



June 28, 2023

The Honorable Dr. Steven Cliff
Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA

Re: Blue Planet Comments on SB 596 Workshop (May 2023) and Cement Sector Net-Zero Emissions Strategy

Dear Dr. Cliff:

Thank you for the opportunity to comment on SB 596 Cement Sector Net-Zero Emissions Strategy (SB 596 Strategy). The production and use of cement and concrete offers a tremendous opportunity to not just transform a sector and achieve net-zero emissions, but also to develop a fully scalable carbon sink in our built environment. We encourage CARB to think holistically about the opportunity to advance the State's climate goals through the use of near-zero and carbon-negative cement and concrete, including strategies to sequester CO₂ in aggregates and concrete, and to identify steps in the SB 596 Strategy to enable and advance these opportunities.

About Blue Planet

Blue Planet is a California company developing technology and products related to economically sustainable carbon capture. Our goal is to solve the carbon capture problem by converting CO₂ into high-value building materials. Our technology can be deployed at cement facilities or other difficult-to-decarbonize industries and can capture not only CO₂, but also particulate matter, NO_x, SO_x and other pollutants hazardous to surrounding communities. It can also be coupled with direct air capture facilities and deployed as a carbon dioxide removal strategy. We are currently constructing and beginning operations of a plant in Pittsburg, California on the Sacramento Delta, and our carbon-sequestered aggregate has been utilized at San Francisco International Airport, where carbon-sequestered concrete is specified.

Blue Planet's technology produces coarse and fine limestone aggregates made from sequestered CO₂ utilizing the carbon mineralization process. It allows lower-cost carbon capture, including from cement facilities, by avoiding the need to purify and enrich captured CO₂ before use, which reduces the cost and energy needs associated with carbon capture. It is also fully scalable and can be applied to any facility in any part of the state where concrete is utilized, regardless of its proximity or access to a geological sequestration site.

Achieving SB 596 objectives requires rapid development of CCUS

We appreciate the strong support and continued progress in decarbonizing the cement industry by minimizing cement in concrete through optimized design, energy efficiency and the use of SCMs (supplementary cementitious materials). These measures, while effective, cannot achieve deep decarbonization or reduce emissions to net-zero, as required by SB 596. About 60% of the carbon intensity from current cement operations comes from “process emissions,” which can only be reduced through carbon capture. Decarbonizing California’s cement sector on timelines and to levels required by SB 596 therefore requires the rapid deployment of CCUS (carbon capture, utilization and storage), in addition to other emerging technologies and strategies.

Carbonate mineralization offers a significant and permanent CCUS solution

As described in our July 9, 2021, comments related to the Scoping Plan kickoff workshops,¹ and validated in peer-reviewed research,² the mineralization process permanently stores carbon in rock, which can then be used in concrete and stored in our built environment. While several technical, legal, and economic questions remain related to geologic sequestration, many of which CARB and other agencies will address through implementation of SB 905 (Caballero, Chapter 359, Statutes of 2022), carbonate mineralization offers a fully scalable, permanent carbon storage solution, ready for deployment today. We appreciate the State recognizing this opportunity, including:

- In the Final 2022 Scoping Plan Update, CARB discusses the role of carbon capture and carbonate mineralization in the context of decarbonizing cement and other sector transitions, stating “Direct air capture and carbon mineralization have high potential capacity for removing carbon...”³
- The CEC identifies carbonate mineralization, including carbon storage in aggregates, as one of the most promising strategies for decarbonizing the cement sector:⁴

Capturing carbon from industrial processes and then utilizing it in a product is considered one of the essential components for mitigating CO₂ emissions since it can achieve net negative emissions, especially for sectors that are unable to achieve zero emissions. For example, carbon capture and utilization appear to be a pathway to achieve significant decarbonization of the cement industry where 60 percent of the carbon dioxide is from process emissions... For instance, carbon capture and utilization in the cement industry has recently emerged with sustainable techniques to use carbon emissions in concrete production. Some emerging utilization techniques, such as mineral carbonation, includes adding carbon into cement to enhance the concrete’s compressive strength. With almost 4

¹ <https://www.arb.ca.gov/lists/com-attach/73-sp22-kickoff-ws-UTMGbFEIVGJQCQd3.pdf>

² For example, see: Xi, F., Davis, S., Ciais, P. et al. Substantial global carbon uptake by cement carbonation. *Nature Geosci* 9, 880–883 (2016). <https://doi.org/10.1038/ngeo2840>

³ CARB (2022) 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board, November 16, pg. 221. <https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp.pdf>

⁴ See pg. 10 at: https://esd.dof.ca.gov/Documents/bcp/2223/FY2223_ORG3360_BCP5441.pdf

billion tons of construction aggregate produced in North America, mineral carbonation could be the most efficient route to CO₂ utilization.

In the SB 596 Strategy, we encourage CARB to evaluate and highlight the need to adopt measures not just to decarbonize cement operations directly, but also to highlight the ability of carbon sequestering concrete materials to lower the carbon footprint of concrete overall. The two strategies go hand-in-hand, and in its SB 596 Strategy, CARB should consider both “supply side” strategies to decarbonize cement operations as well as “demand side” strategies to affect related concrete markets and further support for efforts to decarbonize the cement sector.

Enable carbonate mineralization as a decarbonization strategy for the cement sector by incorporating it into the SB 596 Strategy, CCS Protocol, SB 905 implementation, LCFS, and Cap-and-Trade Program

We encourage CARB to formally recognize mineralization, including its promising application in the cement and concrete sectors, as a key solution for decarbonizing cement and concrete in the SB 596 Strategy. Further, we hope the SB 596 Strategy will identify specific steps and recommendations to advance this promising strategy as a solution for decarbonizing cement and other sectors. These steps should include:

- Formally incorporating carbonate mineralization into the CCS Protocol through implementation of SB 905.
- Adopting amendments in the LCFS (Low Carbon Fuel Standard) that allow new CCUS protocols to be used in that program, as they are developed and adopted through the SB 905 process.
- Incorporating the CCS Protocol into the Cap-and-Trade Program when the program is next amended.
- Developing additional incentives to support CCUS, including carbon stored in concrete, through the Cap-and-Trade program, public procurement, product specifications, or other approaches. (We discuss procurement options below and look forward to commenting separately on potential changes to the Cap-and-Trade program in our response to the recent workshop on that item.)

We look forward to working with CARB staff regarding any technical or accounting questions that would support these efforts.

Public procurement policies critical to advancing low-carbon and negative-carbon cement and concrete strategies

In addition to supporting policies, including new CCUS Protocols and financial incentives, to enable deep decarbonization of cement operations, the State must create demand for those resulting low carbon cement products. The best way to do this is through public procurement policies. Caltrans and other state agencies are among the largest cement and concrete users in the world, accounting for 40% of all concrete use in California, and can literally set the market for low carbon cement and concrete products based on their procurement decisions and product specifications.

Pursuant to SB 596, CARB must evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low greenhouse gas intensity. We believe that additional policy support from the state, especially through public procurement activities, can enable additional and transformational carbon reductions from the cement and concrete sectors. These policies include at least the following, each of which we hope CARB will fully evaluate and include in the SB 596 Strategy:

- Advance market commitments (AMCs) to accelerate the commercialization and scaling of technologies capable of producing ultra-low carbon or even negative-carbon negative cement and concrete.
- Incorporating cement and concrete into the State’s Buy Clean framework, which could be done without legislation under Executive Order N-19-19,⁵ and similar to recent actions at the federal level under President Biden.
- Other related procurement efforts, such as New Jersey’s Low Embodied Carbon Concrete Leadership Act (LECCLA S287), which offers tax incentives to concrete producers who provide reduced carbon products, as well as a supplementary tax credit for products created using CCUS..
- Low Carbon Product Standards.
- Product specifications or bid preferences based on the use of low carbon cement/concrete and concrete with sequestered carbon.
- Requirements in the CALGreen building code requiring use of low-carbon cement and concrete, including stretch codes requiring the use of carbon-sequestered concrete and concrete with net-negative greenhouse gas intensity.

In addition to supporting SB 596 implementation, many of these policy approaches, especially specifying the use of carbon sequestered concrete, would have the added benefit of supporting the State’s carbon removal goals and broader objectives of the Climate Change Scoping Plan for achieving carbon neutrality.

Advance market commitments a critical element of a successful SB 596 framework

Advance market commitments are a particularly important component of a public procurement program to support decarbonizing cement and concrete. The use of AMCs can accelerate the commercialization and scaling of technologies to produce ultra-low carbon/carbon negative cement and concrete. We support comments by the Decarbonized Cement and Concrete Coalition (DC2) related to AMCs, and encourage CARB to highlight their important role in the SB 596 Strategy.

New cement and concrete solutions, including those offered by Blue Planet and several others, hold enormous promise for both zeroing out CO₂ in cement and concrete production and for permanently sequestering CO₂. These solutions have the potential to achieve dramatic carbon reductions—and to eventually achieve the promise of carbon-negative construction. Critically, bringing these solutions to market requires extensive new private sector funding.

⁵ <https://www.gov.ca.gov/wp-content/uploads/2019/09/9.20.19-Climate-EO-N-19-19.pdf>

A key prerequisite for commercial-scale financing is committed offtake, that is customers agreeing in advance to buy the future production of low-carbon cement or concrete plants. Given the outsized role of public agencies in the market for cement and concrete in California, AMCs by the public sector represent a clear demand signal and are regarded as bankable orders, which can unlock private sector investment in deep decarbonization strategies and the required facilities to help them reach commercial scale.

Advance market commitments are increasingly seen as one of the most powerful strategies for accelerating the development and market entry of critical climate solutions. This is the approach taken by the First Movers Coalition—a joint initiative of the Biden Administration and the World Economic Forum—which secured pledges from some of the world’s largest private companies to use AMCs to improve the market for certain low-carbon industrial materials, including cement and concrete. Earlier this year, the U.S. Department of Energy identified the potential need for demand-support measures, such as AMCs, for low-carbon materials in a publicly released Request for Information (OCED-RFI-21-1).

Establishing a public pathway by which California state agencies could enter into AMCs would provide the most promising suppliers with the proof of demand they need to scale-up production. At the same time, it would enable state agencies to establish a pipeline of the ultra-low-carbon materials they will increasingly need to meet California’s climate goals. Furthermore, it would place emerging California companies and their peers in other states at the epicenter of a global effort to decarbonize the cement industry.

Thank you for your consideration of these comments, and we look forward to working with you to implement SB 596 – as well as related strategies such as the LCFS, Cap-and-Trade, and SB 905 – in the coming months.

Sincerely,

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