General Application

(The General Application applies to everyone, all applicants should complete this)

Company or organisation name

Carbonaught Pty Ltd

Company or organisation location (we welcome applicants from anywhere in the world)

Brisbane, Australia

Name of person filling out this application

Andrew Pedley.
James Lyons, PhD.
Prof. Balz Kamber.
Assoc. Prof. David Rowlings.

Email address of person filling out this application

[redacted]

Brief company or organisation description

Converting waste basalt rock to a carbon removal solution.

1. Overall CDR solution (All criteria)

a. Provide a technical explanation of the proposed project, including as much specificity regarding location(s), scale, timeline, and participants as possible. Feel free to include figures and system schematics.

<1500 words

Project Description

Carbonaught removes carbon dioxide from the atmosphere at scale. We take highly available waste rock from mining/quarry operations, crush it and then spread it on surrounding farmland as an organic fertiliser. Carbonaught then uses chemistry to validate the increases in soil fertility and sequestered carbon dioxide that results and provides the platform for the registry and trading of sequestered carbon. A key dynamic in Carbonaught's approach is establishing a network of such projects. Having now moved a Pilot project to small scale production we have funded and are mobilising our first kilotonne project 300km away.

The kilotonne project builds on the success of the pilot project (currently producing 200 tCO2-e p.a.) and is situated on a 659 hectare mixed horticultural/agricultural business in the area surrounding the town of Childers in Queensland Australia. It was selected for its close proximity to surrounding quarries producing suitable basalt rock dust, its high mean annual rainfall (1071 mm) and high average maximum and minimum temperatures (26.9 and 15.5°C, summer/winter respectively); all supporting faster enhanced silicate weathering and thus higher application rates of rock dust.

Our initial scope is to remove 1100 tonnes of CO2e per year on a gross basis. We do not expect any significant portion of CO2 to be re-emitted within 100 years. Bicarbonate in the ocean can eventually be re-emitted as CO2, but on timescales much longer than 100 years. To achieve this we will require 300 hectares of cropping land. The owners of the project farm own +3000 hectares of cropping farmland and have made a subset of this land available for the project.

Operational Summary

Operationally, the process is to load and haul the feedstock from the quarry stockpile to a farm staging area. From there it is applied in a similar fashion to lime or gypsum with an 8-tonne tractor pulled spreader. Prior to this occurring we will install monitoring equipment to help measure the soil fertility and carbon sequestration over time.

Technical Summary

The process of rock weathering involves a series of chemical reactions.
First, the hydration of CO2 forms carbonic acid (Martin, 2017). This weak acid breaks down silicate rock, which releases base cations (e.g. Ca^{2+}, Mg^{2+}) and bicarbonate and carbonate ions (Beerling, 2017). The weathering of silicate minerals is commonly represented using the calcium silicate mineral wollastonite (CaSiO3), and releases bicarbonate ions.

When the dissolved bicarbonate ions are transferred to the ocean and contribute to its alkalinity, two moles of CO2 are captured per mole of calcium (content depending on the rock). However, when soil conditions are favourable, some of the calcium and magnesium cations can precipitate to form carbonate minerals which accounts for half the moles of CO2 captured during the weathering of the rock. The capture potential of each path depends on the type of rock used. The sequestered CO_2 is durably sequestered in the form of carbonate minerals in the soil and bicarbonate ions in the oceans. Both lock up CO_2 for much longer than 100 years.

Energy Sources

The feedstock (basalt) will be sourced from quarries ranging from 17km-70km away, where it is stockpiled as a waste product from production of road base aggregates. While we include the quarry operations in our life cycle analysis, strictly speaking the energy requirements begin once the crusher dust is loaded onto the transport. From there the main energy source is diesel fuel for the transport and application via front loader, truck and belt-spreader. The second major energy source will be battery power for the remote sensing and monitoring equipment. Marginal electricity requirements will be needed for the computation and administration. We should mention that we are relying heavily on heat generated from the sun as part of its natural process. We only mention it since the Australian climate (hot and wet) we are operating in is one of Carbonaught's advantages in deploying this technology (compared to cold & dry climates).

Permits & Regulatory Compliance

No permits will be required for operations that source material from quarries. In the future, however, we are likely to require a quarry licence to move the rock off-site from a mining operation. We will also fill in an application form to utilise the enhanced regulatory sandbox from the Australian Securities and Investment Commission designed to test innovative financial services. This will be required to trial our on-platform registry and trading activity.

Demonstration of Key Weathering Process

Breakdown rate is key to this entire carbon removal approach as the timely breakdown of basalt drives the measurable carbon sequestration and soil fertility benefits. In turn, the rate at which it does this determines the economic viability of the project through rate of stockpile use, required energy and resulting greenhouse gas emissions, required land area and realised benefit to farmers. These dynamics in turn determine liquidity in terms of marketable offset capacity and scalability.

We have a pilot site that has been doing this for 20 years that allows us to test and validate the breakdown rate.

To validate our assumed breakdown rates, twelve 50-100 cm deep soil cores were taken with a mechanical soil corer (5 each from rock dust amended avocado and macadamia plantations, and 2 from untreated pasture). These cores were then prepared and subjected to XRD analysis.

The results of the XRD were then compared against the expected results for a range of different half-lives in an attempt to estimate the true half-life and therefore the breakdown, and sequestration rate of the application.

The analysis demonstrated that for the cumulative 250 tonnes per hectare of crusher dust applied over the last 10 years over 90% of that material has broken down and that the carbon weight at depths of 30-35cm are between 1 and 1.5 wt% which is significant.

The soil profiles clearly showed the application of fresh rock dust with olivine and clinopyroxene disappearing very rapidly with depth, plagioclase persisting slightly more and ilmenite persisting most. These observations exactly reflect the predictions of weatherability (Goldich Series):

glass>>olivine>clinopyroxene>plagioclase>>>ilmenite.

Independently Verified Results

Carbonaught's approach was independently verified by Assoc Prof Michael Babechuk on 30 January 2022, whose CV highlights relevant expert outputs to one or more of the key scientific/technical verification areas needed for the Team CARBONAUGHT proposal (inc. silicate rock, including basalt, breakdown processes; mineralogical and chemical analytical methods of assessing rock weathering; calculations of major ion mass balance to determine CO2 conversion during rock weathering; involvement with experimental/lab-based and field-based CO2 sequestration studies).
All review activities took place remotely through the provision of detailed documents (proposal text, spreadsheet calculations, linked references to the literature, clear satellite imagery) as well as further confirmation and discussion of details via Zoom with Prof. Balz Kamber of the CARBONAUGHT Team. For this stage of the project, it was deemed this method of evaluation to be adequate and allowed for the provision of an accurate and thorough verification of the proposal.
The evaluation for this verification included all steps of the geoengineering workflow and the data available from the CARBONAUGHT Team's Pilot Project site (the demonstration site) and the proposed scaling for the Demonstration Site (kilotonne project), the technological methods proposed, and data quality control verification.

b. What is your role in this project, and who are the other actors that make this a full carbon removal solution? *(E.g. I am a broker. I sell carbon removal that is generated from a partnership between DAC Company and Injection Company. DAC Company owns the plant and produces compressed CO_2. DAC Company pays Injection Company for storage and long-term monitoring.)*

<50 words

For the kilotonne project Carbonaught's role is to serve the application site by sourcing, transporting, applying feedstock and providing measure/model/validation and credit registry services.

c. What are the three most important risks your project faces?

<300 words

Drawdown rate

This risk relates to a basalt not breaking and drawing down carbon dioxide at the expected rate. This can be caused by larger particle sizes, more alkaline soils, colder, drier weather and unfavourable petrology. The main consequence is the need to apply basalt to more hectares than originally planned which significantly affects the unit economics of the operation. To mitigate this risk, thorough soil and petrology tests have been carried out to ensure the right material is applied to the right environment (soil/climate) which is backed by our independently verified approach built off a 20-year historical analysis of a very similar operation.

Land access

Our second major risk is access to appropriate broadacre cropping/horticultural land. Without significant land size Carbonuaght's approach will be limited to a network of kilotonne projects and will not be able to step up to the megatonne level on either a national or global scale. This risk can be both compounded in both the positive and negative directions by the large average landholdings of our initial client base. As a mitigation we are relying on the fact that Australia has approx 31m hectares of cropping farmland to hedge this risk. https://www.abs.gov.au/statistics/industry/agriculture/agricultural-commodities-australia/latest-release.

Credit/Offset credibility

Finally, we face the risk of perceived quality/validity of credits produced, specifically by the financial institutions responsible for insurance and capital provision. This may be caused by a reluctance to outsource due diligence/responsibility to the compliance market(s) and/or a reluctance to be a first mover. The effects are higher costs of capital for hard-to-abate sectors and reduced outright access to capital. To mitigate this, our approach provides full provenance through a web portal including independently analysed soil chemistry results that can be traced back in space and time along the entire value chain.

d. If any, please link to your patents, pending or granted, that are available publicly.

N/A.

e. Who's the team working on this? What's your team's unfair advantage in building this solution? What skills do you not yet have on the team today that you are most urgently looking to recruit?

<300 words

The core team were working together at one of the world's largest coal mining companies across the data science and mining engineering teams. We then coupled our domain expertise in operations research and remote monitoring for open cut mining operations with expertise in petrology (recruiting the former chair of geology and mineralogy from Trinity College Dublin) and soil science (specialising in carbon measurement and fertiliser efficacy).

Our unfair advantages:

- Our belief that mining isn't inherently evil but will serve as the **vanguard** for the net-zero transition.
- Our **mining background** includes specialisation across mining engineering, electric engineering, machine learning and profitability optimisation of load and haul operations.
- While everyone claims their scientific expertise we have a very credible **academic spine** with approximately 20,000 citations across petrology, soil science and machine learning between the founders.
- **Our Pilot Project**. Independently verified carbon sequestration approach and results from a >20 year application history complete with receipts.
- **Our location**. Australia has abundant feedstock, application areas and ideal climate to couple with stable jurisdiction risk and a deep pool of mining and agricultural skill sets to draw upon.
- Our experience in sales and trading across **OTC markets** and resulting view of how carbon markets will evolve and our ability to build the platform and leverage our network to capitalise on this.

Skill deficiencies:

- Legal expertise in contracts relating to agriculture, mining and commodity trading.
- Trade-finance expertise in the structuring and raising of green-bonds.
- PR - while we are creative in the scientific/markets realm we aren't very good at marketing and branding. We feel this is an important gap we need to address.

2. Timeline and Durability (Criteria #4 and Criteria #5)

a. Please fill out the table below.

	Timeline for Offer to Stripe
Project duration *Over what duration will you be actively running your DAC plant, spreading olivine, growing and sinking kelp, etc. to deliver on your offer to Stripe? E.g. Jun 2022 - Jun 2023. The end of this duration determines when Stripe will consider renewing our contract with you based on performance.*	2 years
When does carbon removal occur? *We recognize that some solutions deliver carbon removal during the project duration (e.g. DAC + injection), while others deliver carbon removal gradually after the project duration (e.g. spreading olivine for long-term mineralization). Over what timeframe will carbon removal occur?* *E.g. Jun 2022 - Jun 2023 OR 100 years.*	Continuously over 10+ years *<10 words*
Distribution of that carbon removal over time *For the time frame described above, please detail how you anticipate your carbon removal capacity will be distributed. E.g. "50% in year one, 25% each year thereafter" or "Evenly distributed over the whole time frame". We're asking here specifically about the physical carbon removal process here, NOT the "Project duration". Indicate any uncertainties, eg "We anticipate a steady decline in annualised carbon removal from year one into the out-years, but this depends on unknowns re our mineralization kinetics".*	20% in the first year, dropping off exponentially with a half life of around 3 years. 10% will remain at the 10 year mark. *<50 words*
Durability *Over what duration you can assure durable carbon storage for this offer (e.g, these rocks, this kelp, this injection site)? E.g. 1000 years.*	Bicarbonate in solution >1k years in the ocean *<10 words*

b. What are the upper and lower bounds on your durability claimed above in table 2(a)?

The lowest estimate of >1000 years is effectively permanent sequestration on human time scales. Renforth et. al gives a residence time of 100k years.

c. Have you measured this durability directly, if so, how? Otherwise, if you're relying on the literature, please cite data that justifies your claim. *(E.g. We rely on findings from Paper_1 and Paper_2 to estimate permanence of mineralization, and here are the reasons why these findings apply to our system. OR We have evidence from this pilot project we ran that biomass sinks to D ocean depth. If biomass reaches these depths, here's what we assume happens based on Paper_1 and Paper_2.)*

There are 2 avenues of sequestration, one as bicarbonate in the ocean, and the other as solid carbonates. The following citations give lifetimes for bicarbonate in the ocean.

We rely on findings from the literature e.g. >1000 years in Montserrat, Francesc, et al. "Olivine dissolution in seawater: implications for CO2 sequestration through enhanced weathering in coastal environments." Environmental science & technology 51.7 (2017): 3960-3972.

"The residence time of dissolved inorganic carbon in the whole ocean is around 100 ka" - Renforth, Phil, and Gideon Henderson. "Assessing ocean alkalinity for carbon sequestration." Reviews of Geophysics 55.3 (2017): 636-674.

Solid carbonates are expected to last at least as long, though we're finding it hard to find papers specifically citing the persistence of limestone.

<200 words

d. What durability risks does your project face? Are there physical risks (e.g. leakage, decomposition and decay, damage, etc.)? Are there socioeconomic risks (e.g. mismanagement of storage, decision to consume or combust derived products, etc.)? What fundamental uncertainties exist about the underlying technological or biological process?

Once Bicarbonate reaches the ocean, there are no leakage or decay risks, or risk of mismanagement of storage. Plants will consume some proportion of the Calcium ions before it reaches groundwater, however this is expected to be minimal.

e. How will you quantify the actual permanence/durability of the carbon sequestered by your project? If direct measurement is difficult or impossible, how will you rely on models or assumptions, and how will you validate those assumptions? *(E.g. monitoring of injection sites, tracking biomass state and location, estimating decay rates, etc.)*

We will be placing wick lysimeters buried on application sites to directly measure breakdown of basalt and formation of carbonates over a period via soil water testing. The information thus gathered can be combined with measurements of remaining basalt in the soil profile to prove that sequestration has occurred, and an accurate model of how quickly it occurs can be built.

3. Gross Capacity (Criteria #2)

a. Please fill out the table below. **All tonnage should be described in metric tonnes here and throughout the application.**

	Offer to Stripe (metric tonnes CO_2) over the timeline detailed in the table in 2(a)
Gross carbon removal Do not subtract for embodied/lifecycle emissions or permanence, we will ask you to subtract this later	540 t*CO2-e*
If applicable, additional avoided emissions e.g. for carbon mineralization in concrete production, removal would be the CO_2 utilised in concrete production and avoided emissions would be the emissions reductions associated with traditional concrete production	Soil enrichment from basalt rock is well documented to provide general soil health improvements. As such, we believe that our farming partners should see a reduction in fertiliser usage, and that this process could replace some of the soil enrichment processes that they currently perform. As such there is likely to be a reduction in related emissions. However, we have not accounted for any of those in this offering.

b. Show your work for 3(a). How did you calculate these numbers? If you have significant uncertainties in your capacity, what drives those? *(E.g. This specific species sequesters X tCO_2/t biomass. Each deployment of our solution grows on average Y t biomass. We assume Z% of the biomass is sequestered permanently. We are offering two deployments to Stripe. X*Y*Z*2 = 350 tCO_2 = Gross removal. OR Each tower of our mineralization reactor captures between X and Y tons CO_2/yr, all of which we have the capacity to inject. However, the range between X and Y is large, because we have significant uncertainty in how our reactors will perform under various environmental conditions)*

We are deriving our Stripe offering from two deployments of our process, split into 200t net at one, and 300t net at the second. In both cases, we are planning on applying 25t feedstock material per Ha (over approximately 30 and 50 Ha respectively). A total of just over 2026t of

feedstock will be used. Each tonne of feedstock material will sequester an assumed 0.267t of net CO2e. This number is a conservative estimate based on elemental analysis of feedstock and assumed ratio of two weathering processes. For reference, a typical number seen in the literature is 0.3t net CO2e sequestered. This leads to the total sequestered number of 541t (2026t feedstock * 0.267 gross sequestered per tonne).

c. What is your total overall capacity to sequester carbon at this time, e.g. gross tonnes / year / (deployment / plant / acre / etc.)? Here we are talking about your project / technology as a whole, so this number may be larger than the specific capacity offered to Stripe and described above in 3(b). We ask this to understand where your technology currently stands, and to give context for the values you provided in 3(b).

Our current total *capacity* is 1,200 metric tonnes CO_2/yr

This number is comprised of:

- 200 tCO2-e per year from the Pilot Site (producing).

- 1000 tCO2-e per year from kilotonne project (mobilising/ramp up phase)

Note we have 10x potential to increase capacity in both feedstock and cropping area under management (nameplate capacity).

d. We are curious about the foundational assumptions or models you use to make projections about your solution's capacity. Please explain how you make these estimates, and whether you have ground-truthed your methods with direct measurement of a real system (e.g. a proof of concept experiment, pilot project, prior deployment, etc.). We welcome citations, numbers, and links to real data! *(E.g. We assume our sorbent has X absorption rate and Y desorption rate. This aligns with [Sorbent_Paper_Citation]. Our pilot plant performance over [Time_Range] confirmed this assumption achieving Z tCO_2 capture with T tons of sorbent.)*

The key fundamental assumptions are around the tonnes sequestered per tonne of feedstock, the rate at which the feedstock will weather, and the carbon output of our process. Regarding tonnes sequestered per tonne of feedstock, we have performed elemental analysis of our feedstock material to determine the chemical composition and therefore weathering capacity, as well as soil analysis post weathering for our pilot project. We are confident in our (conservative) estimate of 0.267t sequestered / tonne feedstock. Regarding weathering rate, our scientific team has modelled the results from our pilot project and calculated an in situ halflife of 3 years that makes the project feasible. And finally we've modelled our life cycle analysis of emissions based on those seen in the literature with factors tailored to our specific project and local conditions (IE transportation distances, electrical grid carbon outputs, etc).

e. Documentation: If you have them, please provide links to any other information that may help us understand your project in detail. This could include a project website, third-party documentation, project specific research, data sets, etc.

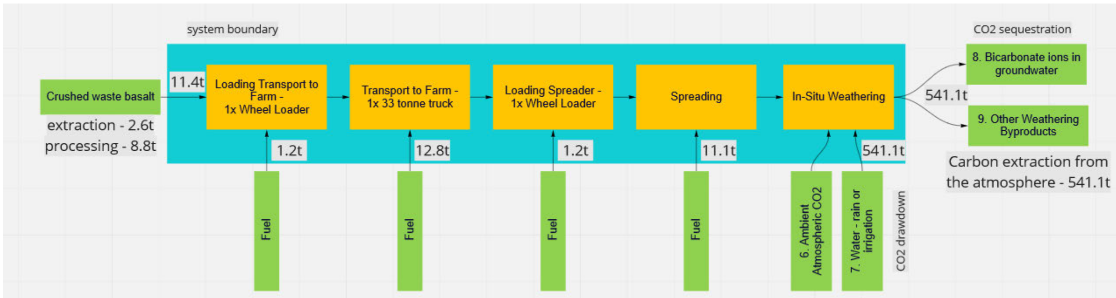
- Verification documents and appendices
- Independent verification review
- Stripe proposal specific life cycle analysis

4. Net Capacity / Life Cycle Analysis (Criteria #6 and Criteria #8)

a. Please fill out the table below to help us understand your system's efficiency, and how much your lifecycle deducts from your gross carbon removal capacity.

	Offer to Stripe (metric tonnes CO_2)
Gross carbon removal	542 t
Gross project emissions	42t
Emissions / removal ratio	0.076 (92.78% efficiency)
Net carbon removal	500t

b. Provide a carbon balance or "process flow" diagram for your carbon removal solution, visualising the numbers above in table 4(a). Please include all carbon flows and sources of energy, feedstocks, and emissions, with numbers wherever possible *(E.g. see the generic diagram below from the CDR Primer, Charm's application from 2020 for a simple example, or CarbonCure's for a more complex example).* If you've had a third-party LCA performed, please link to it.



c. Please articulate and justify the boundary conditions you assumed above: why do your calculations and diagram include or exclude different components of your system?

For the sake of the two deployments in this offering, we are buying crushed basalt as a waste product from existing quarrying operations. While these waste products are created and regardless of our purchasing them, we have still chosen to include them in our life cycle analysis and are offsetting their carbon emissions in our offering.

The remainder of the process flow captures a series of diesel powered processes (loading, transportation, and spreading of feedstock), which are all due directly to our operations.

d. Please justify all numbers used in your diagram above. Are they solely modelled or have you measured them directly? Have they been independently measured? Your answers can include references to peer-reviewed publications, e.g. Climeworks LCA paper.

Our life cycle analysis is based on the 2019 paper titled "Assessing the potential of soil carbonation and enhanced weathering through life cycle assessment: A case study for Sao Paulo state, Brazil" by Lefebvre et al, the authors perform a life cycle analysis for this method in Brazil. For the feedstock extraction and processing energy requirements we are assuming the same numbers as them, however have used carbon emission figures from our local power grid. For the transport components, we've used efficiency numbers from larger trucks that we will need to use, and we've replaced their assumptions on distances with specific details of our projects. For material spreading we have used the authors assumptions.

As we start to scale out our own projects, we will be able to get more specific numbers for some of these processes. For example, for the carbon output of the spreading process we will be able to replace the assumed fuel usage with numbers that are specific to the application.

In addition to the elements outlined by Lefebvre et al, we have also accounted for sundry emissions from site visits, soil sampling, computer usage, etc of 2t for the current offer.

e. If you can't provide sufficient detail above in 4(d), please point us to a third-party independent verification, or tell us what an independent verifier would measure about your process to validate the numbers you've provided.

- Verification documents and appendices
- Independent verification review

5. Learning Curve and Costs (Backward-looking) (Criteria #2 and #3)

We are interested in understanding the learning curve of different carbon removal technologies (i.e. the relationship between accumulated experience producing or deploying a technology, and technology costs). To this end, we are curious to know how much additional deployment Stripe's procurement of your solution would result in. (There are no right or wrong answers here. If your project is selected we may ask for more information related to this topic so we can better evaluate progress.)

a. Please define and explain your unit of deployment. *(E.g. # of plants, # of modules)*

<50 words

Tonnes of basalt applied to farmland.

b. How many units have you deployed from the origin of your project up until today? Please fill out the table below, adding rows as needed. Ranges are acceptable.

Year	Units deployed (#)	Unit cost ($/unit)	Unit gross capacity (tCO_2/unit)	Notes
2022	0	0	0	*<50 words* Although our Pilot site is producing 200t CO2-e p.a we physically didn't lay the basalt in the last cycle so technically can't claim this. Measuring protocols coming after the fact and we are likely to take over operations from here out (tbc April '22).
2021	0	0	0	*<50 words*

c. Qualitatively, how and why have your deployment costs changed thus far? *(E.g. Our costs have been stable because we're still in the first cycle of deployment, our costs have increased due to an unexpected engineering challenge, our costs are falling* *because we're innovating next stage designs, or our costs are falling because with larger scale deployment the procurement cost of third party equipment is declining.)*

Our cost assumptions are currently stable with the potential to significantly decrease in-ground lysimeter deployment costs.

d. How many additional units would be deployed if Stripe bought your offer? The two numbers below should multiply to equal the first row in table 3(a).

# of units	Unit gross capacity (tCO_2/unit)
2022 tonnes of basalt	0.267 tCO2/tBasalt

6. Cost and Milestones (Forward-looking) (Criteria #2 and #3)

We are open to purchasing high cost carbon removal today with the expectation the cost per ton will rapidly decline over time. We ask these questions to get a better understanding of your potential growth and the inflection points that shape your cost trajectory. There are no right or wrong answers, but we would prefer high and conservative estimates to low and optimistic. If we select you for purchase, we'll expect to work with you to understand your milestones and their verification in more depth. If you have any reservations sharing the information below in the public application format, please contact the Stripe team.

a. What is your cost per ton of CO_2 today?

\$/ton CO_2 \$357.40/tCO_2-e

b. Help us understand, in broad strokes, what's included vs excluded in the cost in 6(a) above. We don't need a breakdown of each, but rather an understanding of what's "in" versus "out." Consider describing your CAPEX/OPEX blend, non-levelized CAPEX costs, assumptions around energy costs, etc.

<100 words Broadly this cost reflects feedstock, transport, application, soil chemistry operations (drill, sample-prep and lab fees), measurement infrastructure (lysimeters, sensors, software subscription) and software development costs. It does not include OPEX considerations. These costs encapsulate the underlying direct costs associated with the delivery of a ton of sequestered carbon (e.g. feedstock basalt cost includes the rolled in capex,opex,margin of the supplying quarry and transport costs include fuel, labour, provisions etc).

What is not included in this current cost is indirect costs from head office such as the founders' salaries and SGA.

c. How do you expect your costs to decline over time? Specifically, what do you estimate your cost range will be as you reach megaton and then gigaton scale? We recognize that at this point, these are speculative and directional estimates, but we would like to understand the shape of your costs over time.

\$/ton CO_2

We have modelled our solution at the megatonne per year scale to be **USD \$95/tonne CO_2-e.** To the best of our estimations, we believe that at the gigatonne scale the cost profile may be able to drop a further 20%.

d. Where are the primary areas you expect to be able to achieve cost declines? E.g., what are the primary assumptions and sensitivities driving your cost projection? What would need to be true for a long-term cost of <\$100/ton to be achievable with your technology? (i.e., you are able to negotiate an x% reduction in CAPEX at scale and purchase renewable electricity at \$y/kWh)

<300 words

We anticipate the major levers of cost decline, in no particular order, will be:

1. **Better models driving down the MMV infrastructure/process requirements (and costs) for each hectare covered. The drastic reduction in key elements of that infrastructure.**

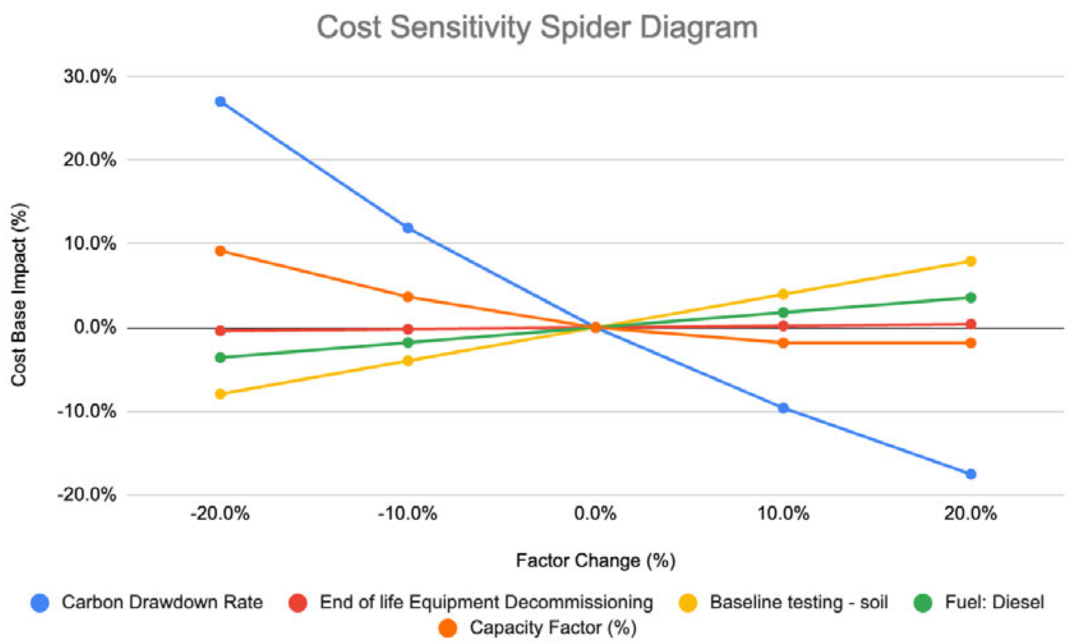
We expect to be able to proxy rock breakdown and its associated carbon sequestration and soil fertility benefits as we scale. This will involve a capital intensive phase while we are at smaller scales to over-measure our land which will help bolster existing models and validate different carbon measurement technologies currently available in the market. In addition to this, we are developing a prototype lysimeter that is 10x cheaper than commercially available alternatives.

2. **Feedstock costs as mines become the source rather than quarries.**

We expect to achieve material declines in feedstock costs once we begin sourcing from appropriate stockpiles and processing ourselves rather than sourcing from quarries. There are early indications that for certain operations we may be able to source the material for free or even be compensated for taking the rocks off-site.

3. **Accelerating the breakdown rate of the basalt by better material/land matching.**

By accelerating the drawdown rate by 20% we estimate the cost base of our operations at the megatonne scale will fall by just over 15%. The main underlying dynamic is the hectares required to generate an equivalent carbon drawdown (with its equivalent overheads etc) drives the total cost up/down.



e. In a worst case scenario, what would your range of cost per ton be? We've been doing a lot of purchasing over the past few years and have started to see a few pieces that have tripped people up in achieving their projected cost reductions: owned vs leased land, renewable electricity cost, higher vendor equipment costs, deployment site adjustments, technical performance optimization, supporting plant infrastructure, construction overruns, etc. As a result, we'll likely push on the achievability of the cost declines you've identified to understand your assumptions and how you've considered ancillary costs. We would love to see your team kick the tires here, too.

<300 words

Carbonaught's "worst case" scenario would firstly be defined as:

- the inability to achieve the hectares under process (HUP) that would enable economies of scale across the measure,model, validate component of our approach, *and*
- A 20% or more slower breakdown rate of the ground basalt once applied.

To bear out that scenario we imagine we are only able to treat one hectare and that the breakdown occurs so slowly that only 1 ton of CO_2 is sequestered. This scenario would yield no soil fertility or real carbon sequestration benefits (in the form of offset purchase) as well as sinking the capital expenditure required to confirm no breakdown had occurred.

In this scenario we would incur a loss of approximately USD $6-7,000 per hectare. This cost includes soil testing costs (incl. drill rig hire), feedstock processing, transport and application, soil chemistry measure and monitor costs (incl. Relevant hardware).

As our approach seeks to 'over-monitor' the initial hectares under process to build credible and sustainable modelling that will remove the need for the full monitoring suite as the land sizes scale up (e.g. by matching on soil, climate, material types) the risks really lie in not being able to scale.

f. List and describe **up to three** key upcoming milestones, with the latest no further than Q2 2023, that you'll need to achieve in order to scale up the capacity of your approach.

Milestone #	Milestone description	Why is this milestone important to your ability to scale? (200 words)	Target for achievement (eg Q4 2021)	How could we verify that you've achieved this milestone?
1	*<100 words* Reach nameplate application rate for kilotonne project. This would be defined as having spread the required amount of feedstock on the required amount of land which would eventually yield the kilotonne per year target.	*<200 words* Whereas the pilot project was important to prove the core science, the kilotonne project is vital to proving not just the core scientific process but also the business model surrounding that process. To create defendable IP novelty is required across core process, business and operating models. The kilotonne project gives us this.	Q3 2022	*<100 words* To prove that we have executed the full deployment we envision providing relevant receipts and records of the full value chain via our web platform.
2	*<100 words* Add x5 core offtakers (>100 tonnes) to the Carbonaught web platform and achieve organic on-platform penetration	*<200 words* Achieving this milestone is crucial to scaling as it signifies the de-risking of the operations through diversification of the buyer base. Namely,	Q4 2022	*<100 words* Our platform's trading function will be able to provide a historical record of all transactions. This method

	through their respective supply chains.	a diversified offset purchaser base not only creating meaningful physical trade volume but the endorsement of our approach that would be implicit in the purchase. This base would fund/trigger the downstream activity to produce the offsets and all of this occurring on a platform that delivers transparency into the provenance of the eventually produced offsets and associated soil benefits. The resulting liquidity is expected to produce superior price discovery and attract more market participants to the platform to participate and enable further trade and scale.		should allow Stripe to single out >10 agents on the platform with sellers representing core offtakers and buyers representing nodes in their supply chains. As an added measure we're sure we could arrange meetings/introductions to desired parties.
3	*<100 words* Mobilise 10KT project in Western Australia.	*<200 words* This project would likely be the first instance where feedstock material would be sourced directly from mining operations and need to be processed before transport and application. Incorporating the operating model and platform requirements to facilitate this switch	Q1 2023	*<100 words* Actually, we're not sure. If Stripe is not involved in any aspect of the 10KT project then disclosing commercial terms will likely not be feasible. Is it possible to put a flag on this and potentially visit this during negotiations if we are

		is vital to Carbonaught's ability to scale as it will set the blueprint for operations required to achieve the megatonne project scale which sets us up to achieve our gigatonne removed vision we have set by 2030.		progressed?

g. How do these milestones impact the total gross capacity of your system, if at all?

Milestone #	Anticipated total gross capacity prior to achieving milestone (ranges are acceptable)	Anticipated total gross capacity after achieving milestone (ranges are acceptable)	If those numbers are different, why? (100 words)
1	*Should match 3(c)* 100-200 tCO_2-e	1,200	*<100 words* By achieving nameplate application over the required hectares of land we 'unlock' the kilotonne project and increase our capacity beyond our Pilot site net capacity of 200tCO_2-e.
2	1,200	1,200	*<100 words* N/A
3	1,200	11,200	*<100 words* Milestone 3 mobilises our first mine fed/self-processed project adding another 10KT per year of CO_2-e removal capacity.

h. How do these milestones impact your costs, if at all?

Milestone #	Anticipated cost/ton prior to achieving milestone (ranges are acceptable)	Anticipated cost/ton after achieving milestone (ranges are acceptable)	If those numbers are different, why? (100 words)
1	*Should match 6(a)* $357.40/t$CO_2$-e	$230-250/t$CO_2$-e	*<100 words* Due to historical soil sampling records we have been able to determine the groups of hectare soil types. As there are only several clusters of soil types being utilised we will not need to equip all hectares with the required hardware (being able to proxy due to similarities across a number of dimensions). This should bring down our cost significantly.
2	$230-250/t$CO_2$-e	$200-230/t$CO_2$-e	*<100 words* Our low-cost lysimeter enters in-field testing phase here - we are confident the cost will be 10x lower than current commercially available substitutes.
3	$200-230/t$CO_2$-e	$100-150/t$CO_2$-e	*<100 words* This milestone sees us shift to mine-sourced feedstock and mobile crushing plant as well as larger scale land application and low-cost operational hardware deployed. These economies of scale should drive us close to the targeted $100/t level.

i. If you could ask one person in the world to do one thing to most enable your project to achieve its ultimate potential, who would you ask and what would you ask them to do?

<50 words

Larry Fink to publicly endorse Carbonaught's platform, approach, process and the offsets it generates as a flagship company within the surface mineralisation technology stack.

j. Other than purchasing, what could Stripe do to help your project?

<50 words

Help Carbonaught set up an approach/strategy to validate our process and its associated offsets to the major financial institutions in Australia including major lenders such NAB, Westpac, Commonwealth Bank and ANZ as well as major superannuation funds such as Australian Super.

7. Public Engagement (Criteria #7)

In alignment with Criteria 7, Stripe requires projects to consider and address potential social, political, and ecosystem risks associated with their deployments. Projects with effective public engagement tend to do the following:

- Identify key stakeholders in the area they'll be deploying
- Have mechanisms to engage and gather opinions from those stakeholders and take those opinions seriously, iterating the project as necessary.

The following questions are for us to help us gain an understanding of your public engagement strategy and how your project is working to follow the White House Council on Environmental Quality's draft guidance on responsible CCU/S development. We recognize that, for early projects, this work may be quite nascent, but we are looking to understand your early approach.

a. Who have you identified as your external stakeholders, where are they located, and what process did you use to identify them? Please include discussion of the communities potentially engaging in or impacted by your project's deployment.

<300 words

We have split the kilotonne project stakeholders into two broad categories: value chain (direct) and wider community (indirect).

Within the value chain we have the feedstock providers, transportation companies, landowners, operational staff at site, soil testing laboratories, scientific equipment providers and computing capability. The indirect stakeholders will be community groups, Regional First Nations representatives and local government.

For our kilotonne project these stakeholder groups are:
DIRECT

- Local Quarries (identified by petrology of feedstock and proximity to farm).
- Local haulage companies.
- Landowner/company employing the staff to apply feedstock.
- Contracted agronomist (contracted by landowner).
- Scientific equipment provider recommended through advisory board.
- Soil testing lab recommended through advisory board.

INDIRECT

- Australian Macadamia Society.
- Australian Marine Conservation Society.
- Woodgate & District Residents Association.
- Zonta Club of Bundaberg.
- Gin Gin & District Chamber of Commerce.
- Bundaberg Regional Council.
- Taribelang Aboriginal Corporation.

The Broader Community
In the 2016 Census, there were 1,584 people in Childers. Aboriginal and/or Torres Strait Islander people made up 4.7% of the population. The median weekly household income in Childers was $773 per week which is 10% higher than the Queensland median and 7.5% higher than the Australian median. Of note, however, is that over 44% of households reported that both parents were not working. Our best guess at this stage is that there are a large proportion of retirees who own their own home/land but this is to be confirmed as we progress.

In terms of impact we believe we can build a powerful collaboration with the Taribelang Aborginal Corporation and Bundaberg Regional Council by integrating a new venture into our supply chain.

b. If applicable, how have you engaged with these stakeholders and communities? Has this work been performed in-house, with external consultants, or with independent advisors? If you do have any reports on public engagement that your team has prepared, please provide. *See Project Vesta's community engagement and governance approach as an example.*

<100 words
We have, thus far, only engaged the direct value chain elements of our stakeholder network through the course of transactional business, keeping each element as separate as possible for now. We are also conforming with the landowner's request to keep the project flying under the radar as long as possible to hedge reputational risk amongst other considerations during the mobilisation phase of the project.

c. If applicable, what have you learned from these engagements? What modifications have you already made to your project based on this feedback, if any?

<100 words
Not yet applicable.

d. Going forward, do you have changes planned that you have not yet implemented? How do you anticipate that your processes for (a) and (b) will change as you execute on the work described in this application?

<100 words
As we ramp up the project we will gradually fold in relevant stakeholders under a tried and true model used and known by the team from their mining experience. Our community engagement model will follow established best practice in Australia and rest on six core pillars:

- Gaining an initial and ongoing understanding of our operational context;
- Establishing, maintaining and resolve a material issues checklist;
- Establishing and maintaining an engagement record;
- Establishing and maintaining an stakeholder checklist;
- Establishing and maintaining a risk assessment file;
- Addressing stakeholder feedback.

We also see scope to stand up a new Indigenous owned and led organisation to participate in our value chain.

8. Environmental Justice (Criteria #7)

a. What are the potential environmental justice considerations, if any, that you have identified associated with your project? Who are the key stakeholders?

<100 words
We intend to keep a close eye on the quarry from where we source our material. The concern is that our activity extrapolated may shift the unit economics of the current operations and drive commercial behaviour (land clearing for example). To this end we enquired about the permits being sought by the operations and received confirmation that the relevant authorities would not be able to grant extensions due to encroachment on local farming operations.

b. How do you intend to address any identified environmental justice concerns?

<300 words
Carbonaught is a reaction to the prevailing climate emergency. This is an important point as we are in a slightly better position than legacy companies and industries who are having to retrofit business and operating models to reflect the shifting dynamics brought about by the drive to net-zero.

Specifically, our advantage is that we are able to hard-code the requirements - including our position on Environmental Justice - into our business and operating models. This nimbleness is vital to us as we have chosen to address not only the challenge of lowering atmospheric carbon dioxide levels but servicing the sectors, companies and projects that put it there in the first place.

Environmental justice, for Carbonaught, goes beyond pollution and contamination affecting those who are already doing it toughest in local, regional and national communities by degrading their quality of water, air and life. It accepts that almost all communities, families and people underpin a complex system that no formula, or legislation will be able to provide for.

With this as a starting point, we have resolved to, as a first port of call, to have an open ear to concerns that may or may not fall into our direct scope of operations. We believe that listening builds the foundations of trust that are required to engage in a proper dialogue. We also believe in transparency. If there are identified issues we plan to not only listen but also ensure our discovery, critical thinking and assumptions are openly provided to ensure an issue is at least appropriately bounded and articulated.

It is tough to provision mandates of operating procedures beyond this listen and show working principle. The reason it is tough is that the concept of Environmental Justice, while powerful and certainly valid, is so broad as to defy a common form, language and manifestation. It is, by our reasoning, a principle; we intend to meet its challenge with our principles which in turn will guide our actions.

9. Legal and Regulatory Compliance (Criteria #7)

a. What legal opinions, if any, have you received regarding deployment of your solution?

<100 words

We have obtained legal advice from two reputable IP lawyers that the process of enhanced weathering is not able to be patented as the activity has been carried on for centuries and carbon sequestration is a feature inherent in the act.

b. What domestic permits or other forms of formal permission do you require, if any, to engage in the research or deployment of your project? Please clearly differentiate between what you have already obtained, what you are currently in the process of obtaining, and what you know you'll need to obtain in the future but have not yet begun the process to do so.

<100 words Because the definition of 'mineral' in the Mineral Resources Act 1989 excludes most materials used for construction purposes. Quarry (or extractive industry) sites are largely approved and administered by local governments under the Planning Act 2016. Accordingly, no permits will be required for operations that source material from quarries. Under Australian law, however, we are likely to require a quarry license to move the rock off-site from a mining operation. We will also fill in an application form to utilise the enhanced regulatory sandbox from the Australian Securities and Investment Commission designed to test innovative financial services. https://asic.gov.au/for-business/innovation-hub/enhanced-regulatory-sandbox/

c. Is your solution potentially subject to regulation under any international legal regimes? If yes, please specify. Have you engaged with these regimes to date?

<100 words We would assume that when/if we expand internationally we will be subject to a raft of new laws and regimes. Legal opinion has informed us that it all depends on which country we operate in and/or sell products to. As this is currently unknown we must leave this as unknown.

d. In what areas are you uncertain about the legal or regulatory frameworks you'll need to comply with? This could include anything from local governance to international treaties. For some types of projects, we recognize that clear regulatory guidance may not yet exist.

<100 words We would assume that when/if we expand internationally we will be subject to a raft of new laws and regimes. Legal opinion has informed us that it all depends on which country we operate in and/or sell products to. As this is currently unknown we must leave this as unknown.

e. Has your CDR project received tax credits from any government compliance programs to-date? Do you intend to receive any tax credits during the proposed delivery window for Stripe's purchase? If so, which one(s)? (50 words)

<50 words No tax credits have or are likely to be received from any government. We have designed our approach to stand on its own commercial feet without any government assistance.

10. Offer to Stripe

This table constitutes your offer to Stripe, and will form the basis of our expectations for contract discussions if you are selected for purchase.

	Offer to Stripe
Net carbon removal *metric tonnes CO_2*	500 tonnes
Delivery window *at what point should Stripe consider your contract complete?*	2 years (June 2024)
Price (\$/metric tonne CO_2) ***Note on currencies:*** *while we welcome applicants from anywhere in the world, our purchases will be executed exclusively in USD (\$). If your prices are typically denominated in another currency, please convert that to USD and let us know here.*	*This is the price per ton of your offer to us for the tonnage described above. Please quote us a price and describe any difference between this and the costs described in (6).* \$450 The difference is required to measure, model validate the current suits of the measure, model , validate capability, i.e. deploying and vetting existing carbon measurement technologies across most/all prevailing regional soil types to: a) Enable us to build accurate models to predict carbon sequestration over time in that region. b) Enable us to build low-cost versions of expensive required scientific measurement apparatus. c) Enhance life-cycle measurement infrastructure, including run-off measurement apparatus. d) Operating costs, including specialist agricultural lawyers to help with contracting at scale. This capability will allow us to decouple from the 1:1 relationship between hectares under management and required scientific infrastructure.

Application Supplement: Surface Mineralization

(Only fill out this supplement if it applies to you)

Source Material and Physical Footprint (Criteria #1 and #8)

1. What source material are you using, and how do you procure it?

For the Kilotonne Project, Carbonaught has purchased basaltic crusher dust (diameter < 7mm) from a series local quarries.

In terms of mineralogy, the crusher dust is composed of 45% plagioclase, 19% clinopyroxene, 18% olivine and 16% volcanic glass, with traces of quartz (0.5%; siderite; 0.5% and 1.2% magnetite). Therefore, 98% of this material is amenable to enhanced silicate breakdown, with minimal previous alteration (0.5% siderite).

2. Describe the ecological impacts of obtaining your source material. Is there an existing industry that co-produces the minerals required?

<50 words

The quarry specialises in the production of screened high-quality aggregate for road base. Crusher dust is a low-quality by-product. This product is unsuitable for road bases precisely because of its propensity to break down too quickly.

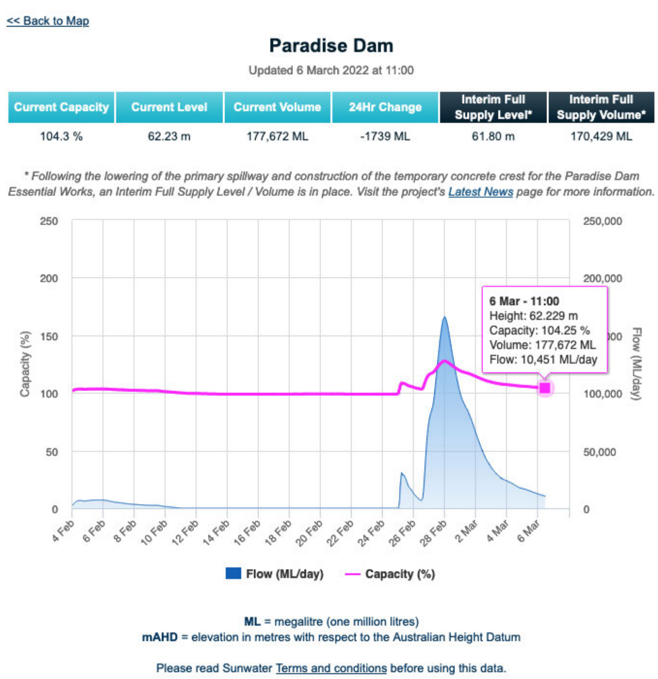
3. Do you process that source mineral in any way (e.g grinding to increase surface area)? What inputs does this processing require (e.g. water, energy)? You should have already included their associated carbon intensities in your LCA in Section 6.)

<200 words

For the kilotonne project, although Carbonaught only purchases a known waste-product from the quarry, it has calculated and adopted the full CO_2 penalty for extraction, production, transport and application. Based on the life-cycle components and our Pilot project we estimate the CO_2 penalty rate as being 13.85 kg per ton of carbon dioxide removal.

Regarding water use - to mitigate any respiratory hazard from the trace presence of quartz, the quarry keeps crusher dust sprayed with water. Our calculations of application rates will assume a 5.5 wt% moisture content (determined with 6 replicates) of the stock-piled crusher dust. Backing out water requirements to keep the stockpile damp implies approx. 625 KL of water will be required. Water is not in short supply.

As per the latest government report in 2015, of the total water allocation of Bundaberg's reticulation network, approximately 110 000 ML of medium priority and 17 000 ML of high priority water allocation was not committed and was available for purchase.



Sources:

https://storagelevels.sunwater.com.au/win/reports/win_storages.htm

https://www.rdmw.qld.gov.au/__data/assets/pdf_file/0005/335435/bundaberg-rwssa.pdf

4. Please fill out the table below regarding your project's physical footprint. If you don't know (e.g. you procure your source material from a mining company who doesn't communicate their physical footprint), indicate that in the square.

	Land area (km^2) in 2021	Competing/existing project area use (if applicable)
Source material mining	*E.g. X km^2 (dedicated basalt mining facility) OR N/A (material is waste product from X km^2 mine).* N/A - Source material is a waste by-product from a 1.48 km2 quarry.	*E.g. Existing mine for basalt* Existing quarry for road-base aggregates.
Source material processing	*E.g. 2 km^2 (manufacturing facility or mine)* 0.142 km^2 processing and ROM pad.	*E.g. Gravel production facility* Road base production infrastructure.
Deployment	*E.g. 20 km^2 (transportation hub + beach area)* 300-400 hectares.	*E.g. Agricultural land + beach* Our approach complements existing mixed crop farming operations.

1. Imagine, hypothetically, that you've scaled up and are sequestering 100Mt of CO_2/yr. Please project your footprint at that scale (we recognize this has significant uncertainty, feel free to provide ranges and a brief description).

	Projected # of km^2 enabling 100Mt/yr	Projected competing project area use (if applicable)
Source material mining	It should be noted that even under a 100MT scenario feedstock would still be sourced from existing open-cut mining operations with a significant waste basalt profile. An estimate of **0 km^2** is therefore not technically incorrect. However, if we were to adopt the full land area penalty of the feedstock sources (i.e. treat the	N/A. Our approach targets *existing* open cut mining operations with a significant basalt waste product profile.

	mines as solely mining basalt) then we estimate land area of approximately **300 to 400 km^2**.	
Source material processing	**400-600 km^2** This was arrived at from extrapolating the land size of an existing large quarry of a similar material with annual production over approx 2MT pa.	The production of coarse aggregates, road construction materials and fines.
Deployment	**90,000 km^2** Again - we would be deploying onto existing cropping operations so do not envisage any new land requirements.	N/A. Our approach seeks to restore soil fertility on *existing* cropping, horticultural and grazing land.

5. If you weren't proceeding with this project, what's the alternative use(s) of your source material? What factors would determine this outcome? *(E.g. Alternative uses for olivine include X & Y. It's not clear how X & Y would compete for the olivine we use. OR Olivine would not have been mined but for our project.)*

<50 words
The primary competing use of our feedstock is as a 'filler' for the primary quarry output of road base aggregate and concrete. Residual quantities are sold as an organic fertilser as crusher dust is well known amongst biodynamic farmers.

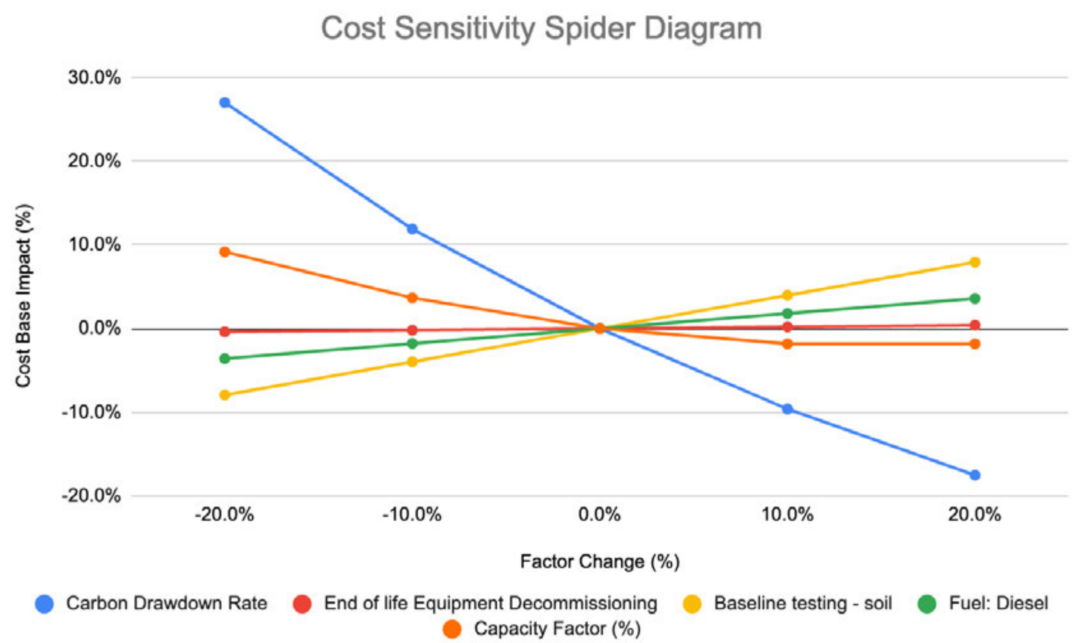
Measurement and Verification (Criteria #4 and #5)

6. We are aware that the current state of the field may include unknowns about the kinetics of your material. Describe how these unknowns create uncertainties regarding your carbon removal and material, and what you wish you knew.

<200 words
The largest uncertainty resides in the expected mean breakdown life-time when calculating the CO_2 drawdown. In view of the application history at the Pilot Project, tau must be between 0 and 25 years. From the observation that in CRD amended soil cores #1 and #2, olivine and clinopyroxene are only found in the top 2.5 cm, yet plagioclase and ilmenite (above background concentration) persist to 13.75 cm, it is clear that tau is <<25 years.

The preferred value of 3 years was obtained by modelling the mineralogy depth distribution as a function of changing tau.

By focusing on Tau we are able to construct more accurate drawdown models which, in turn affect the unit economics of the entire project. Indeed, financial sensitivity analysis confirmed that breakdown rate is the single largest determinant of project profitability at the megatonne scale.



7. If your materials are deployed extensively, what measurement approaches will be used to monitor weathering rates across different environments? What modelling approaches will be used, and what data do these models require?

<100 words

Carbonaught plans to verify and measure the progress of CO_2 consumption by monitoring the basalt rock breakdown. The CO_2 drawdown modelling uses the following input parameters:

1) An annual average application rate of CRD;
2) water content of CRD;
3) The potential CO_2 drawdown RCO_2 as below;

$$R_{CO_2} = \frac{M_{CO_2}}{100}\left(\frac{\%CaO}{M_{CaO}} + \frac{\%MgO}{M_{MgO}}\right)\cdot\omega \qquad (2)$$

4) The sequential dissolution of minerals as determined from the downhole soil profile mineralogy (following expected Goldich reaction series);

5) A mean life-time (tau) of the applied basalt as calculated by the below:

$$t_{1/2} = \frac{\ln(2)}{\lambda} = \tau \ln(2)$$

where $t_{1/2}$ is the half life-time (years), tau is the mean life-time (years), and lambda the decay constant (dimensionless).

Human and Ecosystem Impacts, Toxicity Risk (Criteria #7)

8. What are the estimated environmental release rates of heavy metals (e.g. Cr, Ni, Pb, Hg)? Dust aerosol hazards? P loading to streams? How will this be monitored?

<100 words

Although not established directly, the transition metal data presented for a large number of comparable Cenozoic regional basalts by Jones et al. (2020) show low concentrations of potentially problematic toxic metals such as Cr, Co and Ni (233+/-71, 42+/-6, and 156+/-50 parts per million, respectively). This is the predicted outcome of using alkali-basalt from a continental providence, as recommended for CRD by Beerling et al. (2018).

Additionally, to mitigate any respiratory hazard from the trace presence of quartz, the quarry keeps crusher dust sprayed with water.

9. If minerals are deployed in farmland, what are the estimated effects on crop yields, what's this estimation based on, and how will actual effects be monitored?

<100 words

We expect crop yields to increase at least 10%. In their 2006 paper, "Sustainable farming with native rocks: the transition without revolution", Theodoro and Leonardos conducted showed the productivity of rock fertilised plots generating equal or greater productivity (up to 40%) to conventionally fertilised plots. This results from other benefits that include a slow release of nutrients, increases yield and CEC, rebalances soil pH, increases in plant resistance to insects, disease, frost and drought, and increases in microorganism growth and earthworm activity, among
other things. We plan to measure as much as possible replicating the methods contained in the relevant scientific literature (Bergmann et al., 2013; Campe et al., 2015; Gillman et al., 2002; Harley and Gilkes, 2000; Kantola et al., 2017;
Leonardos et al., 1998; Manning, 2010; Massey et al., 2007; Melo
et al., 2012; Mersi et al., 1991; Nunes et al., 2014; Ramos et al., 2017, 2015).

10. How will you monitor potential impacts on organisms in your deployment environment? (E.g. Health of humans working in agricultural contexts, health of intertidal species, etc. depending on the context of deployment)

<100 words
Our monitoring program will initially focus on contractors performing load and haul and application activities. As an initial step we will ensure all required insurance etc is up to date and valid.
On farming operations we will comply with all relevant laws with both representatives from Farnsfield and Carbonaught supervising all activity as part of our statutory responsibilities of employers. This will include safe operation of heavy machinery and all appropriate PPE is provided and worn.
At the workforce level, we will ensure there is an open and clear line of communication for the escalation of all concerns and will have SOPs to ensure their timely resolution.

11. If you detect negative impacts, at what point would you choose to abort the project and how?

<100 words
At the chemical process level, if trace metal concentrations or any other issues threaten the viability of the program we will first pause execution and investigate. As our application targets the areas between hedgerows, there is the possibility to scrape up the material and reuse it as a road base on the property.
If negative impacts at the business model level are discovered then a thorough analysis will be conducted and scenarios openly explored with all stakeholders. In both cases, stop, maintain, expand, contract mechanisms will be built into all long-term contracts.