To whom it may concern,

In the 2022 Climate Scoping Plan the California Air Resources Board authors have notably and very correctly identified the importance of land management in climate change management and in the path of action to achieve carbon neutrality by 2045. As described in the Plan, land management represents a significant portion of the carbon dioxide equivalent (“CO2”) emissions budget for the State. Yet, even in the Proposed Scenario for emissions reduction, Natural and Working Lands (NWLs) are expected to remain a Net Emissions Source in CA. This is complicated by the high likelihood of continued mega wildfires which pose the compounded problems of releasing CO2 during the combustion of CA forests, and the further release of CO2 through the impairment of our scarred soils. The magnitude of this problem is increasing as wildfire encroaches on the urban and wildland interface, consuming transitional biomes as well as Developed Lands.

NWLs pose unique opportunities for carbon sequestration, and climate planning should be done with an eye that NWLs become a net CO2 sink, perhaps compared to all other mitigation alternatives. In recent years, concerns over the degradation of agricultural soils due to industrial farming practices have been highlighted. An estimated 10% of annual CO2 emissions is associated with agricultural soils management, and 30% of annual CO2 emissions can be attributed to the food production system overall. The Rodale Institute makes a compelling case that robust soil management, on a Global Scale, has the potential to sequester all the world’s human-made sources of emissions.

The use of innovative soil health restoration techniques has also been championed in recent years. Techniques include the use of composts as soil amendment leading to rapid improvements in soil structure and chemistry and thus mitigating erosion, a leading source of emissions, in many different types of environments. Importantly, the restoration of thriving soil microbial communities is thought to be the main driver in carbon sequestration in agricultural and rangeland soils.

As described, the Scoping Plan seeks to implement near- and long-term actions to accelerate carbon sequestration and build climate resilience to serve all communities and in particular the disadvantaged and vulnerable. For Developed Lands, the Scoping Plan and the NWL Climate Smart Strategy call for investments in Urban forestry practices such as increasing urban tree canopy to reduce heat island effects while implementing drought sensitive tree watering and maintaining defensible space to reduce fire risk. Other areas include an emphasis on “green” stormwater infrastructure such as bioswales.

It should be emphasized that rebuilding soil health is of paramount importance for CA’ s Developed Lands, as well as other NWL types. Planting alone is insufficient for CO2 sequestration benefits – sustained microbial biomass is necessary for plant nutrition and water needs. A survey of Developed Lands in CA highlights a large-scale land management problem throughout the State. In present day CA, Urban soils are highly degraded along roads and highways, at construction and development sites, at many urban parklands, and perhaps especially at impaired lands. These lands have sparse, invasive or monoculture vegetation. They are typically covered with litter – most notably plastic wastes. Urban soils are characterized as compacted, lacking aeration and failing to allow infiltration. These lands are also contaminated with heavy metals, organic chemicals, including pesticides, oils and greases, and tire wear.

Due to their poor properties, Developed Lands are highly prone to erosion and contaminant leaching. Eroded particles from Developed Lands foul stormwater and clog receiving waters – impairing their health, growth and ultimately their CO2 sequestration potential. Wildfire too is increasingly damaging soils in these areas as well as forested areas, as fire now regularly encroaches on Developed Lands comingling soil contaminants and short circuiting the soil ecosystem and stressing our State’s water resources.

Managing impaired soils requires a systems approach integrated with traditional knowledge and the regenerative agriculture awakening. In my view, promoting soil health to achieve CO2 sequestration is interconnected with our approaches to management of stormwater, wastewater, wastewater residuals (aka biosolids) and other solid wastes (e.g., manures, food waste, and green waste). Management of these by-products of the systems within our Urban ecosystems is critical for CA’s soils to thrive and provide the ecosystem services and climate change relief that we are counting on for a healthy and prosperous lifestyle.

Several waste management approaches offer climate benefits that could be traded for the current large-scale prices we pay for mismanagement of these by-products. A prime example is hauling and landfilling waste materials far from the point-of-use that could be recycled or repurposed. In the case of plastic wastes, avoiding disposal in favor of reuse defers new emissions from production and also from landfilling. In the case of biosolids, land applied materials aid considerably in carbon sequestration outcomes. Both of these reuse paths represent CO2 emissions mitigation potential, as compared to the status quo. These also defer the emissions sources associated with transporting and landfilling the materials as wastes. They are integrated by the idea that keeping plastic pollution from our soils is needed to produce and apply high quality organic amendments, such as high quality biosolids. Prioritizing land management in Developed Lands provides significant added environmental benefits in these two examples.

Roadsides, urban forests and the wildland urban interface need the soil moisture and nutrients provided by biosolids but currently biosolids are seen as a burden on our management systems. While it is true that biosolids contain microplastic waste, it is also true that Urban soils, and potentially wildland soils, already contain high levels of microplastic – to a degree that additives would make a very small difference in the mass balance. The use of plastic in industrial agriculture is polluting these soils at an alarming rate and at the same time limiting opportunities for carbon sequestration on these lands. Other potentially valuable by-products, especially green waste and food waste, also contain high levels of contamination including but not limited to microplastics. These by-products all have soil health benefits when applied correctly – and defer emissions when land applied. Indeed, composted biosolids have much less potential for environmental pollution than other organic wastes.

Poor waste management, coupled with wildfire impacts, is posing extreme public health pressures across CA. Failure to manage solid wastes generates significant sanitation problems and ultimately pollutes CA’s receiving waters – lakes, rivers, estuaries and our beloved Pacific Ocean. Many of these problems are the result of poorly managed stormwater, poorly managed urban soils, and the failures of CA solid waste management systems. The impacts from fugitive plastic waste pose untold ecological burdens on our most precious resources and result and now we know that these wastes pollute our stormwater and inestimable levels. In order to combat these impacts, we must employ systematic management approaches to our solid waste streams and thus improve the quality of our stormwater. Stormwater management systems such as bioswales to improve stormwater and wastewater quality but rely on organic amendments for success.

The scoping plan and NWL Climate Smart Strategy should more fully consider the extremely powerful, and necessary, carbon sequestration potential of Urban and Developed Lands achieved through waste management paradigms. Poor waste management practices result in large-scale CO2 emissions when in fact these wastes can be nutritive and should provide climate mitigating forces through the re-establishment of vegetation, soil building and carbon sequestration.

Biosolids use on Developed Lands is perhaps the most effective way to achieve several health soil outcomes. Biosolids are the most important ingredient in soil management and readily available at the wildland urban interface –wastewater treatment plants are often proximal to impaired developed lands. Biosolids and other high organic content residuals are extremely nutritive to soils and can rapidly change the soil’s ability to generate vegetative cover – quickly reducing erosive loss. What is often overlooked is that biosolids provide an injection of moisture, nutrients and most importantly, soil microbes needed to restore soil health and structure – reanimating the soil. We must focus on keeping plastic pollution out of the environment while emphasizing the critical role of our organic by-products in restoring soil health. By re-imagining how to manage our Urban soils, and integrating our waste management priorities, we have the power to make NWLs a net CO2 sink while also improving many aspects of CA’s unique Natural environment.

**Biographical Details**

Harry is an environmental scientist with the US EPA Southwest Regional Office where he has served since 2002. He is a former adjunct professor at the University of San Francisco in the Department of Environmental Management. Harry is a member of St. James Parish, South Pasadena, and the Greater Los Angeles Area Council of Scouts BSA. He lives in South Pasadena with his wife, Herodia, 2 daughters and 1 son.

Harry has extensive experience in environmental emergency response, pollution investigation, and remediation through his work for the Region 9 Superfund Division. Harry also specializes in the identification and quantification of microplastics in the environment with over 10-years of experience in the field. He also is an expert in the safe and effective use of biosolids in land reclamation.

Harry serves as an advisor to ASTM International D19 committee, the CA Association of Sanitation Agencies, the CA Ocean Protection Council, the Water Environment Federation, and the Sean N. Parker Center for Allergy and Asthma Research at Stanford University and many other CA universities.

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