



October 11, 2024

Dr. Hanjiro Ambrose  
California Air Resources Board  
1001 I Street  
Sacramento, CA 95814

**Re: Blue Planet Comments on the Kick-off Workshop on Building Embodied Carbon**

Dear Dr. Ambrose:

Thank you for the opportunity to comment on the September 19, 2024, Kick-off Workshop on Building Embodied Carbon. Our built environment offers a tremendous opportunity to develop a fully scalable and permanent carbon sink to support achievement of California's carbon neutrality goals.

We encourage CARB to think holistically about embodied carbon of buildings and building materials, accounting not just for the carbon associated with manufacturing materials and construction, but also the carbon *stored* in the materials and building itself. We also appreciate the nuance and challenges associated with the use of Environmental Product Declarations (EPDs) that were highlighted at the workshop. We encourage CARB to support use of alternative protocols and accounting methods in its embodied carbon framework, including the use of the CarbonStar standard for accounting for the embodied carbon of concrete.

**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 CO<sub>2</sub> into high-value building materials. Our technology can be deployed at cement facilities or other difficult-to-decarbonize industries and captures not only CO<sub>2</sub>, but also particulate matter, NO<sub>x</sub>, SO<sub>x</sub> 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. Our demonstration plant in Pittsburg, California has been operating for about three years, and we are currently upgrading the batch plant to incorporate automation, which should be completed over the next 3-6 months. Our carbon-sequestered aggregate has also 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 CO<sub>2</sub> utilizing the carbon mineralization process. It allows lower-cost carbon capture by avoiding the need to purify and enrich captured CO<sub>2</sub> 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.

### **Carbonate mineralization offers a significant, timely and permanent CCRUS solution to advance California’s climate change goals**

As identified in the 2022 Climate Change Scoping Plan, carbon capture, removal, utilization and storage (CCRUS) will be critical to achieving California’s 2030, 2045 and ongoing climate change goals. Indeed, pursuant to direction from the Governor, the Scoping Plan establishes annual CCRUS goals of 20 million metric tonnes CO<sub>2</sub> (MMTCO<sub>2</sub>) by 2030 and 100 MMTCO<sub>2</sub> by 2045. Achieving these levels of CCRUS will require development of significant sources of permanent carbon storage, in addition to geologic storage.

While several technical, legal, and economic questions remain related to geologic sequestration, carbonate mineralization offers a fully scalable, permanent carbon storage solution ready for deployment today. As described in our July 9, 2021, comments related to the Scoping Plan kickoff workshops and validated in peer-reviewed research, the mineralization process permanently stores carbon in rock and can then be used in concrete and stored in our built environment.<sup>1</sup> California uses enough concrete every year that it could store nearly all the carbon needed to meet the state’s CCRUS goals in carbon-sequestered aggregates in the state’s buildings and roads.

We appreciate the State recognizing the opportunity around carbon mineralization and storage in concrete, including:

- In the Final 2022 Scoping Plan Update, CARB discusses the role of carbon capture and carbonate mineralization in the context of decarbonizing concrete and other sector transitions, stating “direct air capture and carbon mineralization have high potential capacity for removing carbon...”<sup>2</sup>
- The CEC identifies carbonate mineralization, including carbon storage in aggregates as one of the most promising strategies for decarbonizing the cement sector:<sup>3</sup>

Capturing carbon from industrial processes and then utilizing it in a product is considered one of the essential components for mitigating CO<sub>2</sub> 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,

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

<sup>2</sup> 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>

<sup>3</sup> See pg. 10 at: [https://esd.dof.ca.gov/Documents/bcp/2223/FY2223\\_ORG3360\\_BCP5441.pdf](https://esd.dof.ca.gov/Documents/bcp/2223/FY2223_ORG3360_BCP5441.pdf)

such as mineral carbonation, includes adding carbon into cement to enhance the concrete's compressive strength. With almost 4 billion tons of construction aggregate produced in North America, mineral carbonation could be the most efficient route to CO<sub>2</sub> utilization.

### **California's embodied carbon framework should account for both embedded emissions and carbon stored in building materials**

Buildings and materials are not direct sources of emissions, and therefore embodied carbon accounting tracks emissions associated with other processes that go into developing a material. It is important, therefore, for embodied carbon accounting to also include any carbon that might be stored in building materials. By fully accounting for both emissions generated in the production of a building material as well as carbon storage in the material, embodied carbon accounting can offer a complete picture of a material or building's carbon profile. The state's embodied carbon framework should include both positive (embodied carbon emissions) and negative (embodied carbon storage) accounting elements, allow for building materials with net-negative embodied carbon (i.e., those storing more carbon than embodied emissions in the material), and include CCRUS in building materials in accounting towards the 40% reduction target included in statute.

Including carbon storage in the state's building embodied carbon framework will support a wide array of new and emerging technologies and climate strategies, including development of concrete and buildings as scalable carbon sinks to store captured or removed carbon and accelerate the state's climate goals. We urge CARB to ensure that carbon storage in buildings and materials is a key element of its embodied carbon framework and accounting.

### **Alternative accounting standards, including CarbonStar, should be supported to overcome challenges with environmental product declarations (EPDs)**

We appreciate the thoughtful and candid conversation about EPDs that was presented at the workshop, and agree that several challenges and barriers exist related to their use. EPDs can be very expensive for manufacturers to prepare and vary greatly for every concrete mix design. AB 2446 (Holden), subsequently amended by AB 43 (Holden), requires CARB to develop an embodied carbon framework that includes submission of EPDs or "similarly robust material life-cycle assessment approaches."<sup>4</sup> Pursuant to the statute, and considering the wide array of challenges facing EPDs and highlighted in the workshop, we encourage CARB to incorporate and allow for a wide array of validated lifecycle accounting standards to be used in the building carbon framework.

For example the Standards Council of Canada (SCC), a Canadian crown corporation with a government mandate to promote standardization, funded the development of the CarbonStar Standard, and engaged the Canadian Standards Association (CSA Group), a not-for-profit association engaged in standards development and certification, to spearhead its development. CSA developed CarbonStar through a consensus standards development process approved by SCC and the American National Standards Institute (ANSI).<sup>5</sup> The result is CSA/ANSI R118,

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<sup>4</sup> [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=202320240AB43](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240AB43)

<sup>5</sup> [https://www.csagroup.org/store/product/CSA-ANSI\\_R118%3A24/](https://www.csagroup.org/store/product/CSA-ANSI_R118%3A24/)

CarbonStar – National Standard of Canada/American National Standard. As described in the Standard, “The Standard provides minimum requirements and recommendations for the quantification and verification of the carbon intensity in a unit of concrete, including any carbon that is permanently sequestered during the production of concrete and/or its input materials.”<sup>6</sup>

CarbonStar focuses solely on global warming potential (GWP) information and provides an easy to compare quantification of embodied carbon among concrete mixes. Compared to EPDs, which account for many other impacts than embodied carbon and GWP, CarbonStar offers an easy protocol for concrete manufacturers to calculate lifecycle GWP associated with their process and product, and for builders to understand the embodied carbon impacts of products they use. We recommend that CARB allow for CarbonStar and other potential standards that may emerge to be used in its embodied carbon reporting requirements, in order to provide the greatest flexibility for reporting and maximize participation in the state’s building embodied carbon framework while minimizing potential costs and burdens on reporting entities.

### **Reporting requirements should be broad and capture all market participants and sources of emitted or captured carbon in a building material**

We believe all relevant public sector and private sector entities should understand and report embodied carbon, including manufacturers, building owners/developers, and contractors. It is especially important to have producers of materials report – including cement, concrete, and aggregate suppliers. For concrete and aggregate suppliers and users, in particular, reporting entities should track and report whether any embodied CO<sub>2</sub> is captured via effective carbon abatement or removal and permanently mineralized and sequestered in the building/material.

Blue Planet is interested in working early with CARB to help define reporting tool development and provide input on the methodology used in baseline development and data robustness, including CCRUS via mineralization.

### **Embodied carbon framework should drive investments in low carbon materials and CCRUS in the built environment**

To effectively reduce embodied carbon in building materials and support California’s climate goals, a holistic approach is needed to drive investments and rapid scale up of low carbon materials production and CCRUS in the built environment. This approach should include both supply-side measures—such as decarbonizing concrete production—as well as demand-side measures that promote public and private procurement and use of low-carbon concrete and CCRUS in the built environment.

Public procurement plays a crucial role in advancing low-carbon and negative-carbon concrete and other building materials. Government entities, including Caltrans and other agencies, account for a significant portion of concrete use, giving them the power to drive the market in California. By setting clear procurement guidelines that prioritize low-carbon materials and CCRUS in the built environment, state agencies themselves can drive innovation and decarbonization of the building materials industry. For example, specific product specifications,

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<sup>6</sup> See page 8 of the standard, available here: [https://www.csagroup.org/store/product/CSA-ANSI\\_R118%3A24/](https://www.csagroup.org/store/product/CSA-ANSI_R118%3A24/)

such as those used by San Francisco Airport<sup>7</sup> or Dublin's new Low-Carbon Concrete Code,<sup>8</sup> can drive demand for greener building materials. Other potentially helpful procurement policies include incorporating cement and concrete into the State's Buy Clean framework; offering tax incentives or bid preferences to concrete producers who provide reduced carbon products, such as New Jersey's Low Embodied Carbon Concrete Leadership Act (LECCLA S287); developing Low Carbon Product Standards or trading schemes pursuant to AB 43; and further strengthening embodied carbon requirements in the CALGreen building code – including stretch codes requiring the use of carbon-sequestered concrete and concrete with net-negative greenhouse gas intensity. These efforts would all help move the bar on embodied carbon emissions and further incentivize innovation in the private sector by lowering the green premiums typically associated with low-carbon products during the early stages of adoption.

Advance Market Commitments (AMCs) are particularly essential for stimulating investment in low-carbon concrete technologies. AMCs provide long-term purchasing commitments, helping to secure the financing needed to scale up production of new, low- and negative-carbon building materials. By guaranteeing future demand, AMCs offer a clear market signal that can unlock private investment, accelerate commercialization, and drive down costs. Government agencies can use these commitments to support the deployment of ultra-low carbon and even carbon-negative building materials, thereby aligning construction practices with California's broader decarbonization strategy.

Finally, as CARB implements the SB 905 CCRUS framework, it will be critical to develop new CCRUS protocols for mineralization and carbon storage in building materials, including aggregates and concrete, to enable additional value streams through programs like the Low Carbon Fuel Standard (LCFS) and the Cap-and-Trade Program and help reduce the costs and support development of new low carbon building materials. By incorporating new CCRUS protocols and incentivizing the use of materials that store captured carbon, the state can further accelerate its transition to carbon-neutral construction. These policies, combined with supportive procurement practices, would enable California to lead in the development of sustainable building practices that are integral to meeting its climate goals.

Thank you for your consideration of these comments. We look forward to working with you to implement the state's building embodied carbon framework and related programs pursuant to SB 596, SB 905, SB 253, SB 261, the Low Carbon Fuel Standard, Cap-and-Trade, and others.

Sincerely,

David Gottfried  
Chief Commercial Officer  
Blue Planet Systems Corporation

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<sup>7</sup> For example, as part of its renovation of the international terminal, SFO specified concrete with a maximum CarbonStar rating of 200 lbs/yd<sup>3</sup> and a regenerate goal of -200 lbs/yd<sup>3</sup> for part of the project.

<sup>8</sup> [https://www.independentnews.com/news/dublin\\_news/dublin-to-require-low-carbon-concrete-in-all-new-projects/article\\_94ffc378-706e-11ef-a5a2-cb3ece448894.html](https://www.independentnews.com/news/dublin_news/dublin-to-require-low-carbon-concrete-in-all-new-projects/article_94ffc378-706e-11ef-a5a2-cb3ece448894.html)