PRODUCTION FACILITY & OUTPUT AUDIT REPORT

For PURO.EARTH

Company / CO_2 Removal Supplier	**O.C.O Technology Limited**
Production Facility Name	**O.C.O Aggregate Manufacturing Facilities: Avonmouth, Brandon, Leeds, UK**
Production Facility Address	**Avonmouth:** Unit 1 Severn View Industrial Estate, Central Avenue, Avonmouth, UK BS10 7SD **Brandon:** High Street Brandon, Suffolk UK IP27 0AX **Leeds:** Hub 45 37 Knowsthorpe Gate Leeds, UK LS9 0NP
Net Volume of CO_2 Removal	**18,755 CORCs** **Avonmouth: 5,920 CORCs** **Brandon: 3,640 CORCs** **Leeds: 9,195 CORCs**
Removal Method	**Carbonated Building Material**
Removal Period	**1 Sept 2021 –30 Sept 2022**
Auditor	**Tim A. Hansen, P.E.** **350Solutions, Inc.**

O·C·O TECHNOLOGY
CARBON:CAPTURED®

ISSUED: FEBRUARY 24, 2023

350 SOLUTIONS

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PRODUCTION FACILITY & OUTPUT AUDIT REPORT

Company: O.C.O Technology Limited	Company Contact: Dr. Peter Gunning	Audit Team: *Tim Hansen, PE Bill Chatterton
Removal Method: Carbonated Building Material		
Report Date: February 24, 2023		
Document No: 350VR-OC-PU2204		
Rev: 1.2		

** primary contact/lead author*

1. INTRODUCTION

350Solutions was contracted to perform an audit and validation of the production facilities as well as verification of carbon dioxide removal credit (CORC) claims for O.C.O Technology Limited's carbonated aggregate production process.

The O.C.O Technology (O.C.O) process and technology uses carbon dioxide to treat various waste materials via Accelerated Carbonation Technology (ACT). O.C.O produces a lightweight carbonated aggregate for use in construction applications, such as in precast concrete block and ready-mixed concrete. O.C.O currently operates from three sites in the UK treating air pollution control residue (APCr) primarily from waste-to-energy plants and producing aggregate that meets EN13242 and EN13055 requirements. The aggregate production process utilizes CO_2 from biogenic or other sources injected during the accelerated carbonation step, and also absorbs and reacts with significant amounts of CO_2 in ambient air during on-site curing and storage. For CORC purposes, only CO_2 from biogenic sources or absorbed and removed via direct air capture during curing is credited. CO_2 is permanently sequestered in the aggregate product in the form of carbonates. The process is summarized in Figure 1.

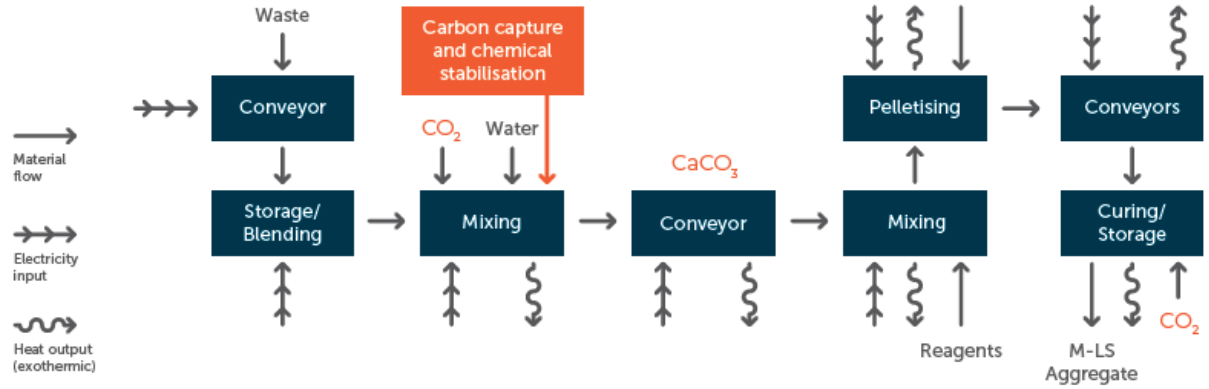

FIGURE 1. O.C.O TECHNOLOGY CARBONATED AGGREGATE PROCESS

O.C.O operates three production facilities in the U.K. (Avonmouth, Brandon, Leeds) utilizing the same general process, inputs and outputs in each location.

O.C.O Manufactured LimeStone (M-LS) aggregate is currently sold primarily as construction material to concrete block makers, ready-mix concrete producers, and for pavement, earthworks (i.e. foundation fill), and similar applications.

350Solutions conducted an audit of the process, lifecycle CO_2 emissions assessment (LCA), and other administrative details to verify compliance with the requirements of the Puro.Earth Puro Standard General Rules (Version 3.0) and Carbonated Building Material Methodology (Edition 2022, v 1.0) [1]. The audit and verification began with a document review and followed with a site visit on December 20, 2022 at the Avonmouth facility, and detailed data audit during and following the site visit.

TABLE 1. O.C.O TECHNOLOGY VERIFICATION SUMMARY

Verification Summary	
CO_2 Removal Supplier	O.C.O Technology Limited
Production Facility Name	O.C.O Aggregate Manufacturing Facilities: Avonmouth, Brandon, Leeds, UK
Removal Method	Carbonated Building Material: Production of carbonated aggregate from waste materials
Verified CO2 content of Product	144 kg CO_2 / tonne aggregate product
Verified CORCs	18,755 CORCs
Audit Report Date	February 24, 2023
Site Visit Date	Dec. 20, 2022
Production Facility Location (Address and GPS Coordinates)	**Avonmouth:** Unit 1 Severn View Industrial Estate, Central Avenue, Avonmouth, UK BS10 7SD **Brandon:** High Street Brandon, Suffolk UK IP27 0AX **Leeds:** Hub 45 37 Knowsthorpe Gate Leeds, UK LS9 0NP
Verification Type	Combined Production Facility Audit and Output Audit for Puro.Earth, including on-site visit and facility audit; Puro Standard General Rules (v3.0) and Annex B: Carbonated Building Material Methodology

2. TECHNOLOGY DESCRIPTION[1]

Accelerated carbonation is a reaction occurring between carbon dioxide and alkali earth hydroxides and silicates. The process has been successfully used to treat waste materials to reduce toxicity and improve mechanical properties to facilitate re-use. Natural carbonation is a slow process, taking years or decades due to the low concentration of carbon dioxide in the atmosphere. The carbonation process can be accelerated by exposing the reactive material (cement, lime or reactive waste) to an elevated concentration of carbon dioxide. The accelerated carbonation process can be completed within hours or minutes.

The manufacture of M-LS involves several processing stages (see Figure 1, Figure 2), beginning with the blending of different thermal residues. The residue is conditioned with water, which is essential to allow

[1] *Technology Description obtained from O.C.O Technology documents, process descriptions, and specification brochures.*

the carbonation reaction to proceed, after which liquid CO_2 is added. The carbonated residue is combined with fillers and binders and pelletized to form a rounded pelleted product.
CO_2 removals occur at two points in the manufacturing process. Firstly, the direct injection of CO_2 in the initial mixing stage. The CO_2 added during mixing is in liquid form and is measured by a flowmeter. Pressure sensors in the mixer control the rate at which the CO_2 is delivered. After manufacture, the M-LS remains on site for 2-3 weeks. During this time, it is first allowed to cure before initial processing (screening or size separation) takes place. The processed M-LS is placed in stockpiles for sampling and testing for quality control and regulatory compliance purposes. During this time, the M-LS continues to react with atmospheric CO_2.

The aggregate product (Figure 3) is tested regularly to meet End-of-Waste regulatory compliance requirements, as well as demonstrate that it meets specifications for aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (EN 13242) and lightweight aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for use in concrete, mortar and grout (EN13055).

FIGURE 2. O.C.O TECHNOLOGY CARBONATED AGGREGATE MANUFACTURING PROCESS – MIXING PROCESS (L) AND PELLETIZATION (R).

FIGURE 3. O.C.O TECHNOLOGY M-LS CARBONATED AGGREGATE PRODUCT

3. AUDIT SUMMARY

3.1. AUDIT APPROACH

A planned series of audit activities were conducted by 350Solutions to independently validate and verify the production facility, its operations, production and output data, and CORC claims. The audit was conducted following the specifications of Puro General Rules and the Annex B Carbonated Building Materials Methodology. Specific audit activities conducted are summarized in Table 2. A completed Puro Carbonated Building Materials Methodology Compliance Checklist used during the verification is attached to this report as Appendix 1. Photographs of the facility, equipment, and operations are provided in Appendix 2. Verifier qualifications are attached as Appendix 3.

TABLE 2. AUDIT ACTIVITIES

Date(s)	Verification Activity	Verification Tasks	Documents Reviewed
Dec 14-20, 2022	Introductory Document Review	- Review of LCA and supporting documentation - Review of Puro CORC calculations - Review of facility registries and permits	- Organization details in Puro registry_20220714.pdf - Leeds_Production facility details in Puro registry_20220722 - Brandon_Production facility details in Puro registry_20220722 - Avonmouth_Production facility details in Puro registry_20220722 - 01 EPD Manufactured LimeStone - 23b EPD Raw Data - 24a CO2 Removal Methodology.pdf - 10 O.C.O Technology Summary.pdf - 22b Product Despatch Report Oct21-Sep22.xls - 22a Product Despatch Report Sep 21.xls - 26 Laboratory Test Report.pdf - 23a 2019-2020 Mass Balance - 23c Laboratory Test Report - 23d CO2 deliveries Sep 21-Oct 22 - 12 Permit Avonmouth - 13 Permit Brandon - 14 Permit Leeds - 15 Avonmouth Compliance Assessment - 16 Brandon Compliance Assessment - 17 Leeds Compliance Assessment - 18 Compliance Rating Dataset (2021) - 25a ISO Certificates - 25b ISOQAR Report - 04 Sustainability-Report 19-20
Dec 14, 2022 – Feb 24, 2023	Data Review	- Review of raw material sources and sustainability - Review of system inputs and outputs - Review evidence of product output - Review of product properties - Review of product end use - Review of finances and additionality claims	- 05 BES 6001 Certificate - 06 BES 6001 Examination Report - 49 Avonmouth CO2 Delivery Note - 23a 2019-2020 Mass Balance - 23b EPD Raw Data - 23c Laboratory Test Report - 24a CO2 Removal Methodology - 34 Steinour Correction Dataset - 22b Product Dispatch Report Oct21-Sep22.xls - 22a Product Dispatch Report Sep 21.xls - 35 Avonmouth's Monthly Usage.xls - 36 SCADA Stage 1 & Stage 2 Batch Data - 37 Avonmouth Daily Figures - 33 Aggregate Customers & Applications 50 Leeds Weighbridge Certificate - 41 Roxspur SC250 Flow Meter Specification

Date(s)	Verification Activity	Verification Tasks	Documents Reviewed
			- Weighbridge calibration report - Avonmouth - 51 Brandon Weighbridge Certificate (1) - 55 CE Certificate EN13242 6F - 54 Declaration of Performance EN13242 6F - 53 CE Certificate EN13055 BlockMix - 52 Declaration of Performance EN13055 BlockMix - 2023-02-20 O.C.O audit reponse
Dec 20, 2022	On-site Visit	- Opening meeting and process walk through - Witness of operations, measurement points, and instrumentation - Review of equipment and calibrations, independent measurement cross checks - Review of intake and production data collection - Confirmation of company and facility administrative details - Confirmation of facility environmental and social safeguards	- Verifier observations of operations, measurement points, and instrumentation (see compliance checklist) - Review of above listed files as needed for clarification, plus the following: - Business registration document; Puro Registry data records; - GOV.UK OCO business record 12-20-2022 - O.C.O review of carbon credit attribution_SRoscoe_12-20-2022 - 20 Terms and Conditions of Sale - 22 EPD based CORC calculation Oct21-Sep22 - 21 EPD based CORC calculation Sep21

3.2. PROCESS INPUTS & OUTPUTS

The O.C.O aggregate manufacturing process uses similar inputs as a concrete batching process, with the primary exception being the use of air pollution control residue (APCr) as a primary feedstock, which the O.C.O process treats and stabilizes in the aggregate carbonate matrix that forms. Primary inputs include APCr, water, CO_2, sand, and other aggregates or residues, such as limestone dust or scalpings. The process uses electricity for operation of equipment, and requires heavy equipment for material handling, which require diesel fuel use.

The O.C.O process produces very little to no waste products and has very limited emissions of any kind from the facility. Any wastes produced on site are typically recycled and used in the mix in small quantities, as they are often components of feedstock or product. There are no air emission points, with the primary potential emissions being fugitive dust, which is controlled and monitored at the sites, and water vapor emitted as a result of the exothermic reaction of carbonate formation. All CO_2 inputs are absorbed and reacted in the Stage 1 process, which is controlled and monitored by pressure in the sealed mixer to ensure CO_2 is not injected until prior injection has been reacted.

Table 3 summarizes the observed inputs and outputs from the process and typical rates from supplied operational data.

TABLE 3. VERIFIED PRODUCTION FACILITY INPUTS & OUTPUTS

Input/Output	Verified Rate* For EPD Development	Verified Rate* For Reporting Period#	Notes (Specifications, source, etc.)
APCr (tonne)	131,261	-	O.C.O tests each APCr delivery to ensure it is within specifications to enable aggregate production.
CO_2 (tonne) - Biogenic injected - Fossil injected - Direct Air Capture (during curing)	3,228 - - -	1,252 294 948 -	CO_2 values provided for reporting period are the total CO_2 delivered to O.C.O.
Water (m^3)	45,692	-	
Sand (tonne)	47,692	-	
Scalpings (tonne)	2,317	-	
Cement (tonne)	32,242	-	
Limestone dust (tonne)	44,869	-	
Other waste materials (C&D debris, recycled glass, etc.) (tonne)	564	-	
Raw material supply inputs (extraction, handling, transportation emissions)	Included in Production & Operation CO_2 emissions below		Emissions are from raw material extraction and production processes (Ecoinvent database used for emission factors and calculation) as well as transport of materials to O.C.O.
Production inputs: - materials handling equipment (diesel) - site electricity use	 92,072 liter 1,781,623 kwh	 - -	No additional energy inputs are required. All electricity and diesel usage is based on utility bills or purchase records.
Aggregate product output (tonne)	310,624	401,773	Aggregate product output is based on delivered product weighed as it leaves the plant gate on calibrated weigh scales.
CO2 stored in aggregate (E_{stored})	144.02 kg CO_2e per tonne aggregate		From EPD, based on stoichiometric calculation and correction factor based on analysis of raw materials and products
Production and operation CO_2 emissions output ($E_{production}$)	94.98 kg CO_2e per tonne aggregate		From EPD. Includes all raw material extraction and transportation and aggregate production process.
Net CO_2 emissions	-49.04 kg CO_2e per tonne aggregate		From EPD (stored – production) (Note – includes CO2 from all sources)

**CORC calculations are based on the net CO_2 emission rate determined and verified in the valid Environmental Product Declaration (EPD) for O.C.O. CORC values are calculated based on this factor and the total aggregate product delivered during the reporting period. The values of inputs during the reporting period are verified and reported here for completeness and to cross check versus the EPD. Calculation of Net CO_2 Emissions for CORC determination must deduct fossil CO2 use from value calculated using aggregate production and EPD factor.*

#Values for reporting period are not provided for most parameters, as the CORC calculation is based on the EPD Net CO_2 calculation, which has been verified, as well as the total aggregate production for the reporting period. Note that 350Solutions reviewed the EPD and Reporting period inputs for the Avonmouth facility to ensure consistency. Values of inputs during reporting period are generally consistent with the EPD values, with the exception of a reduction in injected CO_2, primarily due to significant CO_2 cost increase during COVID. CO_2 uptake would not be affected, however, due to additional CO_2 uptake during curing via direct air capture.

3.3. VERIFIED OUTPUT & CORCS

Table 4 includes the specific CORCs claimed by O.C.O Technology for its three UK facilities during the reporting period, as well as the level verified by 350Solutions during the on-site audit and data review.

TABLE 4. VERIFIED CORCS FOR O.C.O TECHNOLOGY LIMITED

Performance Metric Name / Description	Claimed Value	Verified Value	Data Source	Reporting Period
Net CO_2 Removal Factor⁺	49.04 kg CO_2/ tonne aggregate	49.04 kg CO_2/ tonne aggregate	- 22 EPD based CORC calculation Oct21-Sep22 - 21 EPD based CORC calculation Sep21 - 22b Product Dispatch Report Oct21-Sep22.xls - 22a Product Dispatch Report Sep 21.xls - 23a 2019-2020 Mass Balance - 23b EPD Raw Data - 23c Laboratory Test Report - 24a CO2 Removal Methodology - 34 Steinour Correction Dataset	09/01/2021 - 09/30/2022
Aggregate Output	401,773 tonne	401,773 tonne		
Fossil CO_2 Injected⁺	948.1 tonne	948.1 tonne		
Total CORCs	18,755 CORCs	18,755 CORCs Avonmouth: 5920 Brandon: 3640 Leeds: 9195		

**Claimed values are those submitted by O.C.O after completion of revisions based on results of audit.*
⁺CO_2 Removal factor is the net value of CO_2 removed in the aggregate product based on the O.C.O M-LS Environmental Product Declaration. It includes CO_2 of any source. Therefore, CORC values are calculated using this value, but removing any CO_2 injected that was derived from a fossil source.

4. AUDIT SUMMARY

4.1. SUMMARY OF AUDIT FINDINGS

350Solutions has reviewed and audited the documentation of the technology, the instrumentation, the procedures, performance and collected data and has found that the data presented in the Puro Audit Package and during the site visit and follow up:

☒ ***Meets the requirements of the Puro General Rules and the Annex B Carbonated Building Material Methodology***

☐ ***Meets the requirements of the Puro General Rules and the Annex B Carbonated Building Material Methodology with minor modifications***

☐ ***Does Not Meet the requirements of the Puro Standard General Rules and the Annex B Carbonated Building Material Methodology***

A summary of specific findings associated with each requirement of the Puro Standard and Carbonated Building Material Methodology and any identified issues with the audit are summarized below.

TABLE 5. AUDIT FINDINGS

Puro Standard CBM Method. Section Ref.	Audit Verification Topic	Final Findings
1.1.1	*CO_2 Source*	**Acceptable.** O.C.O utilized both fossil derived and biogenic CO_2 during the reporting period. The CORC calculation was modified to remove the fossil derived CO_2. In addition, a significant portion of the CO_2 in the product occurs via direct air capture/absorption from ambient atmosphere and reaction in the aggregate during the curing and storage process on-site.
1.1.2 *5.2.1* *5.2.2*	*Sustainable Raw Materials*	**Acceptable.** O.C.O utilizes waste material (APCr) as a primary input, serving as a certified End-of-Waste treatment facility. In addition, O.C.O has obtained BES 6001 certification for Responsible Sourcing of Construction Materials for other inputs.
1. *3.1.1* *3.1.2* *3.1.3* *5.2.1* *5.3.1* *5.3.2* *5.3.3*	*Net-Negative LCA*	**Acceptable**. O.C.O has demonstrated an appropriate basis for CORCs according to the Puro Methodology. The LCA was completed and independently verified as part of the EPD development, and utilizes the appropriate standard (ISO 14040/14044), system boundary (cradle to gate – excluding distribution use and end-of-life), cut-off approach for secondary materials, and results in a net-negative LCA, with 49.04 kg CO_2 removed per tonne of aggregate.
1.2.2	*Environmental & Social Safeguards*	**Acceptable.** O.C.O operates under environmental permits as required, with quality UK compliance ratings for all sites. Due to the status as a permitted End-of-Waste facility for treatment of APCr, additional scrutiny is provided. O.C.O also operates under an accredited ISO9001 and ISO 14001 management scheme, and has received high ratings during audits. O.C.O has also received a RoSPA Gold Award for health and safety activities in 2022.
1.2.3	*Demonstrated Additionality*	**Acceptable.** O.C.O has provided financial models and financial records demonstrating the need for carbon finance. Specifically, the primary counterfactual for the O.C.O process is the treatment and landfilling of the APCr residues. Companies that perform this process are typically able to provide lower tipping fees than what O.C.O charges for treatment, which is in large part due to the additional costs of operating the O.C.O process compared to traditional landfilling. To remain competitive with the counterfactual, O.C.O requires carbon finance to enable tipping fee reductions for APCr, to secure their primary input. In addition, with increasing operating costs (electricity, CO2), and low value of aggregate product, the carbon finance revenues support financial results that significantly improve options for future investment and scaling. In addition, no sales nor the production process are currently required by any regulation or policy.
1.2.4	*Output Quantification*	**Acceptable.** All reported aggregate production is based on deliveries at the gate, as measured on a calibrated weigh scale at each facility (Brandon uses an off-site, but calibrated scale). All shipped aggregate

		product is accounted for in dispatch records, which form the basis for the claimed production and CORCs. O.C.O also documents raw material usage and production via plant SCADA systems, which can be used for cross-check purposes. Water, electricity, and diesel fuel use are determined by either on-site meters, utility bills, or purchase receipts, respectively. O.C.O has a valid EPD (issued Nov 25, 2022 and valid until Nov 25, 2027) for the M-LS aggregate product. All LCA inputs in the EPD are complete and analysis performed in compliance with the Puro methodology.
1.2.5	*Verified Production Facility standing data*	**Acceptable.** Conformance to the requirements of Section 1.2.5 of the methodology is documented and verified.
2.1.3 *5.4.1*	*Product usage*	**Acceptable.** The carbonated aggregate produced by O.C.O is utilized in a variety of construction processes. O.C.O maintains a complete list of customers and a summary of applications of the aggregate. In addition, O.C.O certifies that the product meets EN13242 and EN 13055 standards for specific aggregate types for use in certain construction materials.
4. *5.3.2*	*CORC Calculation Methodology*	**Acceptable.** O.C.O follows the CORC quantification methodology in the CBM Methodology. Note that O.C.O uses a CO_2 uptake estimation approach based on stoichiometric calculations and analysis of the raw materials (APCr). In addition, O.C.O uses a conservative correction factor to reduce CO_2 uptake by the aggregate based on analysis of feedstock and product for various types of inputs. During the reporting period, O.C.O utilized CO_2 derived from both fossil and biogenic sources, in addition to CO_2 absorbed via direct air capture from the atmosphere (reaction with aggregate during curing and storage). The CORC calculation was modified to utilize the EPD CO_2 stored factor for the aggregate, but then all fossil derived CO_2 quantities were removed from the total CO_2 removed value, resulting in properly calculated CORC values. Note that initial CORC calculations had an error in calculation for removal of fossil CO_2 (Avonmouth fossil CO_2 was off by a factor of 10). This was corrected during the site visit and new CORC calculation verified.
5.5.1	*Statement re: Double Counting*	**Acceptable.** O.C.O is aware of end-user customer practices and assures no-double counting is taking place. O.C.O has provided written confirmation of use of product. O.C.O utilizes language in its terms and conditions that state that the carbon credits associated with the product do not transfer with the product purchase and credit ownership may be negotiated separately. For future orders, O.C.O will strengthen the language to provide more detail and continue to ensure no double-counting occurs.
5.5.2	*Marketing / Branding Restrictions on end-user*	**Acceptable with minor modifications**. O.C.O does utilize language in marketing materials (brochures, website, presentations) that indicates the aggregate product is 'carbon negative'. O.C.O is in the process of modifying its marketing materials to provide the required disclaimer under section 5.5.2. O.C.O has provided draft documents

		and language and is completing such modifications to materials, web pages, and related information.

Additional details regarding audit activities, documents reviewed, and observations during the audit process are summarized in Appendix 1.

4.2. AUDIT ISSUES

Findings of the LCA review and on-site validation of operations included identification of certain items of concern as well as items for consideration for improvement of operations, LCA, and CORC calculations in the future.

Requirements to be implemented have all been addressed by O.C.O. No further action is required. Significant additional information was provided by O.C.O after the site visit to support all data, claims, and verified CORC values. The required changes identified during the audit were as follows:

- Modify the initially submitted CORC calculation file to correct the value of fossil CO_2 subtracted from the total removals calculated via EPD values. Avonmouth value was incorrectly entered into calculator (18560 kg entered, correct to 185600 kg (FY 2021); 2224 kg entered, corrected to 22240 kg (Sep 2021)). ***Corrected on-site during audit (Dec 20, 2022).***
- Provide a disclaimer on all marketing materials, such as brochures, web-site, or others, indicating the product is 'carbon negative' to state that carbon credits associated with the product are managed in Puro.Earth's carbon removal registry. ***Draft modification example was provided via email on Jan 4, 2023. Changes are in process.***

The following items are those that did not require immediate action and are recommendations for improvement of future LCAs, as well as monitoring and recordkeeping procedures. Addressing these recommendations to improve future data quality is suggested but is not required.

4.3. RECOMMENDATIONS & OPPORTUNITIES FOR IMPROVEMENT

Based on the above audit findings and issues, as well as on-site observations, 350Solutions has the following recommendations for improvements prior to the next output audit and verification.

Recommendations for improving the quality of data, accuracy, and verifiability of the LCA and CORC claims in the future include:

- Have CO_2 flow meters for injection calibration checked or, purchase new flow meters that have calibrations that are traceable to national standards. This does not impact CORC calculations, but is a valuable cross check and traceable validation of injected CO_2 amounts.
- Because the EPD data is based on 2019-2020 production data, and there is potential for change in processes (modifications in mix recipes, raw materials used, operational efficiency, etc.), we recommend monitoring all inputs for the reporting period and comparing to the values used in the EPD (see Table 3) annually. Significant changes in, for example, the amount of cement or electricity used per tonne of product could result in changes to the total CO_2 removal value reported in the EPD and used in CORC calculations. We recommend monitoring and comparing to EPD values the following:

  - Total aggregate product
  - Total raw material inputs (sand, cement, etc.) and ratio to total product
  - Total water usage and ratio of water to total product
  - Total electricity usage and ratio of electricity to total product
  - Diesel fuel usage and ratio to total product
- Use the calculated Steinour correction factor based on MSW residues only, since majority of APCr is from MSW to energy facilities. Data shows a .73 slope, so the 70% correction factor is still conservative. But, this should be re-evaluated if new or additional data is obtained or APCr sources change significantly.
- Perform additional C in product measurements annually for cross check vs. Steinour based calculations, if possible. Monitor developments in low-level carbonate measurement in concrete materials as they develop (i.e. ASTM e1311 thermogravimetric methods or other)
- If possible, document examples of the product duration on site in stockpiles to verify total carbonation time prior to delivery, since a large portion of the product CO_2 uptake is via direct air capture
- Ensure documentation of any new additives used in production (i.e. plasticizers, water reducing, etc.) that were mentioned as potentially being explored in the next year during the site visit
- Monitor transportation distances for raw materials and products to ensure no major changes occur as compared to the EPD values, especially if supplier or customers change significantly
- Modify terms and conditions of sale to more directly indicate carbon credits associated with product are not transferred and are managed in Puro.earth's registry
- Monitor O.C.O marketing materials to ensure claims of carbon negativity or neutrality include proper reference to ownership of credits.
- Monitor company financials and impacts of carbon finance on company to ensure changes in markets, inputs, product value, and other factors do not significantly alter the ability for carbon removals to remain additional

5. REVISION HISTORY

Original date of issue: January 5, 2023

Version	Date Issued	Noted Changes
Draft Versions (v1.0, 1.1)	Jan 5, 2023;	NA
Final Version (v1.2)	February 24, 2023	Updated CORC values; Clarified additionality; Minor edits

References

[1] Puro.Earth, *Puro Standard General Rules, Version 3.0, Edition 2022.* https://puro.earth/puro-standard-carbon-removal-credits/

[2] *Environmental Product Declaration. O.C.O Technology Manufactured Limestone (M-LS). EPDHub. November 25, 2022.*

[3] 22 EPD based CORC calculation Oct21-Sep22.XLS. Dec 31, 2022.

[4] 22 EPD based CORC calculation Sep21.XLS. Dec 31, 2022.

See Appendix 1 for list of specific files reviewed during the verification audit.

APPENDIX 1: PURO.EARTH CARBONATED BUILDING MATERIALS METHODOLOGY AUDIT CHECKLIST

Production Facility and Output Audit - Carbonated Building Element Methodology	
Audit ID	Puro O.C.O Technology, Ltd.
Audit Inception Date	20 December 2022
Production Facility ID	GSRN 643002406801000671
Production Facility Location	Av onmouth, UK
Auditing Body	350Solutions
Auditor Initials	Tim Hansen
QA	Bill Chatterton

Checklist Version: 2.1 (October 18, 2022)

Please refer to the Carbonated Building Materials Methodology 2022 v 1.0 for additional details and supporting references.

Guideline Reference	Requirement	Requirement Met Y/N	Compliance Evidence Provided Insert evidence used to verify requirement	Site Visit Findings If applicable	Verification Remarks Insert auditors comments	Value Insert numerical value or description (if applicable)	Units Insert unit (if applicable)
Standing Data Confirmation - The following standing data has been collected from Puro and checked for consistency against other evidence:							
Annex B - 1.2.5	**Verification of the CO2 Removal Supplier that is registering Production Facility**	Y	Business registration document; Puro Registry data records; GOV.UK OCO business record 12-20-2022 Organization details in Puro registry_20220714.pdf Leeds_Production facility details in Puro registry_20220722 Brandon_Production facility details in Puro registry_20220722 Avonmouth_Production facility details in Puro registry_20220722	The CO2 Removal Supplier is O.C.O Technology Limited	O.C.O operations in the UK for which CORCs are claimed are privately, and solely owned by O.C.O Technology ltd. Future developments (australia and Spain) may be under joint ventures or other forms.		
	A certified trade registry extract (business license/registration, etc.) for the CO2 Removal Supplier	Y	Business registration (via Uk.gov Companies House registration document) GOV.UK OCO business record 12-20-2022	Business registration documentation provided	Business registration covers the O.C.O company as a whole (all sites in UK)		
	Evidence of the location of the Production Facility	Y	On site identification (Avonmouth); Puro Registry data record; verbal confirmation by O.C.O (Stephen Roscoe) Organization details in Puro registry_20220714.pdf Leeds_Production facility details in Puro registry_20220722 Brandon_Production facility details in Puro registry_20220722 Avonmouth_Production facility details in Puro registry_20220722	Locations are as specified in Puro Registry documentation	Three sites currently operating in U.K. (Avonmouth, Brandon, Leeds). Fourth site being developed in Wretham (ops expected early 2024). Australia, Japan, Spain plants in development.		
	Evidence of the Volume of Output for the full calendar year prior to registration	Y	Production logs for all plants: 22b Product Despatch Report Oct21-Sep22.xls 22a Product Despatch Report Sep 21.xls	Dispatch Logs document each delivery from plant. Deliveries are weighed using on site weigh scale.	Sales receipts and invoices also provided for sample of individual sales. Sales receipts match the values in the Dispatch logs. Logs are for fully carbonated product that has been on site for minimum two weeks.	401773 (370,037 + 31,736) tonne aggregate product	tonne
	Evidence of the Removal Method(s) for which the plant is eligible to receive CORCs	Y	Site observation of entire process in operation; O.C.O process summary documents: 24a CO2 Removal Methodology.pdf 10 O.C.O Technology Summary.pdf 26 Laboratory Test Report.pdf 35 Avonmouth's Monthly Usage.xls 36 SCADA Stage 1 & Stage 2 Batch Data 37 Avonmouth Daily Figures	Observed full process in operation from inputs delivery to product output. Product is an aggregate substitute produced from waste air pollution control residues, CO2, and additional reagents (sand, water, cement);	Process results in production of aggregate subsitute containing CO2 as carbonate due to reaction of CO2 and Ca, Mg, etc. in waste product as well as cement binder.		
	Evidence of the date on which the Production Facility became eligible to receive CORCs	Y	Verbal confirmation of dates provided in Puro Registry Business registration document; Puro Registry data records; GOV.UK OCO business record 12-20-2022 Organization details in Puro registry_20220714.pdf Leeds_Production facility details in Puro registry_20220722 Brandon_Production facility details in Puro registry_20220722 Avonmouth_Production facility details in Puro registry_20220722 22b Product Despatch Report Oct21-Sep22.xls 22a Product Despatch Report Sep 21.xls 35 Avonmouth's Monthly Usage.xls	O.C.O is claiming CORCs for period from September 1, 2021 through September 30, 2022.	Confirmed. Note that O.C.O has sold C credits to Microsoft for period through August 31, 2021. Available credits are only for 13 months from Sept 1 2021-Sept 30 2022		
	If the Production Facility has benefited from public support, evidence to show this	Y	Production facility / company have not received public support for development or operation of any of the UK facilities. Verbally confirmed by Stephen Roscoe, O.C.O	Confirmed during site visit	NA		

Eligibility Checklist							
Annex B - 1	**The production facility is technologically capable of producing carbonated building elements**	Y	Site observation of entire process in operation O.C.O process summary documents: 24a CO2 Removal Methodology.pdf 10 O.C.O Technology Summary.pdf 22b Product Despatch Report Oct21-Sep22.xls 22a Product Despatch Report Sep 21.xls 35 Avonmouth's Monthly Usage.xls 36 SCADA Stage 1 & Stage 2 Batch Data 37 Avonmouth Daily Figures	Facility processes air pollution control residue (APCR) waste - primarily lime and fly ash from MSW combustion. Facility utilizes mixing process which combines APCr with water and liquid CO2, then additional inputs (sand, cement, water) to produce carbonated aggregate, which is then pelletized and cured. Product is a sized and screened lightweight aggregate used in concrete, masonry, asphalt, and other products	Note that CO2 utilized has been a combination of biogenic (from anaerobic digestion primarily) as well as some fossil fuel derived. Recommend continued monitoring and documentation of CO2 sourcing going forward. **Fossil derived CO2 was verified as properly deducted** from total CO2 in aggregate for claimed period via additional calculation in CORC calculator spreadsheet. Also note that a significant portion of CO2 captured by aggregate is NOT via injection, but via air curing. CO2 injected can be adjusted (so proportion of air cure vs injected changes) Note that CO2 content contained in product is calculated by a stoichiometric basis, with a correction factor applied based on analytical study of actual mineral content available for carbonation. Additional study demonstrates a correction factor for stoichiometric calculation that is appropriately conservative and based on analytical data. We recommend monitoring samples for CO2 content or mineral content on a more regular basis to ensure changes in feedstock or operations don't significantly impact CO2 uptake.		
	Production of carbonated building elements is based on mineral carbonation (typically via formation of CaCO3 or MgCO3, with low reversal risk) and overall net CO2 removal.	Y	01 EPD Manufactured LimeStone 23a 2019-2020 Mass Balance 23b EPD Raw Data 23c Laboratory Test Report 24a CO2 Removal Methodology 34 Steinour Correction Dataset	Aggregate product is produced via reaction of residual Ca and Mg (and Na and S) in APCR with CO2 to form carbonates. XRF testing demonstrates Mn, Ca, S Na) content and stoichiometric calculation with analytical carbonate testing based corection factor is used to calculate fully carbonated product CO2 content. Overall product is net negative in CO2 based on results of EPD and CO2 removal calculations.	OCO provided example raw plant data, delivery tickets, weigh tickets, etc. Traced raw data to confirm inputs to EPD / CO2 net calculation. Stoichiometric approach is modified with correction factor based on analytical data and verified via modeling approach demonstrating that the stoichiometric approach plus correction factor are appropriate and conservative.		
Annex B - 1.1	**The carbon dioxide mineralised in the carbonated building material shall be of biogenic origin or from direct capture from the ambient atmosphere (CO2 from fossil fuels or cement production is not eligible)**	Y	23d CO2 deliveries Sep 21-Oct 22 24a CO2 Removal Methodology 49 Avonmouth CO2 Delivery Note	CO2 utilized in 2021-2022 came from a variety of sources. Primary CO2 source is from biogenic CO2 from anaerobic digester. Some CO2 was from fossil sources. Total CO2 (biogenic) delivered to facility in reporting period is 293.55 tonne). Remainder of CO2 uptake is from direct air capture via diffucion and reaction in the product while curing in the stockpiles.	Contract in place going forward for biogenic CO2 supply from AD only (for all sites). CO2 delivery source noted on all delivery tickets and documented in CO2 delivery spreadsheet.		
	The raw material used in the carbonated building element production is of eligible type and that EU, other national, or local legislation is followed in its sourcing and extraction	**Y**	05 BES 6001 Certificate 06 BES 6001 Examination Report	Raw materials are primarily a waste product (APCr) along with CO2 , cement, water, sand (or other filler). OCO has obtained BES Certification of responsible Sourcing (BES 6001).	Confirmed.		

Annex B - 2.1	**The point of creation of the CO2 removal certificate is the production of the carbonated building element that has absorbed CO2 at the eligible production facility**	**Y**	On Site Observation. Verbal confirmation.	CO2 is injected in mixer on site and reacts to form carbonates within <8 minutes. Additional CO2 is adsorbed and reacted during outdoor storage and curing prior to shipping.	Confirmed. Note that aggregate product reacts with ambient air to uptake much more CO2 via carbonation than is initially injected into product and this is accounted for in the product via stoichiometric calculation and conservative correction factor based on analytical testing.		
	The producer of the carbonated building element is the CO2 Removal Supplier	**Y**	On Site Observation. All production records.	Confirmed during site visit	Confirmed.		
	The carbonated building element that possesses the CO2 absorbing characteristics is used in construction to replace currently used concrete elements that are manufactured using conventional technologies	**Y**	Sales records provided. Verbal confirmation (Peter Gunning, Stephen Roscoe) 22b Product Despatch Report Oct21-Sep22.xls 22a Product Despatch Report Sep 21.xls 33 Aggregate Customers & Applications 25a ISO Certificates	Sales records indicate provision of aggregate product for a variety of construction related end uses where aggregate is typically used, This includes concrete (ready-mix and masonry), asphalt, The product is also certified as a lightweight construction aggregate under EN	All end uses result in permanent removal of CO2.		
Annex B - 1.2.3; General Rules - 2.1.3	**CO2 Removal Supplier shall be able to demonstrate additionality, meaning that the project must convincingly demonstrate that the CO2 removals are a result of carbon finance. Even with substantial non-carbon finance support, projects can be additional if investment is required, risk is present, and/or human capital must be developed. To demonstrate additionality, CO2 Removal Supplier must:** **- Provide full project financials and counterfactual analysis based on Baselines that shall be project-specific, conservative and periodically updated.** **- Show that the project is not required by existing laws, regulations, or other binding obligations.**	**Y**	19 Puro Additionality questions to Suppliers. Verbal discussion with OCO (Stephen Roscoe) 44 Maryvale_Fin_Model_Mar22_ROI 45 Maryvale_Fin_Model_Mar22 2023-02-20 O.C.O audit reponse	OCO has provided analysis of costs compared to the counterfactual (s) which are treatment and landfilling of waste as well as aggregate production via traditional means (quarrying). To remain cost competitive with landfilling counterfactual OCO requires carbon finance to be able to reduce their treatment gate/tipping fee. O.C.O is currently being underbid in many markets for APCr due to cost of operations, making it difficult to secure their primary feedstcok. In addition, although current plants are generally financially viable based on sale of aggregate product and receipt of tipping fees for waste disposal and treatment, current margins are low enough and costs increasing signficiantly such that meeting requirements to obtain additional investment for scalingis becomes difficult. C Credit Sales will enable expansion, growth, and securing of investment for expansion. OCO also provided revised financial models after audit to both 350 and Puro indicating value of credits in business operation and success.	Note that the aggregate product and the haz waste treatment approach are not currently required by regulation, policy, or other legal demands. Future policies, such as procurement contract specifications may come into play and purchase requirements should be monitored.		

Production Facility Checklist (Desktop, Verbal, or Site Visit Confirmation)							
Annex B - 1.2.2; General Rules - 2.1.2 *(Env. & Social Safeguards)*	**Evidence of proper environmental permitting and practices (e.g. environmental impact statement, air permit, wastewater permit, proper recycling or disposal of solid wastes)**	Y	12 Permit Avonmouth 13 Permit Brandon 14 Permit Leeds 15 Avonmouth Compliance Assessment 16 Brandon Compliance Assessment 17 Leeds Compliance Assessment 18 Compliance Rating Dataset (2021) 25a ISO Certificates 25b ISOQAR Report 04 Sustainability-Report 19-20 Verbal discussion with P. Gunning and S. Roscoe, O.C.O during site visit	All three plants are properly permitted under UK law, and demonstrate compliance with permits as evidenced by Compliance Assessments. In addition, O.C.O operates under ISO 9001 and 14001 certification.	On site plant tour and discussion indicatese that the facility operates with a minimal to no-waste approach, as all APCr must be treated and properly disposed to maintain permits. And, due to APCr treatment, permitting and compliance are strictly monitored. Facility has very limited wastes and emissions.		
	Evidence of meeting industry-standard safety practices, including documentation of safe performance (such as annual accident reporting)	Y	25a ISO Certificates 25b ISOQAR Report 31 2021-2022 Mgmt Review IMP Close-Out RoSPA Gold Award Certificate	Site adheres to industry-standard safety practices. Site is managed under ISO 9001 and 14001 systems. Part of that includes the management review processs, which includes review of KPIs that include safety practices and reporting. Most recent Management Review includes review of all incident history, reporting and compliance for safety. No major issues identified by verifier.	O.C.O received a Royal Society for the Prevention of Accidents Gold Award in 2022, indicating its excellence in safety performance and accident prevention.		
	Evidence, including records or policies, of addressing social and environmental issues, including community input regarding operations, response to complaints, or other approaches or evidence	Y	25a ISO Certificates 25b ISOQAR Report 04 Sustainability-Report 19-20 Verbal discussion with P. Gunning and S. Roscoe, O.C.O during site visit	O.C.O operates under ISO 9001 and 14001 certification, which provides significant guidelines, procedures, assessments, and audits associated with environmental and operational performance. O.C.O manages any complaints, though infrequent, with direct response and improvement.	Only complaints noted from the community are very infrequent complaints of dust from neghboring industrial facilities, which have been addressed via weather monitoring, dust control, use of street sweepers, and other activities.		
Annex B - 3 *(Lifecycle GHG Emissions)*	**CO2 Removal Supplier provides a LCA (LCA report or environmental product declaration)**	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology	O.C.O maintains an EPD for its aggregate product which includes full LCA analysis	EPD LCA analysis complies with Puro requirements, boundary, and methodology		
	LCA follows general guidelines of ISO 14040 and ISO 14067 rules for product LCA (where carbonated building material is the product and LCA is cradle to gate)	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology	EPD references ISO 14040, ,ISO 14044, EN 15804+A2 and ISO 14025 and ISO 21930. The EPD was created with one-click LCA and verified by EPDHub.	EPD LCA analysis complies with Puro requirements, boundary (cradle to gate), and methodology. Note that the EPD includes CO@ removal using any CO2 source for injection. O.C.O provided additional calculations to remove any injected fossil-derived CO2 from LCA and CORC calculation.		
	The LCA activity boundary includes raw material used: CO2 emissions from extraction and production of the raw material used for the production of the carbonated elements	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology	Review of EPD indicates all emissions from extraction and production of raw materials and equipment are included in LCA. Ecoinvent database is used for emission factors.	Confirmed		
	The LCA activity boundary includes CO2 emissions from transporting the raw material to the production facility where the carbonated building elements are produced	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed.	Confirmed via review of EPD and raw data files.		
	The LCA includes all GHG emissions associated with production at the production facility	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed.	Confirmed via review of EPD and raw data files.		
	In case of waste or secondary materials being used in the production of the carbonated building material, it is recommended to apply the cut-off approach for waste, recycled, and secondary products (see Annex B Section 3.1.5	Y	01 EPD Manufactured LimeStone 24a CO2 Removal Methodology	Confirmed. EPD states use of cutoff approach for waste/secondary materials.	Confirmed via EPD.		
	The activity boundary excludes: transport of elements to construction site(s), construction activities, and end of life (e.g., emissions from demolition or end of life activities)	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed.	Confirmed via review of EPD and raw data files.		

Annex B - 1.2.1, 5 *(Production Facility Audit Proofs and Site Visit)*	**Confirm the process that is in place to quantify emissions from the extracting, handling, and transport of raw materials, including documentation from such activities and emission factors utilized.**	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Review of EPD indicates all emissions from extraction and production of raw materials and equipment are included in LCA. Ecoinvent database is used for emission factors.	Confirmed		
	The LCA specifics and emissions boundary are consistent with observations on site, including inclusion of all inputs and outputs, energy used, wastes emitted, and production processes	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed. All site activities and production processes are accounted for in the EPD and LCA. All inputs and outputs are included. No additional inputs, outputs, wastes, or energy use was identified.	Confirmed		
	Proof that the production process and technology used for the manufacturing of the carbonated building element results in a net CO2-negative product (that is, the product stores more CO2 than the processes for producing it and the raw materials used). Note: The above items may be demonstrated via a a third party EPD or LCA	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed. The EPD was created with one-click LCA and independently verified by EPDHub. 350Solutions verified EPD data via tracing of EPD input data and comparison to annual operating data.	Confirmed via review of EPD and raw data files. Note that 350 verified raw data and annual usage data for 2021-2022 and compared to the 2019-2020 data that the EPD is based on to confirm all operations were similar and that EPD net negative value would be within similar range. Confirmed.		
	The carbon content of the carbonated building element product is documented via laboratory analysis or other third party scientific analysis (Annex B Section 5.2) (this should also account for any carbon content in raw materials)	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance 34 Steinour Correction Dataset	O.C.O uses a stoichiometric based carbonation calculation (Steinour equation), which utilizes analytical results for the Ca, Mn, Na, S content of inputs (APCr, cement) to calculate potential carbonation amount. The equation typically overstates carbonation level. Therefore, O.C.O has performed analytical testing of various inputs to determine ratio of actual carbonation to Steinour predicted carbonation. Results indicate a range of ratio from 73 to 81% or predicted. Therefore, O.C.O selected a conservative correction factor of 70% of Steinour prediceted carbonation to calculate the CO2 utilization via the aggregate carbonation process.	O.C.O has performed a detailed analysis of carbonation to determine correction factor. Recommend revisiting this on some frequency (every five years?) based on variation in inputs, potential new analytical methodologies, and variation in operating conditions.	144.02	kg CO2e/tonne product
	The quantity of the carbonated building element produced and sold is quantified and documented in a reliable manner	Y	22a Product Despatch Report Sep 21 22b Product Despatch Report Oct21-Sep22 33 Aggregate Customers & Applications	Total product produced is measured via weighbridge for all product shipments leaving the facility. The product dispatches are tracked in the plant operating system software and are summaried in the Product Dispatch spreadsheets.	Confirmed. Every shipment is weighed and documented.	401773 (370,037 + 31,736) tonne aggregate product	tonne
	Relevant meters are in place and they are calibrated for measuring carbonated material product output, CO2 input, and raw material consumption;	Y	50 Leeds Weighbridge Certificate 41 Roxspur SC250 Flow Meter Specification Weighbridge callibration report - Avonmouth 51 Brandon Weighbridge Certificate (1)	All CO2 uptake is based on product shipments and calculation procedure. All shipments are weighed via calbrated weigh scales. All calibrations are completed annually and are up to date (Avonmouth: 10-11-2022, Brandon: 05-10-2022, Leeds: 9-14-2022)	Note that CO2 meters are used in plant operation system to monitor and control CO2 injection, and load cells are used in process to monitor inputs. These meters are purchased with specifications, but national-standard-traceable calibrations were not previously purchased for these. However, the data from these meters is not used for calculation of full CO2 uptake, but solely as a cross check. Recommend purchasing and maintaining calibration in the future, but not critical to CORC calculation.		
	The emissions from the extracting and transporting of the raw material are estimated and calculated in a reliable manner (section 5.2.), with documentation of emission factors used, including scope of such emission factors.	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Review of EPD indicates all emissions from extraction and production of raw materials and equipment are included in LCA. Ecoinvent database is used for emission factors.	Confirmed		
	The energy use of the Production Facility can be quantified and the emissions from the process calculated	Y	23a 2019-2020 Mass Balance				
	The Removal Supplier provides a statement that the carbonated building material product will not be sold as carbon negative if the CO2 removal certificate (CORC) for the product is removed and sold to another stakeholder not associated with the product.	Y	O.C.O review of carbon credit attribution_SRoscoe_12-20-2022 20 Terms and Conditions of Sale	Terms and conditions of sale contain the statement "The ownership of the material shall pass to the Purchaser...save for the rights toi embodied carbon, which are subject to separate negotiation". In addition, a review of sales by O.C.O indicates no known sales were provided to projects or entities that were claiming carbon credits or negativity.	Discussions with OCO indicate that they will strengthen the terms and conditions language immediately and also review all marketing materials to ensure that carbon negativity mentions are marked with indication that credits have been sold and are not attached to the product purchase.		
	Disclaimers are provided by the Removal Supplier and any user in any marketing claims that indicate carbon net negativity, removal, or similar. Disclaimer states that the carbon credit associated with the product is managed in PuroEarth's registry.	Pending	O.C.O review of carbon credit attribution_SRoscoe_12-20-2022 20 Terms and Conditions of Sale Email communicatoin and draft language provided by P. Gunning O.C.O 1-4-2022	Reviewed marketing material (brochures, website) during site visit. Identified places where carbon net negativity was mentioned. No disclaimer was provided previously, O.C.O is completing a full review and modification to reflect the changes. Draft version provided by O.C.O 1-4-2022	Discussions with OCO indicate that they will strengthen the terms and conditions language immediately and also review all marketing materials to ensure that carbon negativity mentions are marked with indication that credits have been sold and are not attached to the product purchase. Draft revision provided 1-4-2022.		
	Proof of product quality with respect to construction specifications and end uses, such as lab tests of product composition or product performance specifications	Y	55 CE Certificate EN13242 6F 54 Declaration of Performance EN13242 6F 53 CE Certificate EN13055 BlockMix 52 Declaration of Performance EN13055 BlockMix	Product is tested and certified as aggregate product to blockmix and readymix standards. EN13242 and EN 13055.	Confirmed		
	The auditor goes through the Quantification of CO2 Removal requirements with the CO2 Removal Supplier, so that the Supplier is able to calculate the CO2 Removal independently in its Output Report	Y	NA	Completed	Completed		

Quantification and Calculation Checklist - Ouput Audit							
Annex B - 4	**The producer of the carbonated building element (Removal Supplier) provides data and documentation on the production volume (in kg) of the carbonated elements produced in the production process of the eligible production facility.**	Y	22a Product Despatch Report Sep 21 22b Product Despatch Report Oct21-Sep22 33 Aggregate Customers & Applications	Total product produced is measured via weighbridge for all product shipments leaving the facility. The product dispatches are tracked in the plant operating system software and are summaried in the Product	Confirmed. Every shipment is weighed and documented.		
	The CORC pre-issuance buffer is set to zero (0%) in this methodology	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21	Confirmed	Confirmed		
Annex B - 4.1	**CORCs = Estored - Eproduction**	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21	Confirmed	Confirmed. Note that CORC calculation requires (and was completed by O.C.O) removal of fossil derived CO2 from the calculated CO2 removals, as the EPD CO2 content of the aggregate is for any CO2 source. Also note that initial CORC file utilized incorrect fossil value for one facility and was corrected during site visit.	18,755	CORCs
Annex B - 4.2	**Estored = Q_{CBE} x A_{CO2}**	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21	Confirmed	Confirmed	57,863,347	kg CO2
	QCBE = the amount of carbonated building material, in metric tonnes, produced by the supplier. It is calculated by the supplier, and appropriate documentation must be available (e.g., number of units produced, weight of units produced	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21 22a Product Despatch Report Sep 21 22b Product Despatch Report Oct21-Sep22 33 Aggregate Customers & Applications	Confirmed	Confirmed	401,773	tonne
	ACO2 = actual amount of carbon dioxide sequestered in tonnes CO2 per tonne product. It is based on measurements or on other scientifically sound methods verified by a qualified third-party auditor	Y	01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance 34 Steinour Correction Dataset	Confirmed (see above for details)	Confirmed (see above for details)	144.02	kg CO2e/tonne product
Annex B - 4.3	**Eproduction = GHG emissions from all activities involved in production of carbonated building material**	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21	Confirmed (see above for details)	Confirmed (see above for details)	94.98	kg CO2e/tonne product
	Eproduction activities are are grouped as: sourcing of CO2, sourcing of raw meterials, production of building materials	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21 01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed (see above for details)	Confirmed (see above for details)		
	For all Eproduction activities included, a full scope of emissions is provided, i.e., including all life cycle stages (manufacturing, use and disposal) of the processes involved.	Y	22 EPD based CORC calculation Oct21-Sep22 21 EPD based CORC calculation Sep21 01 EPD Manufactured LimeStone 10 O.C.O Technology Summary 23b EPD Raw Data 24a CO2 Removal Methodology 23a 2019-2020 Mass Balance	Confirmed (see above for details)	Confirmed (see above for details)		

Documentation of raw materials for carbon building element production & Sustainable Sourcing evidence
Version: 1 October 2022

Carbonated Building Elements

Raw Materials	Used in Process? (Y/N)	Identify type of material, if necessary (i.e. fly ash, waste product)	Source or Specification	Proof of Sustainable Sourcing	Audit Findings / Notes
Sand	Y		Flint sand or similar	O.C.O maintains a BES6001 certification for Responsible Sourcing of Construction Products, with an Excellent rating (currently valid June 23, 2021 to June 22, 2024)	
Gravel	N		NA		
Aggregate	Y	Scalpings	quarry scalpings (<20mm typical) (Breedon Materials and others)		
Cement or other Binders	Y		Cement I (42.5N); Cement II A-L - 42.5R; or similar (Dragon Alfa Cement and others)		
CO2	Y		Liquified CO2: NGUK-000 or similar. Nippon Gas, Air Liquide, others.		Delivery tickets note source of CO2 (i.e. biogenic - via Vale Green Energy (anaerobic Digester Plant) or Fossil (Azelis CF Fertilizer Plant).
Water	Y		Industrial process water; well water.		
Supplementary Cementitious Materials (SCMs)	N		NA		
Additives (plasticizers, strengtheners, etc.)	N		NA		
Waste Materials (i.e. slag)	Y	(Air Pollution Control Residue (APCr)	APCr is obtained from various waste to energy plants. O.C.O is an approved treatment facility for the APCr stabilization and use. O.C.O has established stringent quality specifications for the APCr that it will acccept.	In addition to the BES 6001 certification, the APCr is managed under UK Hazardous Waste Regulations, O.C.O is permitted and audited, and meets all requirements for sourcing, tmasporting, storing, treating, and using the materials, based on audit records.	350Solutions reviewed the APCr testing requirements and acceptance specifications and evidence of completion. O.C.O tests every batch delivered to ensure it is within specification for use in their aggregate product.
Other Materials	Y	Recycled C&D Debris	unk. OCO maintains specifications	O.C.O maintains a BES6001 certification for Responsible Sourcing of Construction Products, with an Excellent rating (currently valid June 23, 2021 to June 22, 2024)	
	Y	Limestone dust	Limestone < 4mm typical (Hanson aggregates or other)		
	Y	Recycled glass	unk. OCO maintains specifications		

APPENDIX 2: SITE VISIT PHOTOS

Figure A2-1. O.C.O Technology Avonmouth Production Facility:
Raw Material Storage Silos (L) and CO_2 tanks (R)

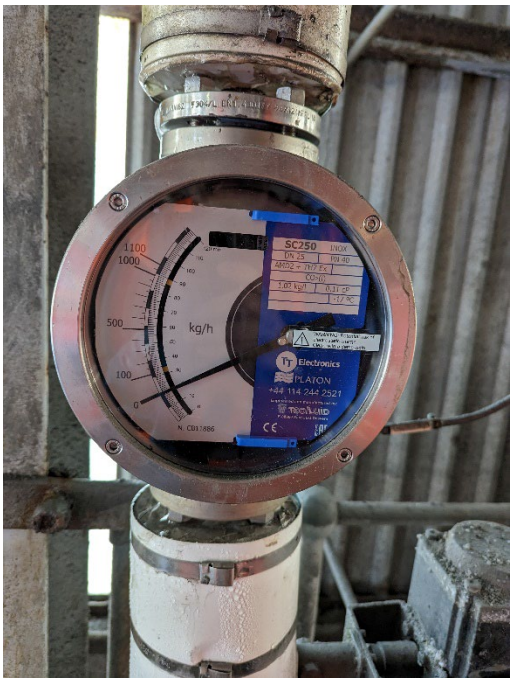

Figure A2-2. CO_2 injection flow meter at O.C.O Avonmouth

Figure A2-3. Calibrated weigh scale on weighbridge at O.C.O Avonmouth

Figure A2-4. O.C.O manufactured limestone (M-LS) aggregate product after pelletizing.

APPENDIX 3: VERIFIER QUALIFICATIONS

Supporting documentation, including verifier resumes, and verifier or corporate accreditations are also included in this appendix.

Verifier Qualifications

Company Name:	**O.C.O Technology**
Audit Date:	**12/20/2022**

Verifier Name:	**Tim Hansen, P.E.**
Company Name (where applicable):	**350Solutions**
Verifier Contact Information:	**tim@350solutions.com, (919) 675-6432**
Verifier Address:	**1053 E. Whitaker Mill Rd. Suite 115, Raleigh, NC 27604**
Verifier Scope of Activities:	**Verification through observation and review of key technology components and documentation.**

Verifier Qualifications	**Criteria Met?**	**Evidence / Notes** *(note how the criteria was met, specific documents - resume/CV, publications, certifications, etc.).*
Verifier has relevant technical knowledge of the type of technology being evaluated and carbon removal processes in general		
A) Does Verifier have:		
1. An in-depth technical knowledge of the technology type under verification;	☑	350Solutions is accredited to ISO/IEC 17020:2012 and ISO 14034 Environmental Technology Verification (ETV) as a Type A (third party) Inspection Body (ANAB Certificate Number: AI-2618). The technical scope of 350's accreditation includes verification of performance and environmental impact as it relates to design, materials, equipment, installation and operations of technologies in the categories of Energy, Clean Production and Process, and Air Pollution Monitoring and Abatement. As documented in 350Solutions' ETV Standard Operating Procedure (ETV QPM 350-223-03), and Quality Systems Procedures for verifier qualifications (QSP-350-005-02), 350Solutions conforms to the requirements of ISO 17020 Annex A with respect to verifier qualifications and procedures relevant to the Puro.Earth General Standard. 350 staff have participated in the evaluation and verification of 5+ novel technologies that utilize CO_2 in the manunfacture of concrete, concrete products, and concrete additives. 350 also served as lead verifier for the Carbon XPrize competition and contributed to the development of procedures and processes for verification of relevant calculations, modeling, and statistical methods in order to assess team results and calculations of performance metrics and uncertainty. 350 has demonstrated knowledge of data quality and data validation approaches and execution in supporting verification of performance claims and results.
2. Knowledge of specific risk areas associated with performance of such technologies (i.e. common failure points, performance issues, barriers to scaleup);	☑	
3. Knowledge of the environmental implications related to the use of the technology from a life cycle perspective, such as impact of the technology on lifecycle CO_2 emissions and carbon removal;	☑	
4. Knowledge of relevant applicable test methods and standards for evaluating performance or impact of the technology;	☑	
5. Knowledge of relevant calculation, modeling, and statistical methods in order to assess test results and calculations of performance metrics and uncertainty, as applicable;	☑	
6. Knowledge of data quality and data validation approaches, including QA/QC procedures, for example.	☑	
Verifier is a credible independent 3rd party		
B) Is Verifier:		
1. third-party body independent of the company registering for Puro Earth CORCs;	☑	350Solutions is accredited to ISO/IEC 17020:2012 and ISO 14034 ETV as a Type A (third party) Inspection Body. As documented in 350Solutions ETV Policy Manual (ETV QPM 350-200-03), 350Solutions conforms to the requirements of ISO 17020 Annex A with respect to impartiality for Type A inspections, pursuant to ISO 14034 activities.
2. Not directly involved in the design, manufacture or construction, marketing, installation, use or maintenance of the specific technologies submitted to Puro.Earth for verification, or represent the parties engaged in those activities.	☑	
3. Not part of a legal entity that is engaged in design, manufacture, supply, installation, purchase, ownership, use or maintenance of the items inspected.	☑	

Tim Hansen, P.E.
Founder and CEO, 350Solutions

EDUCATION:
B.S., Chemical Engineering, University of Virginia, 1993
M.S., Engineering Science, Thayer School of Engineering, Dartmouth College, 1995

EXPERIENCE SUMMARY:
Mr. Hansen has 26 years of experience in management of energy and environmental technology development and demonstration projects and programs, as well as multimedia environmental engineering efforts. These majority of his recent work has focused on the evaluation of innovative carbon capture, utilization, and removal technologies. Mr. Hansen has led the development and management of large technology evaluation programs in the advanced energy, transportation, and climate change areas.

RESEARCH AND PROFESSIONAL EXPERIENCE:
2019-Present Founder – CEO, 350Solutions, Inc.
Owns and operates a small cleantech engineering consulting business focused on the independent evaluation of new cleantech innovations and their impact on the environment and carbon emissions. Provides engineering consulting, testing and evaluation, techno-economic assessment, and other support to companies developing, using, or investing in new clean technology innovations. Manages administrative, business development, and project activities for 350Solutions.

2012-2019: Director - Energy and Environment, Southern Research
Manages scientific and technical staff performing research, development, and evaluation of innovative clean energy technologies. Projects range from $25,000 to $6million in size, and are funded by the US Department of Energy, Department of Defense, and commercial partners. Technical focus areas are conversion of biomass to fuels and chemicals, carbon capture and utilization, energy efficient building technologies and renewable energy generation.

2009-2012: Program Manager – Transportation & Climate Change Technology, Southern Research
2003-2009 Sr. Project Leader, Environmental Engineer, Southern Research
1996-2003 Environmental Engineer, Bensinger & Garrison Environmental

PROJECT EXPERIENCE:
Mr. Hansen has executed several independent technology performance verifications of emerging carbon, energy and transportation technologies, as CEO of 350Solutions, Director of Energy & Environment at Southern Research, and Director of the U.S. EPA's Greenhouse Gas Technology Center. Mr. Hansen has completed clean technology evaluations for the Department of Defense, state energy agencies, commercial clients, investors, and technology developers, involving evaluation of commercial feasibility, economic and environmental impacts, and technology performance. Mr. Hansen served as the Measurement and Verification Program Lead for the NRG COSIA Carbon XPrize – a $20M prize competition for technologies that capture and beneficially utilize CO_2. Mr. Hansen also served as U.S. Technical Expert for the development and implementation of ISO 14034 – Environmental Technology Verification, an international standard, issued in 2016

William Chatterton
350Solutions, Verification Program Manager

EDUCATION
B.S. Environmental Science, SUNY at Plattsburgh, 1982
Certified Measurement and Verification Professional (CMVP), 2019

Professional Experience
William Chatterton is an Environmental Scientist with 28 years' experience in technology evaluation and demonstration, project management, air pollution monitoring, testing, and regulation. He serves as Program Manager at 350Solutions and manages projects and programs for commercial and government clients. Previously the past 20 years at Southern Research, Mr. Chatterton has managed, and supported programs designed to integrate, demonstrate, and evaluate technology performance in the advanced energy field. Technology demonstrations and evaluations that he has been involved with include technologies designed to promote sustainable energy sources, increase energy use and efficiency, mitigate GHG and other emissions, and in most cases provide other social and economic benefits to potential users. Mr. Chatterton has been heavily involved in the evaluation of numerous emerging energy technologies, distributed generation technologies, and technologies relevant to transportation and oil and gas markets. Mr. Chatterton's roles in support of these projects has included program and project management from administrative and technical perspectives, lead or technical support on test plan development, method development and validation, design and implementation of field-testing activities, data evaluation and presentation, and reporting of results. He has managed numerous projects for both commercial and government clients.

350Solutions: 08-2019 – Present
Verification Program Manager: As Verification Program Manager, Mr. Chatterton manages and executes technology performance demonstrations and verifications of emerging energy (efficiency and green building) and transportation technologies, primarily for U.S. governmental agencies, energy research associations, and state energy agencies. These performance evaluations generally involve evaluation of commercial feasibility, economic impacts (installation, operating, and capital costs, simple payback, and return on investment), environmental impacts (primarily greenhouse gas and criteria pollutant emission reductions), and technology performance. He also manages and monitors 350Solutions' quality management programs and ISO accreditations.

Southern Research Institute: 1999 - 2019
Program Manager, Energy & Environment Technologies: As Program Manager, Mr. Chatterton has managed and executed several technology performance demonstrations and verifications of emerging energy (efficiency and green building) and transportation technologies, primarily for U.S. governmental agencies, energy research associations, and state energy agencies. Mr. Chatterton also has direct experience with management and execution of projects under DOE and DoD grants and contracts. He has recently managed activities on three large DoD projects including Demonstration of a Solar Thermal Combined Heating, Cooling and Hot Water System Utilizing an Adsorption Chiller for DoD Installations, Demonstration and Verification of the Performance of Microturbine Power Generation Systems Utilizing Renewable Fuels, and the Electric Power with Small Scale Organic Rankine Cycle (ORC) Engine/Generator Technology demonstration.

350Solutions, Inc. Corporate Experience

350Solutions serves as an independent expert in cleantech, low carbon, and environmental technologies. We provide an unbiased assessment of innovative technologies. 350Solutions is accredited through ANAB under ISO 17020 as an independent inspection body to provide independent technology evaluation services using the ISO 14034 ETV process. In addition, 350Solutions staff include a Certified Measurement and Verification Professional (CMVP for IPMVP) and a North Carolina Registered Professional Engineer (P.E.). 350Solutions ANAB Accreditation certificate is provided below.

ANAB
ANSI National Accreditation Board

CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

350Solutions, Inc.
1053 E. Whitaker Mill Rd., Suite 115
Raleigh, NC 27604

Fulfills the requirements of

ISO/IEC 17020:2012

and

ISO 14034:2016, Environmental Management - Environmental Technology Verification (ETV)

In the field of

INSPECTION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 25 September 2024
Certificate Number: AI-2618

ANAB
ANSI National Accreditation Board

ilac-MRA

An inspection body's fulfilment of the requirements of ISO/IEC 17020:2012 means the inspection body meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid inspection results (refer to joint ISO-ILAC-IAF Communiqué dated Sept 2013).

ANAB
ANSI National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17020:2012

and

ISO 14034:2016, Environmental Management - Environmental Technology Verification (ETV)

350Solutions, Inc.
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Raleigh, NC 27604
Tim Hansen tim@350Solutions.com
(919) 675-6432

INSPECTION
TYPE A (THIRD-PARTY) BODY

Valid to: **September 25, 2024** Certificate Number: **AI-2618**

General

Products Categories	Range	Stage	Methods and Procedures
Energy Technologies (ET):	Performance and Environmental impact as it relates to design, materials, equipment, installation and operations.	Operating	QSP-350-223-02 - *SOP ISO 14034 ETV*
Cleaner Production and Processes (CPP):	Performance and Environmental impact as it relates to design, materials, equipment, installation and operations.	Operating	QSP 350-223-02 - *SOP ISO 14034 ETV*
Air pollution monitoring and abatement (APP):	Performance and Environmental impact as it relates to design, materials, equipment, installation and operations.	Operating	QSP 350-223-02 - *SOP ISO 14034 ETV*
Water monitoring and treatment (WMT)	Performance and Environmental impact as it relates to design, materials, equipment, installation and operations.	Operating	QSP 350-223-02 - *SOP ISO 14034 ETV*

Note:
1. This scope is formatted as part of a single document including Certificate of Accreditation No. AI-2618.

R. Douglas Leonard Jr., VP, PILR SBU

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