime for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{L,Rc} = \bar{E}_{L,Rc} - (\bar{E}_{L,BEP} + S_{E_{L,BEP}})$$ **Equation L10**

Where:

$\Delta\bar{E}_{L,Rc}$ = material difference in the emissions from lime between the baseline emissions period and the reporting period *Rc*; t CO_2-e.

$\bar{E}_{L,Rc}$ = mean annual emissions from lime application in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{L,BEP}$= mean annual emissions from lime application in the baseline emissions period; t CO_2-e/y.

$S_{E_{L,BEP}}$ = standard deviation of the annual emissions from lime for the baseline emissions period; t CO_2-e.

(3) If the material difference calculated in accordance with Equation L10 is less than zero, then the material difference is taken to be zero.

(4) If the mean annual emissions from lime for the reporting period are less than the mean annual emissions from lime for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{L,Rc} = \bar{E}_{L,Rc} - (\bar{E}_{L,BEP} - S_{E_{L,BEP}})$$ **Equation L11**

Where:

$\Delta\bar{E}_{L,Rc}$ = material difference in mean annual emissions from lime between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{L,Rc}$= mean annual emissions from lime in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{L,BEP}$= mean annual emissions from lime for the baseline emissions period; t CO_2-e/y.

$S_{E_{L,BEP}}$ = standard deviation of the annual emissions from lime for the baseline emissions period; t CO_2-e.

(5) If the material difference calculated in accordance with Equation L11 is greater than zero, then the material difference is taken to be zero.

6.48 Lime project emissions—total change

The total change in emissions from lime for the reporting period must be calculated using the following formula:

$$\Delta E_{L,Rc} = \Delta\bar{E}_{L,Rc} \times n_{Rc} \qquad \textbf{Equation L12}$$

Where:

$\Delta E_{L,Rc}$ = total change in emissions from lime for the reporting period *Rc*; t CO_2-e.

$\Delta\bar{E}_{L,Rc}$ = material difference in mean annual emissions from lime between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

n_{Rc} = number of years in the reporting period; y.

Subdivision 6.2.5 Calculation of emissions from tillage events

6.49 Tillage project emissions—general

Emissions from tillage events must be determined for a reporting period by calculating:

(a) the mean annual emissions from tillage events during the reporting period;

(b) the material difference, if any, between mean baseline period emissions and mean reporting period emissions; and

(c) the net emissions from tillage events for the reporting period.

6.50 Tillage project emissions—crop residues

The quantity of emissions released from the residues of each crop or pasture that:

(a) follows a tillage event; and

(b) is grown in each year of the reporting period;

must be calculated for each year of the period using the following formula:

$$E_{R,v,Y} = VQ_{v,Y} \times Z_v \times (1 - RF_{v,Y}) \times O_v \times XF_v \times RN_v \times EF_R$$ **Equation T8**

Where:

$E_{R,v,Y}$ = emissions from residues of crop type *v* in year *Y*; t CO_2-e/y.

$VQ_{v,Y}$ = quantity of harvested crop by crop type *v* in year *Y*; t residue/t crop.

Z_v = residue to crop ratio as set out in the Standard Parameters and Emissions Factors; t.

$RF_{v,Y}$ = fraction of crop residue of crop type *v* removed in year *Y*.

O_v = dry matter content of crop type *v* as set out in the Standard Parameters and Emissions Factors; t dry weight/t residue.

XF_v = carbon mass fraction in crop residue in dry matter of crop type *v* as set out in the Standard Parameters and Emissions Factors.

RN_v = nitrogen to carbon ratio in crop residue of crop type *v* as set out in the Standard Parameters and Emissions Factors; t N/t C.

EF_R = National Inventory emission factor for residues; t CO_2-e/t N.

v = crop type.

Y = each year of the reporting period.

6.51 Tillage project emissions—residues of all crop types

The total quantity of emissions released from residues applied to the project area must be calculated for each year of the reporting period using the following formula:

$$E_{R,Y} = \sum_{v=1}^{n} E_{R,v,Y}$$ **Equation T9**

Where:

$E_{R,Y}$ = emissions released from residues of all crop types for year *Y*; t CO_2-e/y.

$E_{R,v,Y}$ = emissions released from residues of crop type *v* in year *Y*; t CO_2-e/y.

n = total number of crop types grown.

v = crop type.

Y = each year of the reporting period.

6.52 Tillage project emissions—pasture renewal

The quantity of emissions released from residues of each pasture renewal or renovation event in the project area must be calculated for each year of the reporting period using the following formula:

$$E_{P,Y} = EF_R \times O_p \times (1 - RF_{p,Y}) \times RN_p \times Area\text{-}T_Y \qquad \textbf{Equation T10}$$

Where:

$E_{P,Y}$= emissions from each pasture renewal or renovation event in year Y; t CO_2-e/y.

EF_R = National Inventory emission factor for residues; t CO_2-e/t N.

O_p = annual dry matter yield for pasture as set out in the Standard Parameters and Emissions Factors; t/ha.

$RF_{p,Y}$ = fraction of residues of pasture removed in year Y.

RN_p = nitrogen content of residues as set out in the Standard Parameters and Emissions Factors; t N/t residue.

$Area\text{-}T_Y$ = tilled area for pasture renewal or renovation in year Y; ha.

Y = each year of the reporting period.

6.53 Tillage project emissions—fuel use

Emissions released from fuel use associated with tillage events in the project area must be calculated for each year of the reporting period using the following formula:

$$E_{Fg,Y} = Area\text{-}T_Y \left(\frac{0.012 \times EC_F \times EF_{Fg}}{1000} \right) \qquad \textbf{Equation T11}$$

Where:

$E_{Fg,Y}$ = emissions of gas type g (being carbon dioxide, methane or nitrous oxide) released from the use of fuel type F associated with all tillage events in year Y; t CO_2-e/y.

$Area\text{-}T_Y$ = tilled area for pasture renewal or renovation in year Y; ha.

EC_F = energy content factor for fuel type F as set out in the NGER Measurement Determination; GJ/kL.

EF_{Fg} = emission factor for each gas type *g* for fuel type *F* as set out in the NGER Measurement Determination; kg CO_2-e/GJ.

Y = each year of the reporting period.

0.012 = fuel use per hectare; kL/ha.

1000 = conversion factor from kg to t CO_2-e.

Note Values for EC_F and EF_{Fg} are specified in Part 4 of Schedule 1 to the NGER Measurement Determination.

6.54 Tillage project emissions—total emissions

The total quantity of emissions released from all tillage events and fuel use in the project area must be calculated for each year of the reporting period using the following formula:

$$E_{T,Y} = E_{Fg,Y} + E_{P,Y} + E_{R,Y}$$ **Equation T12**

Where:

$E_{T,Y}$ = emissions from all tillage events for year *Y*; t CO_2-e/y.

$E_{Fg,Y}$ = emissions from fuel use associated with all tillage events in year *Y*; t CO_2-e/y.

$E_{P,Y}$ = emissions from each pasture renewal or renovation event in year *Y*; t CO_2-e/y.

$E_{R,Y}$ = emissions from each crop or pasture crop grown in year *Y*; t CO_2-e/y.

Y = each year of the reporting period.

6.55 Tillage project emissions—mean annual emissions

The mean annual emissions from tillage events in the reporting period must be calculated using the following formula:

$$\bar{E}_{T,Rc} = \frac{1}{n_{Rc}} \sum_{Y=1}^{n_{Rc}} E_{T,Y}$$ **Equation T13**

Where:

$\bar{E}_{T,Rc}$= mean annual emissions from tillage events in the reporting period; t CO_2-e/y.

$E_{T,Y}$ = emissions from all tillage events in year *Y*; t CO_2-e/y.

Y = year Y of the reporting period.

n = number of years in the reporting period; y.

6.56 Tillage project emissions—material difference between baseline and reporting periods

(1) The material difference between mean annual emissions from tillage events for the baseline emissions period and the reporting period must be calculated in accordance with this section.

(2) If the mean annual emissions from tillage events for the reporting period are greater than the mean annual emissions from tillage events for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{T,Rc} = \bar{E}_{T,Rc} - (\bar{E}_{T,BEP} + S_{E_{T,BEP}}) \qquad \textbf{Equation T14}$$

Where:

$\Delta\bar{E}_{T,Rc}$ = material difference in the mean annual emissions from tillage events between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{T,Rc}$ = mean annual emissions from tillage events in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{T,BEP}$ = mean annual emissions from tillage events in the baseline emissions period; t CO_2-e/y.

$S_{E_{T,BEP}}$ = standard deviation of the emissions from tillage events in the baseline emissions period; t CO_2-e/y.

(3) If the material difference calculated in accordance with Equation T14 is less than zero, then the material difference is taken to be zero.

(4) If the mean annual emissions from tillage events for the reporting period are less than the mean annual emissions from tillage events for the baseline emissions period, then the material difference must be calculated using the following formula:

$$\Delta\bar{E}_{T,Rc} = \bar{E}_{T,Rc} - (\bar{E}_{T,BEP} - S_{E_{T,BEP}}) \qquad \textbf{Equation T15}$$

Where:

$\Delta\bar{E}_{T,Rc}$ = material difference in mean annual emissions from tillage events between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{T,Rc}$ = mean annual emissions from tillage events in the reporting period *Rc*; t CO_2-e/y.

$\bar{E}_{T,BEP}$ = mean annual emissions from tillage events for the baseline emissions

period; t CO_2-e/y.

$S_{E_{T,BEP}}$ = standard deviation of the tillage emissions for the baseline emissions period; t CO_2-e.

(5) If the material difference calculated in accordance with Equation T15 is greater than zero, then the material difference is taken to be zero.

6.57 Tillage project emissions—total change

The total change in emissions from tillage events for the reporting period must be calculated using the following formula:

$$\Delta E_{T,Rc} = \Delta \bar{E}_{T,Rc} \times n_{Rc} \qquad \textbf{Equation T16}$$

Where:

$\Delta E_{T,Rc}$ = total change in emissions from tillage events for the reporting period *Rc*; t CO_2-e.

$\Delta \bar{E}_{T,Rc}$ = material difference in mean annual emissions from tillage events between the baseline emissions period and the reporting period *Rc*; t CO_2-e/y.

n_{Rc} = number of years in the reporting period; y.

Subdivision 6.2.6 Calculation of emissions from all sources within greenhouse gas assessment boundary

6.58 Project emissions from all sources—general

(1) The total change in emissions from all sources within the greenhouse gas assessment boundary during the reporting period must be calculated in accordance with this Subdivision.

(2) If there is a material difference between the mean annual emissions in the baseline emissions period and the reporting period for a given source, this difference must be used to calculate the total change in emissions from that source.

(3) The values for total change in emissions from each non-soil organic carbon source within the greenhouse gas assessment boundary must be summed to calculate a total change in emissions from all such sources within the greenhouse gas assessment boundary.

6.59 Project emissions from all sources—calculation

(1) The total emissions from all sources within the greenhouse gas assessment boundary during the reporting period must be calculated in accordance with the following formula:

$$\Delta E_{all,Rc} = \Delta E_{LS,Rc} + \Delta E_{SF,Rc} + \Delta E_{L,Rc} + \Delta E_{T,Rc} + \Delta E_{all(Rc-1)}$$ **Equation EALL1**

Where:

$\Delta E_{all,Rc}$ = total change in emissions from all sources for the reporting period *Rc*; t CO_2-e.

$\Delta E_{LS,Rc}$ = total change in livestock emissions for the reporting period *Rc*; t CO_2-e.

$\Delta E_{SF,Rc}$ = total change in synthetic fertiliser emissions for the reporting period *Rc*; t CO_2-e.

$\Delta E_{L,Rc}$ = total change in lime emissions for the reporting period *Rc*; t CO_2-e.

$\Delta E_{T,Rc}$ = total change in tillage emissions for the reporting period *Rc*; t CO_2-e.

$\Delta E_{all(Rc-1)}$ = total change in emissions from all sources for the reporting period prior to the current reporting period.

(2) The value for $\Delta E_{all(Rc-1)}$ must be equal to or less than zero to be included in Equation EALL1.

(3) If the total change in emissions from all sources within the greenhouse gas assessment boundary is a positive value for the reporting period, then this value must be deducted from soil organic carbon stock change for the reporting period to calculate net abatement in Equations NA1, NA2 and NA3.

(4) If the total change in emissions from all sources within the greenhouse gas assessment boundary is a negative value for the reporting period, then this value must be taken to be zero for the purpose of the net abatement calculations for the reporting period in Equations NA1, NA2 and NA3.

(5) If the total change in emissions from all sources within the greenhouse gas assessment boundary is a negative value for the reporting period, this value must be used in calculations of total change in emissions in the subsequent reporting period under subsection (2).

Division 6.3 Calculation of the carbon dioxide equivalent net abatement amount

6.60 Calculating the carbon dioxide equivalent net abatement amount—first reporting period

Note See paragraph 106(1)(c) of the Act.

(1) The carbon dioxide equivalent net abatement amount for the first reporting period for an eligible offsets project to which this Determination applies must be calculated using the following formula:

$$NA_{Rc} = \Delta CO_2e\text{-}PA_{Rc} - \Delta E_{all_{Rc}}$$ **Equation NA1**

Where:

NA_{Rc} = project net abatement in CO_2-e for the reporting period *Rc*; t CO_2-e.

$\Delta CO_2e\text{-}PA_{Rc}$ = change in corrected soil organic carbon stock for the project area in CO_2-e for the reporting period *Rc*; t CO_2-e.

$\Delta E_{all_{Rc}}$ = total change in greenhouse gas emissions for the project area from all sources in CO_2-e for the reporting period *Rc*, calculated using Equation EALL1; t CO_2-e.

(2) In accordance with subsections 6.58(3) and (4), the total change in greenhouse gas emissions for the project area from all sources ($\Delta E_{all_{Rc}}$) must be greater than or equal to zero.

(5) If the change in corrected soil organic carbon stock in CO_2-e for the reporting period ($\Delta CO_2e\text{-}PA_{Rc}$), as calculated using Equation SC31 or Equation SC43, is less than zero, then $\Delta CO_2e\text{-}PA_{Rc}$ is taken to be zero.

(6) The change in soil organic carbon stock for the project area in CO_2-e over the reporting period ($\Delta CO_2e\text{-}PA_{Rc}$) must be:

(a) if 2 sampling rounds have been completed within the first reporting period—$Discounted\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_1)}$ as calculated using Equation SC31; or

(b) if 3 or more sampling rounds have been completed within the first reporting period—$Critical\text{-}\Delta CO_2e\text{-}PA\_cor_{(t_0-t_x)}$ as calculated using Equation SC43.

6.61 Calculating the carbon dioxide equivalent net abatement amount—subsequent reporting periods

(1) The carbon dioxide equivalent net abatement amount for subsequent reporting periods for an eligible offsets project to which this Determination applies must be calculated in accordance with this section.

(2) If the carbon dioxide equivalent net abatement amount for the reporting period immediately before the current reporting period was greater than or equal to zero, then the net abatement number for the current reporting period must be calculated using the following formula:

$$NA_{Rc} = \Delta CO_2e\text{-}PA_{Rc} - \Delta E_{all_{Rc}}$$ **Equation NA2**

Where:

NA_{Rc} = project net abatement in CO_2-e for the reporting period *Rc*; t CO_2-e.

$\Delta CO_2e\text{-}PA_{Rc}$ = change in corrected soil organic carbon stock for the project area in CO_2-e for the reporting period *Rc*, calculated using Equation SC44; t CO_2-e.

$\Delta E_{all_{Rc}}$ = total change in greenhouse gas emissions for the project area from all sources in CO_2-e for the reporting period *Rc*, calculated using Equation EALL1; t CO_2-e.

(3) For the purpose of calculating the net greenhouse gas abatement using Equation NA2:

(a) if the change in soil carbon stock in CO_2-e for the reporting period ($\Delta CO_2e\text{-}PA_{Rc}$), as calculated using Equation SC44, is less than zero then, subject to subsection (4), $\Delta CO_2e\text{-}PA_{Rc}$ is taken to be zero; and

(b) $\Delta E_{all_{Rc}}$ must be greater than or equal to zero in accordance with subsections 6.58(3) and (4).

(4) If the current reporting period is the final reporting period of the final crediting period of the project, then $\Delta CO_2e\text{-}PA_{Rc}$ equals the value calculated using Equation SC44.

(5) If the carbon dioxide equivalent net abatement amount for the reporting period immediately before the current reporting period was less than zero, then the net abatement number for the current reporting period must be calculated using the following formula:

$$NA_{Rc} = \Delta CO_2e\text{-}PA_{Rc} - \Delta E_{all_{Rc}} + NA_{R(c-1)} \qquad \textbf{Equation NA3}$$

Where:

NA_{Rc} = project net abatement in CO_2-e for the reporting period *Rc*; t CO_2-e.

$\Delta CO_2e\text{-}PA_{Rc}$ = change in corrected soil organic carbon stock for the project area in CO_2-e for the reporting period *Rc*, calculated using Equation SC44; t CO_2-e.

$\Delta E_{all_{Rc}}$ = total change in greenhouse gas emissions for the project area from all sources in CO_2-e for the reporting period *Rc*, calculated using Equation EALL1; t CO_2-e.

$NA_{R(c-1)}$ = net abatement number for the reporting period immediately before the reporting period *Rc*; t CO_2-e.

(6) For the purpose of calculating the net greenhouse gas abatement using Equation NA3:

(a) if the change in soil carbon stock in CO_2-e for the reporting period ($\Delta CO_2e\text{-}PA_{Rc}$), as calculated using Equation SC44, is less than zero then, subject to subsection (7), $\Delta CO_2e\text{-}PA_{Rc}$ is taken to be zero;

(b) $\Delta E_{all_{Rc}}$ must be greater than or equal to zero in accordance with subsections 6.58(3) and (4); and

(c) $NA_{R(c-1)}$ must be less than zero.

(7) If the current reporting period is the final reporting period of the project, then $\Delta CO_2e\text{-}PA_{Rc}$ must be the value calculated using Equation SC44.

Division 6.4 Data collection

6.62 Livestock emissions—data

(1) For each year of the baseline emissions period, the following information is required for livestock baseline A:

(a) the number of animals in each livestock group within the project area for that year; and

(b) the number of days in each year that each livestock group was within the project area.

(2) For the baseline emissions period, the following information is required for livestock baseline B:

(a) the assessed carrying capacity for the project area:

(i) expressed as the appropriate animal unit for the region; and

(ii) provided by the relevant government body;

(b) an auditable description of the process used to derive the assessed carrying capacity referred to in paragraph (2)(a); and

(c) the stocking rate for the first year of the project:

(i) calculated in accordance with the process referred to in paragraph (2)(b); and

(ii) expressed in the same animal units referred to in subparagraph (2)(a)(i).

(3) For each year of a reporting period, the following information relating to livestock emissions is required:

(a) the number of animals in each livestock group within the project area for that year; and

(b) the number of days in that year that each livestock group was within the project area.

6.63 Synthetic fertiliser emissions—data

For each year of the baseline emissions period and of a reporting period, the following information relating to synthetic fertiliser emissions is required:

(a) the number of tonnes of each type of synthetic fertiliser applied within the project area for that year;

(b) the nitrogen content of each type of synthetic fertiliser applied within the project area for that year; and

(c) the number of tonnes of urea applied within the project area for that year.

6.64 Lime emissions—data

For each year of the baseline emissions period and of a reporting period, the following information relating to lime emissions is required:

(a) the number of tonnes of each type of lime applied within the project area for that year; and

(b) the carbonate content of each type of lime applied within the project area for that year.

6.65 Tillage emissions—data

For each year of the baseline emissions period and of a reporting period, the following information relating to tillage emissions is required:

(a) the quantity of each crop type harvested within the project area for that year; and

(b) the total number of hectares of the project area that underwent a tillage event in each baseline and project year.

Part 7 Monitoring, record-keeping and reporting requirements

Note See subsection 106(3) of the Act.

Division 7.1 General

7.1 Application

A project proponent of an eligible offsets project to which this Determination applies must comply with the monitoring, record-keeping and reporting requirements of this Part.

Division 7.2 Monitoring requirements

7.2 Project monitoring—general

(1) A project proponent must undertake monitoring specified in this Division.

(2) The proponent must provide to the Regulator the information specified in this Division.

7.3 Project monitoring—risk of reversal events and known erosion events

(1) The proponent must monitor risk of reversal events and known erosion events in the project area.

(2) A 'risk of reversal event' occurs when a portion of the project area referred to in paragraph 7.4(1)(c):

(a) is subject to bare fallow;

(b) is subject to a fire or other event that reduces surface vegetation cover below 40%; or

(c) is converted from permanent pasture to cropland with no pasture cover.

7.4 Project monitoring—notification of risk of reversal events and known erosion events

(1) The proponent must notify the Regulator in writing if a risk of reversal event, or a known erosion event:

(a) occurs after the date that credits are first issued; and

(b) if the relevant declaration for the project under section 27 of the Act has never been varied so as to amend the project area—the period that has passed since the first occasion on which credits were issued in relation to the project is shorter than the maximum potential relinquishment period for the project; and

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(c) if the relevant declaration for the project under section 27 of the Act has been varied so as to amend the project area—the period that has passed since the last occasion on which the declaration was so varied is shorter than the maximum potential relinquishment period for the project; and

(d) affects the smaller of the following portions of the total project area:

(i) 5%; or

(ii) 50 hectares.

Note See section 87 of the Act for the meaning of ***maximum potential relinquishment period***.

(2) The proponent must notify the Regulator within 90 days of the date that the risk of reversal event or known erosion event commenced or was discovered by the proponent.

(3) Notification of a risk of reversal event or a known erosion event must set out:

(a) the nature of the event;

(b) the parts of the project area affected by the event;

(c) the date on which the event either commenced or was discovered by the proponent; and

(d) any reasonable steps taken by the proponent to mitigate the effect of a risk of reversal event or known erosion event on soil carbon stocks.

7.5 Project monitoring—notification of proposed changes to project management actions

(1) The proponent must provide written notification to the Regulator advising of any proposed changes to the project management actions, including cessation of management actions.

(2) The notification must:

(a) be in the form required by the Regulator;

(b) identify and describe all proposed changes to the project management actions;

(c) describe how the proposed set of project management actions has the potential to increase carbon inputs to the soil, reduce losses of soil organic carbon, or both;

(d) identify the new management actions in the revised set of project management actions; and

(e) describe how the revised set of project management actions is consistent with the requirements in Part 3.

(3) The proposed project management actions must meet the requirements of section 2.2 and Part 3.

(4) The proponent must not implement the proposed changes to the project management actions until the Regulator confirms, in writing, that the project management actions for the project have been amended to include the proposed changes.

Division 7.3 Record-keeping requirements

7.6 Records that must be kept—general

(1) Records must be kept to an auditable standard to demonstrate that the project is carried out in accordance with this Determination.

(2) In addition to the record-keeping requirements specified in this section, a project proponent must comply with the record-keeping requirements specified in the CFI soil sampling design method and the CFI soil sampling and analysis method.

(3) The proponent must create and maintain records to demonstrate that:

(a) the requirements in Part 2 have been satisfied;

(b) the soil sampling plan has been designed in accordance with the CFI soil sampling design method;

(c) the soil sampling and analysis has been carried out in accordance with:

(i) the CFI soil sampling design method; and

(ii) the CFI soil sampling and analysis method.

(d) the project management actions occurred:

(i) as described to the Regulator under sections 2.2, and 7.5; and

(ii) in accordance with section 3.7;

(e) reported rates of soil organic carbon stock change have been calculated in accordance with Part 6;

(f) emissions from livestock, synthetic fertiliser, lime and tillage events have been calculated in accordance with Parts 5 and 6; and

(g) net abatement was calculated in accordance with Part 6.

(4) The proponent must record the date on which new management actions were first implemented within each carbon estimation area.

(5) The proponent must create and maintain to an auditable standard records demonstrating that the project management actions took place in the years after the activity start date and before the end of the final crediting period of the project.

Note Records referred to in subsection 7.6(5) may include:

(a) taxation records;

(b) shareholder statements;

(c) log-books;

(d) farm management records;

(e) herd books;

(f) invoices for goods or services;

(g) planning approvals or inspection reports from government agencies or authorities;

(h) grazing management plans;

(i) date-stamped photographs or aerial photographs with GPS coordinates.

(6) The proponent must maintain the following taxation or other similar records to an auditable standard:

(a) for all purchases of synthetic fertiliser, lime, seed, or any other materials relevant to calculating emissions from sources in the greenhouse gas assessment boundary;

(b) that identify the type and composition of all of the following substances applied to the project area during the baseline emissions period and the reporting periods:

(i) synthetic fertiliser containing urea;

(ii) synthetic fertiliser not containing urea; and

(iii) lime containing carbonates;

(c) that show the tonnage of all harvested crops (whether for sale or otherwise) from within the project area.

(7) The records specified in subsections (5) and (6) must be sufficient to verify the data inputs used to calculate baseline and project emissions in accordance with Parts 5 and 6.

7.7 Records that must be kept—livestock baseline A

(1) If a project proponent uses livestock baseline A, the proponent must keep the following records:

(a) taxation records of the annual opening and closing inventory of numbers of production livestock kept on the project area for each year of the baseline emissions period;

(b) records documenting movements in the number of animals during the year, from births, deaths and sales during the year; and

(c) taxation records from the project area indicating the numbers of livestock from which products and services are sold.

Note The data referred to in paragraph 7.7(1)(b) may be supported by National Livestock Identification System tag records for sales and movements from the project area.

(2) The records specified in paragraph (1)(a) must be:

(a) supported by one or both of the following:

(i) the herd book used to prepare the tax records;

(ii) the National Livestock Identification System; and

(b) sufficient to verify the data required by section 6.62.

Note Section 6.62 specifies the information required for livestock baseline A.

7.8 Records that must be kept—livestock baseline B

(1) If a project proponent uses livestock baseline B, the proponent must keep records of the assessment of the carrying capacity of the project area used to complete the Equations in Subdivision 5.5.3.

(2) The records specified in subsection (1) must:

(a) be from the relevant state or territory government agency; and

(b) apply to the relevant year, or years, of the baseline emissions period.

7.9 Records that must be kept—sampling rounds

A project proponent must keep the following records relating to the timing and frequency of sampling rounds:

(a) records of the day, month and year of the baseline sampling round for each carbon estimation area in the project area;

(b) records of the day, month and year of all carbon estimation area sampling rounds subsequent to the carbon estimation area baseline sampling round; and

(c) evidence to support the use of the extended period for carrying out sampling as described in section 4.11.

Note Section 4.11 allows a project proponent in exceptional circumstances to apply to the Regulator to extend the time to carry out a carbon estimation area sampling round.

7.10 Records that must be kept—soil organic carbon stock

A project proponent must keep the following records relating to the calculation of soil organic carbon stock and soil organic carbon stock change over time:

(a) data inputs and calculations for all equations in the CFI Soil Sampling and Analysis Method and Guidelines to calculate the parameters required to calculate the soil organic carbon stock in each composite sample;

(b) data inputs and calculations for Equations SC1–SC16 to calculate soil organic carbon stocks; and

(c) data inputs and calculations for Equations SC20–SC44 to calculate change in soil organic carbon stocks over time.

7.11 Records that must be kept—emissions

A project proponent must keep records relating to the calculation of emissions from livestock, synthetic fertiliser, lime and tillage events in the baseline emissions period and reporting period (or periods) for all equations in Divisions 5.5–5.8 and 6.2.

7.12 Records that must be kept—net abatement

(1) A project proponent must keep records relating to the calculation of the net abatement number, as calculated using Equations NA1–NA3.

(2) If project proponents use the CFI Soil Carbon in Grazing Systems Calculator to calculate the net abatement number, they must keep digital or hard copies of all data inputs and outputs to and from the calculator.

(3) In this section:

CFI Soil Carbon in Grazing Systems Calculator means the online tool of that name, as published and made available on the Department's website and as in force from time to time.

Division 7.4 Offsets report requirements

7.13 Information in first offsets report

(1) The following information must be included in the first offsets report for a project to which this Determination applies:

(a) a description of the project management actions implemented in the project area;

(b) the day, month and year of:

(i) the baseline sampling round and each subsequent sampling round for each carbon estimation area in the reporting period;

(ii) the first day and last day of the project area baseline sampling round and the first day and last day of each subsequent project area sampling round in the reporting period; and

(c) the date on which new management actions were first implemented within each carbon estimation area.

(2) If no more than 2 sampling rounds have been completed prior to the end of the first reporting period, the following results relating to the calculation of soil organic carbon stock change must be reported:

(a) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area over the period t_0 to t_1 with a probability of exceedance of 60% from Equation SC27;

(b) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each carbon estimation area over the period t_0 to t_1 with a probability of exceedance of 60% from Equation SC28;

(c) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_1 with a probability of exceedance of 60% from Equation SC29;

(d) the value calculated for the total critical change in corrected soil organic carbon stock (in CO_2-e) in the equivalent soil mass for the project area over the period t_0 to t_1 with a probability of exceedance of 60% from Equation SC30; and

(e) the value calculated for the discounted change in corrected soil organic carbon stock (in CO_2-e) in the equivalent soil mass for the project area over the period t_0 to t_1 from Equation SC31.

(3) If more than 2 sampling rounds have been completed prior to the end of the first reporting period, the following results relating to the calculation of soil organic carbon stock change must be reported:

(a) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC40;

(b) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each carbon estimation area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC41;

(c) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC42; and

(d) the value calculated for the total critical change in corrected soil organic carbon stock (in CO_2-e) for the equivalent soil mass for the project area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC43.

7.14 Information in subsequent offsets reports

The following information must be included in the second and subsequent offsets reports for a project to which this Determination applies:

(a) any changes to the project management actions implemented in the project area in accordance with section 7.5;

(b) the day, month and year of the first day and last day of each:

(i) carbon estimation area sampling round in the reporting period; and

(ii) project area sampling round in the reporting period; and

(c) the following results relating to the calculation of soil organic carbon stock change:

(i) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each soil layer of each carbon estimation area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC40;

(ii) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for each carbon estimation area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC41;

(iii) the value calculated for the total critical change in corrected soil organic carbon stock in the equivalent soil mass for the project area over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC42;

(iv) the value calculated for the total critical change in corrected soil organic carbon stock for the equivalent soil mass for the project area (in CO_2-e) over the period t_0 to t_x with a probability of exceedance of 60% from Equation SC43; and

(v) the value calculated for the change in corrected soil organic carbon stock for the equivalent soil mass for the project area (in CO_2-e) for the current reporting period from Equation SC44.

7.15 Information in all offsets reports

(1) The information specified in this section must be included in all offsets reports for a project to which this Determination applies.

(2) All reports must contain the following information in relation to the greenhouse gas sources specified in subsection (3):

(a) the mean annual emissions for:

(i) the baseline emissions period; and

(ii) the reporting period;

(b) the standard deviation or tolerance margin (where relevant);

(c) the material difference (if any) between the mean annual emissions from the baseline emissions period and the mean annual emissions from the reporting period; and

(d) the total change in emissions between the baseline emissions period and the reporting period.

(3) The relevant greenhouse gas sources for the purposes of subsection (2) are:

(a) livestock;

(b) synthetic fertiliser;

(c) lime; and

(d) tillage events.

(4) All reports must contain:

(a) the information required by:

(i) the CFI soil sampling design method; and

(ii) the CFI soil sampling and analysis method;

(b) a statutory declaration by the person carrying out sample collection stating that the sample collection and preparation has been undertaken in accordance with the CFI soil sampling and analysis method;

(c) the total change in emissions between the baseline emissions period and the reporting period for all sources; and

(d) the carbon dioxide equivalent net abatement amount, calculated in accordance with Division 6.3.

Note

1. All legislative instruments and compilations are registered on the Federal Register of Legislative Instruments kept under the *Legislative Instruments Act 2003*. See http://www.frli.gov.au.