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Project Description Document

BRODIE BIOMASS, SURREY, ENGLAND

accend

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Important information

This report has been prepared on behalf of Brodie Biomass, by the author, Accend AS. The owner, Brodie Biomass, holds the rights to the information herein. Copying and distributing the contents are not permitted without the owner's permission. Accend has prepared this report based on the information provided by Brodie Biomass, to ascertain the net CO_2 removal of biochar produced by their Surrey facility. The report contains a carbon footprint calculation for the production and application of biochar using the life cycle assessment approach per ISO 14040 and 14044, ISO 14067 and the Puro Earth methodology for biochar edition 2022 version 3, where applicable.

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Abbreviations

C	Carbon
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
Corg	Organic Carbon
GHG	Greenhouse gases
GWP	Global Warming Potential
H	Hydrogen
ISO	International Organization for Standardization
kg	kilogram
kWh	kilowatt hour
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
m	meter
m^3	cubic meter
MC	moisture content
MJ	megajoule
tkm	metric ton x kilometers
CORC	CO_2 Removal Certificate
IPCC	The Intergovernmental Panel on Climate Change

Glossary of terms

- Allocation: A way of dividing emissions and resource use among the different products of a process. The partitioning can be made on a weight basis, energy content, or economic value.
- Cradle-to-gate: LCA model which includes the upstream part of the product life cycle, i.e. all steps from raw material extraction to product at the factory gate.
- Cradle-to-grave: LCA model which includes all the product life cycle, from production and supply of the biomass, from biomass conversion to biochar, and biochar distribution and use.
- Functional unit: expresses the function of the studied product in quantitative terms and serves as the basis for calculations. It is the reference flow to which other flows in the LCA are related. It also serves as a unit of comparison in comparative studies.
- Life cycle assessment (LCA): Method for the environmental assessment of products from a life cycle perspective.
- Life cycle inventory (LCI): LCA phase that quantifies relevant inputs and outputs of a product system over its life cycle. Some assessments can go as far as an inventory analysis without including an impact assessment.
- Life cycle impact assessment (LCIA): Phase of an LCA study during which the environmental impacts of the product are assessed and evaluated.
- Modules A1, A2, A3, A4, and B1: LCA model of the product life cycle stages according to Puro. earth methodology.
- System boundary: A set of criteria that specifies which processes are part of a product system.
- Global warming potential (GWP): The capacity of a gas to contribute to global warming. GWP is a method to compare the global climate change effects of different greenhouse gases relative to CO_2.

Executive Summary

Brodie Biomass Ltd (BBL) is a company owned by the Brodie family who have been farming in Surrey, England for over 50 years. Over the last twenty-five years, the farm business has diversified into processing biomass materials, primarily focusing on 'Arboreal risings' (offcuts of timber) supplied by local tree surgeons. Currently, BBL only processes arboreal risings, but the company has plans to expand its operations in the future to include the processing of coppiced wood from their own managed woodlands.

This continued diversification of the farm's business steered the Brodie family toward researching biochar and its application, eventually leading to the purchase of a pyrolysis technology that operates on their farm. Initially, this technology uses wood chip derived from arboreal risings as feedstock, with future plans to incorporate coppiced wood from their own manged woodlands.

BBL purchased a Woodtek engineering C-1000 pyrolysis technology with a potential annual production capacity of ~900 tons of biochar.

BBL is transitioning to regenerative agriculture through the use of biochar. The biochar produced is mixed into BBL's composts and spread on their farmlands to increase the quality and yield of their crops and improve their land, by returning the farm to a minimum/no-till operation. Using biochar in a compost reduces the reliance on chemical fertilizers and pesticides. BBL is also actively investigating using biochar as a water filter to clean lakes and ponds and then returning the biochar to land as an activated material. As the demand for biochar from both the farming and gardening communities, increases, BBL intends to support that demand through increased biochar production and supply to neighboring farmers and local garden centers.

The project's financial model is based on the revenue generated through the sale of carbon credits. The biochar market is not yet developed in the region, and consequently, BBL could not have established a business based on biochar sales alone. BBL will sell the carbon credits issued under the Puro.Earth carbon removal standard. The project requires carbon credit financing to operate in an economically feasible manner. Other sources of finance included green loans and private investment capital.

The LCA presented conforms to ISO standards 14040, 14044, 14067 and the Puro biochar methodology edition 2022. Based on the parameters of BBL's operations the carbon footprint of the biochar results in between 2.31 and 2.55 tonnes of CO_2 removed for each dry metric tonne of biochar produced and applied as compost, being the average for the period assessed 2.35 tonnes of CO_2 per dry metric tonne.

BBL's biochar project meets the eligibility criteria for certification in line with Puro.earth Standard 4.1 and the Biochar Methodology edition 2022 v3.

Project Description

a. Project Proponents and Participants

For the implementation of the biochar project, the following groups and partners are involved:

Brodie Biomass Ltd (BBL) is the project owner and operator. BBL produces biochar which is used in the manufacture of a diverse range of biochar products applied on their family-owned farmlands.

Alex Brodie, formerly a chartered surveyor, businessman, and farmer for 25 years, oversees farm operations along with his son Tom Brodie, who has been a farmer for 5 years. Andy Jackman, a farmer for over 50 years is the farm manager.

Accend acts as the carbon project proponent and registered marketplace participant on the Puro.Earth platform for the BBL project. Their role in the project involves conducting an independent lifecycle assessment to quantify the net carbon capture of biochar and marketing the carbon credits.

WoodTek Engineering is the technology supplier for the project. WoodTek, a family-owned engineering group, has over 30 years of experience designing, operating, installing, and servicing a wide range of biomass boilers and energy from waste plants.

b. Geographic Scope and Site Description

BBL is a new company specifically created to run and manage biochar operations and biochar sales at one of the family farms near Brockham in Surrey, England. Specifically at coordinates: 51°13'31.44 , -0°17'26.16.

With Surrey being England's most wooded county, with woodland covering over a fifth of the county, approximately 24%, [1]BBL has access to an abundance of wood feedstock.

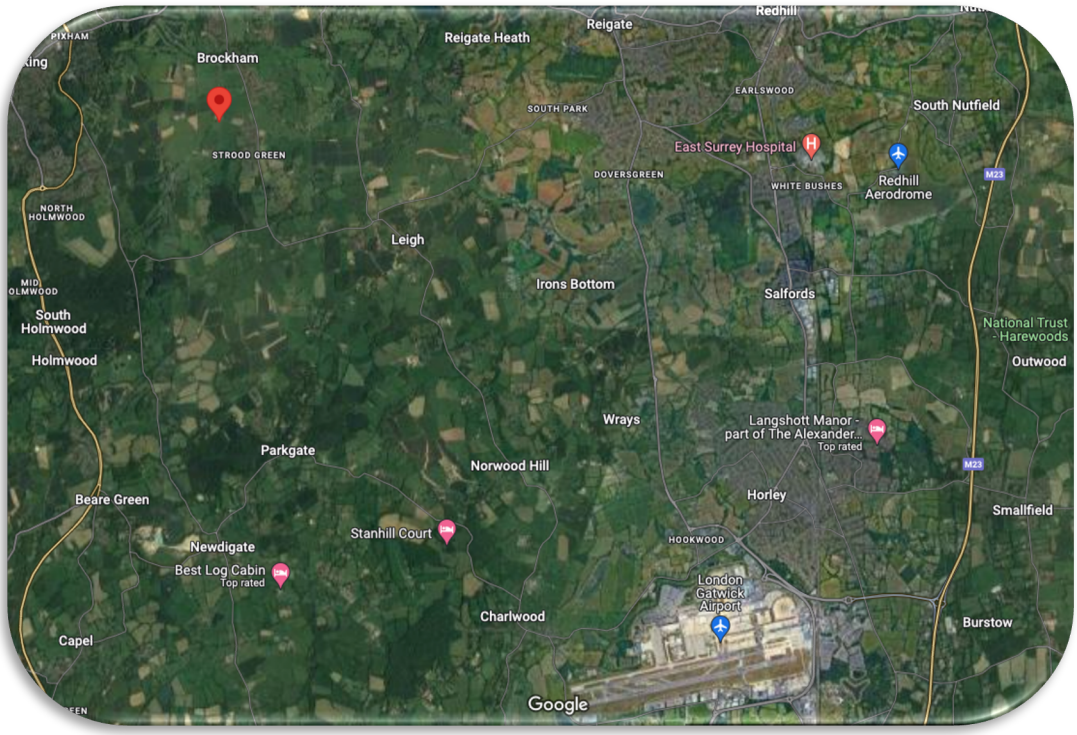


Figure 1. Farm location, Brockham, Surrey, England

The biochar facility and operations are housed on the farm, within a newly constructed dryer barn and a newly renovated existing barn. Other areas at this location are used to process wood and store biochar and compost. The family owns three farms in the area with a combined total of over 500 acres, of which 80 acres are woodlands, some designated as ancient woodland.

[1] https://www.surreycc.gov.uk/culture-and-leisure/countryside/what-to-see/woodlands

Figure 2. Surrounding woodland owned by BBL and the newly constructed dryer barn

c. Feedstock

Currently, BBL is sourcing its wood feedstock from Arboreal risings (Offcuts of timber) supplied by four tree surgeon operators with whom BBL has existing relationships. However, there are plans to diversify the feedstock sources in the future by incorporating coppiced wood[2] from BBL's own managed woodlands. All feedstock is obtained within a 25-mile radius of the farm.

The feedstock is sorted into three categories:

a. Logs- Chipped offsite and combined with the other woodchip
b. Brash (leaves and twigs)- Shredded and transported to the composting site situated 300m from feedstock delivery area (not used in biochar production).
c. Woodchips- The chips are processed offsite before reaching the facility. The processed chips are then screened onsite into three sizes:

   1: Oversize chip: Sold and used in the poultry market for heating as well as bedding for cattle,

   2: Chips 10mm- 20mm: Transferred first to the drier before being fed into the pyrolysis reactor

   3: Small fine chip: To be used in composting, along with the brash

Figure 3 below shows the different feedstock groups at BBL.

[2] Coppicing is a traditional woodland management technique to improve the health and biodiversity of a woodland area, involving the felling of trees at their base to create a 'stool' where new shoots will grow

Logs and brash for processing into wood chips and fines

BBL woodlands where coppiced feedstock will be sourced in the future and, the screened wood chip feedstock being prepared for drying and pyrolysis

Figure 3. Wood chip screening. Middle pile - chips under 20mm used in pyrolysis. Finer wood chips from screening are piled ready to be used in compost

d. Description of the equipment

The C-1000 pyrolysis technology is built and designed by Woodtek Engineering. The C1000 benefits from thorough research and development efforts, utilizing operational knowledge from the C600 model to guarantee its dependability and position it as a leader in advanced pyrolysis technology. The C-1000 has a unique precision two-stage pyrolysis thermal combustion, allowing for thermal energy production from the manufacture of biochar. This thermal energy can be easily converted into electricity, providing enough energy to produce more electricity than a C-1000 requires, resulting in a carbon-negative production of electricity. A future consideration for BBL. The equipment is fitted with a scrubber to reduce particulate emissions and a dryer used to bring moisture content of the feedstock down to suitable levels for pyrolysis.

Figure 4: C-1000 pyrolysis technology showing the two biochar outfeeds, the scrubber and dryer installed at the facility

e. Detailed Biochar Production Process

Once on site at BBL, the feedstock input to biochar output, through the C-1000 undergoes the following process:

Feedstock is screened to remove the fines (leaves and twigs from tree clippings) which are then sent for composting. Logs and branches are processed (chipped) offsite. Moisture content of chips is initially reduced during natural external storage resulting in three dried chipped materials.

1- Wood chips suitable for use in biochar production (<20mm).
2- Oversize chip (between 30mm and 50mm) which is sold to a poultry farmers.
3- Fine wood chips used to make compost.

After screening, the woodchip 10-20mm in size, is transferred to the drier.

The processed wood chips suitable for pyrolysis are put through a drier before being stored in the screened chip barn where chips are ~8-12% moisture content.

Screend chip is then transported using a frontloader into the neighbouring barn bay where rotary feeders mechanically feed the chip into the pyrolysis unit via a conveyor and auger system, to be turned into biochar.

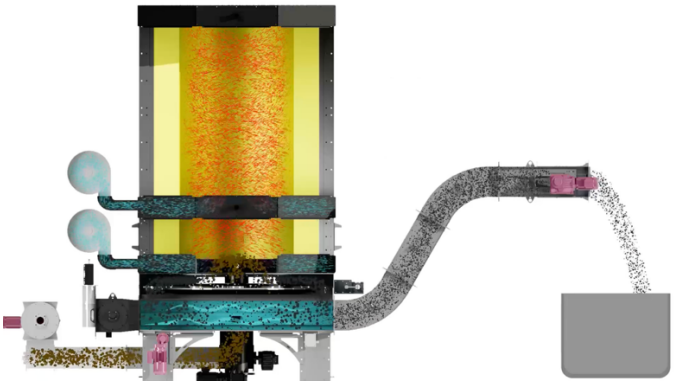
In the pyrolysis unit, the feedstock undergoes thermal transformation at approximately 850-900°C for 10 minutes.

The syngas released by the feedstock is thermally oxidized at the top of the chamber. Excess heat is taken off and channeled to heat water, which is then circulated to keep the drier operational to dry incoming feedstock (and in the future, potentially be used to generate

electricity). Any overload heat is released through a heat converter located in a separate bay of the facility.

The biochar is then quenched in a bath for cooling and dust prevention, before being augured into the biochar bay where it is deposited.

Biochar exiting the C-1000 has ~60-65% moisture content.



The biochar leaves the C-1000 unit out the biochar outfeed Into the biochar output bay.

Once biochar accumulates to approximately 10 tons in the biochar bay it is measured for moisture and temperature before being allocated a barcode prior to exit.

The biochar is either bagged and sold directly or taken up to the compost site (300m away).

On the compost site, once every two and a half days, the biochar is then mixed with compost (horse manure from the farm and the fines that were previously screened), into a variety of blends to form the compost materials. The biochar compost is used on BBL's fields.

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Figure 5 below gives an overview of biochar production at the BBL facility.

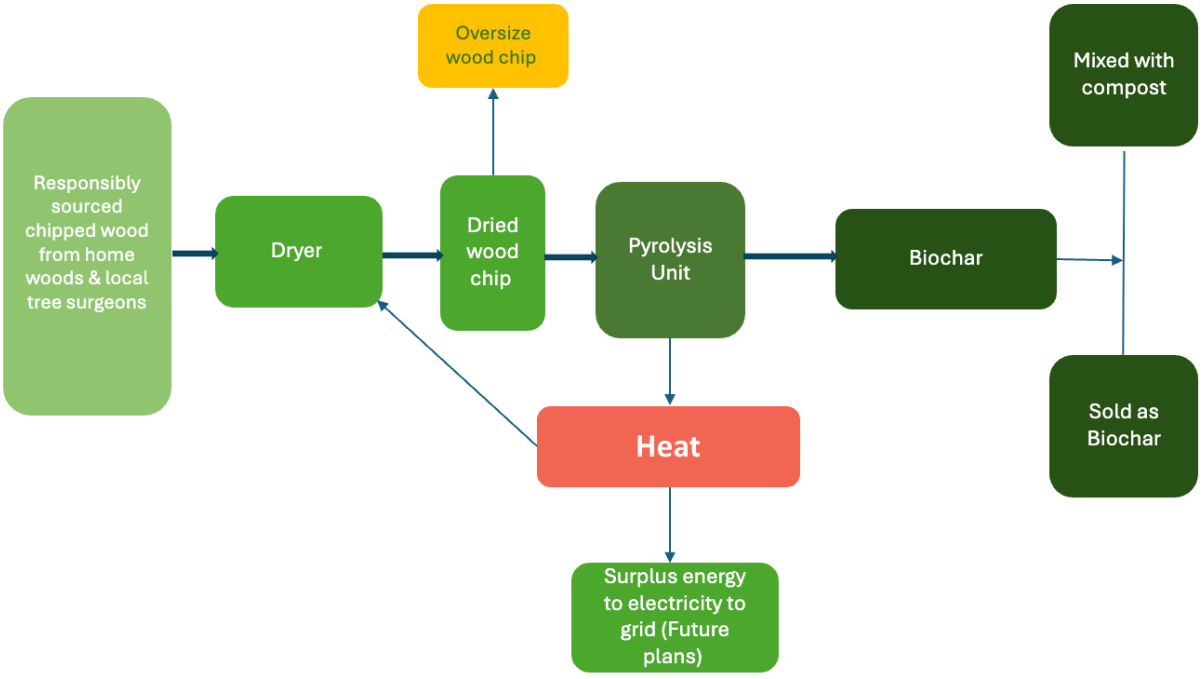

Figure 5: Biochar production process at BBL

f. Transport and Application

BBL mixes the biochar with manure from their farm and the fines (derived from leaves and twigs) that were initially screened from the feedstock, into a variety of blends to form compost materials. The biochar compost is used on BBL's own fields, as shown in figure 6 below.

Figure 6: Biochar compost applied to BBL's own fields

Small volumes of biochar are also sold as is, in bulk.

In the future, although they have already sold some biochar compost, BBL intends to increase their sales and sell even more as part of their business strategy. They are also actively investigating using biochar as a water filter to clean lakes and ponds and then returning the biochar to land as an activated material.

g. Baseline: Conditions Before Project Initiation

Before project initiation, the wood feedstock (logs and branches) used in the production of biochar, was chipped and sent for further processing at Walton in Leicestershire, over 100 miles away, before being transported to power stations in Kent, to be used as fuel, resulting in the conversion of carbon to CO_2. In addition to this release of CO_2, there were also the transport costs and GHG emissions associated with this process.

The fines (leaves and twigs) were taken to be composted and sold. Transport costs and greenhouse gas emissions were also associated with this process.

The use of this wood feedstock in the production of biochar- and not as a fuel- and then the blending of this biochar in composts, and applying it on the farm's fields, prevents this additional release of CO_2 into the atmosphere.

h. Project Start Date

The new pyrolysis technology was installed onsite in September 2024 with operations and project commissioning on 15th September 2024.

i. Project Crediting Period

The first date of the first Monitoring Period marks the beginning of a Crediting Period. BBL's monitoring period begins September 2024 and goes through July 2025.

Through the Puro.earth standard v4.1 and following the Biochar methodology edition 2022 v3, the crediting period lasts 5 years. The crediting period can be renewed twice by successfully undergoing a new Production Facility Audit. An Output report is submitted to each Production Facility once, every 12 months throughout the crediting period.

BBL expects to complete both, its Production Facility Audit and first Output Audit in August 2025 with their first carbon credit issuance through Puro.earth, expected September 2025.

During the monitoring period BBL produced 618.1 tonnes of dry biochar.

Figure 7 below outlines the timeline from the beginning of the crediting period through to the end of the crediting period and includes the main milestones of the project, such as credit issuance dates and plans for expansion.

The expected functional lifetime of the production facility is 20 years.

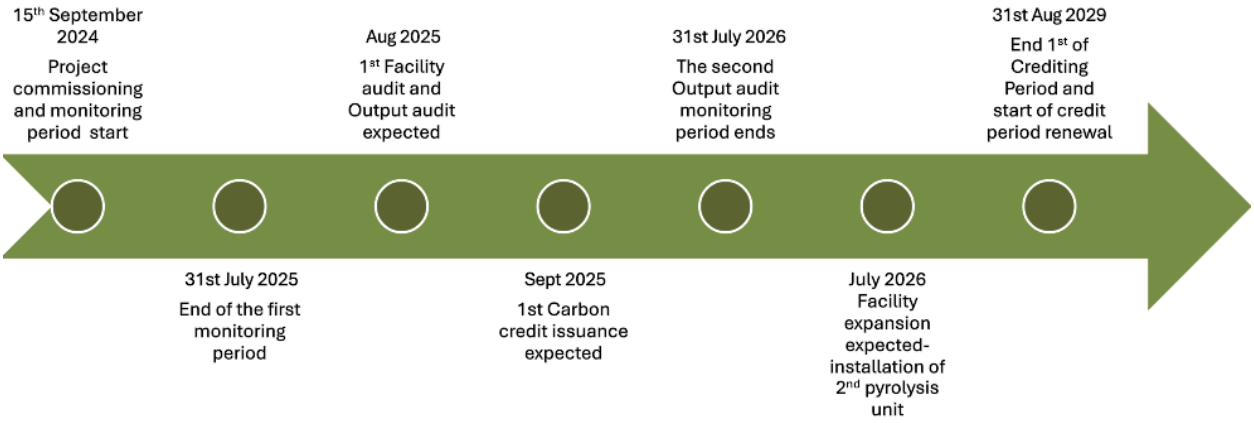

Figure 7: Timeline crediting period start date through to crediting period end date

Positive SDG Impacts

BBL's facility will achieve Sustainable Development Goal (SDG) 13: Climate Action, with certification through the Puro standard. In addition, the project will contribute to the achievement of several other SDGs that are yet to be fully verified, in the following ways:

Sustainable Development Contributions		Intention
	#7- Affordable and Clean Energy	After the initial production phase, BBL intends to take the excess heat from the pyrolysis process to generate electricity that will be used to power their own operations. The energy can be considered renewable and clean given the feedstock and biochar production process.
	#8- Decent work and Economic growth	The production of biochar through BBL creates economic opportunities for businesses, including the local tree surgeons and transportation/distribution groups. The current biochar distribution channel will need to expand to support the biochar production volume.

	#9 -Industry, innovation and infrastructure	The project creates new industrial infrastructure and can be expected to reliably operate for twenty years. The project's manufacturer of biochar composts in the same production line, using responsibly and locally sourced materials, is innovative.
	#12- Responsible Consumption and Production	BBL takes low-value biomass that is typically regarded as waste and turns it into a high-value biochar product, that reduces the need for fertilizers which often carry a substantial carbon footprint.
	#13- Climate Action	The project has removed and permanently sequestered 1455 tonnes of CO_2 in biochar since Sept 2024. The biochar application in soil will further contribute to positive climate action by reducing soil GHG emissions and reducing the requirement for fertilizers that typically have a heavy carbon footprint.
	#14- Life Below Water	The biochar produced is applied to soil. Biochar helps increase nutrient and water retention, reducing nutrient leaching into waterways.
	#15- Life on Land	Used in soil products, biochar can increase soil fertility by holding onto nutrients and moisture, making it available for plants to use. Additionally, biochar can improve soil structure, leading to better drainage and aeration. The addition of biochar can also increase soil microrganisms, mycorrhizal fungi, increasing soil organic matter.

Additionality

a. Financial Additionality and Impact of Carbon Revenues

BBL has made significant investments to develop this project, with the expectation of benefitting from the carbon credit market to enhance business stability. Given the evolving economic landscape, revenue from carbon credits is becoming increasingly vital for businesses like BBL. Since 2021, BBL has been working toward launching this project, recognizing that it offers both a valuable business opportunity and significant environmental sustainability benefits.

After several attempts to secure funding through various channels, BBL obtained support via a green loan. However, the project would not have proceeded without the potential revenue from carbon credit sales. Currently, there is not a biochar market that BBL can rely on for income from biochar sales alone. Consequently, the business could not have been established soley based on biochar sales. Revenue generated from carbon credits will strengthen and help expand the business, facilitating operational development and investment in additional technologies. This will lead to increased volumes of biochar being applied locally in soils. This

application of biochar through compost will also reduce the use of chemical fertilizers, which have a significant carbon footprint.

The income from carbon revenues supports the long-term, proper application of the biochar, preventing the feedstock being diverted to being used as fuel- thus avoiding CO_2 emissions back into the atmosphere. Without the incentive provided by carbon revenues, the most cost-effective option would be to cease biochar operations and instead sell arboreal risings and coppiced wood, as fuel to power stations. Alternatively, BBL could produce charcoal briquettes, which generate high revenue but do not offer carbon savings.

Cost analysis:

The project costs nearly £2 million, financed through bank loans and family funds. For a small family-run business, this is significant.
Revenue is mainly expected from carbon credit sales, which will cover most of the finacing costs. Sales of compost/biochar are also antipcated to generate income, though initially, at a low level.

b. Regulatory and policy additionality

BBL is not required by existing laws, regulations, policies, or other binding obligations or regulations to produce biochar or to reduce emissions through sequestration of biochar.

The necessary planning consent has been obtained from the local planning authorities for operations of the facility. BBL is required to provide data on noise and emissions during operations.

Compliance with Puro Methodology

a. Eligibility

Brodie Biomass produces biochar per the eligibility requirements for the Puro biochar methodology Edition 2022 v3 Paragraph references to the requirements detailed in the methodology are included in parentheses.

- The biochar is not used for energy purposes. BBL uses biochar mixed with compost on their fields as a soil enhancement and for soil remediation purposes. (§1.1.1)
- The feedstock is wood supplied by local tree surgeons with future plans for wood from BBL's maintenance and management of their woodlands. (§1.1.2)
- All process emissions have been calculated in the LCA using the cradle-to-grave approach including feedstock supply, biochar production, transportation of the biochar, and use of the biochar. (§1.1.3)
- The facility is 100% biomass-fired. Pyrolysis gases are combusted and no fossil fuels are consumed. (§1.1.4.)
- Pyrolysis gases are captured and combusted within the process making negligible, any methane emissions to the atmosphere. (§1.1.5.)
- The biochar produced has a high stable carbon content. Two samples were used throughout this monitoring period. The analysis performed by Eurofins Laboratories in January 2025 demonstrates an organic carbon content of 71.6% in dry state, which corresponds to a gross capture of 2.62 kg CO_2/kg and was used to represent the production and sales from September 2024-May 2025. The analysis performed by Eurofins Laboratories in June 2025 demonstrates an organic carbon content of 78.1% in dry state, which corresponds to a gross capture of 2.86 kg CO_2/kg and was used to represent the production and sales from June 2025-July 2025. (§5.3.3.)
- Both biochar samples demonstrate an H/Corg molar ratio of 0.20 and 0.19 respectivley (Eurofins laboratory analysis), well below the 0.7 threshold. (§1.1.6)
- The biochar produced from the facility is EBC-Certified (§1.1.7)
- BBL has implemented appropriate measures to ensure the safe storage and transport of the biochar, including quenching of the biochar. They have provided a material safety data sheet for transport and storage. (§1.1.8.)

b. Monitoring, Reporting, and Verification (MRV)

By meeting the eligibility requirements of the Puro.earth standard v4.1 and the Biochar methodology edition 2022 v3, BBL is issued carbon credits by Puro.earth. The credits are based on the net carbon removal from the production and application of biochar.

BBL implemented a comprehensive monitoring and reporting system to ensure the safety, eligibility, and precise quantification of CORCs.

The net carbon capture was calculated through LCA and submitted to Puro.earth for verification by a third-party auditor. Once the LCA was validated by the third-party auditor, the carbon credits were issued.

BBL's output data will be validated annually by a third-party auditor.

To support the LCA and carbon credit calculation, the following parameters were measured reported and verified:

Parameter Monitored		Monitoring Method	Monitoring frequency
Biochar production	Crane scale calibration certificate- Brand new	Calibration by certified certification body	Annually
	Moisture readings calibrates	Moisture meter calibration by supplier	Annually
	Mass of biochar offtakes	Scale/bucket records/Big bag weight records	Daily
	Biochar in stock	Mass measurement based on production data from C1000/Big bags in stock	Monthly
	Biochar moisture	Biochar sampling and testing on-site with a calibrated moisture meter	Daily
	Biochar elemental and environmental quality anlaysis	Biochar sampling and testing using Eurofins	At minimum Annually
Feedstock	Feedstock consumed	Feedstock consumption log from the pyrolysis system	Monthly
	Feedstock sustainability	Type of feedstock used from the Puro approved list of biomass types/supplier declarations	Annually
Electricity	Purchased Electricity	Supplier invoices	Monthly

	Electricity consumed by the biochar related equipment	List of the equipment involved power	Once/updated as required
Diesel	JCB diesel consumption	Diesel consumption in litres per hour	Monthly
Direct emissions	CH_4 and N_2O direct emissions	Emissions report and Emission factors based on fuel consumption	For permitting requirements and for output audit period
Biochar transport	Road transport	Distance and load tracking	Daily
	Safe storage and transport of biochar	SDS sheet	Once/updated as required
Biochar application	Soil temperature	Based on biochar application locations provided by BBL, Accend calculates the soil temperature using Global datasets for annual average soil temperature (at depth of 5-15 cm): https://doi.org/10.1111/gcb.16060	Annually or for output audit period
	Biochar application	Track end use of each biochar load	Daily
	Sales invoices with explicit mentions about CO_2 removal claims	Collection of all sales invoices or similar statements issued to the end-user, that includes explanations of what claims can or cannot be made by the end-user regarding biochar carbon removal	Updated as required
	Branding claims on packaging, product data sheets, website (N/A for this assessment period)	Collection of documents representative of all biochar products sold and screenshots showing branding claims. Evidence may need to be updated if branding, packaging, or data sheets claims have changed since the last audit.	Updated as required

Any changes in these parameters that impact the carbon removal calculations will be accounted for in the issuance of carbon credits.

Stakeholder Engagement

BBL has undertaken an extensive process of consultation with the relevant stakeholder groups and the project is supported throughout the region.

Stakeholders include the local planning authority to ensure permitting requirements for biochar production onsite have been met as well as engaging with business consultants to guide BBL through the complexities of entering into a new market.

BBL has worked alongside The University of Nottingham to research the potential of biochar as a fertilizer alternative as well as engaged The Royal Horticultural Society, to better understand and monitor biochar, regarding its potential application in horticulture.

Feedstock suppliers have been informed by letter and through verbal consultation, about the biochar project and supported BBL with the clarification of feedstock sourcing.

The project's components are built, and reliant on, the local community which reduces transportation distances and minimizes carbon footprint.

This is evidenced by:

- Using locally sourced wood as feedstock, from within a 25 mile radius of the biochar production facility.
- Using existing relationships with local tree surgeons to source feedstock.
- Supporting local tree surgeon businesses through feedstock purchases.
- Supporting local tree surgeons who are now planning to expand their activities by buying machinery that can process larger trees.
- Using biochar in the production of compost that is used on the farms land.
- Plans to sell the biochar compost to neighboring farmers which supports efforts to improve local soils and reduce requirements to purchase fertilizers, that have a heavy carbon footprint.
- Plans to sell the biochar compost to local garden centers.
- Creating additional employment opportunities.

By participating in the production of biochar and advancement of practices and by partnering with contributors in the biochar market, BBL engages in the effort that allows the methodology to advance and thus, promotes market trust and survival. The certification of producers such as BBL is critical to prove the concept and involve market stakeholders in the evolution of the carbon removal and biochar markets.

Detailed Life Cycle Assessment (LCA)

a. Goal and Scope

The primary goal is to generate a cradle-to-grave assessment of life cycle greenhouse gas emissions of the biochar produced by Brodie Biomass in Surrey facility, to reliably quantify the net CO_2 removal achieved over the time horizon of 100 years.

The primary audience for the results of this report is Brodie Biomass, the Puro.earth marketplace, third-party auditors, and carbon credit market participants.

The LCA refers only to the greenhouse gas emissions attributable to biochar life cycle, from cradle-to-grave.

The calculation of the carbon footprint of the biochar has been carried out per ISO 14040, 14044, 14067 and Puro biochar methodology Edition 2022 version 3.

The entire production process, including feedstock supply and pre-processing, biochar manufacturing, transport of biochar to the application site, and biochar application until the biochar is permanently secured in a substrate, has been included within the system boundary. For biochar that is already mixed with compost at a biochar content of less than 50%, the biochar is considered safely secured, and therefore no downstream emissions are applicable.

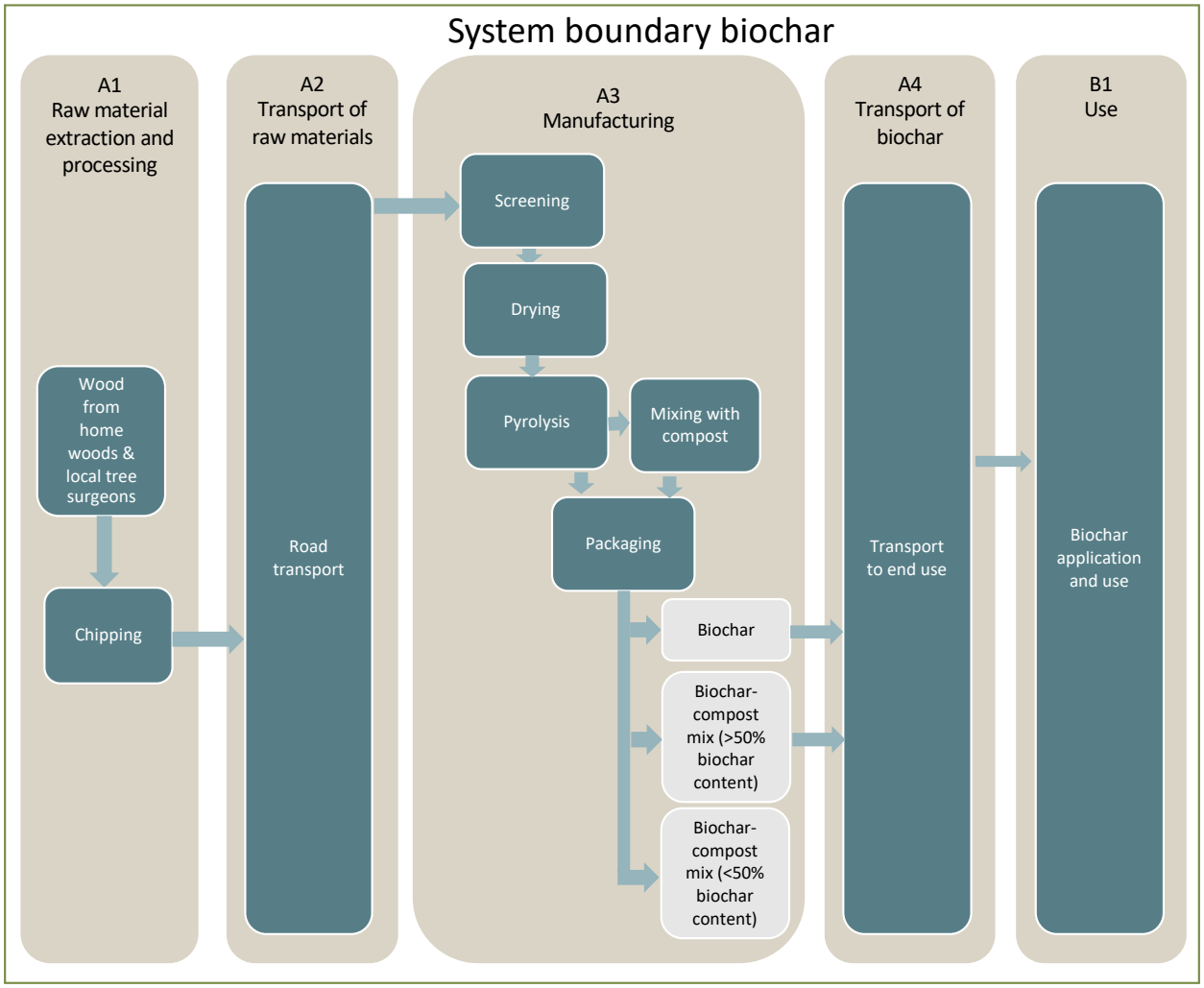

Figure 8: System boundary

The functional unit is 1 metric tonne (1000 kg) of dry biochar produced at Brodie Biomass facility and applied as soil amendment and as soil remediation purposes.

b. Quantification of net CO_2 removal implementation

The net CO_2 removal potential of the biochar is derived using the formula defined by Puro.earth biochar methodology Edition 2022 version 3:

$$\underbrace{CORCs}_{} = \underbrace{E_{stored}}_{} - \underbrace{E_{biomass}}_{} - \underbrace{E_{production}}_{} - \underbrace{E_{use}}_{}$$

Description	Amount of net CO_2-eq removed over 100-year period by the biochar production activity	Amount of CO_2 sequestered over a 100-year time horizon by the amount of biochar produced over the reporting period.	Life cycle greenhouse gas emissions arising from the production and supply of biomass to the production facility, including direct land use changes.	Life cycle greenhouse gas emissions arising from the transformation of the biomass into biochar, at the producing facility.	Life cycle greenhouse gas emissions arising from the use of the biochar, including its distribution up to the point of final use.
Unit	tonnes CO_2-eq	tonnes CO_2-eq	tonnes CO_2-eq	tonnes CO_2-eq	tonnes CO_2-eq

Figure 9: Overall equation to calculate the amount of CORCs supplied by the biochar production activity over a given reporting period.

The methodology for calculating the gross CO_2 capture of biochar (E_{stored}) relies on:

1. Laboratory analysis of the organic carbon content of biochar to estimate the CO_2 captured during photosynthesis in the biomass growth phase.

2. H/C_{org} ratio to determine biochar stability and permanence over time.

3. Soil temperature. The soil temperature of a 20-km radius from Brodie Biomass facility has been used based on application location, using the Global datasets for annual average soil temperature at depth of 5-15 cm (Lembrechts et al, 2021).

Laboratory analyses are conducted at minimum once a year by Eurofins, showing minimal variation due to the consistent quality of the feedstock and production process.

The quantity of biochar produced and sold to non-energy users is multiplied by the carbon content of the biochar, considering the buffer for degradation. The result is the total CO_2 removed over a 100-year period. From this total, emissions are deducted, including those from:

- Feedstock supply,
- Transporting the feedstock to the production facility,
- The manufacturing process,
- Transporting the biochar to the application site (if applicable), and
- Applying the biochar to soil (if applicable).

The result is the net tonnes of CO_2 equivalent removed, which determines the number of CORCs issued.

c. Supply-chain emissions

Ecoinvent 3.11 database allocation, cut-off by classification version (2024) is used as secondary data. The method used to assess the climate change impact is "IPCC 2021 < global warming

potential (GWP100), climate change: total (excl. biogenic CO2)". This method uses Global Warming Potential values for a 100-year time horizon from the IPCC Sixth Assessment Report (Forster et al, 2021), the latest values available. Operations, sales, and feedstock data are provided by BBL, and chemical analyses of the biochar are produced by independent third-party laboratories.

All significant unit processes are included. As far as possible, site and product-specific data is used. Cut-off criteria of <1% of mass, energy and/or environmental significance have been selected per ISO 14044:2006.

Following the Puro.earth Biochar Methodology 2022 Edition version 3, when various co-products are generated, emissions have to be allocated. A mass allocation has been applied at BBL between the feedstock used to produce the biochar and the feedstock sold or used for other purposes, generated at the screener and the dryer. 59% of the electricity consumed by the screener is allocated to biochar, while 90% of the energy consumed by the dryer is allocated to biochar. These factors are also used for the specific equipment infrastructure allocated emissions.

The following table presents the inventory data used to model the project's life cycle emissions, along with the corresponding Ecoinvent datasets selected. To ensure geographical and technological representativeness, some datasets have been created or adapted to better reflect the specific context in which the processes occur.

Level 1	Level 2	Level 3. Inventory data	Dataset	Dataset source	Geography representativeness
Ebiomass	Biomass	Chipping process	RER / kg / wood chipping, terrain chipper, diesel	Created by converting the original Ecoinvent 3.11 dataset from hours to kg.	Europe
	Biomass transport	Road transport	RER / t*km / transport, freight, lorry, 16-32 metric ton, diesel, EURO 6	Ecoinvent 3.11	Europe
Eproduction	Stack emissions	CH_4 and N_2O	CH_4 (negligible) and N_2O to air	CH_4: C-1000 emissions report N_2O: EPA Title 40, Part 98, Subpart C	CH_4: Technology-specific N_2O: USA
	Water	Water consumption	Europe without Switzerland/ kg /	Ecoinvent 3.11	Europe without Switzerland

			market for tap water		
	Electricity	Grid electricity	UK/ kWh / market for electricity, medium voltage	Ecoinvent 3.11	UK
	Mobile fuels	Diesel	GLO/ MJ/ diesel, burned in building machine	Ecoinvent 3.11	Global
	Infrastructure	Manufacturing. C-1000 machine	RER / kg / steel, low-alloyed, hot rolled + 50%drawing of pipe, steel + 50%sheet rolling, steel DE / kg / refractory production, fireclay, packed	Ecoinvent 3.11	Europe Germany
		Manufacturing. Other equipment steel	RER / kg / steel, low-alloyed, hot rolled + sheet rolling, steel	Ecoinvent 3.11	Europe
		Manufacturing. Stainless steel	RER / kg / EDP S-P-08506: COLD-ROLLED AUSTENITIC STAINLESS STEEL	The International EPD System	Europe
		Manufacturing. Cast iron	GLO / kg / market for cast iron	Ecoinvent 3.11	Global
		Materials and components transport to WoodTek. Road	RER / t*km / transport, freight, lorry, >32 metric ton, diesel, EURO 6	Ecoinvent 3.11	Europe
		Materials and components transport to WoodTek. Ferry	GLO / t*km / transport, freight, sea, ferry, heavy fuel oil	Ecoinvent 3.11	Global
		Concrete floor	RoW / m3 / market for concrete, 35MPa	Ecoinvent 3.11	Global
		Transport of equipment to BBL	RER / t*km / transport, freight, lorry, >32 metric ton, diesel, EURO 6	Ecoinvent 3.11	Europe
		End of life. Metal	Recycling – burden free	-	-
		End of life. Refractory blocks	CH / kg / treatment of inert waste, inert material landfill	Ecoinvent 3.11	Switzerland

Euse	Packaging	PP bags Jute bags production and transport	GLO / kg / market for textile, nonwoven polypropylene GLO / kg / market for textile, jute	Ecoinvent 3.11	Global
	Packaging waste. Recycling	Bags management to recycling	Recycling – burden free	-	-
	Packaging waste. Disposal	Bags management to landfill	CH / kg / treatment of waste plastic, mixture, sanitary landfill	Ecoinvent 3.11	Switzerland
	Transport of biochar	Road transport	RER / t*km / transport, freight, lorry, 16-32 metric ton, diesel, EURO 6	Ecoinvent 3.11	Europe
	Application of biochar	Biochar spreading	CH / kg / solid manure loading and spreading, by hydraulic loader and spreader	Ecoinvent 3.11	Switzerland

d. LCA results

From September 2024 to May 2025, the net carbon removal was 2.31 tonnes CO_2/tonne of dry biochar, while from June 2025 to July 2025, the net removal was 2.55 tonnes CO_2/tonne of dry biochar, being the weighted average over the period 2.35 tonnes CO_2/tonne of dry biochar. The emissions arising from the biochar life cycle tonnes 0.29 tonnes CO_2e/tonne of dry biochar.

Given the mass of 620.1 dry metric tonnes of biochar sold, used in own farms or stored on-site mixed with compost during the assessed period, the resulting total CO_2 removed was 1460 tonnes CO_2.

The net carbion removal of one metric tonne of dry biochar produced at the Surrey facility by Brodie Biomass is summarized below per each period.

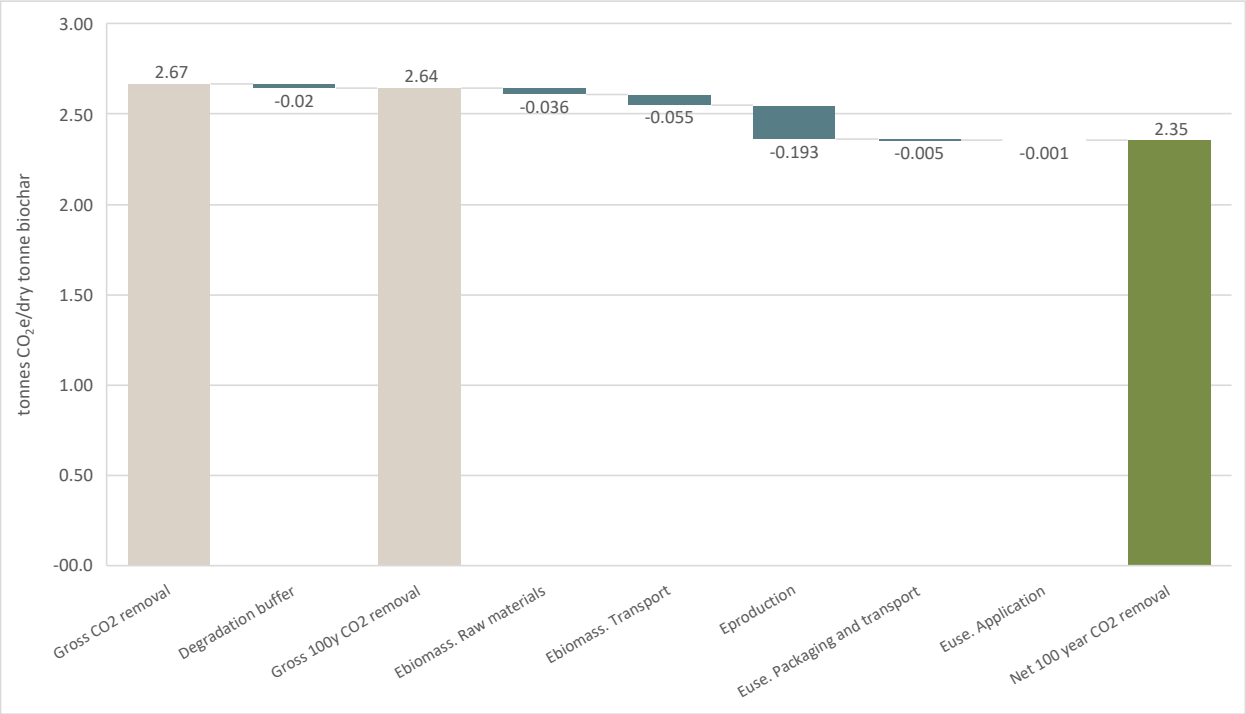

Figure 10: Pathway from gross to net embodied CO_2 using current electricity supplier mix. Metric tonnes CO_2e

Risk Assessment

a. Compliance with laws and regulations

The facility abides by national and local laws, objectives, programs, and regulations and, where relevant, international conventions and agreements. Relevant documentation has been provided to support compliance.

b. Double counting and participation in other GHG programs

BBL owns the rights to the carbon credits issued to the facility. All processes at the facility aim to exclude the possibility of more than one CORC being issued for the same volume of CO_2 removal and that the CORC issued represents the sole proof of ownership of the CORC and associated CORC Attributes.

c. Leakage

Potential for leakage has been identified and where relevant and required by the Puro methodology, quantified and deducted from the CO_2 Removals in the Life Cycle Assessment. A qualitative assessment of potential sources of leakage is done based on the ICVCM classification (Core Carbon Principles, Assessment Framework and Assessment Procedure. Version 1.1 January 2024):

Source of leakage	ICVCM definition	Assessment
Activity-shifting	A type of leakage where the mitigation activity causes emissions to shift location. Mitigation activities can shift emissions to locations not targeted, or emissions not monitored, by the activity. An example is the displacement of agricultural activities from land that is afforested.	Negligible. The feedstock is sustainably sourced eligible biomass from the projects own managed wood land or wood chip supplied from tree surgeons who already delivered to site.
Ecological	A type of leakage where a mitigation activity affects emissions indirectly in areas that are hydrologically connected. An example is carbon dioxide emissions from soils in a wetland if the water level is lowered due to the implementation of the mitigation activity.	Negligible. The feedstock is sustainably sourced comprising offcuts of wood chips supplied by tree surgeon operators and coppiced wood from Brodie Farms own manged woodlands.
Market	A type of leakage where mitigation activities have an impact on the supply or demand of an emissions-intensive product or service, thereby increasing or decreasing emissions elsewhere. For example, forest management or conservation activities may reduce timber harvests within an intervention area, leading to increased harvesting in other areas to meet demand for wood products.	Negligible. No change on the feedstock producer behavior as the feedstock was coming to site anyway. Replacement emissions do occur, as the feedstock is now used in biochar production. Before the project started, feedstock was sold as fuel and transported off site. Positive leakage effects from avoided fossil fuels consumption to transport biomass away from facility. Positive leakage effects from reduced methane and nitrous oxide emissions at biochar use stage, as it is used in soil and mixed with compost. Potenital positive leakage effects in fertilizer market and in the future energy market when Brodie generate their own.
Upstream/ downstream emissions	A type of leakage where emissions occur upstream or downstream of a mitigation activity and are impacted by the mitigation activity. An example is the emissions associated with the production of a fuel or feedstock used under the mitigation activity (e.g., methane emissions from natural gas production).	Included in the LCA as per Puro methodology: • Feedstock production and transport • Biochar production direct and indirect emissions • Biochar distribution • Biochar application

d. Uncertainty

Uncertainty in the LCA stems from data variability, model assumptions, and methodological choices. While these uncertainties are present, they are mitigated as much as possible through the use of site-specific inventory data and measurements, standardized methodologies (such as the Puro Biochar Methodology and ISO 14040/14044 standards), the latest global warming potentials (IPCC AR6 GWP), and the Ecoinvent cut-off system model as the LCA database. The key areas of uncertainty related to each aspect of the net carbon removal calculation are:

	Uncertainty assessment	**Mitigation**
E_{stored}	Uncertainty exists in the calculation of carbon storage stemming from: carbon content and the carbon stability (H/Corg ratio), and moisture content (accurate dry weight of biochar) measured in laboratory analysis. Uncertainty from the sampling and the testing processes.	Regular sampling and testing protocol with daily moisture content and C content and H/Corg ratio from reputable laboratories. Use of volume-weighted average values for Corg of monthly loads.
$E_{biomass}$	Primary data was used for biomass quantity, resulting in minimal uncertainty.	N/A – minimal impact
$E_{production}$	The main sources of uncertainty are allocation factors and infrastructure emissions. Allocation uncertainty arises from specific electricity consumption by each equipment piece, as no machine-specific meters are available. Ecoinvent emission factors have been used to calculate infrastructure emissions, which may not represent the specific production process of the infrastructure.	Use of conservative values and generic Ecoinvent datasets.
E_{use}	Uncertainty arises from the emissions factor used for transport and the biochar application method, which has been modelled with an Ecoinvent dataset.	Use of generic Ecoinvent dataset.

e. Environmental and social safeguards

BBL complies with all legal and permitting requirements. BBL fulfills the environmental and social safeguard requirements and can demonstrate that the production facility activities do no net harm to the surrounding natural environment or local communities.

BBL has provided necessary evidence regarding environmental permitting requirements for operation. These include relevant planning approvals for the use of barns and wood sites as well as emissions, noise level reports, and a health and safety policy.

References and Links

EPA (2024) Title 40 of the CFR: Part 98 - Subpart C General Stationary Fuel Combustion Sources. Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-C?toc=1

Forster, P., T. Storelvmo, K. Armour, W. Collins, J.-L. Dufresne, D. Frame, D.J. Lunt, T. Mauritsen, M.D. Palmer, M. Watanabe, M. Wild, and H. Zhang, 2021: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 923–1054, doi:10.1017/9781009157896.009.

ISO 14040:2006 Environmental management - life cycle assessment - principles and framework. International Organization for Standardization, Geneva

ISO 14044: 2006 Environmental management - life cycle assessment - requirements and guidelines. International Organization for Standardization, Geneva

ISO 14067: 2018 Greenhouse gases – Carbon footprint of products - Requirements and guidelines for quantification

Lembrechts, J. J., van den Hoogen, J., Aalto, J., Ashcroft, M. B., De Frenne, P., Kemppinen, J., Kopecky, M., Luoto, M., Maclean, I. M. D., Crowther, T. W., Bailey, J. J., Haesen, S., Klinges, D. H., Niittynen, P., Scheffers, B. R., Van Meerbeek, K., Aartsma, P., Abdalaze, O., Abedi, M., … Lenoir, J. (2022). Global maps of soil temperature. Global Change Biology, 28, 3110–3144. https://doi.org/10.1111/gcb.16060

Puro.earth Biochar Methodology Edition 2022 version 3. Available at: https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/Supplier%20Documents/Puro.earth%20Biochar%20Methodology.pdf

Puro.earth Standard General Rules version 4.0. Available at: https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/General%20Rules/Puro.earth_General-Rules_v.4.0.pdf

Smith, C., Z.R.J. Nicholls, K. Armour, W. Collins, P. Forster, M. Meinshausen, M.D. Palmer, and M. Watanabe, 2021: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity Supplementary Material. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K.

Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Available from https://www.ipcc.ch/.

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B. (2016) The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, 21(9), pp.1218–1230. Available at: http://link.springer.com/10.1007/s11367-016-1087-8

Woolf D, Lehmann J, Ogle S, Kishimoto-Mo AW, McConkey B, and Baldock J (2021) Greenhouse Gas Inventory Model for Biochar Additions to Soil. Environmental Science & Technology 2021 55 (21), 14795-14805 DOI: 10.1021/acs.est.1c02425

Baseline and Additionality Assessment

The baseline and additionality assessment is a requirement for eligibility under the Puro Standard. The assessment is made by the CO2 Removal Supplier and verified by the independent 3rd party auditor. **The assessment made in this document will be publicly available in the Puro Registry.**

The Puro Standard only certifies durable carbon removals from the atmosphere that are net-negative and does not certify emissions reductions or avoidance. The CORCs (Carbon dioxide removal certificates), issued therefore represent a net carbon removal (1 $tCO_2eq.$ net) from the atmosphere to a durable storage of minimum 100 years, and for mineralization and geological storage minimum 1000 years. Net carbon removal is determined from stored gross CO_2 volume by subtracting supply-chain emissions from the project, any re-emissions over the guaranteed storage time, any baseline removals taking place in a baseline scenario, and any negative indirect leakage effects relative to the baseline scenario.

The CO_2 Removal Supplier must in this assessment:

- **Define** and quantify all reasonable **baseline alternatives** to the proposed project activity to remove carbon with carbon financing. A baseline is a scenario that reasonably represents the natural and anthropogenic carbon removals to a permanent storage (storage durability over 100 or 1000 years) in the absence of the carbon removal activity proposed by the CO_2 Removal Supplier. Although anthropogenic emissions may take place in the baseline scenarios, these emissions do not constitute a reference point for the quantification of CORCs (only the baseline removals do).
- Demonstrate **carbon additionality to the baseline,** meaning that the project must convincingly demonstrate that it is resulting to higher volumes of carbon removals than the likely baseline alternatives (question A1 and A2.).
- Demonstrate **regulatory additionality,** meaning that the project is not required by existing laws, regulations, or other binding obligations (question A4.).
- Demonstrate **prior consideration of carbon credits** through documentation demonstrating that the time period between the commitment date and production facility audit is max. 3 years. (question A5)
- Demonstrate **financial additionality,** meaning that the CO_2 removals achieved are a result of carbon finance. This means that the CO_2 Removal Supplier must show that the carbon credits were needed to secure the investment or to overcome specific barriers to the investment.
- To support the claim the of financial additionality, the project activity cannot already be *common practice* without carbon finance (question A6).

Reference documents: Puro Standard general Rules v4.0, section 6.5 and Additionality Assessment requirements v2.0.

1. General questions to all CO_2 Removal Suppliers

A1. Baseline Determination			
Activity name	**Activity description**	**Removals to storage (100+ yr) due to project activity (human activity)**	**Natural removals to storage (100+ yr), not man-made**
Baseline: Fuel	Wood, primarily tree surgeon residues are sold as biomass fuel to power stations, where combustion releases CO_2 back to the atmosphere almost immediately.	None	None
Project activity: Biochar for soil amendment	The same residues are instead processed in a pyrolysis unit to produce biochar, which is incorporated into soil and compost blends. This stabilises the carbon for centuries and delivers co-benefits for soil health.	2.35tCO2/dry ton biochar (2025 data)	None
Alternative scenarios	Production of charcoal or briquettes for energy use (short-term carbon storage, ultimately emitted).	None	None

A2. Does the project lead to higher volumes of durable carbon removal than the baseline?	Yes / No
In the baseline, the wood feedstock would be sold as biomass fuel to power stations, leading to rapid CO_2 release. In the project scenario, the same feedstock is converted into biochar, which is incorporated into soil and compost blends. This stores carbon in a stable form for centuries while also generating soil improvement benefits. The project therefore delivers permanent removals that are not achieved in the baseline fuel-use case.	Yes

A3. Is the project scenario aligned with net-zero transition? The following activities are considered not to be aligned with net-zero transition: a) directly leading to an increase in the extraction of fossil fuels, b) relating to coal-fired electricity generation, or c) involving other unabated fossil fuel-powered electricity generation, other than new gas-fired generation that is part of increased zero-emissions generation capacity in support of national low carbon energy transitions	Yes / No
Unlike combustion, conversion to biochar locks carbon away for centuries. Applied in soil and compost, the biochar also supports regenerative agriculture, enhancing fertility and resilience. The activity therefore contributes both durable removals and agricultural co-benefits, directly aligned with net-zero objectives.	Yes

A4. Is the project required by existing laws, regulations, or other binding obligations?	Yes / No
There are no laws, or binding obligations to produce biochar in the UK	No

A5. What was the Commitment Date of this facility? Commitment Date is defined as "The calendar date on which the CO2 Removal Supplier committed to implementing the CO2 Removal activity (e.g., the date when contracts for the purchase or installation of	Date

equipment required for the mitigation activity were signed). In the case where a mitigation activity does not involve capital expenditure, it refers to the date when the first physical actions were taken to implement the mitigation activity." If an exception listed in clause 2.1.3 of the Additionality Assessment Requirement applies, describe the situation here.	
The Pyrolysis unit was ordered in March 2024, which marks the commitment date.	March 2024

A6. Is the Technological Readiness Level of the Methodology 8 or 9?	**Yes/No**
Biochar at methodology level considered to be a 6-7. The UK Biochar market is nascent	No

If the answer to question A6 is Yes, please answer question A6.1 to A6.3. Questions A6.2 and A6.3 are different based on whether you are applying a distributed technology (such as enhanced rock weathering) or more centralized technology based on plants/factories producing something. See clauses 3.2.5 and 3.2.6 in the Puro Additionality Assessment Requirements with references for more information.

A6.1. Please define the region being considered and explain why it is relevant level of aggregation for the assessment if different from the host country.

A6.2. Market size or current installations
Distributed technology: What is your estimate for a realistic target market size and what constraints to the market size growth have you identified?
Centralized technology (plants): What projects have you identified that fulfil the criteria in Additionality Assessment Requirements clause 3.2.6?
a) output range of +/- 50% of the project,
b) located in the same region,
c) applying the same measure,
d) produce comparable goods or services in terms of quality, properties, and applications,
e) started commercial operation before the proposed start date of the project, and
f) are not registered in a carbon crediting program.
How many of them apply a different technology?
Please mention or link to any sources you have.

[Information]

A6.3. Market penetration rate
Distributed technology: What is your estimate of the market penetration rate of the activity? How common or widespread is the project activity or similar activities in the relevant sector and region, and what is the trend of adoption over time?
Centralized technology (plants): Provide your calculation of market penetration rate based on the formula in clause 3.2.6 in Additionality Assessment Requirements.

A7. Does the carbon removal project have other income sources besides carbon finance? Include also information about any subsidies you receive or expect to receive. Please describe your business model here, in a short answer (max. 100 words).	**Yes / No**
The project's revenues derive from two sources: (i) biochar sales; blended into compost products, or alone and (ii) CORC revenues. At present, biochar sales alone are insufficient to cover operating costs and debt service. CORCs are essential to financial viability and an acceptable return on the investment. No public subsidies were available for the project. Detailed investment analysis has been provided.	Yes

Please note: Questions under headings '2. Simple cost analysis', '3. Investment analysis', and ' 4. Barrier Analysis' are mutually exclusive options.

2. Simple cost analysis or investment analysis

Some projects may demonstrate additionality through simple cost analysis: this is applicable for projects that have no other source of income besides carbon finance or where ex-ante investment analysis is not applicable, because capital expenditure (capex) is modest compared to operating expenditure (opex). This can include e.g. enhanced rock weathering projects.

B1. Describe how the criteria above applies to your project
N/A see investment analysis below

B Simple cost analysis	**Project response**
B2. Please describe your cost structure here and include evidence in attachment.	
B3. Please summarize the simple cost analysis here. Please include any public subsidies received or expected. Compare with alternative scenarios, if relevant.	
B4. Please provide additional calculation spreadsheet in attachment. All formulas used in the spreadsheet shall be readable to the verifier and all relevant cells shall be viewable and unprotected. Mark confidential when needed.	
B5. Are you willing to provide full calculation spreadsheet to be visible in Puro Registry? If yes, please specify the name of the file that has been provided. If not, please ensure that there is sufficient information provided in your answers in this document.	
B6. Is the information shared here consistent with information presented to the company's decision-making management, investors or lenders?	
B7. Is the information shared here consistent with the information in the audit documentation presented to Puro and its verifiers (e.g. LCA model)? If not, please explain why there are differences.	

3. Investment Analysis

CO_2 Removal Suppliers can be guided by the CDM Methodological Tool 27 of the UNFCCC Clean Development Mechanism "Investment Analysis" to demonstrate financial additionality with Investment Analysis.

C. Financial Additionality – Investment analysis	Project response
C1. Describe the relevant alternative scenarios in terms of investments analysis. **If the only alternative scenario is to carry out the project without CORCs, please answer the following questions:** **Please show your calculations to determine the benchmark rate for either equity IRR or WACC, whichever you are using. Please include documentation of how the rate is suitable for the technology and region. Please specify the currency and whether the rate is nominal or real.**	Financial additionality has been assessed using an equity IRR analysis over a 10-year horizon, in line with Rule 3.4.5 of the Puro Additionality Assessment Requirements. Because the project is financed through a combination of debt and equity, and returns are measured to equity holders, we compare equity IRR results against a cost of equity benchmark. A 15% cost of equity hurdle rate (nominal, post-tax) has been selected, justified by the project's risk profile: The pyrolysis unit is the first of its type commercially deployed, creating technology and performance risk. The biochar market in the UK remains immature, with uncertain demand and pricing, and CORC revenues are subject to evolving buyer confidence. As an SME without institutional backers, the project faces limited access to equity capital, with investors typically requiring 12–20% IRR for high-risk clean-tech. Given that biochar sales alone cannot support debt service (see A7), CORC revenues are essential to reach the equity return hurdle. This supports the use of a 15% benchmark as both reasonable and conservative for assessing financial additionality.
C2. Please state how CORC revenues change the expected IRR or NPV of the project.	Without CORCs: 10-year equity IRRis negative. Even under best-case assumptions (higher biochar price and production), IRR remains below 15%. In downside cases, IRR is negative. With CORCs: 10-year equity IRR = ~25%. This comfortably exceeds the 15% benchmark and remains robustly above hurdle across all sensitivity tests.

C3. Please conduct a sensitivity analysis in relation to the investment analysis and summarize the results here.	Sensitivity Analysis (Rule 3.4.6): We tested ±20% variations in CORC price, biochar price, and production, and ±20% Feedstock cost. Without CORCs, IRR never exceeds the 15% hurdle. With CORCs, IRR remains >15% under downside conditions and rises above 40% in upside cases.
C4. Is the information shared here consistent with information presented to the company's decision-making management, investors, or lenders?	yes
C5. Is the information shared here consistent with the information in the audit documentation presented to Puro and its verifiers (e.g. LCA model)? If not, please explain why there are differences.	yes
C6. Are you willing to provide full calculation spreadsheet to be visible in Puro Registry? If yes, please specify the name of the file that has been provided.	No
C7. If you are not willing to disclose the full spreadsheet, please provide here a summary of the confidential file that has been provided to the Auditor and Puro.earth. Please include: • **Overall description of the spreadsheet, including type of terms (real/nominal), currency, forecasting periodicity** • **Capital structure, if the measure is based on equity return** • **Information sources on main revenues and costs** • **Expected breakdown of income from the different sources** • **Expected or already received public subsidies** • **Growth assumptions** • **Model duration and a comparison with expected lifetime**	The investment model is built in Excel. It is a 10-year forecast in nominal GBP (no inflation escalation applied). Forecasting is on an annual basis. The model calculates equity cashflows after debt service, and derives equity IRR for both "with CORCs" and "without CORCs" cases. Sensitivities are run on CORC price, biochar price, production volumes, and OPEX. The full model is not provided publicly due to commercially sensitive assumptions on financing and pricing. However, summary results (10-year IRR with and without CORCs, plus sensitivity analysis) are disclosed in this submission, and the full model can be made available to Puro's auditor on a confidential basis. Revenue & cost sources: Biochar sales: Based on expected sales (tonnes/year) × price benchmarked against actual early operating data CORC sales: Assumes 2.36 tCO_2 removed per tonne of biochar, with pricing benchmarked against actual transaction data and market expectations. Costs: Feedstock costs, handling, labour, overhead, and allocated operating costs, benchmarked against actual early operating data. Income breakdown: In the "with CORCs" case, ~55–60% of revenues derive from CORCs, the balance from biochar sales. In the "without CORCs" case, only biochar revenues remain, which are insufficient to achieve the equity hurdle rate. Public subsidies The project has not received public subsidies. Growth assumptions: Production ramps up in the first year as operating experience is gained, then stabilises at the unit's design throughput.

4. Barrier Analysis

In Barrier Analysis only one barrier needs to be demonstrated but there needs to be clear, objective, and verifiable evidence to demonstrate its existence. If possible, please provide quantitative estimates for the barrier.

D. Barrier Analysis	No/yes	Project response
D1. Are there financial barriers? (e.g., financing is not accessible for the type of activity in the country due to the risks)		
D2. Are there institutional barriers? (e.g., the investor not being the beneficiary of cost savings associated with the investment)		
D3. Are there information barriers? (e.g., lack of awareness of the financial benefits of by-products)		
D4. Please explain how CORC revenues are crucial element in overcoming identified barrier(s)		
D5. Are there subsidies for the carbon removal activity? If yes, please explain how they are not sufficient to overcome the barrier.		
D6. Please attach verifiable evidence for the existence of the barrier and describe the evidence here. If the file can be included publicly in the Puro registry, please specify the name of the file here. If the evidence is not public, please ensure		

that you describe it in sufficient detail.		
D7. Please demonstrate that at least one other alternative in baseline determination (first question) does not face any significant barriers, including the barriers faced by your project.		

I hereby declare that all information provided is truthful and precise to the best of my knowledge.

X 

Date, Place: 30/07/25

Representative name, title, organization

Director

Environmental evaluation report

Document description and purpose:

A report prepared by the supplier summarizing the main negative environmental impacts entailed by the biochar production activity (e.g. emissions of pollutants to air, water, and soil, generation of solid and liquid waste, accumulation of materials in stock).

The report shall demonstrate the knowledge of the project regarding the negative impacts arising from the activity. The report shall be factual, scientific, and concise, listing sources of impacts, quantifying whenever possible the relevant emissions and waste streams on a yearly basis, and identifying measures for improvement of the environmental performance.

This report is prepared for the following Feltons Farm Project :

- Brodie Biomass -managed by Brodie Biomass LLC

1. Identification of sources of environmental impacts

For the biochar production activity at the given production facility, list all potential sources of negative environmental impacts for each category listed below, and provide a brief description. Whenever possible provide details on the applicable regulation and yearly quantification of emissions.

Emissions Pollutant	Reported Emissions (mg/m³)	UK Environment Agency Reference Limit (mg/m³)	Compliant?
Oxides of Nitrogen (NO2)	130	150	yes
Carbon Monoxide (CO)	5.38	30	yes
Particulate Matter (PM)	16.64	30	yes

Reference: Element report EMT11927, Emissions test on C1000 Scrubber ON and Emissions Report-Woodtek engineering biomass boiler V1

Emissions to air

Carbon monoxide: carbon monoxide is emitted at the chimney of the facility, when combusting pyrolysis gases, but also emitted from other fuel-powered machineries used on site. Annually, carbon monoxide emissions at the chimney are estimated to be around 86.4kg CO per year (10.8 g/hr × 8000 hrs/year; based on emissions test result: Element Report EMT11927, p. 39. Also note this test was carried out without the wet flue gas scrubber). Emissions from other machinery are unquantified.

CO from the pyrolysis reactor was not measured in the most recent emissions test. While it can be emitted during combustion, levels are assumed to be low due to complete secondary gas oxidation. Measurement of CO is not a current legal requirement under the installation's scope.

Under UK law, only NOx and PM need to be measured for biomass boilers and small-scale combustion equipment. Both pollutants were measured and complied, as shown in the table above and in the emission reports.

Carbon dioxide: The carbonization process converts most of the carbon element into a long-term stable solid form, thereby reducing the emission of carbon dioxide into the atmosphere as a greenhouse gas.

Greenhouse gas emissions from the transportation and handling of biochar: are expected but very minimal as biomass is expected to be taken from within a 25-mile radius of the facility and biochar to be delivered to the fields around the biochar facility itself.

C1000 is fitted with scrubber to remove gases and particulate before emitting to air.

Emissions subject to testing and continuous monitoring

Emissions to water

- Biochar does not have negative effects on water. When added together with fertilizers in agriculture or when present in the soil, it helps increase nutrient and water retention, reducing the leakage of nutrients into waterways. It can act as a water filter but there is no water discharge from field applications.
- No process wastewater is generated from biochar operations

Emissions to soil

- Organic hazardous substances are eliminated during pyrolysis. Mineral pollutants are separated or inert and will not return to the environment.
- No leakage from the facility

Generation of solid waste

- N/A

Generation of liquid waste

- No liquid waste. Minimal runoff of waste from site. Since September, 2024, Brodie Biomass have only used 231 m3 of water. There are other uses of water on the meter, feeding some barns. But use of water is minimal.

Accumulation of materials in stock at the facility

- The project stocks the feedstock at the facility externally and inside the barn for less than one month. In reality the project keeps feedstock onsite for 1 week/10 days .
- For biochar storage, the project has a storage area where the biochar piles up straight from the C1000 output before being transported to another area onsite, where it is used in compost. Biochar will not remain in the storage area for a long period before being transported to the site where it is mixed in with a compost before being applied to own fields.

2. Measures currently in place to mitigate negative environmental impacts

For the biochar production activity at the given production facility, list all measures that are currently implemented to mitigate any negative environmental impacts or associated risks.

Emissions to air

- **Carbon monoxide**: emissions from pyrolysis are minimized by using an advanced combustion chamber. Continuous monitoring of CO levels in the flue gases is not a requirement by law in the project's jurisdiction. Levels are maintained below 5.38mg CO/Nm3 (see Element Report EMT11927). For other fuel-powered equipment, selection of high-quality fuel and modern equipment minimizes CO formation.

- **Gas emissions**: The emissions are in full compliance with the relevant regulations. The project must comply with the Environmental Permitting Regulations (EPR), which are enforced by the UK Environment Agency (EA), which states the maximum amount of emission that can be released.
- C1000 is fitted with a scrubber to remove gases and particulate before emitting to air.

Emissions to water

- No water is in effect filtered.

Emissions to soil

- The project mitigates the risk of biochar negatively impacting soil, with regular testing and sample checks. They check live organic matter when they put biochar on their own land (Microbiometer test) . They also test for NPK and organic matter using conventional 3rd party test company.

Generation of solid waste

- Environment Agency regularly monitors water course (mainly because of presence of producing oil well nearby).
- None from the biochar production process

Generation of liquid waste

As above

None from the biochar production process

Accumulation of materials in stock at the facility

As above

3. Measures possible to implement for improving environmental performance

For the biochar production activity at the given production facility, list measures that are not yet implemented but have been identified as possible ways to improve the environmental performance of the production facility.

Emissions to air –

- None – Scrubber/filters and cooler are already in place

Emissions to water

- Not necessary.

Emissions to soil

- When applied to compost, after approx. 2 weeks, the biochar will absorb any nutrients in the compost, thereby inoculating the biochar and it therefore will not deplete the land as might otherwise the case.

Generation of solid waste

- N/A

Generation of liquid waste

- N/A

Accumulation of materials in stock at the facility

Logistics, storage and materials storage management in general, is regularly reviewed for optimization and environmental purposes.

Brodie Biomass Ltd

CO_2 Removal Supplier

Date: 01/08 /2025

Signature: 

Name: A Brodie

Title: Director

Stakeholder Engagement Report

CO_2 Removal Supplier	Brodie Biomass
Production Facility	Brodie Biomass
Production Facility ID	680422
Date of report last update (YYYY-MM-DD)	2025-09-23

PURO.EARTH Puro.earth Oy, Tammasaarenkatu 1, 00180 Helsinki, Finland

Stakeholder Engagement Report

The purpose of this document is to gather results of the Stakeholder Engagement that has been conducted by the CO_2 Removal Supplier, for its Production Facility, in line with Section 6.4 of the Puro General Rules 4.0 and the Puro Stakeholder Engagement Requirements.

This report is divided in the following sections:

1 Identified stakeholders
2 Consultation activities and outcomes
3 Plans for continued consultation during crediting period
4 Summary

This report will be made **publicly available** in the Puro Registry. It shall not contain information about private individuals (e.g. name, personal address) for privacy reasons. Such information shall be provided separately (e.g. list of participants to consultation activity, as an appendix to the report).

1 Identified stakeholders

Provide an overview of the stakeholders that have been identified as relevant to include in the stakeholder engagement process, following the categories defined below:

Stakeholder categories	Identified stakeholders
Local Stakeholders, i.e. stakeholders in the immediate environment of the facility of the CO2 Removal Supplier, and most prone to experience direct or indirect effects of the respective carbon removal activity.	Multiple potential Investors -through 2023 and 2024 Multiple local biochar sales options- 2022 - 2024 Feedstock suppliers- 2022-2024
Stakeholders with **land-tenure rights** within the vicinity of the project boundary	Local farmers- potential biochar sales
Representatives of relevant **local authorities** and relevant **local politicians**	Members of Surrey County Council – Sept 2024 and Feb '25 Officer from Mole Valley District Council – May 2023 Member of Brockham Parish Council- June 2023
Local **non-governmental organizations** (NGOs) or international NGOs who are active in the region and relevant to the topic	Member of Protection Rural England- Jan '25 Member of the Royal Horticultural Society
Representatives of relevant **working groups** or **vulnerable** and **marginalized** groups within the vicinity of the project boundary	
Relevant **industry experts**, given there are any in the near environment	University of Nottingham professors- through 2023 and 2024 Biochar consultants,- 2022
Other, please specify:	Technology provider- through 2023,2024,2025

	Project developer- 2023 onward
Answers are to be written in the second column without disclosing private information. For instance, instead of the name of a specific resident, use terminology like "local residents". Likewise, instead of naming specific public employees, prefer to mention the roles and departments. *In case there are no identified stakeholders in a given category, provide a brief justification instead.*	

Activity directly or indirectly impacting indigenous peoples or their livelihoods, ancestral knowledge or cultural heritage:

Question	Answer
Does the list of identified stakeholders include any indigenous peoples or communities?	☐ Yes ☒ No
If answer is "Yes" to the question above, has the free, prior and informed consent (FPIC) been obtained from those indigenous peoples or communities?	☐ Yes. Please provide evidence of the obtention of the FPIC in a separate document.
As per rule 2.1.6 in the Puro Stakeholder Engagement Requirements, note that "FPIC is distinct from stakeholder engagement in that it is derived from indigenous peoples' right to self-determination. While stakeholder engagement involves consultation and collaboration with all parties affected by a project, FPIC goes a step further by requiring the explicit consent of indigenous peoples before proceeding with activities that impact them."	

2 Consultation activities and outcomes

Provide an exhaustive list of all the **stakeholder consultation activities** that have been conducted. Add as many rows as necessary. The activity categories can for instance be one of the followings (but not limited to these ones): public meeting, online webinar, paper questionnaire, electronic questionnaire, interviews, focus group, site visit, door-to-door visits, etc.

Activity categories	Activity name	Activity date (YYYY-MM-DD)
Site Visit	Project developer visit and assessment	2024-09-10
Site visit	Local young famers association outreach and invite to facility	
email	County council invite to facility	
Online	Citizen Portal Planning Permission application	2023-05-23 and 2023-06-05
Site visit and online	Biochar podcast group (Restord) visited and featured the facility	2024-11-22

Provide a list of all the **stakeholder invitations** that have been sent out, grouping whenever relevant the invitations (e.g., for all local residents as one row). Add as many rows as necessary. The invitation format can be one of the followings (but not limited to these ones): postal letters, email, social media publication, public board information, telephone calls, verbal communication, etc.

Invitation format	Invitation name	Invitation date (YYYY-MM-DD)
Interview/online	Multiple potential investor outreach and planning	2023-2024
Site visit/online	Meeting with biochar consultant	Ongoing support
Site visit	Multiple- Biochar sales opportunities- facility tour	2024-2025

Verbal communications	UK innovate research grant project- University	2023-2024
Site visit/verbal communication	Technology installation, planning updates(plans to hold open days to demonstrate the c1000 unit)	2022-2025
Site visit/letters/verbal	Feedstock suppliers- ongoing discussions	2023-2025
Site visit	Facility tour- Protection Rural England	2025
Letter	Royal Horticulture Society	

As **supporting evidence** to this report, please provide in a separate subfolder, the following:

- Example of invitations sent out, for different consultation activities (e.g. letters, emails, website announcements). See separate folder for:

Please see attached in folder, planning application details pdf to local planning authority.
Please see attached in folder the letter from local parish council expressing their concerns of planning application
Please see email attached in folder, sent to and from The Royal Horticultural Society and Nottingham University outlining their desire to work with Brodie Biomass to monitor their biochar and the effects of its application in horticulture and as a fertiliser alternative.
Please see letter attached and responses, in folder, written to Tree surgeons (feedstock suppliers), which outlines the source of the feedstock and the longevity of the partnership

Lists of all stakeholders invited to the consultation activities and stakeholders participating in the consultation activities. The lists will not be made public, as they can contain private information.

In case identified relevant stakeholders (section 1) were not invited to the consultation activities, please provide clear **reasons for not inviting** them. Add as many row as necessary. Leave blank if not applicable.

Identified stakeholders	Reasons for not inviting

Provide an extensive summary of i) the **information that was provided to stakeholders** during the consultation activities, ii) the **feedback received** during the consultation activities (with a particular focus on concerns, potential issues and critiques), and iii) the **responses provided to stakeholders** about their feedback.

Summary of the feedback received during the consultation activities
See folder for application to local planning authority: Feedback from local planning application and action taken by project: • Development hereby permitted shall be carried out and completed in all respects strictly in accordance with the submitted documents and plan numbers -**Confirmed** • The development hereby permitted shall be begun before the expiration of three years from the date of this permission. **Development began within the 3-year period**.

- There shall be no delivery or dispatch of material to the biomass dryer hereby approved at any time outside the hours of 23:00 to 06:30 Monday to Sunday or Bank or Public Holidays- **Accepted by Project**
- An assessment of the acoustic impact arising from the operation of all internally and externally located plant associated with biomass boiler hereby approved shall be undertaken. **The facility has decibel reading software on iPhones. The facility checks decibel readings frequently and are consistently found to be in range. The facility changed the reversing siren on the JCB to a white noise sound siren to reduce acoustic impact.**
- Details of any proposed external lighting scheme to be installed shall be submitted to and approved by the local authority. **Local Authority visited the facility and was satisfied**

In case any relevant stakeholders **could not take part** in the consultation activities due to reasons such as lack of mobile access or physical disability, please describe and summarize how you engaged with them, what their specific feedback was, and how it was answered. Leave blank if not applicable.

Consultation of stakeholders that could not take part in the scheduled consultation activities

N/A

As **supporting evidence** to this report, please provide in a separate subfolder, the following:

- Materials presented during the consultation activities (e.g. presentations)
- Documentation of the feedback received (e.g. meeting notes, questionnaire answers)
- Documentation of the responses provided to stakeholders (e.g. consultation reports)

Provide an extensive description of the **changes made to the project** plans to address the concerns and issues raised during the consultation activities.

Description of the changes made to the project for addressing concerns and issues

N/A

3 Plans for continued consultation during crediting period

Provide a description of the current plans for maintaining a continued engagement of the stakeholders during the crediting period.

Description of the plans for continued consultation of stakeholders during the crediting period

Stakeholders will be encouraged to provide feedback or raise concerns through multiple accessible channels, including email, web forms on our website, scheduled public meetings, and direct contact with designated community relations personnel. Contact information for these channels will be publicly available and regularly promoted to ensure ease of access.

All incoming feedback and concerns will be recorded and tracked to ensure proper documentation and follow-up. Each submission will be logged with details such as date, stakeholder identity, nature of the feedback, and any actions taken to address it.

To manage and respond effectively, BBL will assign responsible team members to review and address each concern promptly. BBL commit to acknowledging receipt of feedback within a specified timeframe and providing updates on actions taken.

Actions resulting from stakeholder input may include clarifying information, adjusting operational procedures, or engaging in further discussions. All decisions and responses will be documented, and where appropriate, communicated back to the stakeholder.

BBL will conduct regular reviews of our engagement process to evaluate its effectiveness, gather additional feedback on the process itself, and implement improvements. This ensures continuous enhancement of stakeholder engagement and grievance resolution efforts.

Additionally, BBL will maintain ongoing communication with local authorities to ensure all permitting requirements continue to be met, and with feedstock suppliers to guarantee a sufficient supply and that sourcing documentation remains up to date. BBL will also engage regularly with biochar customers to confirm that end-use requirements are fulfilled.

Furthermore, BBL will continue to actively engage with the local community regarding current operations and any future expansion plans. BBL remains open to feedback from all relevant stakeholders, including neighboring farmers.

4 Summary

Based on all the information provided above and the evidence provided separately, write an overall summary of the stakeholder engagement. This summary must follow the structure of this report, tackling identified stakeholders, consultation activities and outcome, and plans for continued consultation. This summary is limited to 500 words. This summary must be re-used in the Project Description.

Overall summary (500-word limit)

BBL has undertaken an extensive process of consultation with the relevant stakeholder groups and the project is supported throughout the region.
Stakeholders include the local planning authority to ensure permitting requirements for biochar production onsite have been met as well as engaging with business consultants to guide BBL through the complexities of entering into a new market.
BBL has worked alongside The University of Nottingham to research the potential of biochar as a fertilizer alternative as well as engaged The Royal Horticultural Society, to better understand and monitor biochar, regarding its potential application in horticulture.
Feedstock suppliers have been informed by letter and through verbal consultation, about the biochar project and supported BBL with the clarification of feedstock sourcing.
The project's components are built, and reliant on, the local community which reduces transportation distances and minimizes carbon footprint.
This is evidenced by:

- Using locally sourced wood as feedstock, from within a 25 mile radius of the biochar production facility

- Using existing relationships with local tree surgeons to source feedstock.
- Supporting local tree surgeon businesses through feedstock purchases
- Supporting local tree surgeons who are now planning to expand their activities by buying machinery that can process larger trees.
- Using biochar in the production of compost that is used on the farms land.
- Plans to sell the biochar compost to neighboring farmers which supports efforts to improve local soils and reduce requirements to purchase fertilizers, that have a heavy carbon footprint.
- Plans to sell the biochar compost to local garden centers
- Creating additional employment opportunities

By participating in the production of biochar and advancement of practices and by partnering with contributors in the biochar market, BBL engages in the effort that allows the methodology to advance and thus, promotes market trust and survival. The certification of producers such as BBL is critical to prove the concept and involve market stakeholders in the evolution of the carbon removal and biochar markets.