The American Carbon Registry™

Wetlands Restoration

Accounting for the GHG Benefits of Pocosin Restoration

Version 1.0

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A.

METHODOLOGY DESCRIPTION

A1. SCOPE

This methodology accounts for the GHG emission reductions from rewetting previously drained pocosins. Pocosins are defined as freshwater wetlands, often shrub-dominated, on organic soils in the Atlantic coastal plain of the southeastern United States that are seasonally saturated primarily through precipitation. The baseline scenario assumes continuation of the pre-existing drained state, and ongoing emissions from the soil organic carbon (peat) pool associated with drainage. Leakage is excluded from accounting via an applicability condition stipulating the absence of any productive land use (that could be displaced or result in commodity shortages) in the project area within two years prior to the project start date.

A2. APPLICABILITY CONDITIONS

General applicability conditions for this methodology are:

1. The project area has been free of any land use that could be displaced outside the project area (e.g. agriculture) for two or more years prior to project start date;
2. The project area is a previously-drained pocosin. Throughout this document, "drained" is defined as subject to a lowering of water table due to deliberate hydrological manipulation, e.g. through ditching and diking;
3. Project activity involves re-wetting previously drained wetlands, in which rewetting is defined as raising the elevation of the average annual water table in drained wetland by partially or entirely reversing the pre-existing drained state;
4. Any areas of soil disturbance associated with implementation of the project activity are less than 3% of the project area;
5. N-fertilizers are not used in the with-project scenario;
6. No timber harvest is expected to occur in the baseline or with-project scenarios;
7. The project activity and project area meet all eligibility requirements set by the currently governing versions of the American Carbon Registry Standard and American Carbon Registry Forest Carbon Project Standard.
8. A baseline reference site must be identified and accessible on which one or more parameters are monitored in the baseline scenario. Parameter-specific criteria to demonstrate the appropriateness of a baseline reference site are detailed in Table 4.

Use of this methodology also requires that applicability conditions specific to the chosen accounting approach are met, as well as similarity criteria demonstrating the validity of one or more selected baseline reference sites (see Section A4 below).

A3. POOLS AND SOURCES

Carbon pools

Table 1. Carbon pools accounted for in the project boundary.

Carbon pools	Included / Optional / Excluded	Justification / Explanation of choice
Above-ground biomass carbon	Included (includes trees and woody shrubs)	Required as the project activity may result in increased mortality or decreased growth and recruitment
Below-ground biomass carbon	Included (includes trees and woody shrubs)	Required as the project activity may result in increased mortality or decreased growth and recruitment
Herbaceous vegetation	Included/Excluded	Must be included when using the flux approach
Dead wood	Excluded	Conservatively excluded (pool is expected to be greater in the project scenario with potentially higher mortality and lower decomposition due to flooding)
Harvested wood products	Excluded	Excluded per applicability condition
Litter / Forest Floor	Included (treated as a component of soil organic carbon)	Component of largest pool expected to be subject to change with the project activity
Soil organic carbon	Included	Largest pool expected to be subject to change with the project activity

Emission sources

Emissions of CO_2 are included through monitoring the carbon pools above.

Emissions of N_2O and CH_4 are excluded as insignificant[1], also a conservative treatment as more fires are expected to occur in the drained baseline scenario.

A4. METHODOLOGY SUMMARY

The methodology centers on two different approaches for estimating belowground emissions: (1) a stock change approach which estimates emissions from net surface level change (due to subsidence, accretion and root dynamics), and (2) a flux approach which models emissions as a function of one or more proxy variables (e.g., water table level, temperature, etc.) that are demonstrated to be significantly correlated with belowground emissions. One or the other approach may be used, provided approach-specific applicability conditions are met.

The methodology is simplified by exclusion of leakage from accounting (explained above) and by accounting for uncertainty as a step in the derivation of parameter values (i.e. uncertainty is not accounted separately and deducted in final calculations as in other methodologies). Uncertainty is accounted in this way for all parameters driving differences between with-project and baseline scenario emissions, which include surface elevation change, above- and belowground biomass, proxy (independent) variables and emissions (dependent variable) modeled as a function of proxy variable(s). Also, in all accounting steps throughout this methodology, sources/sinks collectively amounting to less than 3% of total ex-ante estimate of net emission reductions may be excluded from accounting.

Monitoring is conducted in the project area and in a valid baseline reference site that matches conditions expected in the project area in the absence of the project activity (i.e. rewetting) (see Table 4). Either net surface elevation change (stock change approach) or one or more proxy variables (flux approach) are monitored to estimate emissions from belowground. Trees and woody shrubs are monitored on permanent sample plots to assess and account for any detected differences in stock change due to growth/recruitment/mortality between the project area and the baseline reference site. Accretion/litterfall is monitored either as an undifferentiated component of net surface elevation change (stock change approach) or by monitoring net surface elevation change (flux approach).

Unintentional (natural) fire is conservatively excluded from accounting. Where unintentional burns occur in the project area, it is assumed that equal emissions occur in the baseline (i.e. net zero). Intentional fires (e.g., prescribed burns) in the project area are monitored and emissions accounted.

[1] Richardson et al. 2014. Impacts of Peatland Ditching and Draining on Water Quality and Carbon Sequestration Benefits of Peatland Restoration. Final Report. Duke University Wetlands Center for the US Fish and Wildlife Service and The Nature Conservancy.

As explained above, two approaches are provided for estimating net greenhouse gas emissions in the baseline and with-project cases: Stock Change and Flux. One approach must be selected and used for the entire project crediting period.

The Stock Change approach may be employed if the following applicability conditions are met (note that conditions related to measurement and monitoring apply equally to the project and baseline cases, as measurement and monitoring are carried out in the project area and in a representative baseline reference site):

1. Net surface elevation change measured using Rod Surface Elevation Tables (RSETs), Real Time Kinematic (RTKs) satellite-based approaches or other appropriate technologies;
2. Clear and detailed rules and procedures for determining surface level are documented in field standard operating procedures and adhered to;
3. Bulk density in top 10 cm is monitored; the top layer being the aerated labile portion from which emissions are expected to be sourced, and as well is a conservative value as it's the lowest bulk density throughout the peat profile. The top 10 cm should also capture the majority of root biomass, and permit estimation of emissions from surface level change resulting from root expansion/mortality. Bulk density samples must include soil organic carbon, belowground biomass (fine and coarse roots) and litter.
4. Baseline reference site has been subject to drainage/hydrological alteration for at least 10 years (to minimize influence of new root growth and expansion on surface elevation and bulk density)
5. Repeat measurements of surface elevation change are made at the same water table level (+/- 10% of level at t = 0) or same season, preferably in the dry season;
6. In with-project case, initial surface elevation level is measured no less than 12 months after re-wetting takes place (after initial swell has occurred);
7. In both the project area and baseline reference site, no significant erosion or sedimentation expected to occur (flat terrain, no river flow over project area);
8. In both the project area and baseline reference site, no significant compaction expected to occur and procedures will be in place to safeguard against compaction resulting from surface elevation measurements in the field.

Note that the Stock Change approach treats soil organic carbon, belowground (root) biomass and litter as a single source/sink. No root expansion and related swelling is expected in the with-project re-wetted case, and subsidence due to root die back is treated as an emission (assuming emissions from belowground biomass mortality occur at the time of measurable subsidence).

The Flux approach may be employed where a regression equation correlating one or more proxy variables to belowground emissions meeting the following applicability conditions is available:

1. Peer-reviewed;
2. Empirically-based – specifically, derived from flux chamber studies;

3. Flux chambers capture gas exchange from the soil organic carbon, belowground biomass, litter and herbaceous vegetation pools;
4. Relationship between proxy variable and emissions must be significant at $P < 0.05$ and unbiased (i.e. with minimal trend in residuals);
5. The study site from which proxy relationship developed must be on pocosins or former pocosins (as defined in Section A1);
6. Relationship incorporates one or more proxy variables that are:
   a. measured ex post in a valid baseline reference site,
   b. measured ex post in the project area (e.g., precipitation, temperature), and/or
   c. modeled in the project area on the basis of driver variables monitored ex post in the project area (e.g., water table modeled from monitored precipitation);
7. Uncertainty in predicted emissions (dependent variable) is known and calculated as the root mean squared error (RMSE).

The same relationship must be used in both the project and baseline cases. The regression may be revised based on new data, provided it meets the above requirements.

Accounting using each approach is summarized in the following diagrams, which demonstrate key parameters and calculation flow. The diagrams are intended only to provide a high level view of the methodology structure. Operation of the methodology follows measurement and calculation procedures detailed in Sections C, D and E below.

Figure 1. Overview of accounting using the stock change approach.

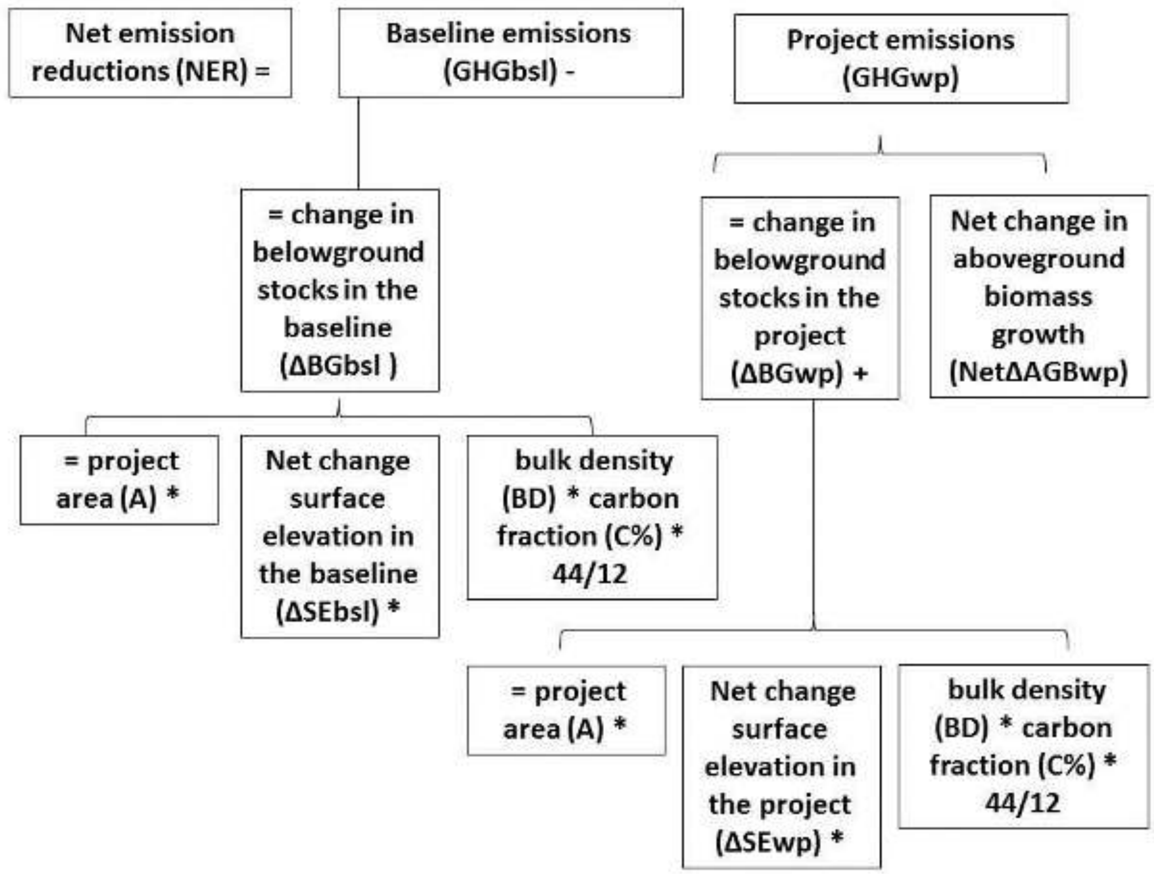
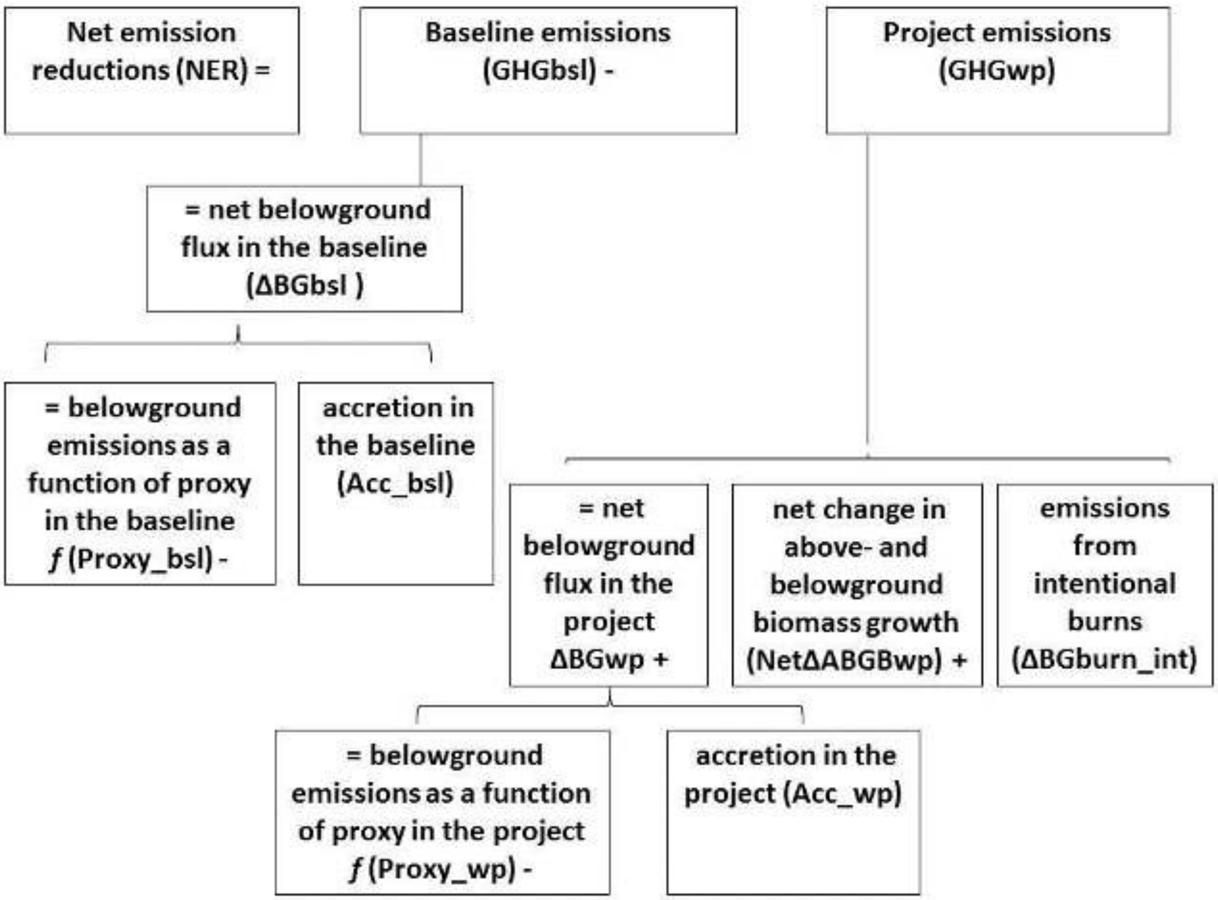


Figure 2. Overview of accounting using the flux approach.



Monitoring procedures are reviewed in the tables below, which, as for the diagrams above, are intended as an overview and to draw distinctions in requirements between the two accounting approaches. Note that for both the stock change and flux approaches, a baseline reference site is required to monitor parameters in the baseline scenario.

Table 2. Monitoring for the stock change approach/

Parameter	**General monitoring of baseline scenario**	**General monitoring of project scenario**
Net surface elevation change; ΔSE	Monitored on baseline reference site via direct measurement of permanent sample points	Monitored on project area via direct measurement of permanent sample points
Aboveground biomass carbon; AGB	Monitored on baseline reference site via direct measurement on permanent sample plots	Monitored on project area via direct measurement on permanent sample plots

Area of unintentional fire; A_{burn_unint}	Monitored in project area via aerial imagery and management records	Monitored in project area via aerial imagery and management records

Table 3. Monitoring for the flux approach.

Parameter	**General monitoring of baseline scenario**	**General monitoring of project scenario**
Proxy variable(s) significantly correlated with belowground emissions; Proxy A, B, etc …	Either monitored via direct measurement in a valid baseline reference site, monitored via direct measurement in the project area, or modeled in the project area (e.g. using a hydrologic model) on the basis of one or more monitored, directly-measured driver variables (e.g. precipitation) in the project area.	Monitored via direct measurement in the project area
Surface elevation change due to accretion/litterfall; ΔSE_{Acc} (optional)	Monitored on baseline reference site via direct measurement of permanent sample points	Monitored on project area via direct measurement of permanent sample points
Above- and belowground biomass carbon; ABGB	Monitored on baseline reference site via direct measurement on permanent sample plots	Monitored on project area via direct measurement on permanent sample plots
Area of intentional fire; A_{burn_int}	N/A	Monitored in project area via aerial imagery and management records
Surface elevation change due to intentional fire; $\Delta SE_{burn\_int,wp,t}$	N/A	Monitored in the project area in the planned burn area via direct measurement of sample points immediately prior to and after the burn
Area of unintentional fire; A_{burn_unint}	Monitored in project area via aerial imagery and management records	Monitored in project area via aerial imagery and management records
Surface elevation change due to unintentional fire; $\Delta SE_{burn\_unint,wp,t}$	Monitored in the project area via direct measurement of sample points in the burn area and outside the burn area after the burn	Monitored in the project area via direct measurement of sample points in the burn area and outside the burn area after the burn

Baseline reference site similarity criteria

Operation of this methodology requires that one or more baseline reference sites be identified on which to monitor a range of parameters in the baseline scenario. The table below outlines similarity criteria that must be met to demonstrate the validity of a baseline reference site, and details similarity criteria values for an existing baseline reference site at Pocosin Lakes National Wildlife Refuge.

Table 4. Baseline reference site similarity criteria**.**

Baseline reference site similarity criterion	**Net surface elevation change; ΔSE**	**Surface elevation change due to accretion/litterfall; ΔSE_{Acc}**	**Aboveground biomass carbon; AGB and Above- and belowground biomass carbon; ABGB**	**Proxy variable(s) significantly correlated with belowground emissions; Proxy A, B, etc …**	**Pocosin Lakes NWR baseline reference site[2]**
Drained freshwater wetland on organic soils in the coastal plain of southeast Virginia, North Carolina or South Carolina, formerly with pocosin vegetation	yes	yes	yes	Yes	yes
Not subject to significant erosion, sedimentation or soil compaction	yes	yes	N/A	N/A	monitored
Not subject to significant sustained flooding above average annual water table or fire	yes	yes	yes	N/A	monitored
Mean bulk density of top 10 cm of peat at project start date	Within +/- 20% of mean bulk density in project area	N/A	N/A	N/A	0.2 g cm^{-1}

[2] Thompson, G.S., R.T. Belcher and R.B. Atkinson. 2003. Soil biochemistry in Virginia and North Carolina Atlantic white cedar swamps. In: Atkinson, R.B., R.T. Belcher, D.A. Brown, and J.E. Perry, eds. Atlantic White Cedar Restoration Ecology and Management, Proceedings of a Symposium, May 31-June 2, 2000, Christopher Newport University, Newport News, VA.
Dolman, J.D. and S.W. Buol. 1967. A Study of Organic Soils (Histosols) in the Tidewater Region of North Carolina. North Carolina Agricultural Research Service Technical Bulletin 181, 52 p.

Baseline reference site similarity criterion	**Net surface elevation change; ΔSE**	**Surface elevation change due to accretion/litterfall; ΔSE_{Acc}**	**Aboveground biomass carbon; AGB and Above- and belowground biomass carbon; ABGB**	**Proxy variable(s) significantly correlated with belowground emissions; Proxy A, B, etc …**	**Pocosin Lakes NWR baseline reference site[2]**
Mean percent carbon of top 10 cm of peat at project start date	Within +/- 20%, in relative terms, of mean percent organic matter in project area	N/A	N/A	N/A	42 %
Mean peat depth at project start date	Equal to or less than mean peat depth in project area	N/A	N/A	N/A	1.0 – 2.0 m
Average annual water level at project start date	Within +/-20% of average annual water level in project area prior to project start (i.e. prior to rewetting of project area)	N/A	Within +/-20% of average annual water level in project area prior to project start (i.e. prior to rewetting of project area)	N/A	- 60 to -100 cm
Length of time subject to drainage/hydrological alteration prior to project start[3]	Within +/-20% of length of time subject to drainage/ hydrological	N/A	N/A	N/A	≥20 years

[3] Note that both the project area and baseline reference site must have been subject to drainage/hydrological alteration for at least 10 years per applicability condition for the stock change approach

Baseline reference site similarity criterion	Net surface elevation change; ΔSE	Surface elevation change due to accretion/litterfall; ΔSE_{Acc}	Aboveground biomass carbon; AGB and Above- and belowground biomass carbon; ABGB	Proxy variable(s) significantly correlated with belowground emissions; Proxy A, B, etc …	Pocosin Lakes NWR baseline reference site[2]
	alteration prior to project start in project area				
Vegetation: Successional stage, tree and shrub species composition, stem density and diameter distribution	N/A	Similar to project area immediately prior to project start	Similar to project area immediately prior to project start	N/A	General description of vegetation on PLNWR reference site
Value of proxy variable at project start date	N/A	N/A	N/A	Not outside of range of measured values from which regression derived	[Too be added]

Baseline reference sites should ideally be selected to have stable management through the project crediting period, however, should the baseline reference site become invalid (due to non-compliance with similarity criteria, e.g. if it becomes subject to a burn or flooding) at any time during the project crediting period, a new valid baseline reference site may be selected to replace the former, or the existing baseline reference site may be reconfigured to comply with the similarity criteria. Different baseline reference sites may be used for different parameters. Multiple baseline reference sites may be used for a single parameter, in which case the similarity criteria are assessed for the composite area.

B.

BOUNDARIES, ADDITIONALITY AND PERMANENCE

B1. PROJECT GEOGRAPHIC BOUNDARY

The project boundary shall be defined at the beginning of a proposed project activity and shall remain fixed through the project crediting period. The project activity may contain more than one discrete area of land.

For all discrete land areas included in the project boundary, the following will be provided:

- Unique identifier for each discrete parcel of land;
- Geo-referenced GIS shapefile of the land parcel boundary;
- Details of ownership and land use rights holder.

Further guidance is provided in the project area parameter table in Section E.

B2. PROJECT TEMPORAL BOUNDARY

The project crediting period is the time period for which GHG emission reductions generated by the project are accounted and eligible for issuance as ERTs. The project must have a robust monitoring plan covering this period.

The start of the crediting period is marked by the start of the project activity, i.e. at the onset of rewetting. The crediting period shall be for 20 years, and may be renewed following governing ACR requirements.

B3. ADDITIONALITY

The project activity must demonstrate additionality applying the ACR's three-pronged additionality test: beyond regulatory requirements, beyond common practice, and facing at least one of three implementation barriers (financial, technological, or institutional).

B4. METHOD OF ASSURANCE OF PERMANENCE

To ensure permanence of credited emission reductions, the project will apply the ACR Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

C.

Stock change approach:

Baseline and with-project scenarios

C.1 Baseline accounting

$$GHG_{BSL,t} = \Delta BG_{stock\_bsl,t} \qquad \text{Equation 1}$$

Where:

$GHG_{BSL,t}$ Annual greenhouse gas emissions in the baseline in monitoring interval ending in year t; t CO_2e yr^{-1}

$\Delta BG_{stock\_bsl,t}$ Annual change in the soil organic carbon and belowground biomass and litter pools using the stock change method in the baseline scenario in monitoring interval ending in year t; t CO_2e yr^{-1}

Note that change in aboveground biomass carbon stocks in the baseline is accounted in parameter ΔAGB_{wp} (derived in Section C.2.2 below) which represents the net of baseline and with project changes in aboveground biomass carbon stocks.

C.1.1 Emissions from belowground in the baseline

Emissions from belowground are estimated from net surface level change. Note that the emission inferred from net surface level change, ΔBG_{stock_bsl}, covers net emissions (due to sequestration and respiration) from soil organic carbon, belowground biomass and litter.

$$\Delta BG_{stock\_bsl,t} = (A - A_{burn\_unint,wp,t}) * - \Delta SE_{bsl,t} * (1/x) * 10 * BD_{wp,t-x} * C\%_{soil,wp} * 44/12 \qquad \text{Equation 2}$$

Where:

$\Delta BG_{stock\_bsl,t}$ Annual change in the soil organic carbon and belowground biomass and litter pools using the stock change method in the baseline scenario in monitoring interval ending in year t; t CO_2e yr^{-1}

$\Delta SE_{bsl,t}$ Mean net surface elevation change (subsidence + accretion + root expansion/mortality) in the baseline reference site in monitoring interval ending in year t; mm

$BD_{wp,t-x}$ Mean dry bulk density in the project area at time t-x; g cm^{-3}

$\%C_{soil,wp}$ Percentage of soil organic C in the project area; %

44/12 Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}

A Project area; ha

$A_{burn\_unint,wp,t}$ Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha

t 1, 2, 3, … t years elapsed since the project start date

x Number of years in monitoring interval; years

The net surface elevation change term is monitored in a valid control site. Parameter $\Delta SE_{bsl,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table). Bulk density is monitored and includes litter, belowground biomass (roots) and soil organic carbon.

C.2 With-project Accounting

$$GHG_{WP,t} = \Delta BG_{stock\_wp,t} + Net\Delta AGB_{wp,t} \quad \text{Equation 3}$$

Where:

$GHG_{WP,t}$ Annual greenhouse gas emissions in the project scenario in monitoring interval ending in year t; t CO_2e yr^{-1}

$\Delta BG_{stock\_wp,t}$ Annual change in the soil organic carbon and belowground biomass pool using the stock change method in the project scenario in monitoring interval ending in year t; t CO_2e yr^{-1}

$Net\Delta AGB_{wp,t}$ Annual net change in aboveground biomass carbon stocks in the project scenario in monitoring interval ending in year t; t CO_2e yr^{-1}

C.2.1 Emissions from belowground in the project

Emissions from belowground are estimated from net surface level change. Note that the emission inferred from net surface level change, ΔBG_{stock_bsl}, covers net emissions (due to sequestration and respiration) from soil organic carbon, belowground biomass and litter.

$$\Delta BG_{stock\_wp,t} = (A - A_{burn\_unint,wp,t}) * - \Delta SE_{wp,t} * (1/x) * 10 * BD_{wp,t-x} * C\%_{soil,wp} * 44/12 \qquad \text{Equation 4}$$

Where:

$\Delta BG_{stock\_wp,t}$	Annual change in the soil organic carbon and belowground biomass pool using the stock change method in the project scenario in monitoring interval ending in year t; t CO_2e yr^{-1}
$\Delta SE_{wp,t}$	Mean net surface elevation change (subsidence + accretion + root expansion/mortality) in the project area in monitoring interval ending in year t; mm
$BD_{wp,t-x}$	Mean dry bulk density in the project area at time t-x; g cm^{-3}
$\%C_{soil}$	Percentage of soil organic C in the project area; %
44/12	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
A	Project area; ha
$A_{burn\_unint,wp,t}$	Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha
t	1, 2, 3, … t years elapsed since the project start date
x	Number of years in monitoring interval; years

The net surface elevation change term must be monitored in the project area. Parameter $\Delta SE_{wp,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

Bulk density is measured at the project start and every 10 years and includes litter, belowground biomass (roots) and soil organic carbon.

C.2.2 Emissions from aboveground biomass in the project

Emissions from aboveground biomass (in trees and shrubs) in the project, $Net\Delta AGB_{wp}$, represent net emissions from aboveground biomass (i.e. net of baseline and with project) resulting from stock change in the project case relative to a baseline reference site. This term is set equal to zero if there is no significant difference in stock change between the project and the baseline reference site.

Step 1

Measure change in stocks of aboveground biomass in the project area and in a baseline reference site. Stock change in aboveground biomass is measured on permanent sample plots, and represents the net of biomass increment, recruitment and mortality. Calculate mean annual change in stocks of aboveground biomass in the project area, ΔAGB_{wp}, and in a baseline reference site, ΔAGB_{bsl}.

$$\Delta AGB_{wp,t} = \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left(\left(AGB_{wp,j,t} - AGB_{wp,j,t-x}\right) * \left(\frac{1}{x}\right)\right) \quad \text{Equation 5}$$

Where:

$\Delta AGB_{wp,t}$	Mean annual change in aboveground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$AGB_{wp,j,t}$	Aboveground biomass carbon stocks in the project area in plot j at time t; t CO_2e/ha
$AGB_{wp,j,t-x}$	Aboveground biomass carbon stocks in the project area in plot j at time t-x; t CO_2e/ha
j	1, 2, 3 … n sample plots
x	Number of years in monitoring interval; years

$$\Delta AGB_{bsl,t} = \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left(\left(AGB_{bsl,j,t} - AGB_{bsl,j,t-x}\right) * \left(\frac{1}{x}\right)\right) \quad \text{Equation 6}$$

Where:

$\Delta AGB_{bsl,t}$	Mean annual change in aboveground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$AGB_{bsl,j,t}$	Aboveground biomass carbon stocks in the baseline reference area in plot j at time t; t CO_2e/ha
$AGB_{bsl,j,t-x}$	Aboveground biomass carbon stocks in the baseline reference area in plot j at time t-x; t CO_2e/ha
j	1, 2, 3 … n sample plots
x	Number of years in monitoring interval; years

Step 2

If $\Delta AGB_{wp,t}$ is not equal to $\Delta AGB_{bsl,t}$ (significantly different using an unpaired t test at P <0.05), then net emissions from aboveground biomass carbon are equal to the difference in stock change between the baseline reference site and the project area. Note that this term can be less than zero, where growth in the project area exceeds that in the baseline reference site, e.g., due to tree and shrub planting efforts conducted as part of the project activity.

$$\mathrm{Net}\Delta AGB_{wp,t} = \left((\Delta AGB_{bsl,t} + UNC_{\Delta AGB,bsl,t}) - (\Delta AGB_{wp,t} - UNC_{\Delta AGB,wp,t})\right) * (A - A_{burn_{unint},wp,t})$$

Equation 7

Where:

$\mathrm{Net}\Delta AGB_{wp,t}$	Annual net change in aboveground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e yr^{-1}
$\Delta AGB_{wp,t}$	Mean annual change in aboveground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$\Delta AGB_{bsl,t}$	Mean annual change in aboveground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$UNC_{\Delta AGB,wp,t}$	Half width of 90% confidence interval exceeding 10% of the mean annual change in aboveground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$UNC_{\Delta AGB,bsl,t}$	Half width of 90% confidence interval exceeding 10% of the mean annual change in aboveground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
A	Project area; ha
$A_{burn\_unint,wp,t}$	Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha
t	1, 2, 3, … t years elapsed since the project start date

If $\Delta AGB_{wp,t}$ is not significantly different than $\Delta AGB_{bsl,t}$, then

$\mathrm{Net}\Delta AGB_{wp,t} = 0$

C.2.3 Emissions from fire in the project

Unintentional burns

Where unintentional burns occur in the project area, emissions from those burns are assumed, conservatively, to be equal in the project and baseline scenarios. Emissions from unintentional burns in the project area are excluded from accounting by delineating the area of the burn, parameter $A_{burn\_unint,wp,t}$, consulting aerial imagery and assigning zero net emissions to the area for the monitoring interval spanning the burn (i.e. from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn); see equations 2 and 4 above. Plans for intentional burns (e.g. prescribed burns) in the project area, that predate their implementation, must be recorded in management records to distinguish unintentional burns (on the absence of management records). Any sample plots/points for surface elevation and/or aboveground biomass located within the area of an unintentional burn in the project area, will not be used to calculate net change in surface elevation, $\Delta SE_{wp,t}$, or change in aboveground biomass stocks, $\Delta AGB_{wp,t}$, in the project area for the monitoring interval spanning the burn (i.e. from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn). Note that if an unintentional burn has occurred, the first monitoring event following the fire must occur after completion of the first growing season following the fire.

Intentional burns

Emissions from the belowground and aboveground biomass pools resulting from intentional burns in the project are captured through monitoring parameters $\Delta SE_{wp,t}$ and $\Delta AGB_{wp,t}$. referencing measurements collected at all sample plots/points for surface elevation and/or aboveground biomass located within the project area.

D.

Flux approach:

Baseline and with-project scenarios

D.1 Baseline Accounting

$GHG_{BSL,t} = \Delta BG_{flux\_bsl,t}$ Equation 8

Where:

$GHG_{BSL,t}$	Annual greenhouse gas emissions in the baseline in monitoring interval ending in year t; t $CO_2e\ yr^{-1}$
$\Delta BG_{flux\_bsl,t}$	Annual emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous biomass using the flux method in the baseline scenario in monitoring interval ending in year t; t $CO_2e\ yr^{-1}$

Note that change in above- and belowground biomass carbon stocks in the baseline is accounted in parameter $\Delta ABGB_{wp}$ (derived in Section D.2.2 below) which represents the net of baseline and with project changes in above- and belowground biomass carbon stocks.

D.1.1 Emissions from belowground in the baseline

Emissions from belowground are estimated as a function of one or more proxy variables. Note that the emission inferred from the proxy variable(s), ΔBG_{flux_bsl}, covers emissions (due to respiration) from soil organic carbon, belowground biomass and litter and net emissions (due to sequestration and respiration) from herbaceous biomass. Sequestration via accretion of peat/litterfall is monitored in a baseline reference site. Sequestration in belowground (root) biomass is assessed separately, as part of parameter $\Delta ABGB_{wp}$.

$\Delta BG_{flux\_bsl,t} = f_t\ (\text{Proxy } A_{bsl,t}\ , \text{Proxy } B_{bsl,t,...})* A \quad - Acc_{bsl,t}$ Equation 9

Where:

ΔBG_{flux_bsl}	Emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous biomass using the flux method in the baseline scenario at time t; t $CO_2e\ yr^{-1}$

f_t (Proxy $A_{bsl,t}$, Proxy $B_{bsl,t,...}$) Regression equation correlating one or more proxy variables to emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous at time t; output in t CO_2e ha^{-1} yr^{-1}

Proxy $A_{bsl,t}$ Mean value of proxy variable A in the baseline at time t; units unspecified

Proxy $B_{bsl,t}$ Mean value of proxy variable B in the baseline at time t; units unspecified

etc…

A Project area; ha

$Acc_{bsl,t}$ Sequestration in the belowground pool via peat accretion/litterfall using the flux method in the baseline scenario in year t; t CO_2e yr^{-1} (if applicable)

Note that the output of the regression equation incorporates uncertainty, derived in proportion to the root mean squared error (RMSE) of the regression (see parameter table).

The proxy variable(s) can be either measured in a valid baseline reference site, measured in the project area, or modeled in the project area. If using a model (e.g. a hydrologic model) to estimate the proxy variable(s), the model(s) must be:

1. Peer-reviewed
2. Empirically-based
3. Incorporate one or more driver variables that are monitored ex post in the project area (e.g. precipitation)

The value(s) of parameter(s) Proxy $A_{bsl,t}$ etc. incorporate uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

Note that the cumulative emissions over time from ΔBG_{flux_bsl}, from both soil respiration and from unintentional fires in the project area (assumed to occur equally in the baseline and project scenarios), cannot exceed the total initial stock in that pool, $BG_{wp,t=0}$, derived below.

$$BG_{wp,t=0} = A * PD_{wp,t=0} * 10{,}000 * BD_{wp,t=0} * C\%_{soil} * 44/12 \qquad \text{Equation 10}$$

Where:

$BG_{wp,t=0}$ Total stocks in the soil organic carbon and belowground biomass and litter pools in the project area at time t=0; t CO_2e

$PD_{wp,t=0}$	Mean peat depth in the project area at time t=0; m
$BD_{wp,t=0}$	Mean dry bulk density in the project area at time t=0; g cm^{-3}
$\%C_{soil}$	Percentage of soil organic C; %
44/12	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
A	Project area; ha
t	1, 2, 3, … t years elapsed since the project start date
10,000	Converts result to units of metric tons

Therefore,

if

$$\sum_{t=0}^{t} \Delta BG_{flux_{bsl},t} + \sum_{t=0}^{t} \Delta BG_{burn\_unint,wp,t} > BG_{wp,t=0}$$

Then, if

$$BG_{wp,t=0} - \sum_{t=0}^{t-1} \Delta BG_{flux_{bsl},t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_unint,wp,t} > 0$$

Then

$$\Delta BG_{flux_{bsl},t} = BG_{wp,t=0} - \sum_{t=0}^{t-1} \Delta BG_{flux_{bsl},t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_unint,wp,t}$$

Otherwise parameter $\Delta BG_{flux\_bsl,t}$ is equal to zero.

Parameter $\Delta BG_{burn\_unint,wp,t}$, emissions from soil organic carbon from unintentional fire in the project scenario in year t, is derived in Section 5.2.3 below.

Accretion/litterfall

Sequestration in the belowground pool is estimated from accretion/litterfall, monitored in a baseline reference site using a soil horizon marker. Note that it is optional to include this parameter in accounting.

$$Acc_{bsl,t} = (A - A_{burn\_unint,t}) * \Delta SE_{Acc,bsl} * (1/x) * 10 * BD_{wp,t} * C\%_{soil,wp} * 44/12$$ Equation 11

Where:

$Acc_{bsl,t}$	Annual sequestration in the belowground pool via peat accretion/litterfall using the flux method in the baseline scenario in monitoring interval ending in year t; t CO_2e yr^{-1}
$\Delta SE_{Acc,bsl,t}$	Mean surface elevation change due to accretion/litterfall in the baseline reference site in monitoring interval ending in year t; mm
$BD_{wp,,t}$	Mean dry bulk density in the project area at time t; g cm^{-3}
$\%C_{soil,wp}$	Percentage of soil organic C in the project area; %
44/12	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
A	Project area; ha
$A_{burn\_unint,t}$	Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha
t	1, 2, 3, … t years elapsed since the project start date
x	Number of years in monitoring interval; years
10	Converts result to units of metric tons

The surface elevation change due to accretion/litterfall, $\Delta SE_{Acc,bsl,t}$, and dry bulk density, $BD_{bsl,,t}$, terms must be monitored in the baseline reference site. Parameter $\Delta SE_{Acc,bsl,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

D.2 With-project Accounting

$$GHG_{WP,t} = \Delta BG_{flux\_wp,t} + Net\Delta ABGB_{wp,t} + \Delta BG_{burn\_int,wp,t}$$ Equation 12

Where:

$GHG_{WP,t}$ Annual greenhouse gas emissions in the project in monitoring interval ending in year t; t CO_2e yr^{-1}

$\Delta BG_{flux\_wp,t}$ Annual emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous biomass using the flux method in the project in monitoring interval ending in year t; t CO_2e yr^{-1}

$Net\Delta ABGB_{wp,t}$ Annual net change in above- and belowground biomass carbon stocks in the project in monitoring interval ending in year t; t CO_2e yr^{-1}

$\Delta BG_{burn\_int,wp,t}$ Emissions from soil organic carbon from intentional fire in the project scenario in year t; tCO_2-e yr^{-1}

D.2.1 Emissions from belowground in the project

Emissions from belowground are estimated as a function of one or more proxy variables. Note that the emission inferred from the proxy variable(s), ΔBG_{flux_bsl}, covers emissions (due to respiration) from soil organic carbon, belowground biomass and litter and net emissions (due to sequestration and respiration) from herbaceous biomass. Sequestration via accretion of peat/litterfall is monitored in the project area. Sequestration in belowground (root) biomass is assessed separately, as part of parameter $\Delta ABGB_{wp}$.

$$\Delta BG_{flux\_wp,t} = f_t\,(Proxy\ A_{wp,t}\ ,\ Proxy\ B_{wp,t},...)\ *\ A - Acc_{wp,t} \qquad \text{Equation 13}$$

Where:

$\Delta BG_{flux\_wp,t}$ Change in the soil organic carbon and belowground biomass and litter pools using the flux method in the project in year t; t CO_2e yr^{-1}

$f_t\,(Proxy\ A_{bsl,t}\ ,\ Proxy\ B_{bsl,t},...)$ Regression equation correlating on or more proxy variables to emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous biomass at time t; output in t CO_2e ha^{-1} yr^{-1}

$Proxy\ A_{wp,t}$ Mean value of proxy variable A in the project area at time t; units unspecified

$Proxy\ B_{wp,t}$ Mean value of proxy variable B in the project area at time t; units unspecified

etc…

A Project area; ha

$Acc_{wp,t}$ Sequestration in the belowground pool via peat accretion/litterfall using the flux method in the project scenario in year t; t $CO_2e\ yr^{-1}$

Note that the output of the regression equation incorporates uncertainty, derived in proportion to the root mean squared error (RMSE) of the regression (see parameter table).

The proxy variable(s) must be monitored in the project area. The value(s) of parameter(s) Proxy $A_{wp,t}$ etc. incorporate uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

As for the baseline, cumulative emissions over time from ΔBG_{flux_wp}, from both soil respiration and from unintentional and intentional fires in the project area, cannot exceed the total initial stock in that pool, $BG_{wp,t=0}$, derived above.

Therefore,

if

$$\sum_{t=0}^{t} \Delta BG_{flux_{wp},t} + \sum_{t=0}^{t} \Delta BG_{burn\_unint,wp,t} + \sum_{t=0}^{t} \Delta BG_{burn\_int,wp,t} > BG_{wp,t=0}$$

Then, if

$$BG_{wp,t=0} - \sum_{t=0}^{t-1} \Delta BG_{flux_{wp},t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_unint,wp,t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_int,wp,t} > 0$$

Then

$$\Delta BG_{flux_{wp},t} = BG_{wp,t=0} - \sum_{t=0}^{t-1} \Delta BG_{flux_{wp},t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_unint,wp,t} - \sum_{t=0}^{t-1} \Delta BG_{burn\_int,wp,t}$$

Otherwise parameter $\Delta BG_{flux\_wp,t}$ is equal to zero.

Parameters $\Delta BG_{burn\_int,wp,t}$, emissions from soil organic carbon from intentional fire in the project scenario in year t, and $\Delta BG_{burn\_unint,wp,t}$, emissions from soil organic carbon from unintentional fire in the project scenario in year t, are derived in Section 5.2.3 below.

Accretion/litterfall

Sequestration in the belowground pool is estimated from accretion/litterfall, monitored using a soil horizon marker. Note that it is optional to include this parameter in accounting.

$$Acc_{wp,t} = (A - A_{burn\_unint,t}) * \Delta SE_{Acc,wp} * (1/x) * 10 * BD_{wp,,t} * C\%_{soil,wp} * 44/12 \quad \text{Equation 14}$$

Where:

$Acc_{wp,t}$	Annual sequestration in the belowground pool via peat accretion/litterfall using the flux method in the project scenario in monitoring interval ending in year t; t CO_2e yr^{-1}
$\Delta SE_{Acc,wp,t}$	Mean surface elevation change due to accretion/litterfall in the project in monitoring interval ending in year t; mm
$BD_{wp,t}$	Mean dry bulk density in the project area at time t; g cm^{-3}
$\%C_{soil}$	Percentage of soil organic C in the project area; %
44/12	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
A	Project area; ha
$A_{burn\_unint,t}$	Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha
t	1, 2, 3, … t years elapsed since the project start date
x	Number of years in monitoring interval; years
10	Converts result to units of metric tons

The surface elevation change due to accretion/litterfall, $\Delta SE_{Acc,wp,t}$, and dry bulk density, $BD_{wp,t}$, terms must be monitored in the project area. Parameter $\Delta SE_{Acc,wp,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

D.2.2 Emissions from above- and belowground biomass in the project

Emissions from above- and belowground biomass (in trees and shrubs) in the project, $Net\Delta ABGB_{wp}$, represent net emissions from above- and belowground biomass (i.e. net of baseline and with project) resulting from stock change in the project case relative to a baseline reference site. This term is set equal to zero if there is no significant difference in stock change between the project and the baseline reference site.

Step 1

Measure change in stocks of above- and belowground biomass in the project area and in a baseline reference site. Stock change in above- and belowground biomass is measured on permanent sample plots, and represents the net of biomass increment, recruitment and mortality.

Note that in this treatment emissions due to mortality of belowground biomass (coarse roots) are double counted, as they are also included in the term, ΔBG_{flux}. This treatment is conservative, as emissions from die-off of root biomass are expected to be greater in the project (flooded) scenario, than in the baseline, and importantly, simplifies monitoring and accounting (i.e. avoids the need to separately track belowground biomass increment, recruitment and mortality).

Calculate mean annual change in stocks of above- and belowground biomass in the project area, $\Delta ABGB_{wp}$, and in a baseline reference site, $\Delta ABGB_{bsl}$.

$$\Delta ABGB_{wp,t} = \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left((ABGB_{wp,j,t} - ABGB_{wp,j,t-x}\right) * \left(\frac{1}{x}\right)) \qquad \text{Equation 15}$$

Where,

$\Delta ABGB_{wp,t}$	Mean annual change in above- and belowground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$ABGB_{wp,j,t}$	Above- and belowground biomass carbon stocks in the project area in plot j at time t; t CO_2e ha^{-1}
$ABGB_{wp,j,t-x}$	Above- and belowground biomass carbon stocks in the project area in plot j at time t-x; t CO_2e ha^{-1}
j	1, 2, 3 … n sample plots
x	Number of years in monitoring interval; years

$$\Delta ABGB_{bsl,t} = \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left((ABGB_{bsl,j,t} - ABGB_{bsl,j,t-x}\right) * (\frac{1}{x}))$$ Equation 16

Where:

$\Delta ABGB_{bsl,t}$	Mean annual change in above- and belowground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$ABGB_{bsl,j,t}$	Above- and belowground biomass carbon stocks in the baseline reference area in plot j at time t; t CO_2e ha^{-1}
$ABGB_{bsl,j,t-x}$	Above- and belowground biomass carbon stocks in the baseline reference area in plot j at time t-x; t CO_2e ha^{-1}
j	1, 2, 3 … n sample plots
x	Number of years in monitoring interval; years

Step 2

If $\Delta ABGB_{wp,t}$ is not equal to $\Delta ABGB_{bsl,t}$ (significantly different using a unpaired t test at P <0.05), then net emissions from above- and belowground biomass carbon are equal to the difference in stock change between the baseline reference site and the project area. Note that this term can be less than zero, where growth in the project area exceeds that in the baseline reference site, e.g. due to tree and shrub planting efforts conducted as part of the project activity.

$$Net\Delta ABGB_{wp,t} = \left((\Delta ABGB_{bsl,t} + UNC_{\Delta ABGB,bsl,t}\ ) - (\Delta ABGB_{wp,t} - UNC_{\Delta ABGB,wp,t})\right) * (A - A_{burn_{unint}},t)$$
Equation 17

Where:

$Net\Delta ABGB_{wp,t}$	Annual net change in above- and belowground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$\Delta ABGB_{wp,t}$	Mean annual change in above- and belowground biomass carbon stocks in the project area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}
$\Delta ABGB_{bsl,t}$	Mean annual change in above- and belowground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t; t CO_2e ha^{-1} yr^{-1}

$UNC_{\Delta ABGB,wp,t}$ Half width of 90% confidence interval exceeding 10% of the mean annual change in above- and belowground biomass carbon stocks in the project area at time t; t CO_2e ha^{-1} yr^{-1}

$UNC_{\Delta ABGB,bsl,t}$ Half width of 90% confidence interval exceeding 10% of the mean annual change in above- and belowground biomass carbon stocks in the baseline reference area at time t; t CO_2e ha^{-1} yr^{-1}

A Project area; ha

$A_{burn\_unint,t}$ Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha

t 1, 2, 3, … t years elapsed since the project start date

If $\Delta ABGB_{wp,t}$ is not significantly different than $\Delta ABGB_{bsl,t}$, then

$Net\Delta ABGB_{wp,t} = 0$

D.2.3 Emissions from fire in the project

Unintentional burns

Where unintentional burns occur in the project area, emissions from those burns are assumed, conservatively, to be equal in the project and baseline scenarios.

Net emissions from the above- and belowground biomass pool, and from accretion, resulting from unintentional burns in the project area are excluded from accounting by delineating the area of the burn, parameter $A_{burn\_unint,t}$, consulting aerial imagery; see equations 11, 14 and 17 above. Plans for intentional burns (e.g. prescribed burns) in the project area, that predate their implementation, must be recorded in management records to distinguish unintentional burns (on the absence of management records). Any sample points/plots for peat accretion/litterfall and above- and belowground biomass located within the area of an unintentional burn in the project area, will not be used to calculate mean surface elevation change due to accretion/litterfall, $\Delta SE_{Acc,wp,t}$ and change in above- and belowground biomass stocks, $\Delta ABGB_{wp,t}$, in the project area for the monitoring interval spanning the burn (i.e. from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn). Note that if an unintentional burn has occurred, the first monitoring event following the fire must occur after completion of the first growing season following the fire. Emissions from the belowground pool, $\Delta BG_{flux\_wp,t}$, estimated applying a regression based on flux chamber measurements, do not consider the emissions from fire and are calculated for the entire project area, using all proxy variable data, as usual.

Although emissions from unintentional fire are excluded from accounting, peat emissions from unintentional fire are tracked to update the threshold on emissions from the belowground pool; equations 10 and 13 above. Emissions from belowground (due to oxidation of peat) from unintentional burns, $\Delta BG_{burn\_unint,wp,t}$, are monitored by sampling surface elevation of peat in the burned area, $A_{burn\_unint,wp,t}$, and areas outside the burned area , after the burn takes place, to assess the depth of peat removed by the fire. Parameter $\Delta SE_{burn\_unint,wp,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

$$\Delta BG_{burn\_unint,wp,t} = A_{burn\_unint,wp,t} * - \Delta SE_{burn\_unint,wp,t} * 10 * BD_{wp,t-x} * CF * EF \qquad \text{Equation 18}$$

Where:

$\Delta BG_{burn\_int,wp,t}$	Emissions from soil organic carbon from intentional fire in the project scenario in year t; tCO_2-e
$\Delta SE_{burn\_unint,wp,t}$	Mean surface elevation change due to unintentional fire in the project area at time t; mm
$BD_{wp,t-x}$	Mean dry bulk density in the project area at time t-x; g cm^{-3}
CF	Combustion factor for peatlands (IPCC 2006GL) = 0.5; dimensionless
EF	Emission factor for all temperate ecosystems (IPCC 2006GL) = 1.569; t CO_2e emitted * t dry matter $burned^{-1}$
$A_{burn\_unint,wp,t}$	Area of unintentional burn in the project area occurring in monitoring interval ending in year t; ha
t	1, 2, 3, … t years elapsed since the project start date
10	Converts result to units of metric tons

Intentional burns

Net emissions from the belowground (due to reduced accretion/litterfall rate) and above- and belowground biomass pools resulting from intentional burns in the project are captured through monitoring parameters $\Delta SE_{Acc,wp,t}$ and $\Delta ABGB_{wp,t}$. referencing measurements collected at all sample plots/points for surface elevation and/or above- and belowground biomass located within the project area.

Emissions from belowground (due to oxidation of peat) from intentional burns, $\Delta BG_{burn\_int,wp,t}$, are monitored by sampling the planned burn area, using temporary surface level markers to assess emission of peat. Peat level is assessed from the markers immediately prior to and after the burn takes place. The actual intentional burned area, $A_{burn\_int,wp,t}$, is determined after the burn takes place by consulting aerial imagery.

Parameter $\Delta SE_{burn\_int,wp,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value (see parameter table).

$$\Delta BG_{burn\_int,wp,t} = A_{burn\_int,wp,t} * - \Delta SE_{burn\_int,wp,t} * 10 * BD_{wp,t-x} * CF * EF \qquad \text{Equation 19}$$

Where:

$\Delta BG_{burn\_int,wp,t}$ Emissions from soil organic carbon from intentional fire in the project scenario in year t; tCO_2-e

$\Delta SE_{burn\_int,wp,t}$ Mean surface elevation change due to intentional fire in the project area at time t; mm

$BD_{wp,t-x}$ Mean dry bulk density in the project area at time t-x; g cm^{-3}

CF Combustion factor for peatlands (IPCC 2006GL) = 0.5; dimensionless

EF Emission factor for all temperate ecosystems (IPCC 2006GL) = 1.569; t CO_2e emitted * t dry matter burned^{-1}

$A_{burn\_int,wp,t}$ Actual (not planned) area of intentional burn in the project area in year t; ha

t 1, 2, 3, … t years elapsed since the project start date

10 Converts result to units of metric tons

E.

DATA AND PARAMETERS

Data and Parameters Available at Validation

Data / Parameter	A
Data unit	Hectare (ha)
Description	Project area
Justification of choice of data or description of measurement methods and procedures applied	Delineation of the project area may use a combination of GIS coverages, ground survey data, remote imagery (satellite or aerial photographs), or other appropriate data.
Treatment of uncertainty	Any imagery or GIS dataset must be georegistered referencing corner points, clear land marks, or other intersection points.
Comments	None

Data / Parameter	$\%C_{soil\_wp}$
Data unit	%
Description	Percentage of soil organic C
Justification of choice of data or description of measurement methods and procedures applied	Soil carbon shall be determined for an aggregate sample (e.g., from 4 systematically-distributed 10 cm cores or auger samples) collected within a sample plot located within the project area. This sample shall be thoroughly mixed and sieved through a 2 mm sieve to remove all non-organic material > 2 mm. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) Determination of the soil organic carbon fraction (or percent soil organic carbon) should follow established laboratory procedures, such as those found in: Nelson, D.W., and L.E. Sommers. 1982. Total carbon, organic carbon, and organic matter. p. 539–580. In A.L. Page et al. (ed.) Methods of soil Analysis. Part 2. 2nd ed. Agron. Monogr. 9. ASA and SSSA, Madison, WI. Schumacher, B. A. Methods for the determination of total organic carbon (TOC) in soils and sediments. U.S.

	Environmental Protection Agency, Washington, DC, EPA/600/R-02/069 (NTIS PB2003-100822), 2002.
Treatment of uncertainty	None
Comments	The soil organic carbon fraction is sampled prior to validation and shall be used in both the baseline and with project scenario for the length of the project. Used in stock change approach only.

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Data / Parameter	f_t (Proxy A_t, Proxy B_{t},...)
Data unit	output in t CO_2e ha-1 yr-1
Description	Regression equation correlating one or more proxy variables to emissions from the soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous
Justification of choice of data or description of measurement methods and procedures applied	The flux approach may be employed where a regression equation correlating one or more proxy variables to belowground emissions meeting the following applicability conditions is available: 1. Peer-reviewed 2. Empirically-based – specifically, derived from flux chamber studies 3. Flux chambers capture gas exchange from the soil organic carbon, belowground biomass, litter and herbaceous vegetation pools 4. Relationship between proxy variable and emissions must be significant at P < 0.05 and unbiased (i.e., with minimal trend in residuals) 5. The study site from which proxy relationship developed must be on pocosins or former pocosins (as defined in Section A1); 6. Relationship incorporates one or more proxy variables that are: a. measured ex post in a valid baseline reference site , b. measured ex post in the project area (e.g. precipitation, temperature), and/or c. modeled in the project area on the basis of driver variables monitored ex post in the project area (e.g. water table modeled from monitored precipitation) 7. Uncertainty in predicted emissions (dependent variable) is known and calculated as the root mean squared error (RMSE) The same relationship must be used in both the project and baseline cases. The regression may be revised based on new data, provided it meets the above requirements.

Treatment of uncertainty	The output of the regression equation incorporates uncertainty where the half width of the (approximate) 90% confidence interval exceeds 10% of the predicted value, by: In the baseline scenario, subtracting from the predicted dependent variable value the following term: root mean squared error (RMSE) of the regression * 1.67 minus 10% of the dependent variable value. In the project scenario, adding to the predicted dependent variable value the following term: RMSE of the regression * 1.67 minus 10% of the dependent variable value
Comments	If the value of any proxy variable is outside the range of values for which the relationship with emissions was determined, the emission value is set equal to the corresponding lowest or highest estimated emission value for that range. Used in flux approach only.

Data / Parameter	$PD_{wp,t=0}$
Data unit	Meter (m)
Description	Mean peat depth in the project area at time t=0
Justification of choice of data or description of measurement methods and procedures applied	Peat depth is measured in the project area using line transects whereby peat depth is measured at an approximate predetermined interval (e.g., 200 m). Peat depth is determined by inserting a depth rod (or series of connected depth rods) until mineral soil/bedrock is reached/the rod meets firm resistance. A minimum of two depths should be taken at each sampling point at least 1 m apart. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Peat depth shall be measured at a minimum of 20 different points. 4. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Treatment of uncertainty	None
Comments	Used in flux approach only. Peat depth is used to determine a cap on potential emissions when utilizing the flux method. As such, peat depth is sampled prior to validation and may be used for the length of the project.

Data and Parameters Monitored

Data / Parameter	$A_{burn\_int,wp,t}$
Data unit	Ha
Description	Actual (not planned) area of intentional burn in the project area in year t
Description of measurement methods and procedures to be applied	Monitored in project area via aerial imagery and management records. The actual intentional burned area, $A_{burn\_int,wp,t}$, is determined after the burn takes place by consulting aerial imagery.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years, or following a fire.
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Any imagery or GIS dataset must be georegistered referencing corner point, clear land marks, or other intersection points.
Calculation method	Not applicable
Treatment of uncertainty	It is assumed that area bounds are known exactly.
Comments	Used in flux approach only.

Data / Parameter	$A_{burn\_unint,t}$
Data unit	ha
Description	Area of unintentional burn in the project area occurring in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Monitored in project area via aerial imagery and management records. The actual unintentional burned area, $A_{burn\_unint,t}$, is determined after the burn takes place by consulting aerial imagery. Plans for intentional burns (e.g. prescribed burns) in the project area, that predate their implementation, must be recorded in management records to distinguish unintentional burns (on the absence of management records).
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years, or following a fire.
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Any imagery or GIS dataset must be georegistered referencing corner point, clear land marks, or other intersection points.
Calculation method	Not applicable
Treatment of uncertainty	It is assumed that area bounds are known exactly.
Comments	

Data / Parameter	$ABGB_{bsl,j,t}$
Data unit	t CO_2e/ha
Description	Above- and belowground biomass carbon stocks in the baseline reference area in plot j at time t

Description of measurement methods and procedures to be applied	Monitored on baseline reference site via direct measurement on permanent sample plots. Procedures to monitor biomass carbon stocks, include trees and woody shrubs, shall reference a minimum dbh or basal diameter which is fixed for the project crediting period. The default carbon fraction used to estimate carbon from biomass shall be 0.47 t C t-1 d.m. in line with the IPCC default (IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3). Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Biomass carbon stocks shall be estimated on a minimum of 20 plots. 4. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) 5. Estimation factors (e.g. allometric equations) are demonstrated to be robust in application to the project circumstances.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years, or following a fire.
Monitoring equipment	Measuring tape, DBH (or diameter) tape
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	Uncertainty is accounted for in the parameter $UNC_{\Delta ABGB,bsl,t}$
Comments	Used in flux approach only. Allometric equations and root to shoot ratios shall be peer reviewed, published in a scientific journal or government publication, relevant for the geographic area where the project occurs, and appropriate for the species/vegetation type found in the project area.

Data / Parameter	$ABGB_{wp,j,t}$
Data unit	t CO_2e/ha
Description	Above- and belowground biomass carbon stocks in the project area in plot j at time t
Description of measurement methods and procedures to be applied	Monitored on project area via direct measurement on permanent sample plots. Procedures to monitor biomass carbon stocks, include trees and woody shrubs, shall reference a minimum dbh or basal diameter which is fixed for the project crediting period. The default carbon fraction used to estimate carbon from biomass shall be 0.47 t C t-1 d.m. in line with the IPCC default (IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3). Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Biomass carbon stocks shall be estimated on a minimum of 20 plots. 4. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) 5. Estimation factors (e.g. allometric equations) are demonstrated to be robust in application to the project circumstances.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Measuring tape, DBH (or diameter) tape
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	Uncertainty is accounted for in the parameter $UNC_{\Delta ABGB,wp,t}$
Comments	Used in flux approach only. Allometric equations and root to shoot ratios shall be peer reviewed, published in a scientific journal or government publication, relevant for the geographic area where the project

	occurs, and appropriate for the species/vegetation type found in the project area. Any sample plots for above- and belowground biomass carbon stocks located within the area of an unintentional burn in the project area, will not be used to calculate $\Delta ABGB_{wp,t}$ in the project area for the monitoring interval spanning the burn (i.e., from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn).

Data / Parameter	$AGB_{bsl,j,t}$
Data unit	t CO_2e/ha
Description	Aboveground biomass carbon stocks in the baseline reference area in plot j at time t
Description of measurement methods and procedures to be applied	Monitored on baseline reference site via direct measurement on permanent sample plots. Procedures to monitor biomass carbon stocks, include trees and woody shrubs, shall reference a minimum dbh or basal diameter which is fixed for the project crediting period. The default carbon fraction used to estimate carbon from biomass shall be 0.47 t C t-1 d.m. in line with the IPCC default (IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3). Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Biomass carbon stocks shall be estimated on a minimum of 20 plots. 4. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) 5. Estimation factors (e.g. allometric equations) are demonstrated to be robust in application to the project circumstances.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Measuring tape, DBH (or diameter) tape

QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	Uncertainty is accounted for in the parameter $UNC_{\Delta AGB,bsl,t}$
Comments	Used in stock change approach only. Allometric equations shall be peer reviewed, published in a scientific journal or government publication, relevant for the geographic area where the project occurs, and appropriate for the species/vegetation type found in the project area.

Data / Parameter	$AGB_{wp,j,t}$
Data unit	t CO_2e/ha
Description	Aboveground biomass carbon stocks in the project area in plot j at time t
Description of measurement methods and procedures to be applied	Monitored on project area via direct measurement on permanent sample plots. Procedures to monitor biomass carbon stocks, include trees and woody shrubs, shall reference a minimum DBH or basal diameter which is fixed for the project crediting period. The default carbon fraction used to estimate carbon from biomass shall be 0.47 t C t-1 d.m. in line with the IPCC default (IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3). Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Biomass carbon stocks shall be estimated on a minimum of 20 plots. 4. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) 5. Estimation factors (e.g. allometric equations) are demonstrated to be robust in application to the project circumstances.

Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Measuring tape, DBH (or diameter) tape
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	Uncertainty is accounted for in the parameter $UNC_{\Delta AGB,wp,t}$
Comments	Used in stock change approach only. Allometric equations shall be peer reviewed, published in a scientific journal or government publication, relevant for the geographic area where the project occurs, and appropriate for the species/vegetation type found in the project area. Any sample plots for aboveground biomass carbon stocks located within the area of an unintentional burn in the project area, will not be used to calculate $\Delta AGB_{wp,t}$ in the project area for the monitoring interval spanning the burn (i.e., from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn).

Data / Parameter	$BD_{wp,t}$
Data unit	g cm^{-3}
Description	Mean dry bulk density in the project area at time t

Description of measurement methods and procedures to be applied	Monitored in the project area using temporary or permanent sample plots. Bulk density is defined as the dry weight of the fine soil fraction, litter, and roots of the core divided by the core volume. Bulk density shall be sampled to a depth of 10 cm. Where roots impede coring, cut roots along the outside perimeter of the sampling ring. For bulk density determination, sample cores of known volume are collected in the field and oven dried to a constant weight at 105 C (for a minimum of 48 hours). The total sample is then weighed, then any coarse rocky (i.e., non-organic) fragments (>2 mm) are sieved and weighed separately. Because coarse (>2mm) rocky fragments occupy space in the soil profile in which carbon is not stored, the volume in the bulk density equation is the volume of the core. Discounting this volume, as in traditional bulk density calculations, would overestimate soil carbon stocks when applied to a volume that does not distinguish between coarse and fine fractions. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation (e.g., allometric equations) procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Frequency of monitoring/recording	This parameter shall be sampled prior to validation and every ten years.
Monitoring equipment	Bulk density may be sampled using a variety of equipment.
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.

Calculation method	The bulk density of the soil core is estimated as: Where: $$BD_{sample} = \frac{ODW - RF}{CV}$$ BD_{sample} = Bulk density of the < 2 mm fraction, in grams per cubic centimeter (g/cm3) ODW = Oven dry mass total sample in grams CV = Core volume in cm3 RF = Mass of coarse fragments (> 2 mm) in grams
Treatment of uncertainty	None
Comments	

Data / Parameter	Proxy $A_{bsl,t}$
Data unit	units unspecified
Description	Mean value of proxy variable A in the baseline at time t. The proxy variable is a measurable variable that is significantly correlated with belowground GHG emissions.
Description of measurement methods and procedures to be applied	Either monitored via direct measurement in a valid baseline reference site, monitored via direct measurement in the project area, or modeled in the project area (e.g., using a hydrologic model) on the basis of one or more monitored, directly-measured driver variables (e.g., precipitation) in the project area. When using a model (e.g., a hydrologic model) to estimate the proxy variable(s), the model(s) must be: 1. Peer-reviewed 2. Empirically-based 3. Incorporate one or more driver variables that are monitored ex post in the project area (e.g., precipitation) When the variable is direct measured: Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring and sampling the proxy variable are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.

Monitoring equipment	Not specified
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	The value of parameter Proxy $A_{bsl,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value, as: If the parameter is positively correlated with belowground emissions (from soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous), the value is equal to the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value. If the parameter is negatively correlated with belowground emissions (from soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous), the value is equal to the mean value plus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value. The 90% confidence interval is calculated referencing sample error (variance) for measured variables, or referencing model error for modeled variables.
Comments	Used in flux approach only.

Data / Parameter	Proxy $A_{wp,t}$
Data unit	units unspecified
Description	Mean value of proxy variable A in the project area at time t. The proxy variable is a measurable variable that is significantly correlated with belowground GHG emissions.
Description of measurement methods and procedures to be applied	Monitored via direct measurement in the project area. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring and sampling the proxy variable are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)

Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Not specified
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	Not applicable
Treatment of uncertainty	The value of parameter Proxy $A_{wp,t}$ incorporates uncertainty where the half width of the 90% confidence interval exceeds 10% of the mean value, as: If the parameter is positively correlated with belowground emissions (from soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous), the value is equal to the mean value plus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value. If the parameter is negatively correlated with belowground emissions (from soil organic carbon and belowground biomass and litter pools and net emissions from herbaceous), the value is equal to the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value. The 90% confidence interval is calculated referencing sample error (variance).
Comments	Used in flux approach only.

Data / Parameter	$\Delta SE_{Acc,bsl,t}$
Data unit	Millimeters (mm)
Description	Mean surface elevation change due to accretion/litterfall in the baseline reference site in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Monitored on baseline reference site via direct measurement of permanent points. Procedures to monitor surface elevation change due to accretion/litterfall shall use a reference plane, such as a soil horizon or feldspar marker. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured

	through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Soil horizon/feldspar marker and measuring device which can accurately measure length in mm.
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	For each sample point, change in surface elevation is calculated as measured surface elevation above horizon marker at time t minus measured surface elevation above horizon marker at time t-x (x = length of monitoring interval in years); i.e. net accretion is a positive value. Mean change in surface elevation is calculated from the sample point-level change values. Measurements of surface elevation above horizon marker are made in mm.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value plus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in flux approach only.

Data / Parameter	$\Delta SE_{Acc,wp,t}$
Data unit	mm
Description	Mean surface elevation change due to accretion/litterfall in the project in monitoring interval ending in year t

Description of measurement methods and procedures to be applied	Monitored on project area via direct measurement of permanent points. Procedures to monitor surface elevation change due to accretion/litterfall shall use a reference plane, such as a soil horizon or feldspar marker. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Soil horizon/feldspar marker and measuring device which can accurately measure length in mm.
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	For each sample point, change in surface elevation is calculated as measured surface elevation above horizon marker at time t minus measured surface elevation above horizon marker at time t-x (x = length of monitoring interval in years); i.e. net accretion is a positive value. Mean change in surface elevation is calculated from the sample point-level change values. Measurements of surface elevation above horizon marker are made in mm.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in flux approach only. Any sample points for surface elevation located within the area of an unintentional burn in the project area, will not be used to calculate net change in surface elevation due to accretion/litterfall, $\Delta SE_{Acc,wp,t}$, in the project area for the monitoring interval spanning the burn (i.e., from the monitoring event immediately prior to the burn to the monitoring event immediately after the burn).

Data / Parameter	$\Delta SE_{bsl,t}$
Data unit	mm
Description	Mean net surface elevation change (subsidence + accretion + root expansion/mortality) in the baseline reference site in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Monitored on baseline reference site via direct measurement of permanent sample points. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) The change in surface elevation shall be determined using either RTK (high precision) GPS , Rod Surface Elevation Table (RSET) or other appropriate technology. Measurements shall be taken at the same time of year (i.e., +/- 6 week) when water table levels are similar. Use of RTK GPS should follow established field procedures, such as those found in: US Geological Survey. 2012. Topographic mapping RTK GPS standard operating procedures. Unpublished protocols. USGS, Western Ecological Research Center, San Francisco Bay Estuary Field Station, Vallejo, CA. Use of RSETs should follow established field procedures, such as those found in: Cahoon, D. R., J. C. Lynch, B. C. Perez, B. Segura, R. Holland, C. Stelly, G. Stephenson, and P. Hensel. 2002. A device for high precision measurement of wetland sediment elevation: II. The rod surface elevation table. Journal of Sedimentary Research. Vol. 72, No. 5. pp. 734-739.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	RTK GPS, RSET station, or other appropriate technology
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.

Calculation method	For each sample point, change in surface elevation is calculated as measured surface elevation at time t minus measured surface elevation at time t-x (x = length of monitoring interval in years); i.e. net subsidence is a negative value and net accretion is a positive value. Mean change in surface elevation is calculated from the sample point-level change values. Measurements of surface elevation are made in meters above sea level (masl) to four decimal points (1/10 mm), where possible.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value plus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in stock change approach only. The Stock Change approach may be employed if the following applicability conditions are met: 1. Net surface elevation change measured using RSETs or RTKs 2. If using RSETs, clear and detailed rules for determining surface level are documented in field standard operating procedures and adhered to 3. Bulk density in top 10 cm is monitored; the top layer being the labile portion from which emissions are expected to be sourced, and as well is a conservative value as it's the lowest bulk density throughout the peat profile. Bulk density samples must include soil organic carbon, belowground biomass (roots) and litter 4. Repeat measurements of surface elevation change are made at the same water table level (+/- 10% of level at t = 0), at the same time as bulk density samples are taken, preferably in the dry season 5. In with-project case, initial surface elevation level is measured 6-12 months after re-wetting takes place (after initial swell has occurred) 6. No significant erosion or sedimentation expected to occur (flat terrain, no river flow over project area) 7. No significant compaction expected to occur and procedures will be in place to safeguard against compaction resulting from surface elevation measurements in the field 8. Must locate reference datum (bottom of peat) if using the SET approach Note that the Stock Change approach treats soil organic carbon, belowground biomass and litter as a single source/sink. No root expansion and related swelling is expected in the with-project re-wetted case, and subsidence due to root die back is treated as an emission (assuming emissions from belowground biomass mortality at the time of measurable subsidence). 9. Baseline reference site has been subject to drainage/hydrological alteration for at least 10 years (to preclude significant influence of new root growth and expansion on surface elevation and bulk density)

Data / Parameter	$\Delta SE_{wp,t}$
Data unit	mm
Description	Mean net surface elevation change (subsidence + accretion + root expansion/mortality) in the project area in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Monitored on project area via direct measurement of permanent sample points. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) The change in surface elevation shall be determined using either RTK GPS (high precision), Rod Surface Elevation Table (RSET) or other appropriate technology. Measurements shall be taken at the same time of year (i.e., +/- 6 week) when water table levels are similar. Use of RTK GPS should follow established field procedures, such as those found in: US Geological Survey. 2012. Topographic mapping RTK GPS standard operating procedures. Unpublished protocols. USGS, Western Ecological Research Center, San Francisco Bay Estuary Field Station, Vallejo, CA. Use of RSETs should follow established field procedures, such as those found in: Cahoon, D. R., J. C. Lynch, B. C. Perez, B. Segura, R. Holland, C. Stelly, G. Stephenson, and P. Hensel. 2002. A device for high precision measurement of wetland sediment elevation: II. The rod surface elevation table. Journal of Sedimentary Research. Vol. 72, No. 5. pp. 734-739.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	RTK GPS, RSET station, or other appropriate technology
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.

Calculation method	For each sample point, change in surface elevation is calculated as measured surface elevation at time t minus measured surface elevation at time t-x (x = length of monitoring interval in years); i.e. net subsidence is a negative value and net accretion is a positive value. Mean change in surface elevation is calculated from the sample point-level change values. Measurements of surface elevation are made in meters above sea level (masl) to four decimal points (1/10 mm), where possible.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in stock change approach only. The Stock Change approach may be employed if the following applicability conditions are met: 1. Net surface elevation change measured using RSETs or RTKs 2. If using RSETs, clear and detailed rules for determining surface level are documented in field standard operating procedures and adhered to 3. Bulk density in top 10 cm is monitored; the top layer being the labile portion from which emissions are expected to be sourced, and as well is a conservative value as it's the lowest bulk density throughout the peat profile. Bulk density samples must include soil organic carbon, belowground biomass (roots) and litter 4. Repeat measurements of surface elevation change are made at the same water table level (+/- 10% of level at t = 0), at the same time as bulk density samples are taken, preferably in the dry season 5. In with-project case, initial surface elevation level is measured 6-12 months after re-wetting takes place (after initial swell has occurred) 6. No significant erosion or sedimentation expected to occur (flat terrain, no river flow over project area) 7. No significant compaction expected to occur and procedures will be in place to safeguard against compaction resulting from surface elevation measurements in the field 8. Must locate reference datum (bottom of peat) for the SET approach. Note that the Stock Change approach treats soil organic carbon, belowground biomass and litter as a single source/sink. No root expansion and related swelling is expected in the with-project re-wetted case, and subsidence due to root die back is treated as an emission (assuming emissions from belowground biomass mortality at the time of measurable subsidence). 9. Baseline reference site has been subject to drainage/hydrological alteration for at least 10 years (to preclude significant influence of new root growth and expansion on surface elevation and bulk density) Any sample points for surface elevation located within the area of an unintentional burn in the project area, will not be used to calculate net change in surface elevation, $\Delta SE_{wp,t}$, in the project area for the monitoring interval spanning the burn (i.e., from the

	monitoring event immediately prior to the burn to the monitoring event immediately after the burn).

Data / Parameter	$\Delta SE_{burn\_int,wp,t}$
Data unit	mm
Description	Mean surface elevation change due to intentional fire in the project area at time t
Description of measurement methods and procedures to be applied	Monitored in the project area in the planned burn area via direct measurement of permanent sample points immediately prior to and after the burn. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan)
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Measuring Tape
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Calculation method	For each sample point, change in surface elevation is calculated as measured surface elevation after burn minus measured surface elevation before burn; i.e. elevation change due to fire is expected to be a negative value. Mean change in surface elevation is calculated from the sample point-level change values. Measurements of surface elevation are made in meters above sea level (masl) to four decimal points (1/10 mm), where possible.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in flux approach only.

Data / Parameter	$\Delta SE_{burn\_unint,wp,t}$
Data unit	mm
Description	Mean surface elevation change due to unintentional fire in the project area at time t
Description of measurement methods and procedures to be applied	Monitored in the project area via direct measurement of permanent sample points in the burn area and outside the burn area immediately after the burn. Acknowledging the wide range of valid monitoring approaches, and that relative efficiency and robustness are circumstance-specific, sampling, measurement and estimation procedures for measuring are not specified in the methodology and may be selected by project proponents based on capacity and appropriateness. Stratification may be employed to improve precision, but is not required. Estimates generated must: 1. Be demonstrated to be un-biased and derived from representative sampling 2. Sampling error quantified with 90% confidence 3. Accuracy of measurements and procedures is ensured through employment of quality assurance/quality control (QA/QC) procedures (to be determined by the project proponent and outlined in the monitoring plan) The change in surface elevation shall be determined using either RTK GPS (high precision), Rod Surface Elevation Table (RSET) or other appropriate technology. Use of RTK GPS should follow established field procedures, such as those found in: US Geological Survey. 2012. Topographic mapping RTK GPS standard operating procedures. Unpublished protocols. USGS, Western Ecological Research Center, San Francisco Bay Estuary Field Station, Vallejo, CA. Use of RSETs should follow established field procedures, such as those found in: Cahoon, D. R., J. C. Lynch, B. C. Perez, B. Segura, R. Holland, C. Stelly, G. Stephenson, and P. Hensel. 2002. A device for high precision measurement of wetland sediment elevation: II. The rod surface elevation table. Journal of Sedimentary Research. Vol. 72, No. 5. pp. 734-739.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	RTK GPS, RSET station, or other appropriate technology
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest biomass/soil inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.

Calculation method	Mean change in surface elevation is calculated as the mean surface elevation in the burned area minus the mean surface elevation in the unburned area; i.e. elevation change due to fire is expected to be a negative value. Measurements of surface elevation are made in meters above sea level (masl) to four decimal points (1/10 mm), where possible.
Treatment of uncertainty	Parameter value incorporates uncertainty by being calculated as the mean value minus the amount of the half width of the 90% confidence interval exceeding 10% of the mean value.
Comments	Used in flux approach only.

Data / Parameter	$UNC_{\Delta ABGB,bsl,t}$
Data unit	t CO_2e/ha/yr
Description	Half width of 90% confidence interval exceeding 10% of the mean annual change in above- and belowground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Not applicable as parameter is calculated.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Not applicable as calculated parameter.
QA/QC procedures to be applied	Not applicable as parameter is calculated

Calculation method	Parameter $UNC_{\Delta ABGB,bsl,t}$ is calculated as $$UNC_{\Delta ABGB,bsl,t} = \left(\frac{1}{x}\right) * 1.67 * \sqrt{(Var_{ABGB,bsl,t} + Var_{ABGB,bsl,t-x} - 2 * Cov_{ABGB,bsl,t\_ABGB,bsl,t-x} * \sqrt{Var_{ABGB,bsl,t}} * \sqrt{Var_{ABGB,bsl,t-x}}) * \left(\frac{1}{n}\right)} - 10\% * \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left(\left(ABGB_{bsl,j,t} - ABGB_{bsl,j,t-x}\right) * \left(\frac{1}{x}\right)\right)$$ Where, $ABGB_{bsl,j,t}$ Above- and belowground biomass carbon stocks in the baseline reference area in plot j at time t; t CO_2e/ha $ABGB_{bsl,j,t-x}$ Above- and belowground biomass carbon stocks in the baseline reference area in plot j at time t-x; t CO_2e/ha $Var_{ABGB,bsl,t}$ Variance in above- and belowground biomass carbon stocks in the baseline reference area at time t; dimensionless $Var_{ABGB,bsl,t-x}$ Variance in above- and belowground biomass carbon stocks in the baseline reference area at time t-x; dimensionless $Cov_{ABGB,bsl,t\_ABGB,bsl,t-x}$ Covariance in above- and belowground biomass carbon stocks in the baseline reference area at times t and t-x; dimensionless j 1, 2, 3 … n sample plots x Number of years in monitoring interval; years t 1, 2, 3, … t years elapsed since the project start date
Treatment of uncertainty	None
Comments	Used in flux approach only.

Data / Parameter	$UNC_{\Delta ABGB,wp,t}$
Data unit	t CO_2e/ha/yr
Description	Half width of 90% confidence interval exceeding 10% of the mean annual change in above- and belowground biomass carbon stocks in the project area in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Not applicable as parameter is calculated.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Not applicable as calculated parameter.
QA/QC procedures to be applied	Not applicable as parameter is calculated

Calculation method	Parameter $UNC_{\Delta ABGB,wp,t}$ is calculated as $$UNC_{\Delta ABGB,wp,t} = \left(\frac{1}{x}\right) * 1.67 * \sqrt{\left(Var_{ABGB,wp,t} + Var_{ABGB,wp,t-x} - 2 * Cov_{ABGB,wp,t\_ABGB,wp,t-x} * \sqrt{Var_{ABGB,wp,t}} * \sqrt{Var_{ABGB,wp,t-x}}\right) * \left(\frac{1}{n}\right)} - 10\% * \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left(\left(ABGB_{wp,j,t} - ABGB_{wp,j,t-x}\right) * \left(\frac{1}{x}\right)\right)$$ Where, $ABGB_{wp,j,t}$ Above- and belowground biomass carbon stocks in the project area in plot j at time t; t CO_2e/ha $ABGB_{wp,j,t-x}$ Above- and belowground biomass carbon stocks in the project area in plot j at time t-x; t CO_2e/ha $Var_{ABGB,wp,t}$ Variance in above- and belowground biomass carbon stocks in the project area at time t; dimensionless $Var_{ABGB,wp,t-x}$ Variance in above- and belowground biomass carbon stocks in the project area at time t-x; dimensionless $Cov_{ABGB,wp,t\_ABGB,wp,t-x}$ Covariance in above- and belowground biomass carbon stocks in the project area at times t and t-x; dimensionless j 1, 2, 3 … n sample plots x Number of years in monitoring interval; years t 1, 2, 3, … t years elapsed since the project start date
Treatment of uncertainty	None
Comments	Used in flux approach only.

Data / Parameter	$UNC_{\Delta AGB,bsl,t}$
Data unit	t CO_2e/ha/yr
Description	Half width of 90% confidence interval exceeding 10% of the mean annual change in aboveground biomass carbon stocks in the baseline reference area in monitoring interval ending in year t
Description of measurement methods and procedures to be applied	Not applicable as parameter is calculated.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Not applicable as calculated parameter.
QA/QC procedures to be applied	Not applicable as parameter is calculated
Calculation method	Parameter $UNC_{\Delta AGB,bsl,t}$ is calculated as $UNC_{\Delta AGB,bsl,t} = \left(\frac{1}{x}\right) * 1.67 * \sqrt{\left(Var_{AGBbsl,t} + Var_{AGBbsl,t-x} - 2 * Cov_{AGBbsl,t\_AGBbsl,t-x} * \sqrt{Var_{AGBbsl,t}} * \sqrt{Var_{AGBbsl,t-x}}\right) * \left(\frac{1}{n}\right)} - 10\% * \left(\frac{1}{n}\right) * \sum_{j=1}^{n}\left(\left(AGB_{bsl,j,t} - AGB_{bsl,j,t-x}\right) * \left(\frac{1}{x}\right)\right)$ Where, $AGB_{bsl,j,t}$ Aboveground biomass carbon stocks in the baseline reference area in plot j at time t; t CO_2e/ha $AGB_{bsl,j,t-x}$ Aboveground biomass carbon stocks in the baseline reference area in plot j at time t-x; t CO_2e/ha $Var_{AGB,bsl,t}$ Variance in aboveground biomass carbon stocks in the baseline reference area at time t; dimensionless $Var_{AGB,bsl,t-x}$ Variance in aboveground biomass carbon stocks in the baseline reference area at time t-x; dimensionless $Cov_{AGB,bsl,t\_AGB,bsl,t-x}$ Covariance in aboveground biomass carbon stocks in the baseline reference area at times t and t-x; dimensionless j 1, 2, 3 … n sample plots x Number of years in monitoring interval; years t 1, 2, 3, … t years elapsed since the project start date
Treatment of uncertainty	None
Comments	Used in stock change approach only.

Data / Parameter	$UNC_{\Delta AGB,wp,t}$
Data unit	t CO_2e/ha/yr
Description	Half width of 90% confidence interval exceeding 10% of the mean annual change in aboveground biomass carbon stocks in the project area in monitoring interval ending in year t

Description of measurement methods and procedures to be applied	Not applicable as parameter is calculated.
Frequency of monitoring/recording	Monitoring shall be conducted at least every five years, or prior to each verification event if less than five years.
Monitoring equipment	Not applicable as calculated parameter.
QA/QC procedures to be applied	Not applicable as parameter is calculated
Calculation method	Parameter $UNC_{\Delta AGB,wp,t}$ is calculated as $UNC_{\Delta AGB,wp,t} = \left(\frac{1}{x}\right) * 1.67 * \sqrt{(Var_{AGB,wp,t} + Var_{AGB,wp,t-x} - 2 * Cov_{AGB,wp,t\_AGB,wp,t-x} * \sqrt{Var_{AGB,wp,t}} * \sqrt{Var_{AGB,wp,t-x}}) * \left(\frac{1}{n}\right)} - 10\% * \left(\frac{1}{n}\right) * \sum_{j=1}^{n}((AGB_{wp,j,t} - AGB_{wp,j,t-x}) * (\frac{1}{x}))$ Where, $AGB_{wp,j,t}$ Aboveground biomass carbon stocks in the project area in plot j at time t; t CO_2e/ha $AGB_{wp,j,t-x}$ Aboveground biomass carbon stocks in the project area in plot j at time t-x; t CO_2e/ha $Var_{AGB,wp,t}$ Variance in aboveground biomass carbon stocks in the project area at time t; dimensionless $Var_{AGB,wp,t-x}$ Variance in aboveground biomass carbon stocks in the project area at time t-x; dimensionless $Cov_{AGB,wp,t\_AGB,wp,t-x}$ Covariance in aboveground biomass carbon stocks in the project area at times t and t-x; dimensionless j 1, 2, 3 … n sample plots x Number of years in monitoring interval; years t 1, 2, 3, … t years elapsed since the project start date
Treatment of uncertainty	None
Comments	Used in stock change approach only.

F.

CALCULATION OF ERTs

F1. CALCULATION OF ERTs

Net accounting of GHG emission reductions is produced in Equation X below.

$NER_t = GHG_{BSL,t} – GHG_{WP,t} – GHG_{LK,t}$ Equation 20

Where:

NER_t	Annual net greenhouse gas emission reductions in monitoring interval ending in year t; t CO_2e yr^{-1}
$GHG_{BSL,t}$	Annual greenhouse gas emissions in the baseline in monitoring interval ending in year t; t CO_2e yr^{-1}
$GHG_{WP,t}$	Annual greenhouse gas emissions in the with-project case in monitoring interval ending in year t; t CO_2e yr^{-1}
$GHG_{LK,t}$	Annual greenhouse gas emissions due to leakage in monitoring interval ending in year t; t CO_2e yr^{-1}

Notes:

- $GHG_{LK,t}$ = zero for all years, per applicability condition stipulating the absence of any productive land use in the project area within two years prior to the project start date.

$ERT_t = NER_t * (1-BUF)$ Equation 21

Where:

$ERT_{,t}$	Number of Emission Reduction Tonnes at time t
NER_t	Annual net greenhouse gas emission reductions in monitoring interval ending in year t; t CO_2e yr^{-1}
BUF	The non-permanence buffer deduction as calculated by the ACR Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination (BUF will be set to zero if an ACR approved insurance product is used); fraction