KAJIADO RANGELANDS CARBON PROJECT

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Kajiado Rangelands Carbon Project (KRCP), developed by Soils for the Future Africa in partnership with CarbonSolve, LLC, is an approximately 1.0-million-hectare soil carbon in Kajiado County, Kenya, along the central part of the southern border with Tanzania. Importantly, it uses the same methodology as the validated Verra VCS-CCB Northern Kenya Grassland Carbon Project (#1082), the VM0032 methodology authored by Soils for the Future, LLC. As with the Northern Kenya project, the KRCP involves a two-tiered approach to monitoring project activities and resultant impacts by 1) tracking on-the-ground movements of livestock via grazing coordinators, and 2) remotely measuring the impacts of grazing on vegetation via satellite imagery.

The project proponent will engage with local communities that are acting as either "registered communities" under the Kenya Community Lands Act of 2016 or private landholders with title deeds to their land, such as privatized former Group Ranch lands (e.g., organized as livestock "cooperatives" under the Kenya Co-operatives Act, Cap. 490 of 2005) to implement rapid rotational grazing (RRG) practices that actively restore forage production, remove carbon dioxide (CO_2) from the atmosphere to soil organic carbon (SOC), and enhance biodiversity. The KRCP will accrue exceptional benefits in community adaptation to climate change, improved community well-being, and increased biodiversity in a crucial swath of southern Kenya's savannas and grasslands. The project location straddles the crossroads between world-famous High Conservation Value protected areas: four Kenyan National Parks (Amboseli, Chyulu Hills, Tsavo, and Nairobi); one National Reserve (Maasai Mara); and four Tanzanian National Parks (Kilimanjaro, Arusha, Tarangire, and Serengeti).

In addition, the project will foster additional community High Conservation Values via the preservation of indigenous Maasai pastoralist culture. Restoring the rangelands will also confer many community benefits. Threatened by the encroachment of crop agriculture, and by usurpation and displacement by government, the rangelands are at the center of this project's theory of change. The more productive and sustainable the Maasai's grazing practices prove, the harder the justification to appropriate Maasai rangelands to other uses. Access to deep-rooted perennial grasses and abundant soil carbon will increase the climate adaptability of local communities because soils with more carbon store more water and sustain greater forage production via improved nutrient cycling, that has distinct benefits during dry periods. The prolonged practice of RRG in the project will restore perennial grasses and other livestock forage, which will provide buffers against variable rainfall and reduce the need for long and risky migrations during droughts. Water retained in soils will have the added benefit of improving surface water availability and making intermittent water sources more reliable and longer-lasting, and protecting perennial water sources from vulnerability to extreme drought. Restoration of perennial grasses and soil water storage capacity will also bring important biodiversity benefits. The project area is home to multiple species listed as Endangered or Critically Endangered by the International Union for Conservation of Nature (IUCN), including iconic African mammals like the savanna elephant (*Loxodonta africana*) and the lion (*Panthera leo*).

1.2 Audit History

There is no audit history of this project, as this edition of this document is the first submission for listing as under development.

1.3 Sectoral Scope and Project Type

Sectoral Scope	14: Agriculture, Forestry and Other Land Use
AFOLU project category[1]	Improved Grassland Management
Project activity type	Grouped

1.4 Project Eligibility

1.4.1 General eligibility

The project is eligible under the scope of the VCS Program. The project activities affect Kyoto Protocol greenhouse gases (GHGs), reporting on changes in carbon dioxide, nitrous oxide and methane due to the project activity. The project uses an approved Verra methodology (VM00032) to report these changes.

- Adhering to the Principles of the VCS Program.
- Being a form of Improved Grassland Management (IGM) and thus an eligible Agriculture, Forestry, or Other Land Use (AFOLU) project category. The project activities will use grazing management practices to increase the amount of carbon sequestered within soil.
- The project area has not been cleared of indigenous vegetation within the decade prior to the start date.
- The project will not be implemented in wetlands or peatlands.

1.4.2 AFOLU project eligibility

The project activity is a form of IGM and thus an eligible AFOLU project category. The project activities will use grazing management practices to increase the amount of carbon sequestered within soil.

The project area has not been cleared of indigenous vegetation within the decade prior to the start date.

1.4.3 Transfer project eligibility

The project is not a transfer project.

1.5 Project Design

[1] *See Appendix 1 of the* VCS Standard

☐ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☒ Grouped project

1.5.1 Grouped project design

The grouped project will add new participating communities as new project instances over time. The specific communities to join and the schedule by which they will join is still being determined.

1.6 Project Proponent

Organization name	Soils for the Future Africa Ltd
Contact person	Timothy H. Tear, Ph.D.
Title	Director
Address	276 Canco Rd Portland, ME 04103, USA
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1.7 Other Entities Involved in the Project

Organization name	CarbonSolve, LLC
Role in the project	Technical lead, climate benefits
Contact person	Mark Ritchie, Ph.D.
Title	Director
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Telephone	+1-315-447-1612
Email	mark.ritchie@carbonsolve.world

Organization name	Climate Asset Management as Portfolio Manager for the Nature Based Carbon Fund (NBCF) (Fund)

Role in the project	Investor
Contact person	Caroline van Tilborg
Title	Senior Carbon Investment Manager
Address	Hill House, 1 Little New Street, London, EC4A 3TR, United Kingdom
Telephone	+31 683 792 828
Email	Caroline.vantilborg@climateassetmanagement.com

Organization name	Converge Analytics
Role in the project	Technical lead, community benefits
Contact person	Deepali Gohil
Title	Executive Director
Address	Westlands, Nairobi, Kenya
Telephone	+254 702 788 055
Email	gohil@convergeanalytics.com

Organization name	Biodiversity Research Institute
Role in the project	Technical lead, biodiversity benefits
Contact person	David Evers, Ph.D.
Title	Executive Director
Address	276 Canco Rd Portland, ME 04103 USA
Telephone	+1-207-653-7378
Email	david.evers@briwildlife.org

Organization name	Olgulului Group Ranch
Role in the project	Participating community

Contact person	Daniel Kiria Leturesh
Title	Chairman
Address	P.O. Box 388, Loitokitok, Kenya
Telephone	+254 721 392 296
Email	danielleturesh@gmail.com

Organization name	Eselenkei Group Ranch
Role in the project	Participating community
Contact person	Jackson Lemomo Mereesi
Title	Chairman
Address	P.O. Box 399-90132, Sultan-Hamud, Kenya
Telephone	+254 726 078 085
Email	mereesi@yahoo.com

Organization name	Olkiramatian Community Land
Role in the project	Participating community
Contact person	Paul Koileken Senteu
Title	Chairman
Address	P.O. Box 20, Magadi, Kenya
Telephone	+254 724 957 742
Email	smartpkoileken@gmail.com

Organization name	Shompole Community Land
Role in the project	Participating community
Contact person	Joel Karori Sapiyaya

Title	Chairman
Address	P.O. Box 32, Magadi, Kenya
Telephone	+254 721 134 428
Email	Karorijoel93@gmail.com

Organization name	Olkeri Group Ranch
Role in the project	Participating community
Contact person	Thomas Kunumpe Metian
Title	Chariman
Address	P.O. Box 29, Magadi
Telephone	+254 719 470 665
Email	tometian@gmail.com

Organization name	Mailua Group Ranch
Role in the project	Participating community
Contact person	Daniel Koikai Kironua
Title	Chairman
Address	P.O. Box 47-00207, Namanga, Kenya
Telephone	+254 727 709 439
Email	danielkoikai@gmail.com

Organization name	Oldonyonyokie Group Ranch
Role in the project	Participating community
Contact person	Daniel Ngotiek Nchui
Title	Chairman

Address	P.O. Box 74, Magadi, Kenya
Telephone	+254 725 076 957
Email	danielnchui@gmail.com

1.8 Ownership

Project ownership is established with those entities that have legal ownership and/or management authority to the land for implementing RRG activities that will produce the carbon credits. This includes lands registered under the Community Lands Act of 2016, those communities that have formed legal entities if they did not register under the Community Lands Act (e.g., cooperatives, businesses, or trusts), and private individuals that hold title deeds documenting ownership of the land that is not held by a collective. Cooperative agreements are made between the project proponent and the participating communities and individuals who own the interest in the land that confers grazing management rights and carbon rights. The Memorandums of Understanding (MOUs) and the Benefit Sharing and Transfer of Carbon Rights Agreements between the local communities and Soils for the Future Africa provide proof of project ownership to satisfy the VCS specifications. Together with the property rights of the local communities and individuals, these documents constitute "[a]n enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the land, vegetation, or conservational or management process that generates GHG emission reductions or removals which vests project ownership in the project proponent." (VCS Standard Version 4.5, section 3.7.1).

1.9 Project Start Date

Project start date	01 October 2023
Justification	Project activities commenced with grazing plans

1.10 Project Crediting Period

Crediting period	☐ *Seven years, twice renewable* ☐ *Ten years, fixed* ☒ *Other (40 years)*
Start and end date of first or fixed crediting period	01-October-2023 *to* 30-September-2063

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the estimated annual GHG emission reductions/removals (ERRs) of the project:

☐ < 300,000 tCO2e/year (project)

☒ ≥ 300,000 tCO2e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
Year 2023	379,146
Year 2024	682,463
Year 2025	1,661,512
Year 2026	1,661,512
Year 2027	1,661,512
Year 2028	1,661,512
Year 2029	1,661,512
Year 2030	1,661,512
Year 2031	1,661,512
Year 2032	1,661,512
Year 2033	1,661,512
Year 2034	1,661,512
Year 2035	1,661,512
Year 2036	1,661,512
Year 2037	1,661,512
Year 2038	1,661,512
Year 2039	1,661,512
Year 2040	1,661,512
Year 2041	1,661,512
Year 2042	1,661,512
Year 2043	1,661,512

Year 2044	1,661,512
Year 2045	1,661,512
Year 2046	1,661,512
Year 2047	1,661,512
Year 2048	1,661,512
Year 2049	1,661,512
Year 2050	1,661,512
Year 2051	1,661,512
Year 2052	1,661,512
Year 2053	1,661,512
Year 2054	1,661,512
Year 2055	1,661,512
Year 2056	1,661,512
Year 2057	1,661,512
Year 2058	1,661,512
Year 2059	1,661,512
Year 2060	1,661,512
Year 2061	1,661,512
Year 2062	1,661,512
Total estimated ERRs during the first or fixed crediting period	64,199,065
Total number of years	40
Average annual ERRs	1,604,977

1.12 Description of the Project Activity

The key project activity is the implementation of a form of High Density-Short Duration (HDSD) grazing as defined by Chaplot et al. 2016. For the purposes of this project, we refer to the generalized set of grazing management techniques as rapid rotational grazing (RRG). These techniques will be used in grazing plans that will be conducted by local communities and overseen by locally hired grazing

coordinators. In recent years, RRG has been increasingly recognized as a globally significant ecological restoration tool with the power to reverse the degradation of grasslands from overgrazing and drought, if implemented properly under the right conditions. At its core, RRG means speedy and coordinated movement of livestock to new areas of forage, which allows the rest and recovery of perennial grasses on recently grazed areas. This perennial grass recovery in turn leads to greater carbon inputs to the soil and removal of greenhouse gases from the atmosphere. Crucially, increased soil carbon causes and/or accompanies enhanced soil water retention capacity, enhanced plant diversity (with accompanying increases in overall food web biodiversity), and improved forage for wildlife and for healthy, marketable livestock for pastoralists.

Improved grazing management in the project is modeled on traditional grazing practices implemented by Maasai in the region for centuries (NTRI 2019), and with some important changes (e.g., ensuring RRG *within* wet and dry season grazing areas as well as *between* seasonal grazing areas) will yield significant removal of CO_2e from the atmosphere. This crucial climate benefit will be rigorously verified by closely monitoring altered grazing intensities, records of the time, timing and number of livestock grazers using different portions of the project area, and by measuring vegetation change across the 979,869 hectares of the project area. The project is expected to remove more than 1.6 million tonnes CO_2e per year on average, and more than 64 million tonnes CO_2e over the 40-year project lifetime.

1.13 Project Location

The KRCP is situated entirely within Kajiado County, Kenya, and includes a subset of the communities in the county as participants in the carbon project. The project boundary is shown in Figure 3.1 and a separate KML is provided.

1.14 Conditions Prior to Project Initiation

In southern Kenya, traditional nomadic movements of family groups prior to 1960 have been gradually replaced by sedentary communities whose members then continuously graze surrounding rangeland, leading to large areas of bare ground, eroded soil and diminished forage and livestock productivity. Changes to Kenya's land tenure system, particularly the Community Lands Act of 2016 (CLA), have further promoted privatization of former community-managed grazing lands. Establishment of land ownership, coupled with food insecurity resulting from severe droughts in 2017-18 and 2021-23, has encouraged the sale of private parcels, thus eroding the capacity of Maasai communities to engage in pastoralism, their traditional lifestyle. The carbon project will counter these trends by providing incentives for private landholders to join the carbon project either as individuals or as communities – whether they are registered as CLA communities or as new "communities" (e.g., newly formed cooperatives), and allowing them to benefit from the higher livestock stocking rates that RRG proffers, on the condition of maintaining open land and following coordinated grazing plans. These incentives reduce the need for households to sell their lands, help maintain open rangelands and pastoral lifestyles, and encourage strong collective participation in allocating project revenue shares to meet community needs.

The project area, like much of the rangelands of southern Kenya, has been heavily impacted by overgrazing by pastoralists, which is driven by human and livestock population growth, sedentary lifestyles, and limited access to formerly communal grazing lands (Homewood and Thompson 2010, Norton-Griffiths and Said 2010). Overgrazing in the region has degraded rangelands, especially those closest to permanent settlements, depleted soils of organic matter, and reduced perennial vegetation cover in favor of annual vegetation or bare ground, and damaging the potential production of forage to support healthy livestock. This chain of causation is common to semiarid rangelands across the globe that are subject to overgrazing (Bardgett et al. 2021, Maestre et al. 2022), and a significant contributor to the loss of soil carbon and the addition of greenhouse gases to the atmosphere (Bai and Cotrufo 2022). As an alternative, RRG in semiarid rangelands means moving grazing animals regularly to avoid overgrazing and sometimes great distances to chase rainfall events and fresh forage.

The ecosystem type is arid to semiarid savanna grassland. The current and historical land use is mostly grazing, with some protected areas where wildlife conservation and tourism are also practiced. Hunting is against the law in Kenya.

Topography:

The Great Rift Valley cuts north-south through the western half of Kajiado County and is occupied by lowland plains at roughly 500 meters above sea level (asl) at its lowest points. The lowlands are notably broken by the Shompole volcano which rises above 1,500 meters asl near the Tanzanian border and Lake Natron. West of the Great Rift Valley, the highlands of the Nguruman Escarpment form the western boundary with neighboring Narok County, roughly 1,400 meters above sea level. In the north, the Ngong Hills top 2,400 meters and descend to the Kitengela Plain on the outskirts of Nairobi and the border with Nairobi County. In the east lie the expansive Amboseli plains at roughly 1,200 meters asl, bounded by the Chyulu Hills which rise to 2000 meters asl at the eastern border with Makueni County. To the south the plains slope gently upward toward Kilimanjaro, reaching 2,000 meters asl at the Tanzanian border. The other southern topographic feature to note is the Namanga Hills which rise above 2,500 meters asl.

Soils:

The project area features four major types of soils. 1) Reddish-brown sandy loam soils predominate in the project area that are comprised of 50-60% sand content and clay content varying from 15-35%. In areas northwest of Mt. Kilimanjaro these soils have higher silt content from volcanic tephra deposits and feature substantial gullying and other evidence of water erosion. 2) Elsewhere the project area features lava plateaus, particularly east of Lake Magadi and west of the Nairobi-Namanga highway. These soils have a characteristically high proportion of rocks, are dark in color and have a relatively high (40-50%) clay content, traits characteristic of relatively recent lava flows (< 3 million years old) in the process of degradation to soil. 3) Much older lava flows in the eastern portion of the project area have poorly developed, shallow black cotton soils (vertisols) with high clay content that can be waterlogged during wet seasons. 4) In Amboseli National Park itself, saline-sodic soils predominate in the low points of the endorheic (evaporative) basin.

Climate:

Most of Kajiado County is semi-arid, with mean annual rainfall ranging from 300 mm to 800 mm, with the wettest areas at higher elevations to the north. Most rainfall occurs during the two rainy seasons, the short rains in October-December and the long rains in March-May. Mean annual temperature also varies across the project area, from 18oC in the higher elevations in the northern and central part of the project area, to nearly 24oC in the Lake Magadi and Amboseli basins.

Hydrology:

Major rivers include: the Tsavo River, which rises at the foot of Kilimanjaro and flows east into Taita-Taveta County; the Uasa Nyiro River, which flows south along the western side of the Rift Valley; and the Athi and Kitengela Rivers, which flow north into Machakos County. Many borehole wells have been drilled to access groundwater, especially in central Kajiado County and in the southeast in the Kilimanjaro foothills. The Amboseli and Magadi endorheic basins are the dominant open water features of the Kajiado landscape.

Types of vegetation:

The climate and the alkaline volcanic-influenced soils support classic Vachellia (formerly Acacia) and Commiphora wooded savanna across the project area. Different taxa are dominant on different soils, with *Vachellia tortilis* dominant on more clayey sandy loam soils, Commiphora trothae on more sandy loams, *Vachellia senegal* on lava plateaus, and mixtures of *Vachellia seyal* and *Vachellia drepanolobium* on water-logged black cotton soils. Typical C4 savanna grass species assemblages (e.g., *Cenchrus ciliaris*, *Chloris gayana, Enteropogon macrostachyus, Eragrostis superba*) are found throughout the area.

The County Government Spatial Plan (Kajiado County Gov't 2019) estimates that about 1.99 million hectares or 90% of Kajiado is under natural forage used for grazing. Forest area is only roughly 17,000 hectares or slightly under 1% of the total County area. Open grasslands are predominant around the Amboseli area and the Kitengela Plain in the north, while bush and woodland (woody cover 20-40%) predominate on the higher elevations, with transitional wooded grasslands in between (Kajiado County Gov't 2019).

According to the County Government's 2019-2029 Kajiado County Spatial Plan, only 7,117 hectares of the County (less than 1%) is in agricultural production. Of that, 6,000 hectares is irrigation-fed by river and groundwater sources; the rest is rain-fed (Kajiado County Gov't 2019).

These conditions are the same as the baseline scenario. For a detailed description of the baseline scenario, please see Section 3.4.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is complying with all relevant national, regional, and local laws, statutes, and regulatory frameworks in Kenya that apply to the project activities. The key laws are listed below:

- Land Act, 2012 (Land Act)
- Land Registration Act, 2021 (LRA)
- Community Land Act, 2016 (CLA)
- Land Control Act (Cap. 302) (LCA)
- Kenya Co-operatives Act, 2005 (Cap. 490)
- Wildlife (Conservation and Management) Act, 2013 (Cap. 376)
- Occupational Safety and Health Act, 2007
- Kenya Employment Act, 2007 (Rev. 2012) (Cap. 226)
- Environmental Management and Co-ordination Act, 1999
- Constitution of Kenya, 2010

Devolution is one of the major changes that the Constitution adopted by Kenyans and promulgated in August 2010 has made to the arrangement of government in Kenya (FES 2012). This process could create some disputes as the current Government of Kenya undergoes a process of developing new carbon regulations. The characteristics of Kenya's devolution (as described by FES 2012) are summarized below, highlighting the challenges of a system of that relies on two levels of equal government. The core issue is that there are two levels of government created on equal basis by the Constitution, the County and National governments.

The Constitution divides Kenya into 47 counties with clearly defined geographical boundaries. This is found in Article 6 (1) and in the First Schedule.

Although the Constitution has created two levels of government and forty-seven counties, Kenya is still a unitary state.

Although the two levels are distinct, they are required to respect each other and work in harmony. This is provided for in Article 6 (2) of the Constitution. This means the relationship between the two must be consultative and cooperative.

Neither the County nor the National Government is senior or superior to the other. Both levels of government have power to secure resources. The two governments and institutions established under them are required by the Constitution to ensure participation by citizens in their affairs.

The two levels have democratically elected representatives and autonomous political authority. The elected representatives are for Senate, National Assembly, the President, the County Assembly and the Governor in each of the forty-seven counties.

The two levels of governments have clear mandate to provide a range of significant services. These are outlined in the Fourth Schedule of the Constitution. The two governments can be taken to court or can take others to court. In other words, both the County and National governments are body corporate.

The two governments can hold bank accounts and employ staff. They have the power to control their own budget and accounts and the ability to raise their own revenue. The county governments have been given constitutional authority to make and enforce local legislation. Citizens equal access to available resources at either level is guaranteed.

At the time of writing this document, there are no known ongoing disputes related to devolution and the two levels of government that affect the project area. We only raise this issue because there is some uncertainty over the role of the County Government in the development of the carbon project. The KRCP has letters of no objection from both the Kajiado County and the National Government

In relation to potentially unresolved issues in relation to the devolution of government, the following laws pertain to this issue:

- The County Governments Act, 2012
- The Intergovernmental Relations Act, 2012
- The Urban Areas and Cities Act, 2011
- The Public Finance Management Act, 2012
- The Transition to Devolved Government Act, 2012
- The National Government Loans Guarantee Act, 2011
- The Elections Act, 2012
- The Leadership and Integrity Act, 2012; and
- The Political Parties Act, 2009

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.18 Sustainable Development Contributions

UN Sustainable Development Goal	Project Contributions to Goal
1 No Poverty	The project will contribute to reducing poverty in local communities by enhancing an existing revenue stream from livestock production on local rangelands through healthier animals, greater milk production and potentially a greater number of livestock. The project also introduces a new revenue stream - carbon credit sales - with a substantial portion of revenue going

UN Sustainable Development Goal	Project Contributions to Goal
	directly to communities. In a similar project in northern Kenya, these same project activities were associated with increased milk production during dry seasons, decreased time gathering water, and greater livestock numbers. Finally, the project is also employing part-time and full-time employees from Kajiado County. At the end of 2023, SftFA employed 34 full-time employees, with more hires planned for early 2024.
2 Zero Hunger	The project will promote sustainable agriculture through implementation of RRG, which will strengthen food security by decreasing the likelihood of livestock loss during drought and providing sustained meat and milk production through the dry season.
3 Good Health and Well-Being	Carbon credit payments to communities may be used, at the communities' discretion, to support good health and well-being priorities. This could include funding to health clinics and other health care benefits, thus aiding healthy lives and well-being for all at all ages regardless of income, ethnicity, or other demographics. Improved livestock health and productivity will also result in increased milk production, which will have a direct impact on increased protein availability and sources of vitamins and minerals for infants and youth.
4 Quality Education	Carbon credit payments to communities may be used, at the communities' discretion, for educational benefits. For example, payments could be used to fund bursaries and pay school fees for the poorest community members. Community-led funding of education projects are expected to support inclusive and equitable quality education regardless of income, ethnicity, or other demographics. This project will provide education and professional training opportunities to local grazing coordinators and staff members.
5 Gender Equality	Through progress related to the other sustainable development goals, including food security, education, and health care, opportunities for women and girls will be expanded and gender equality will be improved. The project will employ women in various roles and will engage women in local grazing plans – such as plans for small livestock kept at home to feed family members. These plans will help restore forage production in some of the most degraded areas, which will increase milk for sale, reduce time spent gathering water, and increase women's time and cash opportunities to pursue alternative livelihoods.
6 Clean Water and Sanitation	In the short term, carbon credit payments to communities can be used in part to fund water collection and storage facilities, thus increasing water availability and sustainable management of water in water stressed areas or during times of water scarcity.

UN Sustainable Development Goal	Project Contributions to Goal
	The expected long-term benefits of rapid rotational grazing include increasing soil organic matter, rainfall infiltration, water retention in soil, and the length of time surface and ground water is available for people and livestock.
7 Affordable and Clean Energy	The project will not contribute directly to affordable and clean energy production. However, carbon projects like this one that restore ecosystem services are essential companions to projects that decarbonize sectors of the economy like electricity generation and transportation.
8 Decent Work and Economic Growth	The project promotes sustained, inclusive and sustainable economic growth by introducing carbon credit sales as a new revenue stream to local communities. By introducing and implementing rapid rotational grazing, the project anticipates restoring and enhancing the resource base for production of livestock and livestock products (meat and milk). The project will also create new jobs for some community members – jobs such as grazing coordinators that are culturally acceptable - while allowing others to remain in population centers where education and health services are accessible (e.g., the central office of SftFA is in Kajiado town).
9 Industry, Innovation and Infrastructure	Carbon credit payments to communities could be used in part to fund resilient infrastructure projects such as schools, health clinics, water collection and storage facilities at the discretion of those communities. Revenues, at communities' discretion, may also be used to construct or enhance facilities that allow livestock to be transported to markets and slaughtering facilities, and promote the creation of grass banks that can produce forage that support livestock during the dry season. The project itself models an innovative approach to grazing management and revenue generation that can be implemented in neighboring communities.
10 Reduced Inequalities	Restoring degraded rangelands in partnership with local communities reduces inequality within the country by enhancing traditional livelihoods and introducing a new revenue stream. At least some benefits will be targeted at improving livelihoods of women-led households and the poorest 20% of community members.
11 Sustainable Cities and Communities	Local communities will be made more resilient and sustainable through introducing and implementing rapid rotational grazing and the resulting restoration of degraded rangelands. We anticipate that increased value of rangelands makes it less likely that landowners will convert their native rangelands to agriculture or another land use that may not be sustainable in arid lands especially given changing climate patterns.

UN Sustainable Development Goal	Project Contributions to Goal
12 Responsible Consumption and Production	Rapid rotational grazing will help ensure more sustainable consumption and production patterns by yielding sustained meat and milk production through all seasons while simultaneously promoting perennial grass regrowth.
13 Climate Action	This project takes urgent action to combat climate change by implementing rapid rotational grazing, which will allow recovery of perennial grasses and restore soil organic carbon. On average this project will remove more than 1.5 tCO_2e/ha from the atmosphere annually.
14 Life Below Water	This project indirectly helps conserve and sustainably use the oceans by directly combating climate change by reducing GHGs in the atmosphere, and by association the effects of ocean warming and acidification.
15 Life on Land	Rapid rotational grazing implemented by this project will protect, restore, and promote sustainable use of terrestrial ecosystems in local communities by facilitating vegetation and soil changes. These activities will result in increasing the productivity of degraded rangelands, that support greater livestock production and wildlife/biodiversity resources. Collectively, this will enhance this region's role as a High Conservation Value Area for the Maasai as an indigenous community, and for various declining migratory savannah species such as wildebeest, zebra, Masai giraffe, and savannah elephant. In addition, large carnivores such as lion, cheetah, leopard, wild dog, and spotted hyaena will benefit from enhanced populations of these herbivores, and from sustainable management by Maasai communities.
16 Peace, Justice and Strong Institutions	Rapid rotational grazing will necessitate and foster collaboration across local communities, promoting peaceful and inclusive societies for sustainable development. Regional grazing plans will be developed in close collaboration with village councils and other local community members. Similar grazing plans in other projects have reduced tensions between political entities and ethnic groups and fostered better collaboration among neighboring communities.
17 Partnerships for the Goals	The project will indirectly strengthen the means of implementation of the UN Sustainable Development Goals by enhancing local self-sufficiency within local communities and thus reducing the need for national, regional, and local governments to fund sustainable development programs in this region. This project will serve as a model for bringing in outside investment with the purpose of developing carbon credits and using the proceeds to fund sustainable development locally. This model can be replicated elsewhere.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

According to the VCS VM0032 Methodology, the project proponent must consider two forms of leakage: 1) displacement leakage from the movement of livestock off the project area where they may reduce soil carbon and 2) market leakage, where reductions in livestock numbers as a project activity would create market incentives to replace the lost livestock.

To address *displacement leakage*, the project proponent must prevent or manage incursion of livestock from outside the project area or limit excursion of livestock from inside the project area. Any impacts of such excursions on GHG emissions or reductions outside the project area must be accounted for as leakage. Where the project area is not fenced, such as in open pastoralist systems in the KRCP, the movement and excursion of livestock to more than two kilometers from the project area boundary is considered leakage[2].

Leakage methane emissions are deemed as zero because project methane emissions are accounted from project livestock regardless of whether they are on or off the project area and movement of project livestock off the project area does not result in a net increase in the number of livestock emitting methane. However, the movement of livestock into the project area increases livestock and their methane emissions, for which the project must account. In addition, movement of livestock out of the project area could result in losses of carbon from higher levels of overgrazing off the project area. Leakage may be accounted for in two possible ways – either by a monitored approach or penalty approach. The KRCP will employ the modeled approach where possible, such as when livestock travel outside the project area and can be monitored and their resulting disruption to grazing plans accounted for. Other off-project-area movements that cannot be monitored will likely be treated with the penalty approach. This is due in part to the fact that the *penalty approach* is a more conservative option (leakage calculations will likely be larger) but no monitoring of soils and/or vegetation outside the project area is required and off-project area use of grasslands, croplands, and forests is not differentiated. In this case, displacement leakage must be calculated as a proportion of net removals from increased soil carbon in year *y*, based on the estimated proportion of total project livestock-days in project year that occurred outside the project area.

Market leakage emissions result from an increase in activity by other producers of a commodity outside the project area to compensate for the reduced supply of a commodity from within the project area, such as increased timber harvesting elsewhere in a country to compensate for reduced harvesting in a project area. Market leakage is generally considered to be minimal in ALM projects because the projects still allow the same livelihood choices and production of grassland commodities (e.g., livestock). The applicability condition that limits project size, and thus potential impact of the project on national and international markets, reduces the chance that project activities will result in declining supply of livestock. Nevertheless, market leakage for any intentional reductions in livestock must be

[2] This distance allows for possible uncertainty of herders as to the position of herds in or out of the project area and is a typical allowable buffer between ethnic group communal grazing lands.

made by using the VCS module VMD0033 "Estimation of emissions from market leakage"[3] to estimate LM_y emissions from market leakage.

1.19.2 Commercially Sensitive Information

No commercially sensitive information has been omitted from this document.

1.19.3 Further Information

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.1.2 Stakeholder Consultation and Ongoing Communication

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.1.3 Free Prior and Informed Consent

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.1.4 Grievance Redress Procedure

[3] http://www.v-c-s.org/sites/v-c-s.org/files/VMD0033%20Estimation%20of%20Emission%20from%20Market%20Leakage%2C%20v1.0.pdf

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.1.5 Public Comments

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.2 Risks to Stakeholders and the Environment

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.3.2 Human Rights

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.3.3 Indigenous Peoples and Cultural Heritage

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.3.4 Property Rights

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.3.5 Benefit Sharing

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.4 Ecosystem Health

This section has been omitted in accordance with the Pipeline Listing Process defined in Section 3.1.3 of the Registration and Issuance Process, v4.4 (updated 4 October 2023), which specifies the draft sections that must be included for listing as under development.

2.4.1 Rare, Threatened, and Endangered species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☒ Yes ☐ No

Restoration of perennial grasses and soil water storage capacity will also bring important biodiversity benefits. The project area is home to multiple species listed as Endangered or Critically Endangered by the International Union for Conservation of Nature (IUCN), including iconic African mammals like the savanna elephant (*Loxodonta africana*) and the lion (*Panthera leo*). The perennial grasses will grow taller at higher productivity, which we anticipate will result in an increase in populations of large herbivores, many of them migratory – such as wildebeest, zebra, Masai giraffe, and Thompson's gazelle, as well as resident ungulates including gerenuk and Grant's gazelle. Increased herbivore populations and grass cover is also anticipated to augment the populations of the large carnivores – lion, cheetah, leopard, wild dog, and spotted hyaena. Associated with improvements in the productivity of the grasses and livestock will be increased diversity of rangeland biodiversity indicator species that are considered closely linked to the success of project activities such as dung beetles, grasshoppers, termites, and birds.

The project zone, and likely the project area, has regular occurrence 10 or more individuals of the following 18 endangered species:

IUCN Critically Endangered (CR) species:

1. Hooded Vulture (*Necrosyrtes monachus*)
2. Ruppell's Vulture (*Gyps rueppellii*)
3. White-backed Vulture (*Gyps africanus*)
4. White-headed Vulture (*Trigonoceps occipitalis*)

IUCN Endangered (EN) species:

5. African savanna elephant (*Loxodonta africana*)
6. East African oryx (Oryx beisa)
7. Wild dog (*Lycaon pictus*)
8. Lappet-faced Vulture (*Torgos tracheliotos*)
9. Egyptian Vulture (*Neophron percnopterus*)
10. Bateleur (*Terathopius ecaudatus*)
11. Secretarybird (*Sagittarius serpentarius*)

12. Steppe Eagle (*Aquila nipalensis*)
13. Martial Eagle (*Polemaetus bellicosus*)
14. Gray Crowned-Crane (*Balearica regulorum*)
15. Maccoa Duck (*Oxyura maccoa*)
16. Malagasy Pond-Heron (*Ardeola idea*)
17. Gray Parrot (*Psittacus erithacus*)
18. Basra Reed Warbler (*Acrocephalus griseldis*)

In addition, the project area has regular occurrence of at least 30 individuals or 10 pairs of the following vulnerable mammal species:

IUCN Vulnerable (VU) species:

- Lion (*Panthera leo*)
- Leopard (*Panthera pardus*)
- Cheetah (*Acinonyx jubatus*)
- Masai giraffe (*Giraffa tippelskirchi*)
- Temminck's pangolin (*Smutsia temminckii*)

The entire project area potentially serves as habitat for these species. Improved grazing management and restoration of perennial grasses will increase habitat availability for these species based on their baseline locations. Elephants use virtually the entire project area for grazing and for migration between nearby National Parks and other protected areas.

2.4.2 Introduction of species

No species introductions are part of the project activities.

2.4.3 Ecosystem conversion

This project is not ARR, ALM, WRC or ACoGS, and the project area was not cleared or drained of existing natural ecosystems in the last 10 years.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0032	Methodology for the Adoption of Sustainable Grasslands through Adjustment of Fire and Grazing	1.0
Module	VMD0016	Methods for stratification of the project area (X-STR)	1.0
Tool	VT0001	Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities	3.0
Module	VMD0040	Leakage from Displacement of Grazing Activities	1.0
Tool	N/A	AFOLU Non-Permanence Risk Tool	4.0
Module	VMD0033	Estimation of Emissions from Market Leakage	1.0

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
VM0032	General applicability: VM0032 applies to project activities that adjust the number, type and husbandry of grazing animals, adjust the frequency and intensity of planned or unplanned fires, and/or introduce herbaceous grassland species as potential forage for grazing animals or to restore degraded soils.	The KRCP proposes implementing rapid rotational grazing plans, which will adjust the husbandry practices of grazing animals in the project area.
VM0032	1) The project area must be grasslands in the baseline and project scenarios.	The KRCP project area is grasslands in the baseline scenario, with no conversion proposed or planned in any project scenarios.
VM0032	2) Lands are grazed and/or subject to fires in the baseline and/or project scenarios. Lands may be used for different purposes, such as livestock production, conservation, hunting or tourism.	Lands in the KRCP project area are grazed in the baseline and project scenarios. Some of the project area is used for tourism and/or conservation, but none of the project area is used for hunting (as hunting wildlife is

		illegal in Kenya since 1977 under Legal Notice 120 and later updated in the Wildlife (Conservation and Management) Act of 2013.
VM0032	3) The project must be structured to keep livestock within the project area, and the project proponent must be able to enforce the boundaries of the project area.	Grazing plans approved by participating communities will clearly identify and recognize the boundaries of the project area. These agreements will be generally sufficient to keep livestock within the project boundaries, with the assistance of paid grazing coordinators and with the understanding that all villages will be participants in ensuring that political boundaries are respected. Grazing plans are designed to keep livestock on the project area, which is sufficiently large to include viable grazing areas during both wet and dry seasons and in the case of local droughts. Meetings to communicate grazing plans emphasize to herders the need to remain on the project area and to avoid excursions into neighboring jurisdictions.
VM0032	4) The project must result in no net increase in the density of, or time spent by animals in confined corrals where dung can pile up and begin to decompose anaerobically and result in methane and nitrous oxide emissions, such as an increase in the number of livestock aggregated (e.g., kept in corrals or pens) that would result in more than 50 percent of the ground area covered by dung.	The KRCP will not result in any net increase in density or time spent in corrals, nor in any accumulation of dung that might result in conditions that favor additional methane or nitrous oxide production.
VM0032	5) Baseline emissions derived from livelihood-driven human impacts on aboveground woody biomass (e.g., cutting for fuel wood, charcoal or timber sales) must be deemed de minimis	Baseline emissions from livelihood-driven aboveground woody biomass impacts will be de minimis in the project area, which is overwhelmingly

	(i.e., not included in the cumulative 95 percent of total baseline emissions) and project activities cannot significantly alter such livelihood-driven activities.	dominated by grassland with minimal shrubland or woodland.
VM0032	6) For projects that propose to modify grazing, the maximum individual project size is 3 million ha or 5 percent of a country's land area currently or potentially used to graze livestock, as judged by national government land use inventories or other documentation.	Published estimates of the amount of rangeland in Kenya range from 80-88% of Kenya's land mass of 582,650 sq km (Ogutu et al. 2016, Ndungu et al. 2019). Given that the size of the 1.0 M ha project area is less than 5% of the total rangelands in Kenya, this condition is safely met.
VMD0016	Any module referencing strata must be used in combination with this module.	It is unknown at this time whether stratification will be required; baseline soil sampling and ground truthing efforts will allow the project team to make this determination. If stratification by any spatial variable (e.g. group ranch, soil type) is required, this module will be used.
VT0001	1) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced.	Project activities of the KRCP will not lead to violation of any applicable laws, including but not limited to the list of laws relevant to the project activities provided in this document.
VT0001	2) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	The KRCP employs a stepwise approach to determine and justify the most likely baseline scenario. This process is described in detail in this document under additionality.

VMD0040	The project area is subject to livestock grazing in the baseline scenario.	The KRCP project area is grazed under the baseline scenario.
VCS AFOLU Non-Permanence Risk Tool	The project is an AFOLU project and is thus subject to a non-permanence risk rating.	The project is an AFOLU project and is thus subject to a non-permanence risk rating.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Source 1: Grazing animals	CO_2	No	Balance with CO_2 uptake, respiration, and annual decomposition of grazed plants
		CH_4	Yes	Target removal for methodology
		N_2O	No	No increase in concentration of dung and forage is not fertilized (applicability conditions)
		Other	No	Negligible under applicability conditions
	Source 2: Burning biomass	CO_2	No	Balance with CO_2 uptake by plants
		CH_4	No	The project activities should not affect fire, which currently is very rare in the project area, and so should not affect aboveground woody biomass. Furthermore, change in woody biomass is assumed to be negligible or conservatively excluded because human harvesting of wood reduces aboveground woody carbon stocks by less than 5%.
		N_2O	No	Negligible under applicability conditions
		Other	No	Negligible under applicability conditions
	Source 3: Soil emissions	CO2	No	Assumed to be in balance with C inputs to SOC (SOC at equilibrium)
		CH4	No	Negligible because project area soils are not under anaerobic conditions such as those encountered in wetlands and hydric soils
		N2O	No	Negligible under applicability conditions
		Other	No	Negligible under applicability conditions

Source		Gas	Included?	Justification/Explanation
Project	Source 1: Grazing animals	CO_2	Yes	Balance with CO_2 uptake, respiration, and annual decomposition of grazed plants
		CH_4	Yes	Target removal for methodology
		N_2O	No	No increase in concentration of dung and forage is not fertilized (applicability conditions)
		Other	No	Negligible under applicability conditions
	Source 2: Burning biomass	CO_2	No	Balance with CO_2 uptake by plants
		CH_4	No	The project activities should not affect fire, which currently is very rare in the project area, and so should not affect aboveground woody biomass. Furthermore, change in woody biomass is assumed to be negligible or conservatively excluded because human harvesting of wood reduces aboveground woody carbon stocks by less than 5%.
		N_2O	No	Negligible under applicability conditions
		Other	No	Negligible under applicability conditions
	Source 3: Soil emissions	CO_2	Yes	Accounted for in measured ΔSOC
		CH_4	No	Negligible because project area soils are not under anaerobic conditions such as those encountered in wetlands and hydric soils
		N_2O	No	Negligible under applicability conditions
		Other	No	Negligible under applicability conditions

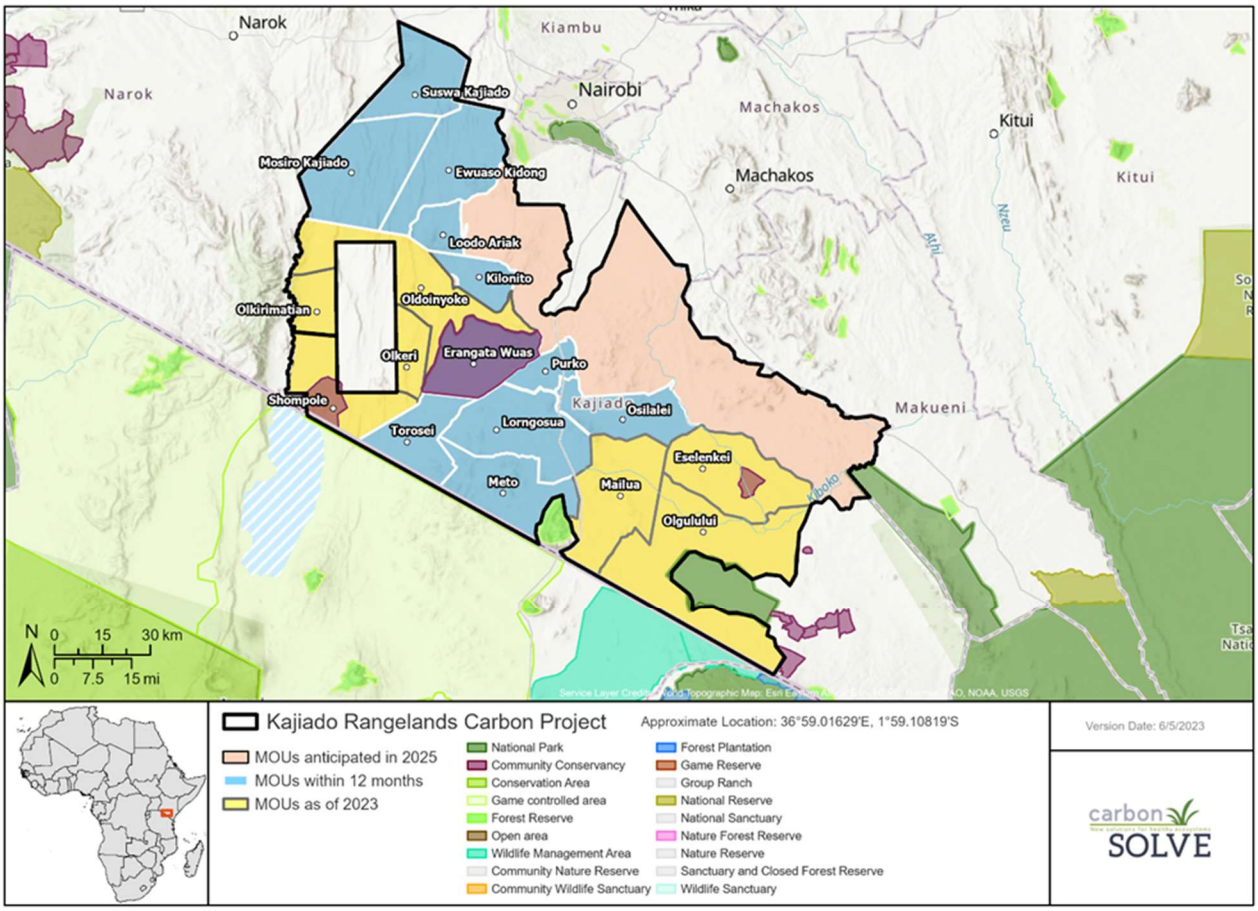


Figure 3-1: the project zone showing the KRCP project boundary (black outline).

3.4 Baseline Scenario

In accordance with the VM0032 methodology, identification of the baseline scenario for these rangelands in the project area is simply the existing or recent historical grazing and fire regime, under the assumption that this grazing and fire regime would continue in the absence of this project. This assumption is justified by the high barriers to change (see Additionality below) that make the existing land use management the most likely to continue without this carbon project.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in a UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

3.5.2 Additionality Methods

The use of VCS tool VT0001 requires a four-step process of determining additionality. Each step is described in detail below.

Step 1: Identification of alternative land use scenarios to the proposed VCS AFOLU project activity.

Substep 1a: Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

Scenario 1: Continuous, uncoordinated grazing

This scenario is a continuation of the pre-project land use in the project area. The rangelands in Kajiado County have seen decades of overgrazing pressure. This scenario includes continued conversion of rangelands that were once valuable but are now degraded to agriculture or commercial/residential sprawling development along infrastructure corridors.

Scenario 2: A shift to rapid rotational grazing, but without the incentive of carbon credits

This scenario considers rapid rotational grazing activities occurring in the project area in the absence of this proposed VCS AFOLU project.

Scenario 3: Intensive land use conversion

Under this scenario, conversion of rangelands to agricultural crops and sprawling commercial/residential development would be intensified from current rates of conversion, which are projected forward in Scenario 1, to a level of land use conversion that far surpasses the rates that have been experienced in the twenty-first century.

Outcome of Substep 1a: a list of three credible land use scenarios.

Substep 1b: Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

Outcome of Substep 1b: All three credible land use scenarios are consistent with mandatory applicable laws and regulations.

Substep 1c: Selection of the baseline scenario

The baseline scenario is identified in section 3.4 above, in accordance with the guidelines of the VM0032 methodology used. In the absence of the proposed VCS AFOLU project, the most likely scenario is Scenario 1, in which the pre-project activities of continuous, unplanned grazing are carried on into the future.

Step 2: Investment analysis

According to the VT0001 VCS documentation, the investment analysis may be skipped in favor of the barrier analysis in step 3. Here step 2 will be skipped, as the barriers and common practice analyses provide a better basis for determining additionality in this case.

Step 3: Barrier analysis

Scenario (i) has no significant barriers as each family or family group chooses to acquire and herd livestock in whatever way they choose within broad constraints of seasonal shifts in available grazing areas. Under business as usual, degrading rangelands will continue to increase the risk of this scenario.

Scenario (ii) has significant barriers in the form of (1) necessary cash payments to pay professional herders to move large herds of livestock over long distances greater than 100 kilometers) across the landscape, (2) cultural traditions that discourage mixing of animals from herds of multiple unrelated families, (3) lack of confidence in the safety of animals kept far from permanent bomas, due to risks of wildlife predation and cattle theft. Without carbon finance to pay grazing assistants and coordinators to provide guidance and discourage theft and grazing of grass banks or other conservation areas, this management practice would not be adopted.

Scenario (iii) has significant barriers in achieving a higher rate of land use conversion above and beyond the rates experienced so far in the twenty-first century. Lack of ready access to surface water hinders the development of extensive irrigation schemes, whereas groundwater extraction-based irrigation requires a massive investment in boreholes, pumping, and water conveyance infrastructure, all in the context of several deep droughts that have occurred in the 2010s and 2020s. As for intensified urbanization, for now this process is confined to areas closest to Nairobi, outside of Kenya's Maasai-dominated rangelands.

Outcome of Step 3: The barrier analysis indicates that Scenario (i) faces no significant barriers to continuation, while Scenarios (ii) and (iii) face significant barriers to replace the pre-project activities in the project area.

Step 4: Common practice analysis

Rapid rotational grazing plans are not practiced in the region, though a remnant of traditional nomadic grazing still occurs. Fencing and security provide control of the forage resource, and forage is abundant enough to sustain the finishing of livestock for sale on meat markets. The economic focus is on production of young livestock, not the accumulation of assets in the form of live livestock. Market-driven cash flow supports the infrastructure and expertise to properly implement rotational grazing. There is no local example for pastoralists to follow to successfully implement coordinated rapid rotational grazing.

On communal lands, virtually all pastoralists currently lack the physical security and financial resources to coordinate grazing along the lines of the proposed project activities, i.e., the planned rapid rotational grazing in scenario (ii). Sedentary settlement patterns and a lack of rest for the foraging resources results in continuous grazing that results in overgrazed perennial grasses, which die and are replaced by annual grasses.

Outcome of Step 4: the common practice analysis indicates that Scenario (i) is favored by common practice in the project area and that scenarios (ii) and (iii) are not favored by common practice.

Consequently, the project meets the criteria that scenario (ii) would not occur in the absence of revenues from the proposed grassland management soil carbon project.

3.6 Methodology Deviations

No methodology deviations are expected for the project, but any deviations that become necessary will be rigorously documented and justified to demonstrate that the conservativeness of the GHG removal estimate will not be jeopardized, and that the deviation relates only to procedures for monitoring or measurement and not to any other part of the methodology.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Developing Baseline Emissions (and/or removals) estimates in the VM0032 methodology consists of four major components:

1. Measure Baseline Soil Carbon
2. Characterize Baseline Vegetation and Grazing
3. Estimate Baseline Methane Emissions
4. Model Baseline Soil Organic Carbon

Measuring Baseline Soil Carbon

Sample Size Determination. As outlined in the VCS VM0032 methodology (page 22), the total number of sampling stations, n, for the project area under a Modeled Approach must be determined by using an online calculator[4]. Sampling stations must be selected to encompass as much of the variability in these factors as possible in order to test that the model is appropriate for use in the project area (see Section 8.1.3.3 of the VCS VM0032 methodology document). In a Modeled Approach, the total number of sampling stations should be sufficient to ensure representation of the full range of soil carbon densities found on the project area, so as to properly evaluate the model.

Stratification. For determination of the expected soil carbon removals across the variation in soils and management conditions of the project, the project area may be stratified according to soil type, by Group Ranch and by management type. Soil samples to a depth of 30 cm will be taken from a

[4] One resource for online calculators is http://www.danielsoper.com/statcalc3

predetermined number of sampling stations in the project area in 2023 and will include both sandy loam and black soils and selected to yield a large range of soil carbon densities in the project area. These soils will be measured for texture, or sand, silt, and clay fractions, as sand content is a variable in the SNAPGRAZE carbon dynamics model that will be used for this project.

Sampling stations will be evaluated across land management units for the effect of management and soil texture on soil carbon density using a K-factor Means analysis. This method sorts sampling stations with similar data combinations into groups and then tests whether the difference in these groups can be due to chance with a Generalized Linear Model, which makes fewer assumptions about distributions than an ANOVA.

Previous experience in Northern Kenya suggests that stratification will be performed on the basis of interpreting high resolution satellite imagery, Google Earth SPOT. The main contributor to color, as detected by satellite, was soils, as trees lacked leaves and herbaceous vegetation was sparse or had been consumed by livestock. Soil class notations made during the soil collection and vegetation measurements at initial sample points will provide training data. Satellite image interpretation will be made by visual inspection based on color (e.g., dark green – trees almost always on mountains or hills with rocky soil; dark gray – black soil, various light red to white colors – sandy loam). A digital elevation map will be used to further identify rocky soils (high elevation gradients) and visual texture (lumpiness indicated trees, rectangular shapes indicate rock). Aggregated clusters of dark gray or dark brown red on known lava plateaus indicated lava that had not yet decomposed into soil and will be classified as lava.

It is anticipated that in most cases, soil classes will form distinct borders, so it will be possible to draw polygons around patches or regions of each soil class. In some cases, however, different soil classes may be highly interdigitated and so we may decide that soil class patches smaller than 30 m in width will be ignored. The VCS requires that strata be delineated by polygons, so we anticipate setting a 30 m threshold in the project zone extending > 100,000 m as a reasonable diminishing return (30/100000 = 0.03% accuracy). In Northern Kenya, our previous experience suggested that ground sampling of polygons were correctly labelled “black” in 64 of 68 cases, “sandy loam” in 169 of 173 cases, and “clay loam” in 12 of 12 cases.

Consequently, the previous analysis revealed that only soil class (sandy loam vs black vs clay loam) and Conservancy and their interaction explained significant ($P < 0.05$) variation in soil organic carbon. Management was not a significant factor (P = 0.347). Consequently, the project area was composed of multiple strata, comprised of each Conservancy and its areas of black, sandy loam, or in the case of extreme eastern Melako and Biliqo Bulesa Conservancies, clay loam soils). These strata by land management unit, soil class, and management were used in a stratification map of the project area.

Our experience in Northern Kenya also revealed that rainfall was another potential variable affecting soil carbon density, that varied across the project area.

Location of Sampling Stations. Sampling stations will be apportioned across the landscape in a hierarchical fashion to meet the requirement of VM0032 that as large a range of soil carbon densities

as possible be sampled on the project area and also to ensure representative sampling across the project area as would be expected from a measurement approach.

Because rainfall varies at relatively fine scale, it is anticipated that a Modeled Approach for soil carbon removal accounting will be used. We do not anticipate stratifying for rainfall but instead allowed the effect of rainfall to be accounted for by the model, since mean annual rainfall is a direct input.

Characterizing Baseline Vegetation and Grazing

Baseline grazing impacts and overall vegetation condition will be assessed in the project area by comparing remotely-sensed estimates that incorporate canopy structural variations, including leaf area index (LAI), canopy type, plant physiognomy, and canopy architecture, from 2013-2023, using the Normalized Difference Vegetation Index (NDVI) product from MODIS satellite imagery. Previous analyses have found NDVI to be more sensitive to the impacts of grazing at low ranges of production of 0-200 g/m2 typical of the region's rangelands under high levels of continuous grazing. The metric is also sensitive to differences in restrictions to grazing use from complete rest, grazing for one third to one half of the year, versus continuous grazing. Higher NDVI scores are associated with greater perennial grass cover during grazing use, and also with overall grazing intensity (Huete et al. 2002).

These data, which reflect seasonal variation, annual variation in rainfall, and long-term trends in vegetation, are anticipated to provide information on the following important issues:

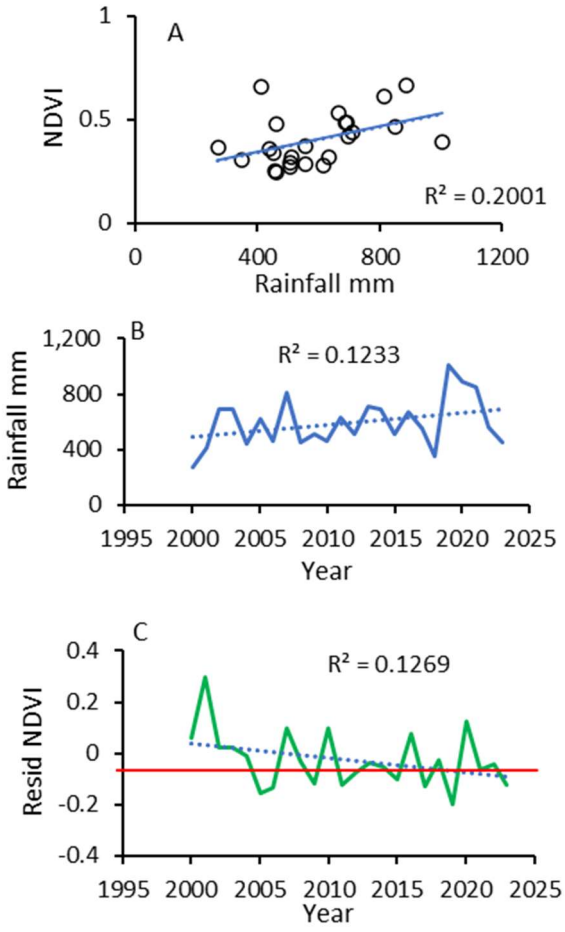


Figure 4-1: For the KRCP project area, relationships between A) rainfall and NDVI index of green plant biomass, B) pattern of mean annual rainfall over time (years 2001-2022), and C) pattern of NDVI over time, plotted as residuals in NDVI after statistically accounting for the influence of rainfall. All relationships are significant at P < 0.01. Note that the negative trend in residual NDVI occurs despite an increase in rainfall over the baseline monitoring period.

NDVI values, after controlling for the influence of mean annual rainfall on NDVI, have declined significantly on average during the 22 years prior to the project start date. Consequently, the satellite images are likely to suggest that vegetation conditions throughout virtually all of the project area have been degraded over the previous 10 years. This satellite database can serve as a baseline for evaluating impacts of the project activity, planned rotational grazing, per the requirements of the VCS VM0032 methodology.

NDVI measurements indicate that, where rapid rotational grazing will be implemented for more than two years, the project activities should result in significant rainfall-corrected increases in NDVI despite dry conditions in 2020-2023.

We anticipate that some Group Ranches may not be consistent in their enforcement of grazing restrictions, and may only begin to implement rapid rotational grazing in 2024. Nevertheless,

experience from Northern Kenya suggests that the chronic degradation of forage production in the project area over the past 10 or more years, combined with the ability of satellite measures such as NDVI to assess potential and realized forage production under different annual rainfall amounts, generated evidence that rapid rotational grazing can improve forage production even under low rainfall conditions.

Estimating Baseline Methane Emissions

Baseline methane emissions from grazing animals will be estimated from data on total numbers for different livestock categories that reflect species, age, sex and their respective sizes, in the project area. Calculations are based on estimating daily methane emissions as a function of the body weight of each major animal category and then multiplied by the number of animals in each animal category and 365 days in a year. Emissions from all categories can then be summed to provide the total annual methane emissions for the project area.

We anticipate using survey data to create a credible baseline estimate for livestock numbers for each of the participating communities. The data source for this baseline estimate will be a survey of livestock-owning households to assess past livestock holdings and thus obtain a historical estimate of livestock per household.

Modeling Baseline Soil Organic Carbon

Soil Carbon Dynamic Model. Baseline soil organic carbon for the proposed activity-based Modeled approach per the VCS VM0032 methodology requires the measurement of the necessary model parameters to test a model. The project will use the SNAPGRAZE model of soil carbon dynamics (Ritchie 2020), a carbon mass balance model developed from the grassland savanna – grazing system in Serengeti National Park. An executable file of this model will be provided in future drafts of this document.

Parameters for Model. The project will employ the SNAPGRAZE model linking grazing management and soil carbon dynamics. This model has the following parameters:

MAPLC = lignin and cellulose content of aboveground biomass, likely inferred from the type of dominant plant cover (bare ground, annuals, perennials, or mixed).

SAND% = percent of the soil comprised of sand

MAP = mean annual precipitation (mm) over the time period for which baseline management conditions have been employed

MAT = mean annual temperature (^{o}C) over the time period for which baseline management conditions have been employed.

FIRE = frequency of fire as mean percent of project stratum area covered by fire in previous 10 years.

DEPTH = depth at which soil is sampled

However, because fire is very rare in the project ecosystem and grazing animal reduction in potential fuel loads is likely to be strong even under new grazing management, FIRE will be set equal to zero in simulations with the model for the baseline scenario and the initial verifications. As perennial grasses become more abundant and a greater proportion of area has high grass biomass entering the dry season, natural wildfires may begin to occur. At that point, burned area maps based on MODIS satellite Burned Area Product will be used to assess fire frequency.

Number of livestock, adults and juveniles, of each species that use the project area or the season

Project area

Growing season days = days in which soil moisture is sufficient to support plant growth, typically estimated from temperature and rainfall estimates.

Grazing blocks : Different discrete locations used by livestock within the project area, such as seasonal ranges, pastures, paddocks, etc.

Model Validation. Model validation (not to be confused with carbon project validation) is the task of evaluating the appropriateness or accuracy of a given statistical or quantitative model using available data. The parameters needed to validate the SNAPGRAZE model are the proportion of the soil made up of organic carbon, expressed as a percent (SOC%) and the soil bulk density.

To estimate baseline soil carbon stocks and validate this model, soils and vegetation will be sampled at a minimum number of permanent sampling stations across all villages, and distributed across soil types based on their relative contributions to the project area (i.e., stations on black cotton soils, clay loam soils, and on sandy loam soils) following the hierarchical assignment of soil sampling sites.

At each site, three 5-cm diameter cores were taken to a depth of 30 cm and mixed to form a composite sample, which was then dried and weighed and analyzed for total organic carbon using the method described by Nelson and Sommers (1982) to quantify levels of oxidizable organic matter (OM). A separate soil core (5 cm diameter x 30 cm depth) will be taken at each station to obtain a known volume (405.366 cm^3). Rocks and pebbles were removed and their volume measured by displacement of water in a graduated cylinder, and this volume was subtracted from the core volume to obtain a net volume. Soil remaining after rocks and pebbles were removed was dried and weighed and divided by net volume to obtain bulk density (g/cm^3) (Hao et al. 2007). Raw data will be available as Excel files on request.

Soil texture of a subset of samples will be analyzed at the Crop Nutritional Services laboratory (in Nairobi, Kenya) to find the mean percent sand associated with each of the major strata. The mean percent sand from the stratum in which each station was located will be used as the SAND% parameter in the model.

Lignin and cellulose content (MAPLC) of aboveground vegetation has already been estimated for Kenyan rangelands by collecting samples of the dominant types of herbaceous vegetation (annual grass, forb, and perennial grass) across 40 random sampling points (Figure 4-2). We gathered vegetation samples by clipping, drying (at 45^{o}C for four days) and weighing the vegetation from two

0.125 m^2 quadrats clipped to the ground surface, followed by combining samples, grinding through a 0.9 mm sieve with a Wiley Mill, from digestion in acid detergent and sulfuric acid (Jensen et al. 2005).

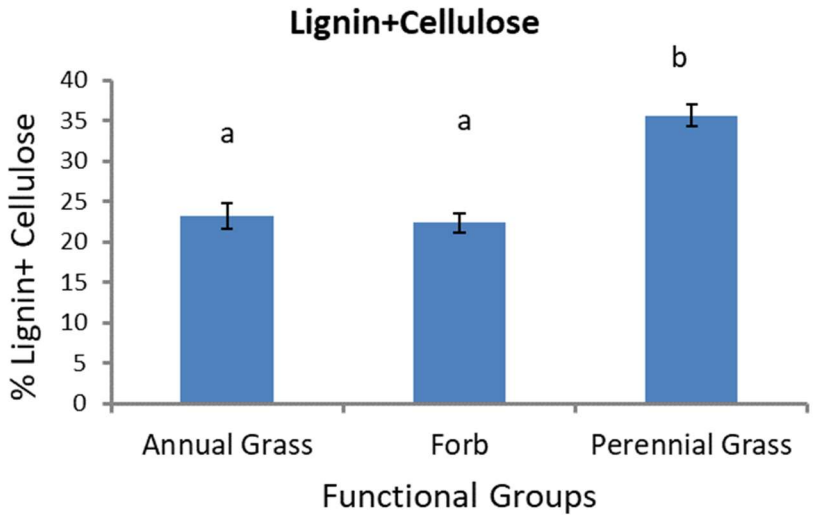


Figure 4-2: Percent lignin plus cellulose in annual grasses, forbs and perennial grasses.

Mean Annual Precipitation (MAP) will be estimated at individual sampling points from for the CHIRPs online satellite database[5].

Mean Annual Temperature (MAT) will be estimated at individual sampling points from $CHIRTS_{monthly}$ online satellite database[6].

Estimation of Baseline Soil Organic Carbon . The SNAPGRAZE model conservative estimate of SOC at each station will be calculated by back-casting the model 10 years from current assumed equilibrium SOC under the same parameter values used in the validation of the model. The procedure is detailed in VM0032 v 2.0.

Uncertainty in Baseline Emissions. In accordance with the methodology, uncertainty in baseline methane emissions will be calculated as a function of the daily methane emissions of grazing animals of different categories, the uncertainty in the mean body weight of the grazing animals, and the uncertainty in the harmonic mean of animal counts.

Estimation of Baseline Emissions and Uncertainty. Following the methodology, the net baseline emissions and removals are in equilibrium under the assumption $\Delta SOC = 0$.

4.2 Project Emissions

[5] CHIRPS: Rainfall Estimates from Rain Gauge and Satellite Observations | Climate Hazards Center - UC Santa Barbara (ucsb.edu)

[6] CHIRTSmonthly | Climate Hazards Center - UC Santa Barbara (ucsb.edu)

Calculation of Project Emissions and Removals

Net GHG emissions and removals under the project scenario are determined by the sum of methane emissions and net removals from the atmosphere due to sequestration in soil carbon.

Project Methane Emissions

According to the VCS VM0032 methodology, if project activities will reduce livestock numbers, then accompanying removals from reduced methane emissions must be conservatively excluded from project removals. This avoids potential leakage from shifting of animals to adjacent grasslands or from market leakage whereby other producers increase livestock numbers to replace project livestock reductions and meet market demand. However, whether or not methane emissions from livestock are reduced, calculations must be based on project data from animal counts or censuses and emission factor data based on project area-applicable body weight of each category. In the KRCP, we do not anticipate a reduction in livestock numbers.

The parameters are similar to those used for calculating baseline methane emissions. The number of grazing animals must be measured, because new animal categories may result due to project activities (e,g. a shift to using different breeds or species of livestock).

Soil Carbon Removals

The KRCP follows the VCS VM0032 methodology, which allows emissions reductions and greenhouse gas removals to be credited on the basis of activity. Activity (altered grazing practices) determines emissions reductions and removals on the basis of a model. First, a soil carbon model developed using East African parameters and ecological descriptions is validated for use, per the requirements of methodology VM0032. Then the model is used to estimate the future equilibrium soil carbon under the assumption of long-term execution of altered grazing practices.

Validation of the SNAPGRAZE Soil Carbon Model. The SNAPGRAZE soil and vegetation parameters (i.e., soil texture, lignin and cellulose content, historic average grazing intensity) along with interpolated average annual rainfall, will be entered into a predictive soil carbon dynamic model called SNAPGRAZE (Ritchie 2020). The SNAPGRAZE model will be used to predict current SOC stocks based on the estimated history of grazing. The mean predicted SOC stocks will then be compared with mean observed SOC stocks for each type of management, and predicted SOC stock at a particular site will be compared against observed SOC at the same site. We anticipate the results will suggest that within the participating communities, the model will predict mean and individual site SOC values with more than 90% accuracy.

The SNAPGRAZE model results suggested that prolonged, heavy, continuous grazing in Northern Kenya over the past 10 years has greatly depleted SOC stocks, but that reduction in grazing intensity will lead to recovery of SOC at a potential rate of 0.3-0.4 tons C/ha/yr across a variety of soil types (Ritchie et al. *in prep*). Because of past degradation, there is a large capacity for recovering SOC stocks in the project area. These results suggest that rapid rotational grazing management beginning in the participating communities should help restore SOC and productivity in these semi-arid grasslands and could result in

an economically viable carbon offset project. As required by the VCS VM0032 v 1.0 Methodology, the model must generate a coefficient of determination $R^2 > 0.80$ across all strata. The slope of the regression line must have a 95 percent confidence interval that overlaps 1 and the 95 percent confidence interval of the intercept must overlap zero. Bias must be determined by evaluating the percent bias of a simulation (carbon model) relative to observed data (Moriasi et al. 2007).

Calculation of Carbon Removals to Soil. The SNAPGRAZE soil carbon model will be used to simulate anticipated project equilibrium soil carbon under the proposed project activities for each stratum. Carbon typically accrues in response to management changes with decreasing increments over time as equilibrium is approached (Paustian et al. 1992, Thornley and Cannell 1997, Williams et al. 1989). Thus, the annual increment in SOC is determined by the difference in SOC between the conservative baseline maximum from 10 years prior to the project start and project equilibrium, divided by the model-estimated time necessary to achieve project equilibrium.

The parameters used for the project scenario will be largely the same as for the baseline, such as mean annual rainfall and soil texture and fire frequency (equal to 0 at baseline but may change in the project scenario as vegetation builds up enough fuel to carry fire). In the project scenario, forage plants would become dominated by perennials after 40 years, so plant lignin and cellulose content would increase to 35.8%. The only other parameter that will be altered for the project scenario is grazing intensity, which will be assumed to shift uniformly across the project area to a still high but more moderate value of 0.85.

Uncertainty in Project Emissions and Removals. Total uncertainty can be calculated by weighting uncertainties according to the magnitude of emission or removal. In this case, uncertainty in net reductions and removals is driven by uncertainty in baseline emissions, project emissions and project net changes in carbon stocks.

For the calculation of baseline emissions and reductions, uncertainty arises in the calculation of methane emissions only, because all other net emissions are conservatively assumed to be zero, unless increasing fire frequency is a proposed management activity. These uncertainties in baseline emissions will be presented for each category of grazing animal.

Uncertainty in changes in soil carbon stocks under a Modeled approach is obtained from the calculated 95% confidence interval, as required by the current VCS Standard and the VM0032 methodology from a Monte Carlo simulation. This interval is determined by iterated calculations that sample from hypothetical normal distributions of values of each parameter in the calculation, defined by the mean and standard errors of each parameter, for each stratum if stratified.

Repeated calculations, with random draws from the distributions from each parameter, give a distribution of calculation outcomes with an overall mean and standard error for the calculation. Such Monte Carlo simulations will be done by the SNAPGRAZE model software. The standard error for the SNAP SOC prediction, SE(PRSm) for each stratum generated by the Monte Carlo simulations will then then be used to calculate 95% Confidence Intervals (95% CI) for SOC removals.

4.3 Leakage Emissions

Leakage can result from displacement of livestock off the project area (displacement leakage) and from replacement of livestock, reduced intentionally from project activities to reduce methane emissions by producers outside the project area to meet market demand (market leakage). Across the international border from Kajiado County lie the Tanzanian districts of Longido and Monduli, where CarbonSolve is working with sister company Soils for the Future Tanzania and local Tanzanian communities on another rangeland soil carbon project using the same VM0032 methodology.

Displacement Leakage

Movement of livestock could result in losses of carbon from higher levels of overgrazing off the project area, or displacement leakage. Displacement leakage can be determined by using the tool VMD0040 Leakage from Displacement of Grazing Activities for a measured approach, or by using the penalty approach based on a reduction in net removals proportional to the total livestock-days spent off the project area. This project will use both a measured and penalty approach. The measured approach will be used when livestock from this project enter an area already being monitored or if use of the area is by a formal agreement (e.g., lease), such as on an adjacent carbon project area. The penalty approach will be used if livestock enter an unmonitored area, such as a protected area or an area dominated by croplands.

In this case, displacement leakage must be calculated as a proportion of net removals from increased soil carbon in each year, based on the proportion of total project livestock-days in that year that occurred outside the project area.

If leakage is not negligible, uncertainty in displacement leakage is conservatively assumed to be the same as uncertainty in project net removals.

Market Leakage

Market leakage is expected to be negligible because livestock reductions are not a planned project activity and livestock numbers are driven by range capacity and rainfall (Barrett et al. 2003, Barrett et al. 2004, Bailey et al. 1999, Barrett 2001) rather than markets.

In the case of methane emissions by livestock, the VM0032 methodology prohibits accounting for reduced methane emissions by livestock from reduced livestock numbers in order to avoid market leakage. In the case of the KRCP, Kenya is a beef exporter and herders in the project area technically do have access to international markets. In any case, international export is not a significant source of commerce in this part of Kenya, and changes in livestock numbers on the project area would be unlikely to affect the international beef market. Therefore, market leakage is expected to be negligible.

Total Leakage

Consequently, with market leakage expected to be negligible, total leakage will be equal to displacement leakage.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Net project emission reductions are estimated as the difference between project methane emissions and baseline methane emissions. Net change in carbon stocks is estimated as the total increase in soil carbon.

Note that there is no term for changes in carbon stocks due to changes in woody plant biomass because there are no project activities that should result in declines in aboveground woody carbon, and any increases in aboveground woody carbon are conservatively excluded. Similarly, there is no term for fire because fire is very infrequent in the project area.

Ex ante estimates of baseline and project emissions/removals, leakage, and net emissions/removals will be provided in future editions of this document.

5 MONITORING

5.1 Data and Parameters Available at Validation

The table below describes the data and parameters that have been determined for validation purposes, in accordance with the project methodology.

Data / Parameter	$SOC\%_{j,m,0}$
Data unit	Dimensionless proportion expressed as percentage
Description	Soil organic carbon proportion at station j in stratum m at time = 0 (years) (i.e., at the start of the project or since the last verification)
Source of data	Measured in the project area at sampling locations
Value applied	Value to be determined
Justification of choice of data or description of measurement methods and procedures applied	Baseline for performance-based removals based on increasing SOC. Tracked at the level of j = 1 to m individual sampling stations in each stratum because net removals will be based on demonstrating how a soil carbon dynamic model, in this case, SNAPGRAZE, can successfully predict current SOC from past conditions at individual stations.
Purpose of data	Calculation of baseline emissions
Comments	Crop Nutritional Services (the laboratory in Nairobi analyzing the samples) uses the Walkley-Black method or a combustion method.

Data / Parameter	$BULK_{m,j}$
Data unit	Grams per cubic centimeter (g/cm3)
Description	Soil bulk density
Source of data	Measured in the project area at sampling locations
Value applied	Value to be determined
Justification of choice of data or description of measurement methods and procedures applied	Necessary to convert proportion of SOC in soil to mass of SOC/area.
Purpose of data	Measured by taking a 30 cm soil core (known volume) at each sampling station, spreading the contents on a flat surface to identify and remove any stones or gravel, drying the soil core at 45oC to a constant weight, and weighing dried soil.
Comments	Calculation of baseline emissions

5.2 Data and Parameters Monitored

The table below describes data and parameters to be monitored, in accordance with the project methodology.

Data / Parameter	$MAP_{j,m}$
Data unit	Millimeters per year (mm/yr)
Description	Mean annual precipitation
Source of data	Recorded at nearby precipitation stations or available from precipitation maps of the region
Description of measurement methods and procedures to be applied	To be determined
Frequency of monitoring/recording	To be determined
Value applied	To be determined

Monitoring equipment	To be determined
QA/QC procedures to be applied	To be determined
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation of project emissions
Comments	To be determined

Data / Parameter	$SAND\%_{j,m}$
Data unit	Dimensionless proportion expressed as a percentage
Description	Proportion of soil that is sand, at station j in stratum m
Source of data	Measured in project area
Description of measurement methods and procedures to be applied	Soil collected to desired depth at each sampling station should be mixed, and a subsample analyzed for clay, silt, and sand fractions in a professional laboratory. SAND% for soils will be estimated by Crop Nutritional Laboratories based in Nairobi, Kenya.
Frequency of monitoring/recording	To be determined
Value applied	To be determined
Monitoring equipment	To be determined
QA/QC procedures to be applied	To be determined
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation of project emissions
Comments	To be determined

Data / Parameter	$GI_{j,m}$
Data unit	Dimensionless proportion
Description	Mean annual grazing intensity at station j in stratum m
Source of data	Measured in project area
Description of measurement methods and procedures to be applied	Measured at each sampling station by visually estimating historical grazing intensity from a calibrated observation method based on species composition, bare ground, and vegetation height. Observational method to be corroborated by comparing using NDVI to estimate herbaceous (forage) biomass at the sampling point relative to ungrazed control for the month the vegetation is sampled on the ground.
Frequency of monitoring/recording	To be determined
Value applied	To be determined
Monitoring equipment	To be determined
QA/QC procedures to be applied	To be determined
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation of project emissions
Comments	To be determined

Data / Parameter	$MAPLC_{j,m}$
Data unit	Dimensionless proportion
Description	Mean aboveground plant cellulose plus lignin at station j in stratum m
Source of data	Measured in project area
Description of measurement methods and procedures to be applied	Lignin and cellulose content for each sampling station to be estimated on the basis of cover of different plant functional types: annual grass, forb (herbaceous dicot), or perennial grass. Five leaf and stem samples from each of the five most common

	species of each plant functional type collected from sampling stations.
Frequency of monitoring/recording	To be determined
Value applied	To be determined
Monitoring equipment	To be determined
QA/QC procedures to be applied	To be determined
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation of project emissions
Comments	To be determined

5.3 Monitoring Plan

The monitoring plan for the project climate benefits features two main components:

1. Monitoring of livestock numbers and movements using rangeland coordinator reports and satellite imagery is necessary to establish that Rapid Rotational Grazing has been successfully implemented for at least a majority of cattle in the participating communities.

2. Vegetation cover and composition need to be monitored every 5-7 years to establish a new, reduced grazing intensity and new values for lignin and cellulose, so that the change in soil carbon (CO_2 removals) can be calculated with the SNAPGRAZE model.

Organizational Structure, Responsibilities, and Competencies

The monitoring of project activities, consequences of these for vegetation and soils will be administered and coordinated by SftFA personnel. All soil and vegetation data used in the SNAPGRAZE model is being collected by SftFA and stored in spreadsheets on both project hard drives as well as a cloud-based storage system for duplication and ease of access on a server supported by the Biodiversity Research Institute (BRI) and Soils for the Future LLC (Soils for the Future US, based in the United States). The structure of data collection and monitoring protocols have been established by Dr. Ritchie of Soils for the Future US who is also the author of this document and author of the SNAPGRAZE model and the VM0032 Methodology used by this project. All policies for oversight and management of personnel and data are contained in the SftFA Employee Handbook.

Internal auditing and QA/QC procedures, as well as procedures for handling nonconformance with the validated monitoring plan, are in development.

Sampling approaches, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement and QA/QC procedures, are still to be determined.