Australian Government
Clean Energy Regulator

EMISSIONS REDUCTION FUND

# Understanding your soil carbon project

Emissions Reduction Fund simple method guide for soil carbon projects registered under the *Carbon Credits (Carbon Farming Initiative – Estimation of Soil Organic Carbon Sequestration using Measurement and Models) Methodology Determination 2021*

# Contents

# The 2021 Soil Carbon Method

## Objective of the method

A soil carbon project aims to store additional carbon in agricultural soils which has the effect of reducing the level of carbon dioxide, an important greenhouse gas, in the atmosphere. These greenhouse gases are accounted for as *carbon dioxide equivalents*. You can improve your soil carbon stocks by undertaking new, eligible management activities. Examples of such activities include improving fertiliser application, re-establishing pasture or modifying grazing practices. Activities need to be undertaken for the duration of the project's permanence period or have enduring impacts for the permanence period of the project (e.g, landscape modification activities such as inversion tillage).

The *Carbon Credits (Carbon Farming Initiative – Estimation of Soil Organic Carbon Sequestration using Measurement and Models) Methodology Determination 2021* (the 2021 soil carbon method) includes 2 approaches for measuring or estimating soil carbon changes:

1. ***Measurement only approach:*** Averaging the results of **soil core measurements** you collect from an area.
2. ***Hybrid approach:*** Estimating results using a combination of **soil carbon model estimates** and **soil core measurements** collected within a soil carbon project or a group of projects.

You'll need to measure or estimate your soil carbon levels before and after you undertake your new eligible management activities in order to calculate soil carbon changes. Report your results to us (the agency) at least once every five years and you can earn carbon credits for increasing soil carbon levels as a result of your soil carbon project.

## Using this guide

This document provides a high-level step-by-step guide on how to plan, register, deliver and report on a soil carbon project under the 2021 soil carbon method – which is the legislative instrument that details the rules for how to run a soil carbon project. In addition to the 2021 soil carbon method and this document, further details on how to run a soil carbon project are included in:

- The Soil Carbon Method Supplement.
- The Soil Carbon Sampling Guidance.
- The Soil Carbon Land Management Strategy Guidance.

This guide walks you through the steps involved in running a soil carbon project under the 2021 soil carbon method for each of the two approaches for estimating soil carbon changes.

There are a range of factors which may influence your decision to participate in the Emissions Reduction Fund. The agency recommends that you seek independent technical, legal, audit and/or financial advice regarding your circumstances and requirements.

## Changes from the 2018 method

The 2021 soil carbon method builds on the *Carbon Credits (Carbon Farming Initiative – Measurement of Soil Carbon Sequestration in Agricultural Systems) Methodology Determination 2018*[1] (the 2018 soil carbon method). Key changes that have been made in the 2021 soil method are outlined in the below table.

**Table 1: Key changes made in the 2021 soil method**

| Issue | Key changes in the 2021 soil carbon method |
|---|---|
| **Discounting arrangements** | • Reduced the temporarily withheld discount from 50% to 25% to achieve a better balance between managing the risk of over-issuance for individual projects and providing a sufficient incentive for uptake of soil projects while still meeting the Offsets Integrity Standards (see schedule 1 s 32 and schedule 2 s 53 of the 2021 soil carbon method). |
| **Removing the regression approach** | • To reduce complexity and maintain a consistent approach throughout the project's crediting period, we have replaced the regression approach to estimating net carbon abatement (for all sampling rounds following the first sampling round after baseline sampling) that applied under the 2018 soil carbon method. The 2021 soil carbon method calculates changes in carbon stocks at the end of each sampling round compared with the baseline carbon stocks. The regression approach was intended to avoid crediting for changes in carbon stocks due to climatic variability rather than management activities by removing the variability. However, comparing carbon stocks at 2 points in time could be seen as a more accurate reflection of abatement in each period. |
| **Calculation errors** | • Revised the net abatement calculations to address the problems with the 2018 calculations.<br>• Moved from a fixed-depth to a fixed-mass accounting approach to reduce complexity and facilitate accounting for soil carbon changes from an increase in soil carbon concentration rather than soil mass (avoiding potential over-issuance on the basis of increased mass).<br>• Amended the abatement accounting to ensure that project emissions that exceed the abatement for a reporting period are carried over into the next reporting period. |
| **Emissions factors** | • Added an equation to account for nitrogen emissions from cover crops, which was not included in the 2018 soil carbon method.<br>• Expanded the table of emissions factors in the supplement to include cover crops. This allows the emissions associated with their use to be accounted for in net abatement calculations.<br>• Updated the emission factors to align with the values used in the National Greenhouse Gas Inventory. |

[1] https://www.legislation.gov.au/Details/F2018L00089

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| **Restricted and excluded activities** | • Amended restricted and excluded activities[2] (see s 11 and s 12 of the 2021 soil carbon method) including:<br>  • Allowing immaterial use of soil amendments containing coal, and non-synthetic fertilisers and biochar that have not been sourced from a designated waste stream[3] or a carbon estimation area (CEA).<br>  • Allowing the use of irrigation efficiency savings achieved through new or upgraded irrigation infrastructure funded by a Commonwealth, state or territory program. This was previously a restriction intended to ensure eligible management activities meet newness requirements, however the Emissions Reduction Fund (ERF) is intended to allow projects to access multiple funding streams. In addition, the method maintains the requirement that the irrigation infrastructure is installed or upgraded after the date of project registration.<br>  • Increasing the irrigation threshold. Disregarding the use of *new irrigation*[4]*,* the 2021 soil carbon method allows the 5-yearly total level of irrigation for the project area, or the CEAs within the project area, to be no more than 20% greater than the total level of irrigation in the baseline period. Previously this threshold was 10%. This change is intended to ensure the change from a 10 year to 5 year baseline period does not result in increased irrigation restrictions.<br>  • Removing the requirement that a state or territory government license/permit or a letter from the delegate of an environmental protection agency be issued for the use of biochar. This has been replaced by a requirement that the use of biochar complies with any relevant state or territory requirements and regulations. The original requirement was intended to address the potential for biochar to cause adverse impacts, however, obtaining a license or permit does not align with the approval processes in most states or territories.<br>  • Allowing de-stocking of land that is under pasture where the land is within a drought affected region. De-stocking restrictions in the 2018 soil carbon method were intended to address a policy concern that agricultural communities were being encouraged to de-stock their properties. In practice however, the restrictions failed to recognise circumstances such as drought during which landholders require the flexibility to de-stock their properties.<br>Each of these proposed changes are intended to increase flexibility for participants in regard to their land management activities without affecting scheme integrity. |

[2] The intention of the restricted and excluded activity lists are to manage the risks of leakage and adverse impacts. Leakage occurs when activities undertaken within the project result in carbon losses or emissions outside of the project area, which reduces the net carbon benefit of the project.

[3] A designated waste stream is defined as an organic waste stream from intensive animal production, food processing, manufacturing, sawmill residue, or municipal or commercial waste collection processes. The use of non-synthetic fertilisers and biochar that have not been sourced from a designated waste stream or a CEA are restricted because there is a risk that leakage could occur. The potential leakage risk does not occur when non-synthetic fertilisers and biochar have been sourced from a designated waste stream, as the removal of biomass through these waste streams is considered business as usual. In these situations, it can be assumed that the project has not caused a decrease of soil organic carbon stocks through the removal of biomass.

[4] *New irrigation* refers to irrigation water obtained through irrigation efficiency savings achieved via upgrades to on-farm infrastructure or changes to management practices, made after the date of project declaration. Irrigation that meets these requirements is not subject to the thresholds set out in s 12 of the 2021 soil carbon method.

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| **Emissions accounting baseline** | • Reduced the baseline emissions accounting period from 10 years to 5 years. A 10-year emissions accounting baseline requirement can pose a barrier to entry when limited historic records are available. Five years is widely considered as a reasonable time period for most businesses to keep records and provides a sufficient time period to accurately estimate baseline emissions. This change is intended to provide greater flexibility to landholders and increase opportunities for participation (see s 5 of the 2021 soil carbon method). |
| **Definitions** | • Broadened the definition of *non-synthetic fertilisers* to include products which are used to *add or stimulate microbial or other life in soils* such as mycorrhiza, phosphate solubilizing bacteria, bio-inoculants and bio-inducers (see s 5 of the 2021 soil carbon method).<br>• Broadened the definition of *designated waste stream* to include organic waste streams from municipal or commercial waste collection processes involving human effluent, as health risks are managed through existing regulations (see s 5 of the method). This change will allow the use of non-synthetic fertilisers and biochar containing biosolids, in recognition that these are widely used products. This change is also consistent with the *Carbon Credits (Carbon Farming Initiative) Sequestering Carbon in Soils in Grazing Systems) Methodology Determination 2014,* and the *Carbon Credits (Carbon Farming Initiative—Estimating Sequestration of Carbon in Soil Using Default Values) Methodology Determination 2015*[5].<br>These proposed changes are intended to increase flexibility for participants in terms of soil amendments that are eligible for use, without affecting scheme integrity. |
| **Sampling requirements** | • Allowed baseline sampling to be conducted once a project registration application has been received by the agency, but before projects have been registered. Proponents will still need to provide the agency with a sampling plan prior to conducting sampling. This change allows landholders to arrange baseline sampling any time after applying, rather than having to wait for the agency to assess their application (see s 16 of the method).<br>• Removed the restriction on non-synthetic fertiliser application within 24 months of a sampling round. This provision was intended to address the risk that projects are credited for the carbon in non-synthetic fertilisers rather than sustained increases in sequestered soil carbon. This requirement is replaced with a withholding mechanism whereby credits will be withheld in proportion to the carbon content of the non-synthetic fertiliser applied, until sampling has occurred more than 24 months after the product has been applied. This change maintains scheme integrity by ensuring credits are issued only for genuine increases in carbon stocks that are maintained, while providing landholders with greater flexibility regarding the choice to apply non-synthetic fertilisers and the timing of their sampling (see s 25 of the 2021 soil carbon method).<br>• Reduced sampling notification requirements in the method to avoid duplication with the requirements of the sampling guidance (see s 32 of the method). |

[5] https://www.legislation.gov.au/Details/F2018C00126

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| **Accounting for deep layers** | • Introduced the option for deep layers of samples to be excluded from abatement calculations in early reporting periods. This change avoids a possible perverse incentive to only sample to the minimum 30 cm. The data for the deep layers is still recorded and can be introduced into the calculations in later crediting rounds if significant differences are observed (and must be included if significant negative changes are observed). |
| **Compatibility with the 2014, 2015 and 2018 methods** | • Allows projects registered under the 2014, 2015 and 2018 soil carbon methods to transfer to the 2021 soil carbon method (see s 22 of the 2021 soil carbon method). |

# Participating in the Emissions Reduction Fund

The ERF offers landholders, communities, and businesses the opportunity to run new projects in Australia that reduce or remove greenhouse gas emissions from the atmosphere.

By running a project, you can earn Australian carbon credit units (carbon credits) and sell them to the Australian Government, or to companies and other private buyers. Each carbon credit represents 1 tonne of carbon dioxide equivalent emissions stored or avoided (noting that legislated discounts apply to abatement from projects that store carbon).

## How participating in the Emissions Reduction Fund works

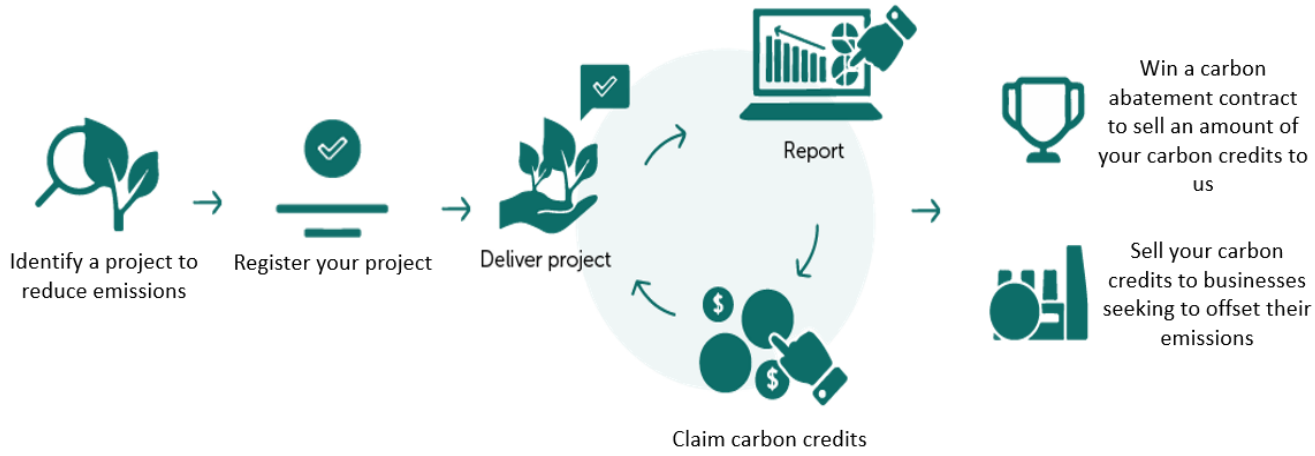


***FIGURE 1: PARTICIPATING IN THE EMISSIONS REDUCTION FUND***

There are 4 general steps involved in running a project and participating in the ERF:

1. Plan your project, make sure the project is eligible, and ensure you hold legal right for the duration of the project.
2. Register your project with the agency.
3. Run your project and deliver on project activities.
4. Report on your project and claim carbon credits. These carbon credits can be sold to the Australian Government or other buyers. See our website for more information on selling your carbon credits[6] to the government or other interested buyers.

[6] http://www.cleanenergyregulator.gov.au/OSR/ANREU/types-of-emissions-units/australian-carbon-credit-units

## Project lifecycles for projects under the 2021 soil carbon method

The key steps and associated actions that are required to run a soil carbon project are outlined below.

The actions required under step 1 (planning your project), step 2 (registering your project) and step 3 (delivering your project) are largely the same for all projects under the 2021 soil carbon method, regardless of the approach you take to estimating carbon abatement.

The actions required under step 4 (reporting and crediting) differ substantially for projects under the 2021 soil carbon method, depending on whether you choose to follow the *measurement only approach* as detailed in schedule 1 of the 2021 soil carbon method, or the *hybrid approach* as detailed in schedule 2 of the 2021 soil carbon method.

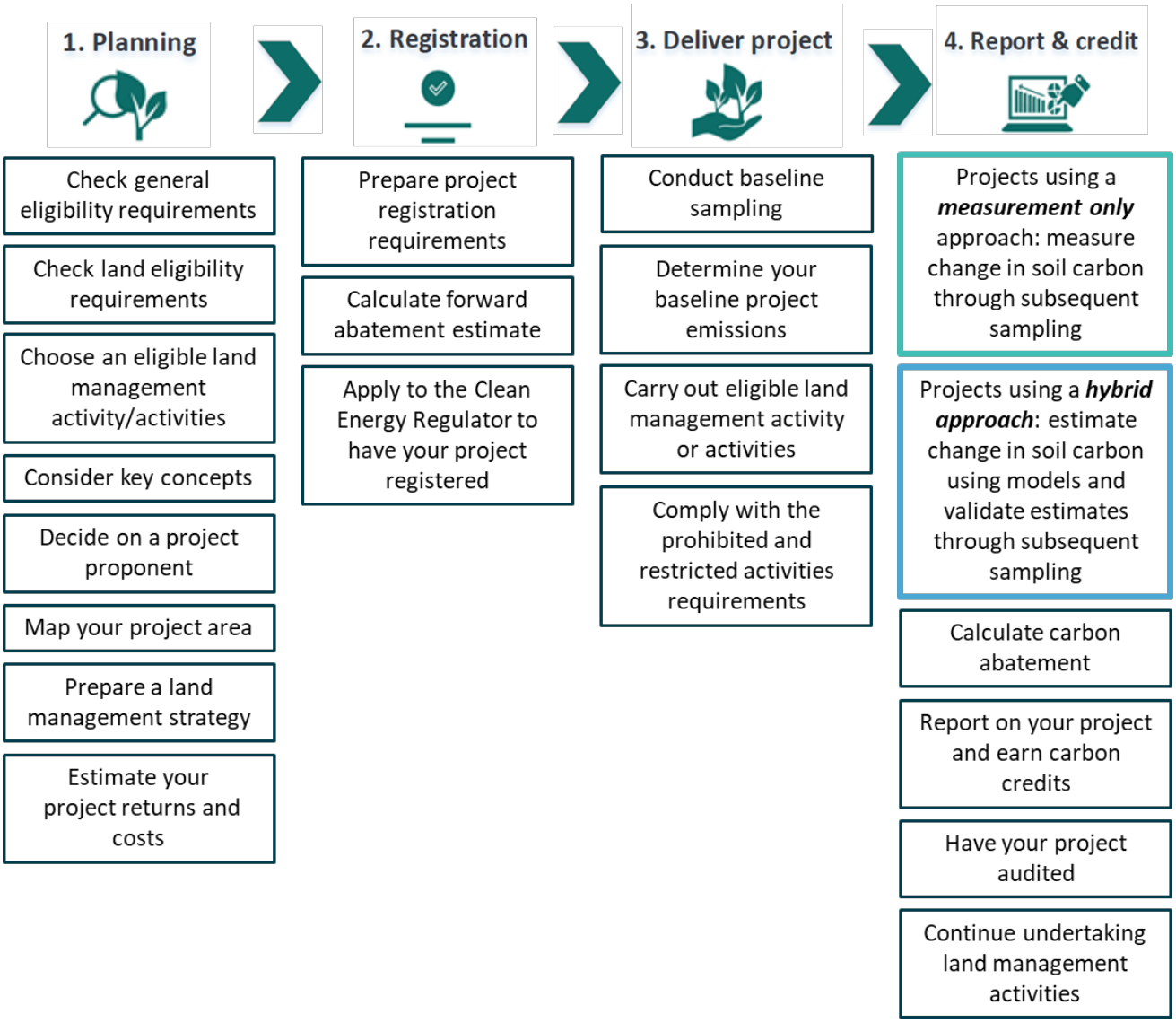


*FIGURE 2: STAGES OF A SOIL CARBON PROJECT*

# Step 1: Planning your soil carbon project

## 1.1 General eligibility requirements

Key considerations are highlighted below. For more information on eligibility, visit the planning a project[7] page on our website.

### Hold legal right

You need to demonstrate that you hold and maintain the exclusive legal right to run your project and claim carbon credits. It is likely that you have the legal right if you own or hold a lease to the project land. You may need a written agreement if there are multiple owners or leaseholders to show you have the exclusive legal right to run the project and earn carbon credits.

### Eligible interest holder consent

You will need consent from all eligible interest-holders before you can submit a crediting application for your project. These are stakeholders who *hold an interest* in the land. They may include:

- any mortgagees - typically banks.
- other people or parties that share, have ownership or leases of the land within the project area.
- Native title holders. See our website[8] for more information.
- for leased Crown land – the Crown lands minister needs to provide consent, usually through a relevant state or territory lands department.

You can demonstrate eligible interest-holders have consented to your project by getting each eligible interest holder to sign a Clean Energy Regulator eligible interest-holder consent form[9].

### Regulatory approvals

You need to ensure you have all relevant approvals, licenses or permits that are required to carry out your land management activities. Examples could include obtaining relevant planning or environmental approvals (although the need for such approvals is unusual for soil carbon projects).

### Fit and proper person assessment

You need to be recognised, and continue to be recognised, as a fit and proper person[10] for the purposes of the scheme. The fit and proper person test involves declarations about any convictions or insolvency and considers whether a person has the necessary capabilities to run a project.

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[7] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Planning-a-project/Eligibility and newness

[8] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Planning-a-project/native-title

[9] http://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-the-land-sector/eligible-interest-holder-consent

[10] http://www.cleanenergyregulator.gov.au/About/Policies-and-publications/fit-and-proper-person-posture

DEADLINES FOR CONSENT AND APPROVALS

All eligible interest-holder consents and regulatory approvals must be supplied to us before the end of your first reporting period (which is set in legislation and will be, at the latest, five years after your project start date).

Your project will be registered 'conditionally' until all consents and approvals are provided. Conditionally registered projects cannot receive carbon credits. You can remove conditions by providing consents through a project variation application (see 4.7 - *making changes to your project*).

## 1.2 Land eligibility requirements

Your land will need to meet certain eligibility requirements in order for you to run a soil carbon project on it.

Your land is **eligible** to be included in a soil carbon project if:

- it was used for pasture, cropping (which may include perennial woody horticulture such as vineyards), or bare fallow during the baseline period[11].
  - » this now includes forested land that is used for agricultural production, provided that the land management activity or activities and soil sampling can be conducted on that land.
- it is reasonably expected that soil carbon can be increased through land management activities.
- it is possible to sample the soil — e.g. you can access the area, and the area does not have large obstacles (e.g. rocky outcrops) that would prevent sampling.

Eligible land can be included in Carbon Estimation Areas (CEAs) when you undertake project mapping, meaning that you can earn carbon credits for increasing soil carbon stocks in the land by introducing a new management activity. See 1.6 - *mapping your project area* for further guidance.

Land is **ineligible** if:

- during the baseline period the land was forest land which was cleared at any point during the baseline period.
- the land is forest land or land with forest potential **and** participates in another ERF sequestration method other than a soil method.
- the land has buildings.
  - » Unless the buildings cover less than 1% or 5 hectares of the CEA (whichever is smaller). This is intended to allow construction within CEAs (e.g cattle yards) where the area covered by buildings is immaterial.

[11] For projects under the 2021 soil carbon method, the baseline period covers the five years prior to your application to register a project – see 3.3 *Determine your baseline project emissions*.

- the land was subject to clearing of forest cover or draining of a wetland, within 7 years prior to registration application.
    - this exclusion period is reduced to 5 years for properties that have changed ownership since the clearing or draining occurred.
- the land contains organosols (commonly referred to as peat soils).

Ineligible areas of land cannot be included in CEAs as you are not be eligible to earn carbon credits for increasing soil carbon stocks in those areas of land. These areas of land either need to be excluded from your project area all together or if they are included in the project area, classified as 'exclusion areas' when you undertake project mapping. There are certain circumstances which may be exempt from this requirement, see 1.6 – *mapping your project area* for further guidance.

## 1.3 Eligible management activities

When planning your soil carbon project, you will need to decide which eligible management activity or activities you will be conducting to increase soil carbon stocks in your land. You will need to conduct or maintain at least one new eligible management activity in each of your CEAs for the duration of your permanence period (See 1.4 – *Key concepts to consider* for further information about permanence periods). This requires a long-term commitment to undertake activities which maintain carbon stocks.

Activities that have ongoing impacts (such as water ponding or inversion tillage) need only be undertaken once but are considered to be continuous activities because of their ongoing impacts. Similarly, other activities such as applying lime to the land to address a material deficiency may only need to be conducted periodically (to align with seasons, for example), but are considered to be continuous activities because of their ongoing impacts.

The activities below are eligible management activities. You need to introduce one or more of the below practices that is new or materially different to what occurred in the project's baseline period. Importantly, if you are already doing one or more of these eligible activities, **you do not need to stop doing these**. You just need to add one **new** or **materially different** activity from the list, in addition to what you are already doing.

- applying nutrients to the land in the form of a synthetic or non-synthetic fertiliser (from eligible sources) to address a material deficiency.
    - for example, applying compost or manure.
- applying lime to remediate acid soils.
- applying gypsum to remediate sodic or magnesic soils.
- undertaking ***new irrigation.***
    - this involves applying new or additional irrigation obtained through improving the efficiency of on-farm infrastructure and/or management practices within your project area.
- re-establishing or rejuvenating a pasture by seeding or pasture cropping.
- re-establishing, and permanently maintaining, a pasture where there was previously no or limited pasture, such as on cropland or bare fallow.
- altering the stocking rate, duration or intensity of grazing to promote soil vegetation cover and/or improve soil health.
- retaining stubble after a crop is harvested.

- converting from intensive tillage practices to reduced or no tillage practices.
- modifying landscape or landform features to remediate land.
  - for example, practices implemented for erosion control, surface water management, drainage/flood control, or alleviating soil compaction. Practices may include controlled traffic farming, deep ripping, water ponding or other means.
- using mechanical means to add or redistribute soil through the soil profile.
  - for example, clay delving or clay spreading.
- using legume species in cropping or pasture systems.
- using cover crops to promote soil vegetation cover and/or improve soil health.

### WHY IS THERE A SET LIST OF ELIGIBLE MANAGEMENT ACTIVITIES?

The purpose of the eligible management activities is not to restrict the actions that land managers can undertake to increase soil carbon on their land, but to ensure that a new or materially different activity is introduced. This ensures that soil carbon projects are credited for activities that go beyond business as usual, which is an essential element of an offsets scheme.

In some cases, these activities may already be in wide-spread use in some parts of the country. However, the activity is still considered additional if it can be demonstrated that it is a new or materially different activity being applied to a property undertaking a soil project, and it has the ability to build soil carbon on that property.

The activities on the list have been included because there is a robust evidence base that demonstrates their ability to generate material increases in soil carbon in Australian agricultural landscapes, as a stand-alone management activity. This is important in ensuring that any carbon credits issued are additional. That is, credits are issued on the basis of carbon gains achieved through implementing the eligible management activity, rather than for carbon gains achieved through other management activities being conducted on the property or factors such as climatic variation.

When developing the 2021 soil carbon method, the agency consulted widely on additional management activities that could be included in the method, such as those included in the Food and Agriculture Organisation of the United Nations and Global Soil Partnership's *Protocol for Measurement, Monitoring, Reporting and Verification of Soil Organic Carbon in Agricultural Landscapes*[12]. The agency has included new eligible management activities and broadened existing eligible management activities where there is a robust evidence base that demonstrates the activity's potential to increase soil carbon in Australia, such as using legume species or cover crops which are new eligible management activities under the 2021 soil carbon method.

[12] http://www.fao.org/3/cb0509en/CB0509EN.pdf

You will be required to account for increases in emissions associated with the management activities you are conducting. These are referred to as ***project emissions*** and could include the carbon in lime, or emissions from diesel used to operate machinery for activities like clay delving. See 3.2 - *Determine your baseline project emissions* and 4.1 - *Calculating carbon abatement* for further information on accounting for project emissions.

### Example: A **new** land management activity

If you have already been conducting conservation tillage to remediate your soil, you would not be able to start a soil carbon project with equivalent tillage practices as your sole eligible land management activity because it would not be new or materially different.

You could, however, introduce a **new practice** that is likely to improve soil carbon.

You would do this by checking the list of eligible land management activities, and choose for example, *using cover crops to promote soil vegetation cover and/or improve soil health*. You could start a soil carbon project based on this new activity. Importantly, this doesn't prevent you from continuing previous land management activities — in this case, you could continue to conduct conservation tillage. For soil carbon projects, you need to be able to demonstrate that carbon can be stored in the soil because of your new and materially different activity.

### Example: A **materially different** land management activity

Applying nutrients to address soil deficiency is another eligible management activity under the 2021 soil carbon method.

Historically, you may have applied super phosphate fertiliser. You would not be able to start a soil carbon project with the same type or rate of fertiliser application as your sole activity, as this would not be new or materially different.

After researching and consulting with your chosen experts and advisers, you might discover that much of the phosphate applied is being locked up in forms not available to plants, inhibiting the potential for increasing soil carbon. From this advice, you decide that changing the type of fertiliser you use may result in increased soil organic matter and therefore stored soil carbon. You could start a soil carbon project by introducing this new type of fertiliser as a materially different land management activity.

## 1.4 Key concepts to consider

### Estimating soil carbon change

Soil carbon change is calculated by estimating changes in soil carbon levels (referred to as carbon stocks) achieved after project registration compared with baseline carbon stocks, taking into consideration increases in project emissions. Your baseline carbon stocks are determined after you have submitted your project registration application (See 3.1 – *Conduct baseline sampling*). Soil carbon stocks are then estimated at least once every 5 years for the duration of the project's 25-year crediting period using either the measurement only or *hybrid approach*. You earn carbon credits by increasing and maintaining your soil carbon stocks above your baseline levels, while deducting increases in project emissions. This helps ensure that credits are only issued for additional carbon sequestered in the soil as a result of your project, and that the carbon benefit of your project is not offset by increases in project emissions.

Figure 3 illustrates how net carbon abatement is calculated at the end of each reporting period. The net carbon abatement at year 5 is calculated by estimating the increase in soil carbon stocks at year 5 compared

to baseline levels and deducting increases in project emissions at year 5 compared to baseline levels (on an annualised basis). Note you may choose to calculate and report your abatement as frequently as every 12 months.

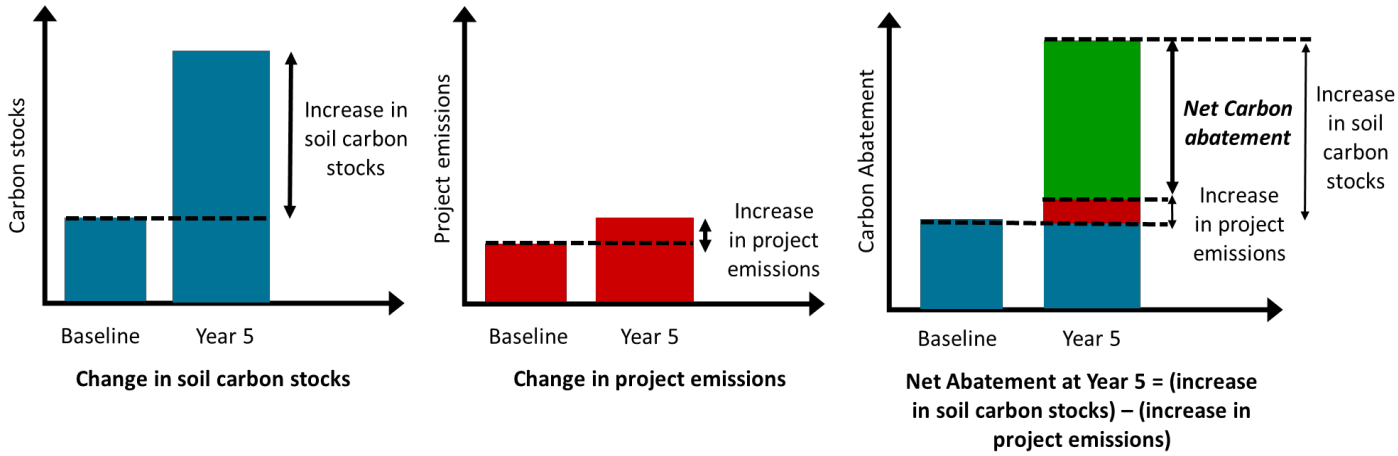


***Figure 3: Estimating soil carbon change***

## The Baseline period

For projects under the 2021 soil carbon method, the baseline period covers the five years prior to your application to register a project. The baseline period is used to benchmark the emissions you typically generate in your project area from sources including livestock and fertilisers, your typical water usage, and your business-as-usual management activities.

The purpose of benchmarking these parameters is to ensure that your soil carbon project:

- Accounts for any material increases in emissions that arise from running the project.
- Does not result in the diversion of irrigation water. Excluding water obtained through irrigation efficiency savings, projects can only increase irrigation levels in their project area within set thresholds compared to baseline levels. This is because any increases in soil carbon within your project area due to increasing irrigation levels could come at the expense of carbon losses outside of your project area due to the diversion of irrigation water from elsewhere.
- Introduces a new or materially different activity: the baseline period also allows the agency to assess whether a proposed eligible management activity is new or materially different from the activities that were conducted in the baseline period. Additionality of the activity is a key requirement of the ERF.

## The crediting period

The crediting period is the period during which you can earn carbon credits by reporting on your soil carbon project. The crediting period for soil carbon projects is 25 years and begins at the date that the project is declared as a registered ERF project. You can apply to the agency to defer the start of the crediting period by up to 18 months after the project is registered, so long as this is done before or together with the first offsets report for the project (s 69 (4-5) of the *Carbon Credits (Carbon Farming Initiative) Act 2011 (The CFI Act)*).

## The permanence period

Carbon stored in soils can be released back into the atmosphere by man-made or natural events, thereby reversing the environmental benefit of the soil sequestration project. Sequestration is regarded as having a 'permanent' benefit to the atmosphere if it is maintained for 100 years. Because of this, all sequestration projects in the ERF are subject to permanence obligations that run with the land.

When registering a soil carbon project, you can choose either a 25 or 100-year permanence period during which the carbon stored in your soils must be maintained. You may be required to return earned carbon credits if you terminate your project, stop land management activities or carbon stocks are reversed before your permanence period ends. This means that activities to maintain soil carbon stocks on your land will need to be continued even if the land is sold, unless the project is revoked and ACCUs relinquished.

The permanence period begins when your project first receives carbon credits, or from when an area of land is added to your project. The first offsets report for your project is due at the latest 6 months after the end of the first reporting period. The first reporting period can be up to a maximum of 5 years in length following your project start date. This means that for some soil carbon projects, the permanence period will not begin until at least 5 years from the project start date (after the report is assessed by the agency and carbon credits are issued). For projects that apply to defer the project start date by a maximum of 18 months, the permanence period could begin 7 years after project registration (or later if no credits are issued).

Soil carbon projects that elect a 25-year permanence period receive a 20% reduction in carbon credits issued. This is called the 'permanence period discount'.

Soil carbon projects electing either a 25-year or 100-year permanence period are also subject to the 'risk of reversal buffer', receiving a 5% reduction in carbon credits issued. The risk of reversal buffer is intended to protect the ERF against temporary losses of carbon and residual risks that cannot be managed by the other permanence arrangements.

In total, soil carbon projects electing a 25-year permanence period receive a 25% reduction in carbon credits issued, while those electing a 100-year permanence period receive a 5% reduction. These discounts are applied to the net abatement amount calculated for each reporting period. There are other additional discounts which are also applied to the net abatement amount to ensure that issued carbon credits do not overestimate stored carbon in soil carbon projects. For further information on these discounts see 4.2 – Carbon credit discounting.

Once you have nominated a permanence period, you will not be able to change it. You will need to conduct, maintain and report on at least one eligible management activity in your project for the duration of the permanence period.

Further information about permanence period obligation requirements can be found on the Clean Energy Regulator website[13] and in the below guidance documents.

- The Emissions Reduction Fund and permanence on the land[14].

[13] http://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-the-land-sector/Permanence-obligations

[14] http://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/The-Emissions-Reduction-Fund-and-permanence-on-the-land.aspx

- Identifying land subject to permanence obligations[15].

## Participation in other Government funded soil programs

The Australian Government Department is administering the following programs which may provide financial support for testing of soil carbon, trialling of new soil carbon measurement technology or trialling of management activities that increase soil carbon:

- the National Soil Carbon Data Program (Department of Industry, Science, Energy and Resources)
- the National Soil Carbon Innovation Challenge (Department of Industry, Science, Energy and Resources)
- the National Soil Monitoring and Incentives Pilot Program (the Department of Agriculture, Water and the Environment)
- the National Soil Science Challenge (the Department of Agriculture, Water and the Environment)

There may be opportunities for you to register an ERF soil carbon project as well as participating in one or more of these programs. If participating in these programs would involve undertaking activities on the same areas of land as those included in the soil carbon project, you should consider registering your soil carbon project before commencing any new management activity expected to sequester carbon in the soil. This will mean that any increases in soil carbon gained as a result of this new activity may be eligible for crediting under the ERF.

In addition, if soil carbon testing is undertaken as part of participating in one of these programs, it could be used to report your changes in soil carbon. If you register your soil carbon project during or after undertaking any new management activities through one of these programs, you will need to undertake baseline sampling and start new, additional activities after applying to register the project (in line with the usual project eligibility requirements). If you have already registered your soil carbon project and you wish to participate in any of these programs you should review the program eligibility requirements as they are made available.

## Prohibited and restricted activities

There are a number of activities which have specific restrictions or are prohibited for soil carbon projects under the ERF, such as destocking of land under pasture (unless certain circumstances are met), and clearing and thinning of woody vegetation (unless certain circumstances are met). These restrictions and prohibitions are intended to manage risks of carbon leakage[16], the crediting of non-genuine abatement and adverse impacts arising as a result of soil carbon projects. It is important to consider these restrictions and prohibitions carefully when planning your soil carbon project and think about how they interact with your broader management practices and business objectives for your land. See 3.4 – Prohibited and restricted *Activities* for further guidance on these requirements.

[15] http://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/Identifying-land-subject-to-permanence-obligations.aspx

[16] Leakage occurs when activities undertaken within the project area result in carbon losses outside of the project area, which reduces the net environmental benefit of the project.

## 1.5 Deciding on a project proponent

To run a soil carbon project, you will need to decide on a business model that is right for you and choose who the project proponent will be. The project proponent is the person or organisation legally responsible for running an ERF project. Choosing who the project proponent will be is an important business decision. For more information visit Choosing a project proponent.[17] You can be the project proponent yourself, or you can engage another person or organisation to be the proponent. You can also be the project proponent and engage an agent to act on your behalf. It's a good idea to seek professional legal and financial advice before entering into any agreement with another person or organisation to be the proponent or act on your behalf in regards to an ERF project. Further information about working with carbon service providers and aggregation under the ERF can be found on our website[18].

## 1.6 Mapping your project area

As part of your project registration application, you will need to provide us with a map identifying the boundary of your project area. Your project area is the area of land on part or all of which, your soil carbon project will be carried out. Your project area must include eligible land, but it can also include areas of ineligible land. You will be required to map your project area into CEAs, emissions accounting areas and exclusion areas (explained below) in the course of the project.

The way you choose to map different areas of your land into these categories will depend on whether areas of your land meet the eligibility requirements outlined above, and a range of other factors such as land use history and biophysical factors. You are not required to include all of the land you own in your project area.

Create your map using geographic information system (GIS) software. QGIS (free), Google Earth (free) and ArcGIS (paid) are examples of commonly used GIS tools.

### Carbon estimation areas (CEAs)

CEAs are used to define the areas within a project where the new or materially different management activities are undertaken, and abatement is estimated. You may decide which areas of your project will be included in CEAs, and how many CEAs your project will have. The size and boundaries of CEAs are typically chosen according to their land use prior to commencing the project, biophysical characteristics of the land, and the management activities that will be undertaken as part of the project.

A similar sampling depth (of at least 30cm) should be achievable across a CEA. If sampling deeper than 30cm is not likely to be possible, these areas should be stratified into separate CEAs to minimise the impacts of shallow soils on crediting.

The 2021 method permits CEAs across non-contiguous project areas. This means that CEAs can span across breaks in project areas (e.g. roads, easements, pipelines, neighbouring properties, and any other non-project areas), provided every area of a CEA has the same landholder(s). This may also be desirable where different management practices are applied across alternating areas of land in a project area, for example, where differing land management practices are applied to the under-canopy zone and mid-row zone of permanent alley crops. The furthest boundaries of non-contiguous areas must not exceed 10 kilometres in distance from

[17] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Planning-a-project/choosing-a-project-proponent-for-landholders

[18] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Planning-a-project/Aggregation-under-the-Emissions-Reduction-Fund

each other within a single CEA. This is to reduce the impact of variance due to differences in soil type and management actions on crediting.

### Emissions accounting areas

Any land within the project area that is not part of a CEA but is used for agricultural production such as pasture, cropping or horticulture must be included in the **emissions accounting area**. You may decide to include some areas in emissions accounting areas rather than a CEA for a range of reasons including that parts of the land cannot be sampled (due to shallow bedrock or excessively rocky land) or the land management activity does not meet the newness or additionality requirements for that area (see 1.3 – *Eligible management activities*).

Project management actions to build soil carbon could affect emissions from sources including livestock, tillage, synthetic fertiliser, and lime application. These are known as project emissions. Changes in these emissions in CEAs and emissions accounting areas compared with baseline levels must be included in the net abatement calculations.

### Exclusion areas

Areas of land within your project area that do not meet the land eligibility requirements (i.e. are not used for agricultural production) and will not contribute towards abatement should be mapped as **exclusion areas.** Exclusion areas should include buildings, dams, roads and other farm infrastructure. Emissions do not need to be accounted for in exclusion areas.

For simplicity of mapping, ineligible land that contains buildings may remain within a CEA where the footprint is considered immaterial compared to the size of the CEA (either 1% or 5 hectares of the CEA, whichever is smaller). The agency may also determine that other types of ineligible land may remain in a CEA if the agency has consulted with the project proponent, and determines that the mapping of the CEA would be appropriate given the circumstances and would not result in the crediting of non-genuine abatement.

### Project mapping example

Figure 4 provides an illustrative example of how you may go about mapping your project area into CEAs, emissions accounting areas and exclusion areas. The Carbon Farming Initiative Mapping Guidelines[19] also contain further mapping instructions and illustrative examples.

[19] https://www.industry.gov.au/data-and-publications/carbon-farming-initiative-cfi-mapping-guidelines

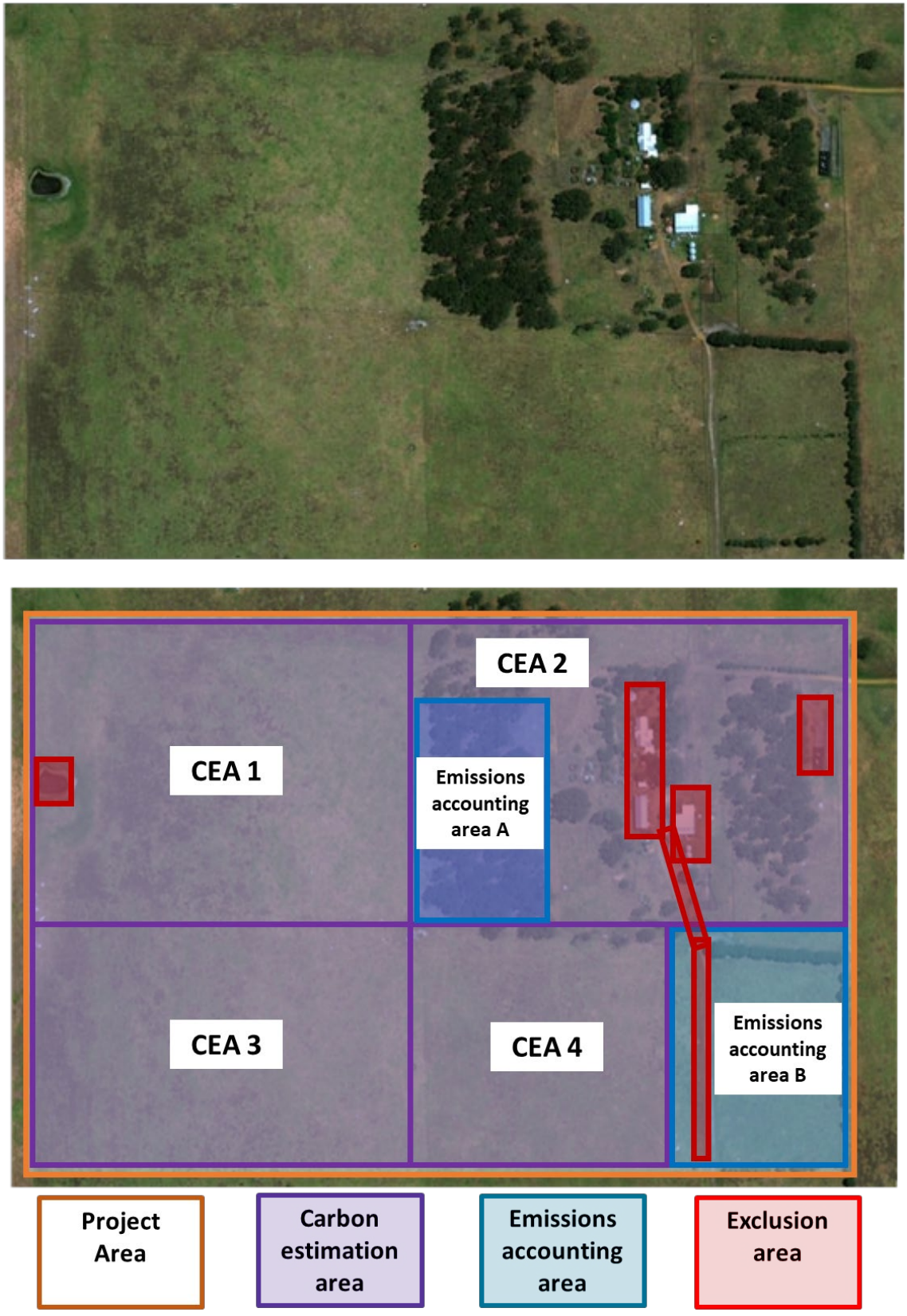


*Figure 4: Illustrative example of project area mapping*

Table 2: Details of example project

| Area | Description |
|---|---|
| **Project area** | The external orange perimeter is the project area in this example. |
| **CEA1, CEA2, CEA3, CEA4** | The boundaries of the CEAs have been determined by the proponent according to land use and soil types. In this example, they have been chosen to align with the paddocks. |
| **Emissions accounting area A** | In this example, the proponent determined that the densely forested area of land would be too difficult to sample, however this land is still grazed. As this part of the project area is still used for agricultural production, it must be mapped as an emissions accounting area. Any project emissions generated in this area must be accounted for. |
| **Emissions accounting area B** | This area may not be eligible land as the eligible management activity being introduced into the CEAs was already being conducted in this area during the baseline period. As this part of the project area is used for agricultural production, it must be mapped as an emissions accounting area. Any project emissions generated in this area must be accounted for. |
| **Exclusion areas** | These areas are not used for agricultural production and do not meet the land eligibility requirements. They include roads, sheds, dams, and other farm infrastructure. |

## 1.7 Prepare a land management strategy

You will need to work with an advisor to prepare and provide us with a land management strategy for your application to register a project. A land management strategy is a document which takes a whole-of-system approach to considering the soil carbon sequestration potential of a project. The intention of the land management strategy is to manage expectations of what activities may influence soil carbon on your land and the quantum of abatement that may be achievable.

The requirements of the land management strategy encourage landholders to consider how to achieve soil carbon outcomes in a way that complements broader business objectives. This ensures that interactions between changing land management activities, climate, environment and whole-of-system outcomes are considered.

More information about how to prepare a land management strategy can be found in the soil carbon land management strategy guidance.[20]

[20] http://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/Guidance-for-meeting-the-requirements-of-soil-carbon-land-management-strategies.aspx

The strategy needs to:

- Demonstrate that the new or materially different land management activity/activities comply with the requirements of the method.
- Demonstrate that at least one new or materially different activity will be carried out or maintained on all land included in a CEA until the end of the permanence period.
- Consider how other activities being conducted in the project area and environmental factors may limit increases in soil carbon and present risks to maintaining it, for example:
    - Acidic soil may limit the likelihood of soil carbon increases.
    - Future drought may be a risk to maintaining soil carbon stocks.
- Include a statement confirming that activities which are excluded by **s 11** or are in breach of restrictions in **s 12** of the 2021 soil carbon method will not be conducted.
- Include a statement confirming whether you intend to use biochar or products containing human effluent in your project (as use of these products may have associated work, health and safety risks).
- Describe your monitoring and record keeping procedures.
- Be prepared or reviewed by a person who has knowledge of agronomy and plant nutrition, experience in the provision of agricultural production advice and a good understanding of the influence of agricultural management on soil carbon (e.g. an agronomist or natural resource management officer).
    - » The requirement that land management strategies are prepared or reviewed by a financially independent person has been removed in the 2021 soil carbon method to provide greater flexibility for participants and facilitate cost savings. The requirements that the person has relevant knowledge and experience maintain the method's integrity.
    - » The same person cannot prepare or review the land management strategy and conduct soil sampling.
- Be signed by yourself and each relevant landholder.

Elements of a land management strategy could be used across multiple projects, provided that project specific information is included where appropriate. The land management strategy can also be used to provide the agency with an explanation of actions participants have taken or will take (or will ensure that landholders take) to protect the carbon sequestered and credited by the project for the permanence period as required by s13(1)(p) of the *Carbon Credits (Carbon Farming Initiative) Rule 2015* (the CFI Rule) as part of project registration applications, and s(70)(4A) of the CFI Rule as part of the offsets reports in years 8 and 24 of the project. Preparing and submitting a land management strategy supersedes the requirement to submit a separate permanence plan.

## 1.8 Estimating project returns and costs

### Estimating project returns

The amount of carbon credits earned over a 25-year crediting period will depend on the size, activity, soil type, weather, existing soil carbon stocks and the geographic location of your project. The agency runs regular auctions to buy carbon credits from projects. By bidding at an auction you can secure a contract to

sell carbon credits to the Australian Government — see our website[21] for more information on what it is to enter into a contract with us to sell carbon credits if you are successful at an auction. There are two types of contracts available through an auction:

- **Fixed**: you are required to sell the nominated number of carbon credits at the bid price over the duration of the contract.
- **Optional**: you have the choice to sell up to the nominated number of carbon credits at the bid price over the duration of the contract.

Selling carbon credits to us is not your only option. You can also sell carbon credits on the 'secondary market' to other parties that hold a contract with us or to private companies or state governments looking to offset their emissions.

The Landscape Options and Opportunities for Carbon abatement Calculator (LOOC-C)[22] developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) provides estimates of the potential soil carbon increases you may be able to achieve based on your project size and land condition. Note that estimates provided through LOOC-C are for illustrative purposes only and may differ from actual project outcomes.

Information on carbon credit prices can be found in our Quarterly Carbon Market Report[23].

## Estimating project costs

There are operating (including monitoring and record-keeping), sampling, reporting and audit costs when running a soil carbon project. If you are using the *hybrid approach*, there will also be costs associated with modelling, but sampling costs are likely to be lower.

**Operating costs** will depend on management activities used, for example:

- buying/applying fertiliser.
- installing irrigation.
- putting up fencing to manage grazing.

If you choose to use the *hybrid approach* to measuring and estimating soil carbon change, you will also need to factor in any costs associated with using a model.

You should also factor in time needed for monitoring and record-keeping.

**Sampling costs** include engaging a soil technician to take soil samples and laboratory analysis fees. If you are following a *measurement only approach*, you need to sample each CEA at least once every 5 years. If you are following a *hybrid approach*, you need to sample each CEA at least once every 10 years.

[21] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Step-2-Contracts-and-auctions/understanding-carbon-abatement-contracts

[22] https://looc-c.farm/introduction

[23] http://www.cleanenergyregulator.gov.au/csf/market-information/Pages/quarterly-Market-report.aspx

**Preparing project reports** may have costs, particularly if you hire assistance (e.g. carbon service providers).

You will need to report at least once every 5 years.

You need to **engage an auditor** to prepare an audit report.

- At least 3 audits are required over the 25-year crediting period.
- The first audit is due with your first project report.

# Step 2: Register your soil carbon project

## 2.1 Registration requirements

You have to register your project with us before you start any project activities. You can apply to register your project online at our register your project page[24].

Some of the information you will be required to provide in order to register your soil carbon project includes:

- details about the project proponent, including a description of the skills and expertise they intend to use to carry out the soil carbon project in a manner consistent with the requirements of the method.
- geographic information about the project including its location and details of any applicable natural resource management plans.
- all eligible interest holder consents.
  - » alternatively, these can be provided up to the end of the first reporting period (the project will be conditionally registered until these are provided).
- details of any regulatory approvals granted as provided by relevant state, territory and commonwealth government entities.
- a geospatial map that identifies the project area and meets the requirements of the CFI mapping guidelines[25].
- a description of the land management activities conducted on your land during the 5-year baseline period.
- evidence that all land you intend to include in a CEA is eligible land.

[24] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Step-1-Apply
[25] https://www.industry.gov.au/data-and-publications/carbon-farming-initiative-cfi-mapping-guidelines

- if you would like to undertake your baseline sampling prior to your project being registered as an eligible offsets project, your baseline sampling plan (for further information see 3.1 – *Conduct baseline sampling*).
- a land management strategy.
- a forward abatement estimate for the project (how much carbon abatement in ACCUs you expect your project will deliver. See 2.2 – *Calculating a forward abatement estimate*).

We will assess your registration application as quickly as possible and within the statutory timeframe (90 days), unless further information is required. The agency is making enhancements to our systems so that in the future we will be able to assess your application within 45 days if all the required information is provided.

## 2.2 Calculating a forward abatement estimate

You need to provide us with a forward abatement estimate. This is your best estimate of the number of carbon credits likely to be earned during the 25-year crediting period. This information is used to determine an audit schedule for your project. Each project will require at least 3 audits.

## 2.3 Transferring projects

The 2021 soil carbon method allows for projects registered under the 2014, 2015 and 2018 soil carbon methods to transfer to the 2021 soil carbon method. Several provisions have been included in the 2021 soil carbon method to facilitate this.

- For projects transferring from the 2014 soil carbon method, the 2021 soil carbon method provides project proponents with the flexibility to alter CEAs by aggregating small 2014-style CEAs to form the strata of larger 2021-style CEAs.
- Projects transferring from the 2015 soil carbon method will be required to conduct baseline sampling once transferred to the 2021 soil carbon method.
- Projects transferring from the 2018 soil carbon method that have not been able to claim credits for a reporting period due to calculation errors in the 2018 soil carbon method will be able to claim these credits in their first offsets report under the 2021 soil carbon method.
    - » If such a project has already undertaken sampling for that reporting period under the 2018 soil carbon method, the 2021 soil carbon method allows these sampled results to be used in the project's first offsets report under the 2021 soil carbon method, in order to claim carbon credits.
    - » In accordance with section 68A of the *Carbon Credits (Carbon Farming Initiative) Rule 2015* (the CFI Rule), this report is referred to as a ***transitional offsets report***, and may be submitted after 1 month of such a project transferring to the 2021 soil carbon method from the 2018 soil carbon method. This allows project proponents to apply for credits they would have received under the 2018 soil carbon method as early as a month after transferring to the 2021 soil carbon method, rather than waiting for 6 months as generally required by the CFI Rule.
- As the 2021 soil carbon method incorporates the measurement only approach of the 2018 soil carbon method, the 2018 soil carbon method has been revoked. This means that new projects are no longer able to register under the 2018 soil carbon method.

The agency has developed guidance to support ERF projects impacted by the revocation of an ERF method for the land sector. This guidance clarifies administrative processes and options for these projects and includes guidance on transferring from previous soil carbon methods to the 2021 soil carbon method.

# Step 3: Delivering your soil carbon project

## 3.1 Conduct baseline sampling

Baseline soil sampling is required to estimate initial soil carbon levels under the *measurement only approach*, or to calculate a model-assisted estimate under *the hybrid approach*. This involves mapping your project area and creating a sampling plan, extracting your soil samples, and sending the samples for laboratory analysis. You will need to undertake baseline sampling in both the *measurement only* and *hybrid approaches* before you first report to us.

You may be eligible to receive a 5000AUD advance payment for ACCUs to assist in meeting the costs of baseline sampling if you have an ERF contract with the agency. See our website for more information.

### Develop a sampling plan

A sampling plan details where and how you plan to sample. It must include a geospatial map which details your CEAs, exclusion areas, emissions accounting areas and strata (defined below), as well as your proposed process for randomly allocating sampling locations. More information on sampling can be found in our soil carbon sampling guidance[26].

For the purposes of sampling, each CEA is required to be divided into three or more strata (*strata* meaning subdivisions of a CEA). At least 3 samples must be taken in each strata. The total number of samples you should take each sampling round will depend on how variable the soil and management activities are across your project and your willingness to pay for additional samples. You will need to take at least 9 samples for each CEA in each sampling round. Note that your project may have multiple CEAs.

### Baseline sampling timing

- Baseline sampling may be conducted once you have submitted your project registration application to the agency, provided us with your baseline sampling plan, and we have acknowledged receipt of your baseline sampling plan.
    - » Note that there may be risks involved with conducting baseline sampling prior to your project registration application being assessed, such as the land you have sampled being found to be ineligible land. Changes to the borders of strata boundaries, for example, would necessitate resampling. These risks will need to be borne by the project proponent.
- For projects using a *hybrid approach*, baseline sampling is required but if the *model-assisted* approach is used, baseline sampling will also need to align with the timing requirements for submitting modelled estimates under the *hybrid approach*.

[26] http://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/Sampling-guidance-for-measurement-based-soil-carbon-methods.aspx

## Extracting soil samples

You will need to engage an independent expert to sample your soil. This person must:

- have experience in the collection of soil samples.
- have a good understanding of sampling requirements.
- not have a financial interest in the project (besides being paid to undertake the sampling).
- not have prepared the land management strategy.

**The measurement only approach**

All cores need to be extracted within 60 days of the beginning of the sampling round to ensure that the samples are collected under similar circumstances. You will need to apply for an extension with the agency in exceptional circumstances and provide an explanation as to why the extension is required (for example, poor weather conditions or damaged equipment). The time between each sampling round must be at least one year, but no longer than 5 years.

**The hybrid approach**

All cores need to be extracted within 120 days of the beginning of the sampling round as participants may wish to undertake sampling to both calibrate a model and then do subsequent sampling to apply a model-assisted estimate. The calibration sampling needs to occur prior to validation sampling. You will need to apply for an extension with the agency in exceptional circumstances and provide an explanation as to why the extension is required (for example, poor weather conditions or damaged equipment). The time between each sampling round must be at least one year, but no longer than 10 years for individual CEAs.

## Laboratory soil analysis

The bulk density of soil samples must be determined to determine the mass of soil in each layer. There are 2 methods you can use to analyse the organic carbon content for this mass:

- **Dry combustion analysis**: heating a small sub-sample of dry soil at a very high temperature (around 1,000°C) to convert the organic carbon to carbon dioxide and measuring the result. The analysis must be undertaken by a laboratory that is certified for organic carbon analysis by the Australasian Soil and Plant Analysis Council (ASPAC). The method used to analyse the organic carbon content must be a dry combustion approach that has been accredited, for that laboratory, by the National Association of Testing Authorities (NATA). You can find ASPAC certified laboratories at Australasian Soil and Plant Analysis Council and NATA accredited laboratories at NATA Find Accredited Facilities.
- **Spectroscopic modelling**: uses visible and infrared measurements of soil carbon. To train the spectroscopic model, some of your soil samples will need to be sent to a laboratory as per the above paragraph to undergo dry combustion analysis. This spectroscopic model is different to the model or models used under the *hybrid approach*. Spectroscopy is used to estimate the carbon content of individual soil samples, whereas the *hybrid approach* applies models to the estimation of the carbon content of a CEA.

MAPPING AND SAMPLING GUIDANCE

More detailed guidance on mapping and sampling can be found in the:

- Carbon Farming Initiative Mapping Guidelines[27]
- Soil carbon method supplement[28], and
- Clean Energy Regulator soil sampling guidance[29].

## 3.2 Determine your baseline project emissions

Project management actions to build soil carbon could affect emissions from sources including livestock, tillage, synthetic fertiliser, and lime application. These are known as project emissions. Changes in these emissions, relative to baseline levels, must be included in the net abatement calculations.

Baseline project emissions are generally calculated using your farm's records. The method allows for alternative estimation techniques for livestock emissions as specified in the Supplement if you have less than 5 years of stock records, as livestock emissions may make up a significant portion of the total emissions.

In addition, if you have less than five years of records, evidence may be provided in order to account for baseline emissions from:

- synthetic fertilisers
- crop and pasture residues
- tillage
- soil modification
- irrigation fuel use
- lime carbonate emissions

This evidence may be supplied in the form of receipts, tax invoices or other farm management records. Where historic data, alternative estimation techniques or evidence are unavailable baseline emissions sources are assumed to be zero. This means that all project emissions will need to be deducted in net abatement calculations.

## 3.3 Carry out eligible management activity

Once you have undertaken baseline sampling, you can begin carrying out your new or materially different management activity or activities. Note that the 2021 soil carbon method allows you to commence your management activity or activities once your project has been registered but prior to baseline sampling,

[27] https://www.industry.gov.au/funding-and-incentives/emissions-reduction-fund

[28] https://www.industry.gov.au/regulations-and-standards/methods-for-the-emissions-reduction-fund/measurement-of-soil-carbon-sequestration-in-agricultural-systems-method

[29] http://www.cleanenergyregulator.gov.au/DocumentAssets/Pages/Sampling-guidance-for-measurement-based-soil-carbon-methods.aspx

provided it does not disturb the soil. However, if you commence your management activity prior to baseline sampling, you will not be credited for any increases in soil carbon prior to baseline sampling. You will need to continue carrying out your nominated management activity/activities for the full duration of the permanence period of your soil carbon project. Note that if your management activities change materially from those outlined in your initial land management strategy, you will need to provide us with a revised land management strategy.

## 3.4 Prohibited and restricted activities

Throughout your permanence period, you will need to comply with the prohibited and restricted activities requirements set out in the method.

### Prohibited activities

The following activities are prohibited during the permanence period of a soil carbon project under the 2021 soil carbon method. This is intended to manage risks of leakage and adverse impacts and ensure that soil carbon levels are maintained.

- Destocking of land that was pasture unless the land is either converted to a cropping system, within a drought affected region, or where exceptional circumstances exist (for example, a disease outbreak among livestock).
- Applying pyrolysised material that is not biochar.
- After the baseline sampling round, land management activities must not disturb the soil any deeper than the baseline nominated soil depth.
- For hypersulfidic materials, lime must not be applied, and land management activities must not be conducted that would result in drainage or physical disturbance.

### Restricted activities

The following activities have restrictions during the permanence period of a soil carbon project under the 2021 soil carbon method.

- Because CEAs with forest cover are now permitted to be included in soil carbon projects, restrictions on clearing and thinning have been introduced to ensure that the 2021 soil carbon method does not incentivise projects to carry out clearing and thinning activities which would result in a material decrease in carbon stored in vegetation.
    - » Woody vegetation may only be cleared if clearing is undertaken in accordance with any applicable regional natural resource management plan and Commonwealth, state, territory or local government environmental and planning laws, and at least one of the following apply:
        - › the clearing is to manage woody horticulture crop, as part of standard business operations.
        - › the clearing is required to manage woody horticulture crop, following a natural disturbance.
        - › the clearing is to manage growth of a known weed species as defined in the Carbon Farming Initiative Regulations.
        - › the clearing is required to reduce the risk of fire.
        - › the land was not forest cover in the 5 years prior to registration application.

- Thinning is only permitted if one of the following apply:
  - the thinning is to the extent necessary to comply with Commonwealth, State, Territory or local government environmental and planning laws.
  - the biomass resulting from thinning is to be used as firewood for personal use (and carbon stock is not reduced by more than 5% compared with what it would have been if the biomass was not thinned).
  - the thinning is in accordance with traditional indigenous practices or native title rights.
  - the thinning is to manage woody horticulture crop, as part of standard business operations (or following a natural disturbance).
  - the thinning is to manage growth of a known weed species as defined in the CFI Regulations.
  - the thinning is required to reduce the risk of fire.
  - the land was not forest cover in the 5 years prior to registration application.

- Land management activities may involve the addition or redistribution of soil using mechanical means only if:
  - any soil is sourced from CEAs in your project.
  - baseline sampling is undertaken at a depth greater than the depth at which soil is added or redistributed.
  - land where soil is sourced from is remediated as soon as practical.
- Soil amendments containing biochar may be added to a CEA only if:
  - the biochar was sourced or created from CEAs in your project or organic matter that previously formed part of a designated waste stream[30].
    - if the biochar is not sourced or created from CEAs in your project or organic matter that previously formed part of a designated waste stream, the biochar may be applied only if:
      - it is applied at a rate lower than 100kg of carbon per hectare per year.
  - the biochar is used in accordance with the laws and regulations of the relevant State, territory of local government.
  - the carbon content of all biochar use is deducted from crediting.
- Soil amendments containing coal may be added to a CEA if:
  - applied at a rate lower than 100kg of carbon per hectare per year.
- Restricted non-synthetic fertilisers (non-synthetic fertilisers that are not sourced from CEAs or a designated waste stream) may be added to a CEA if:
  - applied at a rate lower than 100kg of carbon per hectare per year.
- The new materiality thresholds for biochar, soil amendments containing coal and restricted non-synthetic fertilisers are in recognition that commonly used agricultural products often contain small

[30] The designated waste streams include intensive animal production, food processing, manufacturing, sawmill residue and municipal and commercial waste collection processes.

quantities of soil additives containing coal and restricted non-synthetic fertiliser from unknown sources. The thresholds for application in the 2021 method ensure that only immaterial amounts of these restricted products are used and are not intended to incentivise material use of restricted products.

- Irrigation may be applied to CEAs if:
  - » the annual level of irrigation for the project area or the CEAs within the project area is not more than 20% greater than the highest annual level in the baseline period.
  - » the 5-yearly total level for irrigation of CEAs within the project area is not more than 20% greater than the total level of irrigation in the baseline period.
  - » irrigation efficiency savings made after registration are not included in the above.

# Step 4: Reporting and crediting

## 4.1 Calculating carbon abatement

The way you calculate the changes in your carbon stocks compared to baseline levels and determine how many carbon credits you are eligible for will depend on whether you choose to follow the *measurement only approach* or the *hybrid approach* to measuring and estimating soil carbon changes. The different approaches are detailed in Appendix 1: Reporting and crediting using a *measurement only approach* and Appendix 2: Reporting and crediting using a *hybrid approach*.

## 4.2 Carbon credit discounting

Three discounts apply to soil carbon projects to ensure issued carbon credits do not overestimate stored carbon. They each aim to address a different risk associated with crediting changes in soil carbon and are applied either at the point of calculating the change in carbon stock or at the point of calculating the credits to be issued based on that change. These discounts will reduce the number of carbon credits issued compared to your calculated carbon stored. These discounts apply to both Schedule 1 and Schedule 2 projects.

- **Permanence discounts** (which include the permanence period discount and the risk of reversal buffer) cause a 5% (100-year permanence) or 25% (25-year permanence) reduction in carbon credits issued. This means that for every 100 carbon credits you would earn, only 95 or 75 carbon credits will be issued respectively.
  - » This is a legislative requirement that reflects the risk of losing stored carbon that cannot be recovered. This applies to all carbon credits earned during any ERF sequestration project.
- There is a **discount for reporting highly variable differences in soil carbon stocks within strata**. Soil carbon stocks are likely to be variable across agricultural land and over time, regardless of any project activities. The method applies a statistical approach for adjusting estimates of soil carbon change for the possibility that observed changes are the result of sampling variance (statistical noise) rather than management actions. This is called the 'specified probability of exceedance' discount and is set at 60%.
  - » This can mean that small changes in soil carbon may not result in credits if the soil carbon changes are highly inconsistent within sampled areas. The more consistent the increase in soil carbon is across samples, the lower the discount. The size of this discount can be reduced

through optimally subdividing the CEA into areas with similar characteristics such as soil types, baseline carbon concentrations and management activities applied. Under the hybrid approach, models can also reduce the discount where the modelled point estimates accurately reflect the variance within areas.

- **Temporarily withheld credits:** If claiming credits after only undertaking two sampling rounds (including your baseline sampling round), 25% of the resulting credits (after the probability of exceedance approach and permanence discounts are applied) will be withheld until three sampling rounds have been reported (including the baseline sampling round).
    - » With only two sampling rounds, it is not possible to determine whether a change in soil organic carbon stocks is due to management or some other factor, such as climatic variability. As a consequence, it is not possible to determine whether that increase in soil organic carbon stocks is able to be maintained over time. To avoid credits having to be returned if gains are not maintained, these credits are "banked" temporarily. You will receive the credits if you continue to record increases in soil carbon above your baseline stocks. ACCUs may need to be relinquished if the carbon is not made up over the crediting period.
    - » This is a change from the 2018 soil carbon method, which applied a discount of 50% of the resulting credits if claiming credits after only undertaking two sampling rounds (including the baseline sampling round). Analysis of a range of alternative discounting arrangements concluded that a 25% discount does not materially increase the risk of over-crediting at the portfolio level by the end of the crediting period, and achieves a better balance between managing the risk of over-issuing credits for individual projects (which may need to be repaid) and allowing credits to be issued after the first reporting period.

See Appendix 3 for a simplified example of how each of these discounts are applied when calculating the net abatement of a soil carbon project.

## 4.3 Offsets reports

An offsets report is the document (plus supporting information) that you provide to us each time you report on your project. It details your project's progress, including the net abatement amount. You can claim carbon credits each time you submit an offsets report, provided that you are reporting an increase in soil carbon which also takes into account any increases in project emissions. The offsets report requirements for projects using a *measurement only approach* are included in Appendix 1: Offsets reports requirements for projects using a *measurement only approach*. The offsets report requirements for projects using a *hybrid approach* are included in Appendix 2: Offsets reports requirements for projects using a *hybrid approach*.

You can submit your offsets report through the Clean Energy Regulator Client Portal[31]. To be issued carbon credits, you will need to set up an Australian National Registry of Emissions Units (ANREU) account[32].

We will assess your offsets report within 90 days, unless further information is required. If we assess everything to be in order, we will issue your carbon credits into your ANREU account. The agency is developing new systems and approaches to reduce the time taken to assess crediting applications. In the future we aim to assess applications within 45 days.

[31] http://www.cleanenergyregulator.gov.au/OSR/CP

[32] http://www.cleanenergyregulator.gov.au/OSR/ANREU/Opening-an-ANREU-account

### Reporting frequency

You will need to submit an offsets report at the end of each of your project's reporting periods. You can choose the length for each of your reporting periods, which for soil carbon projects can be between one and five years. Longer reporting periods allow more time for soil carbon to build up and can reduce the costs associated with measuring or modelling the soil carbon change. On the other hand, shorter reporting periods allow for earlier crediting and may assist with cashflow to undertake the project activities.

You should provide an offsets report no later than six months after the end date of each reporting period. The first reporting period begins when your crediting period starts (you can postpone this by up to 18 months after registration—Section 4.6 Making changes to your project). The next reporting period begins right after the previous one ends.

Offsets reports must include all carbon stock estimates available for the project. Appendix 4: Key offsets report requirements for projects under the 2021 soil carbon method includes some of the other key requirements for offset reports.

## 4.4 Notification requirements

There are some important changes that you need to tell us about. You will need to notify us if your project changes, for example, if the person running the project changes. Appendix 6: Notification requirements lists the events which require you to notify us, and how long you have to notify us.

## 4.5 Audit requirements

Your project needs to be audited to align with our legislative requirements. The number of audits required over the 25-year crediting period will depend on the project size and the forward abatement estimate. Most soil carbon projects will require 3 audits, including one with the first offsets report.

Each audit report is submitted at the same time you apply for carbon credits. We will provide you with an audit schedule when your project is registered. It will tell you which of your offsets reports will need to include an audit. For example: '*Audit 2: First project report submitted after 25/07/2024*'.

We recommend that you engage an auditor early when developing your project, as this will help you work out your auditing costs. You can find a list of registered auditors[33] on our website.

## 4.6 Making changes to your project

You can make changes to your project to adjust for changing circumstances. For example, you may wish to add new areas of land to your project or change the person responsible for running the project. See Appendix 7: Project variations for relevant considerations to making changes to a project.

To make changes (variations) to your project, you will need to complete a Project Variation form, located in the Clean Energy Regulator Client Portal[34]. See making Changes to your project[35] for a summary of allowed changes and information requirements.

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[33] http://www.cleanenergyregulator.gov.au/Infohub/Audits/register-of-auditors

[34] http://www.cleanenergyregulator.gov.au/

[35] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Making-changes-to-your-project

# Getting started

**Ready to start a soil carbon project?**

- Visit our website[36] for links to the soil carbon method, the supplement, the soil carbon sampling guidance, the soil carbon land management strategy guidance and other useful resources, or contact us via email at enquiries@cer.gov.au or via phone on 1300 553 542.
- Check for eligible and suitable land, see if there is a new or materially different activity you can do to increase soil carbon and begin planning project registration.
- Carbon service providers (also known as project developers, aggregators, consultants or agents) specialise in supporting or running carbon projects. They may be able to help establish, model and report on your project. You can contact a carbon service provider using the Carbon Market Institute's Australian Carbon Market Directory[37].

# Disclaimer

This document provides general guidance on using the 2021 soil carbon method. It does not replace or supersede any legal requirements, address all applicable legal requirements or recommend any investment.

Figures are indicative and are not necessarily applicable to individual circumstances.

ERF projects involve ongoing legal obligations and returns can vary. You are encouraged to carefully consider if a project is right for you and seek independent professional support relating to your unique circumstances.

[36] http://www.cleanenergyregulator.gov.au/ERF/Pages/Choosing%20a%20project%20type/Opportunities%20for%20the%20land%20sector/Agricultural%20methods/The-measurement-of-soil-carbon-sequestration-in-agricultural-systems-method.aspx

[37] https://marketplace.carbonmarketinstitute.org/market-directory/

# Appendix 1: Step 4 - Reporting and crediting using a measurement only approach

## Subsequent soil sampling to facilitate the estimation and detection of soil carbon change

After implementing your land management activities, you need to sample each of your CEAs within one to 5 years of your baseline sampling round, and then at least once every 5 years thereafter. The steps in subsequent sampling rounds are similar to those required in the baseline sampling round.

1. Create a sampling plan and determine your sampling locations.
2. Engage a soil technician to extract soil samples.
3. Conduct laboratory analysis (with or without spectroscopy) of the soil to determine soil carbon stocks (spectroscopy requires some but not all samples to be validated in a lab).

### Soil Sampling

Soil sampling allows you to measure your project soil carbon stocks. Soil sampling is used in both the *measurement only approach* to measure soil carbon stocks and in the *hybrid approach* to validate the model used to estimate soil carbon stocks.

Each sampling round involves taking samples of soil from your project area in accordance with an approved process for random allocation and analysing them. This is usually done with a soil sampling machine that pushes coring tubes into the ground and extracts a soil core. Samples must be taken to a depth of at least 30cm. You will need to engage a soil technician to assist with the sampling, and the soil cores must be analysed by an accredited laboratory.

OTHER BENEFITS OF SAMPLING

Your soil analysis can provide information about your soil's nutrient deficiencies and acidity, in addition to soil carbon data. This data can be useful for improving your property's soil management. You may need to pay extra for this additional analysis on your samples.

## Calculating carbon abatement

Calculate the change in carbon stocks compared with the baseline (known as the **net abatement amount**) to determine how many carbon credits you will receive after you report. The equations to calculate the net abatement are in Part 4 of the 2021 soil carbon method.

The equations:

- calculate the increase or decrease from baseline soil carbon stocks to current soil carbon stocks, and

- calculate the difference in annualised average project emissions (fuel use, fertiliser and lime application, residue, tillage and livestock emissions) between the reporting period and the baseline period. This quantity captures increases in project emissions since the project started. For example, if more fuel is used for the project compared to the baseline period, project emissions will increase and overall abatement (the number of ACCUs credited) will be reduced.

The net abatement amount is the change in soil carbon minus:

- previous crediting for soil carbon increases.
- increases in project emissions.
- carbon additions from biochar.
- the carbon content of any non-synthetic fertiliser applied within the previous 2 years of sampling.

# Appendix 2: Step 4 - reporting and crediting using a hybrid approach

## Overview of the hybrid approach

The *hybrid approach* under Schedule 2 utilises a 'measure-model-measure' approach, requiring estimation of carbon stocks at intervals of 1 to 5 years—but sampling is only required every 10 years for individual CEAs. Compared to the *measurement only approach* in Appendix 1, it introduces new ways of estimating soil carbon stocks for points in time (estimation events) using models, allowing participants to:

- Use models **with** soil core samples (*model-assisted estimates*) to reduce the sampling density required to obtain precise estimates of soil carbon
- Use models **without** soil core samples (*model-only estimates*) in a proportion of CEAs by applying the model bias and precision observed in the sampled CEAs to the unsampled CEAs. This requires sampling of at least the number of CEAs that represent 10% of the area in the validation group and the number of CEAs that allows 18 points of validation (sample sites) over at least 6 sampling strata every 10 years in every CEA (and every 5 years in 50% of CEAs in the validation group), to enable crediting to take into account the uncertainty of modelled carbon stock estimates in all CEAs over time.

The *hybrid approach* also replicates the measurement-only approach of Schedule 1 (referred to as the measurement-based approach and *measurement-based estimates* under Schedule 2) to allow fall-back to a measurement-based approach within Schedule 2.

The benefits of the *hybrid approach* are to:

- Reduce minimum sampling frequency to every 10 years for individual CEAs when using models while enabling crediting as frequently as annually for all CEAs depending on how often scheme participants choose to report to earn credits.
- Reduce the number of samples per project that are necessary to confidently estimate soil carbon stocks when using models.
- Allow emerging or alternative technologies to be used to collect data to develop and calibrate the models.

## The role of models

- Projects may estimate carbon stocks of CEAs using models for points in time that correspond with the timing of sampling rounds (these are known as estimation events).
- There are no restrictions on the types of models that participants may use, provided the models are spatially explicit i.e. they provide multiple estimates of carbon stocks in every strata within the CEA. For example:
  - » Models could be based on empirical or statistical relationships between spatial variables (topographic variables, yield and groundcover data, survey data) and measured carbon stocks.
  - » Mechanistic models could be used (such as APSIM, FullCAM, Daycent, CENTURY, RothC etc.). These are built around the key structures and processes thought to be important in the system being modelled. For example, a mechanistic model of soil carbon may model decomposition of plant residues (based on groundcover and farmyard manure additions etc.) into pools of soil organic

matter and carbon dioxide with inputs related to temperature, moisture and clay content of the soil. These must be applied spatially (i.e. result in multiple predictions within each sampling strata).

  - » Models could also be a combination of empirical and mechanistic models.
  - » Models that only provide carbon concentration estimations will need to convert carbon concentrations to carbon stocks. This could be done using measured soil mass or soil mass estimates from other models.

- Estimation of change between modelled results and baseline carbon stocks is discounted for the uncertainty of the model (to maintain conservativeness).
- Carbon stock estimates for each CEA must be provided to the agency at intervals of at least one year and not more than five years (starting from when the baseline estimation event (first estimation event) occurred).
  - » Estimates can be measurement-based, model-only or model-assisted.
  - » Estimates must be measurement-based or model-assisted (that is, sampling must occur) at least once every 10 years in every CEA (this ensures at least 3 sampling rounds for all CEAs in the crediting period including the baseline sampling round).
- Carbon stock estimates are provided to a specified soil mass for each CEA (a function of carbon concentration and soil mass).
  - » This allows modelled estimates to be compared with measured estimates.

## Estimating carbon stock change from baseline carbon stock estimates

- To calculate net abatement in a reporting period, carbon stocks from the last estimation event are compared with the baseline carbon stock estimate.
- A specified probability of exceedance approach set at 60% is applied to changes in carbon stock based on the uncertainty of the estimates.

### The baseline (first) estimation event

- All CEAs must be sampled for the baseline (first) estimation event, which:
  - » allows models to be calibrated to the specific conditions in each CEA.
  - » results in either measurement based or a model-assisted baseline carbon stock estimates–see below section for definitions.

## Estimating carbon stocks for each estimation event

### Measurement-based carbon stock estimation

- Measurement-based approaches to carbon stock estimation follow the same stratified random sampling approach that is used in the *measurement only approach* detailed in Appendix 1.

### Model-assisted carbon stock estimation

- Model-assisted estimates can improve on measured estimates where models are more certain compared with measurement (this requires the model to estimate carbon stocks at a more granular scale than the strata level).

- The modelled carbon stock estimates must be provided to the agency prior to collecting validation samples to assure the independence of the validation samples from the model calibration.
- For each CEA, the model bias and precision of the model-assisted estimations are determined on the basis of the samples collected from that CEA.

### Model-only carbon stock estimation

- *Model-only estimates* use the mean of the model for the CEA but are then adjusted for the bias and precision of the model observed in sampled CEAs.
- It is not possible to know the model bias and the precision of *model-only estimates* for a CEA that is not sampled, hence these values can be estimated from other CEAs within a 'validation group' and applied to the unsampled CEAs.
    - » CEAs within a validation group are randomly selected for sampling.
    - » Validation groups are not necessary for *model-assisted* estimates for which the bias and precision of the model for each CEA can be directly estimated from the samples collected from that CEA.

**Validation groups**

- Validation groups are necessary to allow the use of *model-only* estimates in CEAs that are not sampled.
- They allow the model bias and variance observed in sampled CEAs to be applied to an unsampled CEA.
- There are no restrictions on which projects or CEAs can be included in a validation group. For example, different project proponents with separate properties may choose to participate in the same validation group.
- A validation group can be multiple projects grouped together in a validation group or a single project with multiple CEAs.
- A sub-group of the validation group must be randomly selected for sampling (as per the following two sections).
- Validation groups cannot change between providing the agency with modelled estimates and collecting validation samples (as otherwise areas in which modelled results are expected to have high uncertainty could avoid sampling).
    - » Validation groups can be changed before the next modelling and validation event.
        - » This may be advantageous where a model has high uncertainty for certain CEAs or individual project proponents no longer wish to participate in a validation group.
- CEAs that have had an estimation event less than a year ago must be excluded from the validation group (as the minimum interval between estimation events for each CEA is 1 year).

**Splitting CEAs into consistent clusters**

- All CEAs or projects in a validation group must be allocated to consistent clusters to ensure that each validation sub-group contains a representative group of CEAs across the validation group.
    - » The clusters should result in groups of CEAs where similar changes in carbon stocks are expected to be observed over the crediting period based on their baseline soil carbon stocks and other drivers (see below).

- A minimum of two clusters must be used. There is no maximum numbers of consistent clusters to be used as this will depend on the circumstances of the validation group.
- For validation groups that consist of multiple projects, clustering can occur based on groups of projects rather than CEAs. This is intended to reduce logistical and reporting difficulties if parts of projects were to be allocated to different clusters and then included in different sub-groups in the below section.

- Some of the considerations for consistent clusters would include but not be limited to the following:
  - Soil: baseline soil carbon stock and soil texture.
  - Environmental factors: temperature and rainfall.
    - Data for at least the previous 5 years should be considered. This is consistent with the baseline period for soil carbon projects.
    - Consistent data sets should be used across all CEAs.
  - Management activities: cropping vs pasture, productivity (yield, groundcover mapping etc), fertiliser use, tillage, etc.

**Validation sub-groups**

- All CEAs in the validation group must then be divided into 1 to 10 sub-groups each of which must include:
  - the number of CEAs which comprise at least 10% of the area of CEAs in the validation group and
  - the number of CEAs that allows at least 18 points of validation over at least 6 sampling strata.
- As one sub-group is randomly selected for sampling for each estimation event, the sub-groups correspond to the CEAs that would be sampled at the same time if randomly selected.
  - There cannot be more than 10 sub-groups (to ensure at least 10% of the total area of CEAs in the validation group is sampled in a given year).
  - Using less than 10 sub-groups will enable a greater fraction of CEAs to be sampled in a given year (e.g. to improve calibrations for future estimations).
- Participants may choose to only use one sub-group where there are CEAs that have not yet been randomly selected for sampling that are approaching the 10-year maximum sampling interval.
- Sub-groups must contain an equal number of CEAs from each cluster.
    - This will improve confidence in the model being applied across all CEAs based on validation of only a subset of CEAs and allow calibration of the model for future estimation events taking into account the baseline carbon stocks, environmental factors and management activities of individual CEAs.
    - This is done by selecting CEAs from the clusters until every sub-group contains the required number of CEAs (see above section).

**Adjusting model-only estimations based on the uncertainty and bias observed in the validation sub-group**

- The bias and precision of the model is applied to unsampled CEAs based on the sampled CEAs in the validation sub-group.

- In unsampled CEAs, the precision of the model is estimated from other CEAs rather than direct sampling, hence a discount factor is applied to the variance observed in the sampled CEAs, which is then applied to the unsampled CEAs. This factor varies depending on the correlation between the measured and modelled estimates in the sampled CEAs. A greater correlation between the measured and modelled estimates in the sampled CEAs reduces the discounts applied to the unsampled CEAs.

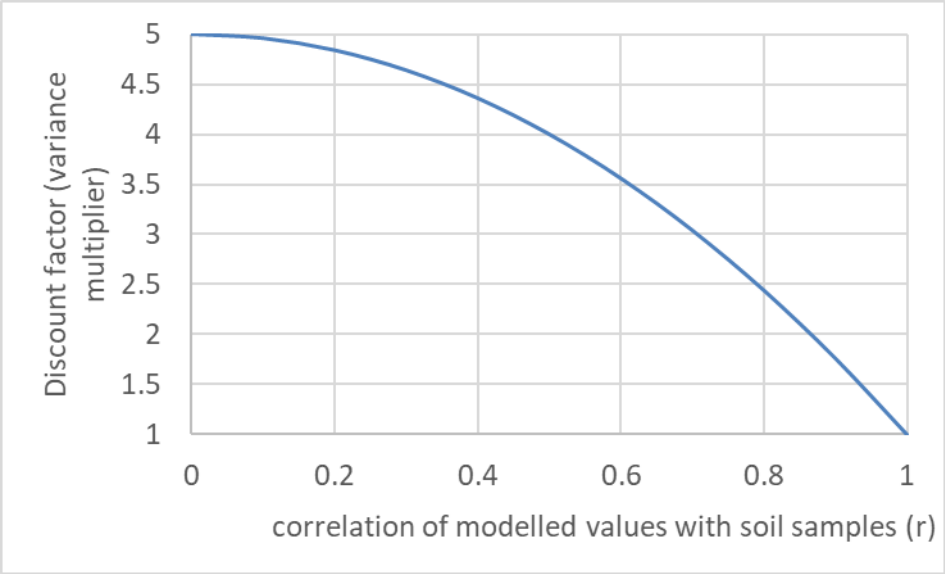


***Figure 7: This illustrates how the discount factor for crediting unsampled CEAs reduces from a maximum of 5 (5 times the variance of sampled CEAs is applied to unsampled CEAs) to a minimum of 1 (same variance is applied to sampled and unsampled CEAs) as the correlation between the modelled estimates and measured samples increases.***

## Calibrating your model

- Participants may choose to collect soil samples to develop or refine their models (calibration samples). In contrast, validation samples are used to determine the uncertainty of a model in model-only or model-assisted estimations.
- Calibration samples are to be collected separately, and prior to validation samples in each estimation event.
- Calibration samples cannot be used as validation samples. This is a key integrity control to ensure the validation samples for a sampling round are not also used for calibrating the model's results for that round (resulting in poor estimates of model bias and precision). However, the validation samples can be used to improve the model's results for subsequent estimation events.
- Calibration samples can be collected from any CEA, regardless of its membership to a validation sub-group.
- Calibration sampling does not need to occur using the sampling protocols in *the measurement only approach* – but not doing so will remove the possibility that these could be used in a measurement based estimate should the model still be imprecise despite calibration sampling.

## Example of a soil carbon project using the hybrid approach

### Project details:

- The project has 6 carbon estimation areas (CEAs)
- The project selected a 25-year crediting period at registration
- The project is using models to estimate carbon abatement

### For the first estimation event (the baseline sampling round) the project proponent will:

| Step | Description |
|---|---|
| **1.** | Stratify each of the 6 CEAs into 3 strata. In total, this will generate 18 strata for the project. |
| **2.** | Create a soil carbon map of each CEA which defines at least 20 modelling units (polygons) per strata. These 360 modelling units will generate 360 modelled soil organic carbon (SOC) estimates for the project. |
| **3.** | Model SOC stocks for each of the 360 modelling units to a series of anticipated soil sub-layers (with the corresponding soil mass of each sub-layer). |
| **4.** | Submit the modelled SOC estimate for all modelling units to the agency (an email address has been provided for this purpose on the Clean Energy Regulator's website). |
| **5.** | Submit a sampling plan to the agency which defines at least 3 sampling locations per stratum. In total, these 54 sampling locations will generate 54 measured SOC estimates for the project. |
| **6.** | Sample, dry and weigh and analyse SOC stocks for each of the 54 sampling locations according to the sampling plan. |
| **7.** | Calculate the equivalent soil mass (ESM), the mean measured SOC, and the variance of the mean measured SOC for each strata based on the samples taken in the strata (these are all adjusted to the ESM to keep masses comparable). |
| **8.** | Calculate a regression estimate of mean SOC and the variance of the regression estimates of mean SOC for each CEA, based on the mean measured and modelled SOC (adjusted to the ESM), and the variance of the mean measured and modelled SOC for each CEA. |
| **9.** | The regression estimates of mean SOC and the variance of the regression estimate of mean SOC are used as the baseline for each CEA against which the results of subsequent estimation events is compared and abatement is determined. |

Three years after the first estimation event (outlined above), the project proponent decides to carry out the second estimation event. The project proponent will:

| Step | Description |
|---|---|
| **1.** | Conduct a sampling round to calibrate the model. This is an **optional** step. |
| **2.** | Establish a validation group that includes all 6 of the project's CEAs as well as the CEAs of other projects that use the same model. |
| **3.** | Repeat steps 1-4 of the first estimation event for all CEAs in the validation group. |
| **4.** | Allocate all CEAs of the validation group into 2 consistent clusters based on their mean measured SOC, as determined during the first estimation event. |
| **5.** | Allocate roughly the same number of CEAs from each of the 2 consistent clusters into 3 validation subgroups (validation subgroup A, B and C) so that each validation subgroup comprises at least 10% of the total area of the CEAs in the validation group |
| **6.** | Submit a sampling plan to the agency that covers all CEAs in the validation group established in step 2. If the validation group includes multiple projects, these must be covered by different sampling plans. The sampling plan will need to include the process by which the proponent will randomly select a validation subgroup to sample. |
| **7.** | Randomly select one of the validation subgroups (which might be validation subgroup A) for sampling using the randomisation process outlined in the validation sampling plan |
| **8.** | Sample the SOC stocks for each sampling location in validation subgroup A according to the validation sampling plan. |
| **9.** | Repeat Steps 6-9 of the first estimation event for all CEAs in validation subgroup A. |
| **10.** | Calculate carbon stock weighted means of the model bias, the correlation of the modelled and measured carbon stocks, and the fraction of variance for all CEAs in validation subgroup A. |
| **11.** | Calculate the change in SOC for all CEAs in the project between the first and second estimation events, with a 60% probability of exceedance. This is based on the:<br>» regression estimates of mean SOC and the variance of the regression estimates of mean SOC for the CEAs in the project in validation subgroup A.<br>» the mean bias-adjusted modelled SOC and the extrapolated variance of the mean bias-adjusted modelled SOC for all CEAs in the project in validation subgroup B and validation subgroup C (a temporary discount factor of 0.25 is applied only for the first reporting period). |

| | |
|---|---|
| **12.** | Calculate the change in annual project emissions for the project for the first reporting period:<br>» Calculate the annual project emissions for the project for the baseline period.<br>» Calculate the annual project emissions of the project for the first reporting period.<br>» Determine the difference in the annual rate of emissions and multiply by the years in the reporting period. |
| **13.** | Calculate the net abatement of the project for the first reporting period based on the change in SOC for all CEAs in the project, and the change in project emissions for the project. |
| **14.** | Submit an offsets report for the first reporting period to the agency to claim carbon credits for the net abatement of the project calculated – including information on the model as required by Appendix 5: Key additional offsets report requirements for projects using a hybrid approach. |

### For the remainder of the crediting period the project proponent will:

Repeat the steps of the second estimation event every 3 years until the end of the 25-year crediting period. Participants can make changes to the validation group for each estimation event prior to submitting modelled SOC estimates to the agency. This may be necessary to exclude CEAs from a validation group where the model performs poorly, or to add CEAs to a validation group. CEAs in a validation group may also be sampled where they are not part of the validation subgroup that is randomly selected for sampling, in order to satisfy the requirement that they are sampled every 10 years. However, sampled CEAs that are not part of a validation subgroup that is randomly selected for sampling do not contribute to the calculations of bias and variance that are applied to the unsampled CEAS in the validation group.

# Appendix 3: A simplified discounting example

**Example – calculating net abatement for a soil carbon sequestration project under Schedule 1.**

An agricultural property has established a soil carbon project under the 2021 soil carbon method and has one carbon estimation area of 100 hectares. After submitting the registration application, baseline sampling is conducted, and subsequent sampling rounds are conducted every 5 years afterwards. The property reports its net abatement to the agency after each subsequent sampling round to receive credits.

Table 4: Simplified discounting example for calculating net abatement. The results of these sampling rounds are:

| Sampling round | Year | Mean soil organic carbon (SOC) stock $\overline{SOC}_{CEA}$ (tC/ha) | Sampling variance of the mean SOC $V(\overline{SOC}_{CEA})$ (tC/ha)² | Degrees of freedom for CEA $df_{CEA_{t_x}}$ |
|---|---|---|---|---|
| **T0 (baseline)** | 0 | 70 | 20 | 9 |
| **T1** | 5 | 72.5 | 20 | 9 |
| **T2** | 10 | 75 | 20 | 9 |
| **T3** | 15 | 77.5 | 20 | 9 |
| **T4** | 20 | 80 | 20 | 9 |
| **T5** | 25 | 82.5 | 20 | 9 |

Note 1: for simplicity, the values for *sampling variance of the mean SOC in the CEA* and *degrees of freedom for the CEA* have been provided as examples in the table. Project proponents calculate these based on the number of samples and the SOC observed in the samples taken from the CEA.

Note 2: The method requires that the degrees of freedom for a CEA must be calculated from the variance and number of samples collected at the strata level. However for the purposes of this example, the degrees of freedom for a CEA at a point in time can be thought of as being approximately equal to the number of samples collected in that CEA.

Note 3: For this example, it has been assumed that the sampling variance of the mean soil carbon stock and degrees of freedom remain constant. However, in reality these may vary considerably.

For simplicity, we will assume that project emissions do not increase with respect to the baseline period, i.e: $E_{net} = 0$.

Work out the total SOC for the CEA at T0 using equation 56:

$$SOC_{CEA} = \overline{SOC}_{CEA} \times A_{CEA}$$

$$SOC_{CEA_{t_0}} = 70 \times 100$$

$$SOC_{CEA_{t_0}} = 7000\ tC$$

Similarly: $SOC_{CEA_{t_1}} = 7250\ tC$

And: $SOC_{CEA_{t_2}} = 7500\ tC$

Work out the change in SOC stocks between T0 and T1 using equation 64:

$$\Delta SOC_{CEA(t_0-t_x)} = SOC_{CEA\ t_x} - SOC_{CEA\ t_0}$$

$$\Delta SOC_{CEA(t_0-t_1)} = 7250 - 7000$$

$$\Delta SOC_{CEA(t_0-t_1)} = 250\ tC$$

Work out the sampling variance of SOC for the CEA for T0 using equation 61:

$$V(SOC_{CEA}) = {A_{CEA}}^2 \times V(\overline{SOC}_{CEA})$$

$$V(SOC_{CEA}) = 100^2 \times 20$$

$$V(SOC_{CEA}) = 200{,}000$$

In this example, the sampling variance of the CEA soil carbon stock remains constant in every sampling round.

Work out the degrees of freedom for the CEA between T0 and T1 using equation 66 (note that this is distinct to the degrees of freedom for a point in time in a single sampling round – $df_{CEA_{t_x}}$):

$$df_{CEA\ t_0-t_x} = \frac{\left(V\left(SOC_{CEA_{t_0}}\right) + V\left(SOC_{CEA_{t_x}}\right)\right)^2}{\left(\frac{V\left(SOC_{CEA_{t_0}}\right)^2}{df_{CEA_{t_0}}} + \frac{V\left(SOC_{CEA_{t_x}}\right)^2}{df_{CEA_{t_x}}}\right)}$$

$$df_{CEA\ t_0-t_1} = \frac{(200{,}000 + 200{,}000)^2}{\left(\frac{(200{,}000)^2}{9} + \frac{(200{,}000)^2}{9}\right)}$$

$$df_{CEA\ t_0-t_1} = 18$$

Work out the standard error of the change in SOC between T0 and T1 using equation 65:

$$SE_{CEA(t_0-t_x)} = \sqrt{V(SOC_{CEA\ t_0}) + V(SOC_{CEA\ t_x})}$$

$$SE_{CEA(t_0-t_1)} = \sqrt{200{,}000 + 200{,}000}$$

$$SE_{CEA(t_0-t_1)} = 632.5$$

Work out the change in SOC in the CEA between T0 and T1 associated with a 60% probability of exceedance using equation 69:

$$\Delta SOC_{60\ CEA(t_0-t_x)} = \left(\Delta SOC_{CEA\ (t_0-t_x)} + SE_{CEA(t_0-t_x)} \times t_{\alpha(df)}\right) \times (1 - TD)$$

$$\Delta SOC_{60\ CEA(t_0-t_1)} = (250 + 632.5 \times (-0.257)) \times (1 - 0.25)$$

$$\Delta SOC_{60\ CEA(t_0-t_1)} = 65.6\ tC$$

$\boldsymbol{t_{\alpha(df)}}$ and TD apply the probability of exceedance approach and the 25% temporary withholding discount to the change in SOC.

Work out the change in SOC in the project area between T0 and T1 associated with a 60% probability of exceedance using equation 6. In this example we will assume that there is no use of biochar($Q_{B,CEA_i}$) or organic fertiliser($Q_{NSF,CEA_i}$) in this reporting period. As there is only one CEA in this example project this equation simplifies very easily.

$$\Delta \boldsymbol{SOC_{PA(t_0-t_x)}} = \sum_{i=1}^{n} \left(\Delta SOC_{60\ CEA_i} - Q_{B,CEA_i} - Q_{NSF,CEA_i}\right)$$

$$\Delta \boldsymbol{SOC_{PA(t_0-t_x)}} = \Delta SOC_{60\ CEA(t_0-t_1)} = 65.6\ tC$$

Work out the net abatement for the project area using equation 2:

$$A_{PA} = \Delta SOC_{PA(t_0-t_x)} \times \frac{44}{12} + \frac{RC}{D} - E_{net} - \sum_{RP=1}^{x-1} A_{PA,RP}$$

$$A_{PA} = 65.6 \times \frac{44}{12}$$

$$A_{PA} = 240.5\ t\ CO_2\text{-e}$$

As this is the first reporting period, previous net abatement for the project area ($\sum_{RP=1}^{x-1} A_{PA,RP}$) is 0.

In this case there is only one project area, therefore the net abatement amount for the project is the net abatement amount for the project area using equation 1:

$$A = \sum_{PA} A_{PA}$$

$$A = A_{PA} = 240.5\ t\ CO_2\text{-e}$$

**Similarly, for the second reporting period:**

Equations 56,61,64 and 66 are the same as for the first reporting period (as variance and degrees of freedom are unchanged between sampling rounds).

Equation 69 gives:

$$\Delta SOC_{60\ CEA(t_0 - t_x)} = \left(\Delta SOC_{CEA\ (t_0 - t_x)} + SE_{CEA(t_0 - t_x)} \times t_{\alpha(df)}\right) \times (1 - TD)$$

$$\Delta SOC_{60\ CEA(t_0 - t_1)} = (500 + 632.5 \times (-0.257)) \times (1 - 0)$$

$$\Delta SOC_{60\ CEA(t_0 - t_1)} = 337.5\ tC$$

Equation 2 gives:

$$A_{PA} = \Delta SOC_{PA(t_0 - t_x)} \times \frac{44}{12} + \frac{RC}{D} - E_{net} - \sum_{RP=1}^{x-1} A_{PA,RP}$$

$$A_{PA} = 337.5 \times \frac{44}{12} - 240.5$$

$$A_{PA} = 996.8\ \text{t CO}_2\text{-e}$$

Equation 1 gives:

$$A = \sum_{PA} A_{PA}$$

$$A = A_{PA} = 996.8\ \text{t CO}_2\text{-e}$$

The proponent for this project has chosen a 25-year permanence period and therefore net abatement is subject to a 20% permanence period discount. There is also a 5% risk of reversal buffer applied to all land-based projects.

Based on the process above the credits issued after each subsequent sampling round are:

**Table 5: Simplified discounting example for subsequent reporting periods:**

| Sampling round | Mean increase in SOC stock (tC) | Change in SOC stock from baseline with 60% probability of exceedance ($tCO_2$-e) | Temporary withholding discount | Net abatement (equation 1) ($tCO_2$-e) | 25-year permanence period discount and risk of reversal buffer | Credits issued (ACCUs) |
|---|---|---|---|---|---|---|
| **T1** | 250 | 321 | 25% | 240 | 25% | 179 |
| **T2** | 250 | 1237 | - | 997 | 25% | 747 |
| **T3** | 250 | 2154 | - | 917 | 25% | 687 |
| **T4** | 250 | 3070 | - | 917 | 25% | 687 |
| **T5** | 250 | 3987 | - | 917 | 25% | 687 |

# Appendix 4: Key offsets report requirements for projects under the 2021 soil carbon method

| Requirement | Information in offsets report |
|---|---|
| **Land management strategy** | Attach a copy of the project's most recent land management strategy.<br><br>Land management strategies must be updated and reviewed by a qualified person at least once every five years. See 1.7 – *land management strategy* for information on what to include in your land management strategy. |
| **Reporting period land management activities** | Include the following information on land management activities undertaken during the reporting period:<br><br>• Date(s) of when the eligible management activities began.<br>• What activities were undertaken.<br>• How closely the land management strategy has been followed.<br>  • If any activities were restricted activities, and evidence that the restricted activities were allowed. |
| **Baseline period land management activities** | Include a description (activities, timing and duration) of all land management activities undertaken during the baseline period (first offsets report only). |
| **Soil sampling information** | Provide information on the sampling processes for each round (baseline sampling and subsequent sampling) that were conducted during the reporting period:<br><br>• number of sampling rounds you conducted in your reporting period.<br>• sampling plans for each round, including:<br>  • geospatial map detailing your project area, CEAs, emissions accounting areas, exclusion areas and strata<br>  • an explanation of your process for randomly allocating sampling locations<br>• sampling field notes and information:<br>  • start and end dates and the median (middle) date of the sampling round.<br>  • accuracy of the GPS used to locate sample locations.<br>  • diameter of the inner cutting edge of the sample coring device.<br>  • sample depth.<br>  • the location of samples taken. |

| | |
|---|---|
| | • a description of why and how sample locations were changed, if applicable.<br>» for example, if the intended sample location was on an unexpected rocky outcrop (which can't be sampled), the sample location should be moved to an area with soil.<br>• a written statement from the person who managed the soil sampling, to verify:<br>• sample collection and preparation was undertaken in accordance with the soil carbon method and supplement.<br>• sampling was not conducted in a manner, or at a time, that was likely to overestimate any increase in soil carbon.<br>• laboratory analysis information:<br>• name of the laboratory used for analysing the soil samples.<br>• carbon content (percentage weight) of each sample analysed.<br>• calculation results:<br>• creditable change in soil carbon.<br>• average annual emissions in the baseline emissions period.<br>• average annual emissions in the reporting period.<br>• total change in emissions from all sources in the reporting period compared to the baseline emissions. |
| **Supplement information** | Provide information required under 'Part 5 Additional Reporting Requirements when spectroscopy is used' of the soil carbon supplement. |

# Appendix 5: Key additional offsets report requirements for projects using a hybrid approach

| Requirement | Information in offsets report |
|---|---|
| **Model validation results*** | For each validation group and estimation event:<br>• the degrees of freedom for the model<br>• extrapolated bias of the model for the unsampled CEAs<br>• the correlation of the modelled and measured carbon stocks. |

*Note that actual model predictions are provided to the Regulator prior to validation sampling and the offsets report.

# Appendix 6: Notification requirements

| Event | Notification triggers | Notification deadline |
|---|---|---|
| **Project change events** | • You conduct a restricted or prohibited activity within the project area.<br>• Your land management strategy changes (you need to provide a copy of the new land management strategy within 9 months).<br>• You change your land management activities after the end of the first reporting period. The notification should include:<br>» descriptions of the activity changes<br>» how the changes are likely to impact soil carbon. | Within 60 days of you becoming aware of the event. |
| **Disturbance or reversal events** | • A natural disturbance occurs (e.g. a flood or a dust storm).<br>• Project soil carbon decreases as a result of another person's actions (that were outside of your control). | Within 60 days of you becoming aware of the event. |
| **Offsets report events** | • You identify an error in your offsets report relating to project eligibility or the net abatement amount. | Within 60 days of you becoming aware of the event. |
| **Project proponent events** | • The person running the project (the project proponent) changes due to death or other circumstances.<br>• The project proponent is no longer a fit and proper person, due to insolvency or other events. | Within 90 days of you becoming aware of the event. |
| **NRM plans** | • Your project becomes inconsistent with a regional NRM plan[38]. | Within 90 days of you becoming aware of the event. |

[38] For more information on NRM plans see: https://nrmregionsaustralia.com.au/what-is-nrm/

# Appendix 7: Project variations

| Variation type | Requirements |
|---|---|
| **Add a project area** | To add a new project area, you need to:<br>• identify where the new area is located.<br>• provide evidence that the new area meets the eligibility requirements<br>• revise your project's forward abatement estimate.<br>• nominate the start date of activities.<br>You must conduct baseline sampling of the added area before the first reporting period ends following the variation application. When baseline sampling is completed, the added area is treated like other pre-existing project areas. All timing requirements in the soil carbon method and supplement must still be met including providing a sampling plan. |
| **Vary or remove a project area** | Varying or removing a project area has more conditions, as it may affect soil carbon calculations in other parts of your project. You will need to:<br>• identify what area is being removed.<br>• revise your project's forward abatement estimate.<br>You can only remove parts of your project area if one or more of these five criteria apply:<br>• the first offsets report has not yet been submitted.<br>• you're only removing exclusion areas or emissions accounting areas from project areas.<br>• a whole project area is being removed.<br>• you're removing a whole CEA where either:<br>» the most recent change in soil carbon is positive.<br>» the removal is not to increase carbon credits issued to the project (e.g. to the remaining CEAs) due to a concern the area subject to proposed removal has declining soil carbon stock.<br>» note: if the CEA being removed has had soil carbon transferred to other CEAs as a land management activity (e.g. soil mixing between CEAs), all CEAs that received the removed CEA's soil must also be removed. |

| | |
|---|---|
| | • you're removing a whole CEA after the end of the project's crediting period.<br><br>Removing project areas that have received carbon credits before the end of the project's permanence period will require the return of carbon credits and uses a special process. See our website[39] for more information. |
| **Vary project proponent** | The project proponent is the person who has the legal right and responsibility for carrying out the project and the right to earn credits. You can add, vary or remove a project proponent. You will need to provide evidence of legal right. |
| **Vary to remove condition** | Your project is considered 'conditional' until all consents and approvals are received.<br><br>You can apply to remove this condition by providing all signed eligible interest-holder consent forms or regulatory approvals through the Project Variation form on the Clean Energy Regulator Client Portal[40].<br><br>You will need to provide all eligible interest-holder consents and regulatory approvals before your first offsets report. |
| **Vary project start date** | You can vary your project's nominated start date (which is also the start of your crediting period and first reporting period). The varied start date cannot be later than 18 months after the date your project is registered.<br><br>You can only vary the start date before you submit your first offsets report, and it can only be varied once. |

[39] http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Making-changes-to-your-project#Vary-your-project-area

[40] http://www.cleanenergyregulator.gov.au/OSR/CP