



Verification Report of Boomitra Grassland Restoration in Northern Mexico



Document Prepared by 4K Earth Science Private Limited

Report ID	25009-VCS-VER
Project title	Boomitra Grassland Restoration in Northern Mexico
Project ID	2887
Verification period	04/09/2018 to 03/09/2022
Original date of issue	23/05/2025
Most recent date of issue	16/02/2026
Version	7

VCS Standard Version	VCS standard, V4.7
Client	Boomitra Inc
Prepared by	4K Earth Science Private Limited (4KES)
Approved by	Ms. Chandrakala R  Managing Director
Work carried out by	Team Leader and Technical Expert: Mr. Ma Paa Puratchikkannal Technical Expert (Models and remote sensing): Dr. Raúl Roberto Poppiel Technical and Local Expert: Dr. Francisco Gonzalez IME (RothC Models): Dr. Brian G. McConkey Technical Reviewer: Mr. Stalin S Technical Expert for Technical Reviewer: Ms. Zainab Hassan

Summary:

A brief description of the verification of the project

4K Earth Science Pvt Ltd (referred to as 4KES) has been commissioned by Boomitra Inc., (referred to as the Project Proponent(PP)) to carry out the verification of the Boomitra Grassland Restoration in Northern Mexico project under the VCS Program. The project is an Improved Grassland Management (IGM) activity, under the Agricultural Land Management (ALM) category, implemented in the region of Mexican deserts to promote sustainable and improved grazing practices within grasslands and to generate GHG removals through mainly soil carbon sequestration. The project has been designed as a grouped project with the aim to incorporate more ranchers adopting improved grazing practices across the project area.

The overall purpose of this project initiative is to develop soil carbon storage through improved grassland management and expected to result in significant removal of CO₂ from the atmosphere, as documented using the VCS methodology, “VM0042 – Methodology for Improved Agricultural Land Management, V1”. The project start date is 4th September 2018, with a 20-year crediting period, until 3rd September 2038.

This project has been registered on 18/02/2025. First instance of this grouped project encompasses 553,486.55 ha covering 104 private ranches and 15 community ranches (Ejidos). The total GHG emission reductions (sequestered) in this monitoring period (4th September 2018 to 3rd September 2022) are 3,033,077 tCO_{2e}.

The purpose and scope of verification

4KES has been contracted by the project proponent, Boomitra Inc, to perform a verification of the VCS grouped project 'Boomitra Grassland Restoration in Northern Mexico', in Mexico (VCS Ref. No. 2887), located in Mexico.

The objective of the goal is to ensure that the Project" and all associated project documentation comply with the monitoring guidelines and specifications of the VCS Standard v4.7, VCS Methodology Requirements, the applied GHG methodology " VCS VM0042 Methodology for Improved Agricultural Land Management, v1 "its applicable tools and modules, the VCS Non-Permanence Risk Tool, v4.0, and VMD0053 module, v1.

The monitoring period

First Monitoring period: 4th September 2018 to 3rd September 2022

The method and criteria used for verification

The scope of the verification audit is defined as an independent and objective review of the registered VCS project design document, the registered project's baseline study, registered monitoring plan and other relevant documents. The verification team reviewed the project activity according to the latest VCS standards, ensuring its applicability to the applied methodology and tools, which include:

- VCS Standard, v4.7
- VCS Program Guide, v4.4
- VCS Program Definitions, v4.4
- VCS Validation and Verification Manual v3.2'
- AFOLU Non-Permanence Risk Digital Tool, version 4

The project activity was found eligible under Project Scope 14 "Agriculture, Forestry, and Other Land Use (AFOLU)" and the Afforestation, Reforestation, and Revegetation (ARR) category

The number of findings raised during verification

During the verification process 35 corrective actions (CARs), 14 clarification requests (CLs) and 02 Forward action request (FAR) concerning verification were raised.

During the registration process (previous audit) of this project, five FARs were raised. Out of these, one of the FAR - FAR 02 was closed during the VCS PRR review process, while the remaining four were pending resolution in the next audit. In this verification audit, these FARs have been reviewed, and the VVB assessment has been provided in the respective sections of this verification report.

Any uncertainties associated with the verification

The report is based on the assessment of the registered VCS project design document, application of standard auditing techniques including but not limited to desk review, site visits and follow up actions and the review of the applicable approved methodological and relevant tools. The verification procedure was free of any uncertainties.

Summary of the verification conclusion

4KES concludes that the project "Boomitra Grassland Restoration in Northern Mexico" VCS 3774 meets all relevant VCS standards and guidelines and correctly applies the methodology VM0042 - Improved Agricultural Land Management, Version 1.0. The project is estimated to result in total emission reductions of 3,033,077 tCO₂e over its 1st monitoring period from 4th September 2018 to 3rd September 2022, which are developed

in line with the requirements specified in the VCS Validation and Verification Manual v3.2. The purpose of the Verification is to confirm that the project and all related project documentation are in accordance with all rules and requirements of the VCS Standard v4.7, applied methodology (VM0042 - Improved Agricultural Land Management”, Version 1.0) and its associated tool.

In conclusion, according to 4KES, the project “Boomitra Grassland Restoration in Northern Mexico”, in Mexico satisfies all pertinent requirements for VCS standards and guidelines and correctly implemented the approved VCS methodology for calculating emission removals in this monitoring period, which starts on 4th September 2018, and ends on 3rd September 2022.

CONTENTS

1	INTRODUCTION	8
1.1	Objective	8
1.2	Scope and Criteria	8
1.3	Level of Assurance.....	9
1.4	Summary Description of the Project	9
2	VERIFICATION PROCESS	11
2.1	Method and Criteria.....	11
2.2	Document Review	14
2.3	Interviews	15
2.4	Site Visits	17
2.5	Resolution of Findings	32
2.6	Eligibility for Validation Activities	33
3	VALIDATION FINDINGS	33
3.1	Methodology Deviations.....	33
3.2	Project Description Deviations.....	33
3.3	New Project Activity Instances in Grouped Projects.....	34
3.4	Baseline Reassessment	34
4	VERIFICATION FINDINGS.....	34
4.1	Project Details	34
4.2	Safeguards and Stakeholder Engagement	40
4.3	Accuracy of Reduction and Removal Calculations.....	81
4.4	Quality of Evidence to Determine Reductions and Removals.....	90
4.5	Non-Permanence Risk Analysis.....	98
5	VERIFICATION OPINION.....	103
5.1	Verification Summary	103
5.2	Verification Conclusion	103
5.3	Ex-ante vs Ex-post ERR Comparison	105
	APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION	113
	APPENDIX 2: LIST OF DOCUMENTS REFERRED	114

APPENDIX 3: FAR FROM PREVIOUS AUDIT	116
APPENDIX 4: LIST OF FINDINGS.....	119
APPENDIX 5: COMPETENCE OF TEAM MEMBERS.....	177
APPENDIX 6: ABBREVIATIONS.....	182

1 INTRODUCTION

1.1 Objective

4KES has been contracted by “**Boomitra Inc**” (hereafter referred to as Project Proponent (PP)) to perform a verification of the VCS project ‘Boomitra Grassland Restoration in Northern Mexico’, (VCS Ref. No. 2887)¹ in Mexico.

The objective of the verification is defined as an independent third-party assessment of this project implementation status, registered monitoring plans,

VCS requirements, relevant rules and host country regulations and other relevant documents. The information in these documents is reviewed against the requirements of ‘VCS Validation and Verification Manual v3.2’ and all other associated VCS requirements and rules. Verification is seen as necessary to provide assurance to stakeholders on the quality of the project and its intended generation of Verified Carbon Units (VCUs) / Emission reductions.

All VCS projects must undergo independent third-party verification in order to assure the VCS and other stakeholders of the project's quality and anticipated Verified Carbon Units (VCUs) from the project.

1.2 Scope and Criteria

The scope of the verification is defined as an independent and objective review of the Project monitoring report/7/ document whether the project has followed the procedures (implementation plan, monitoring plan, etc.) as detailed in the registered PD reviewed against the requirements of VCS Standard. 4KES has employed a risk-based approach in verification, focusing on the identification of significant risks for project implementation and the generation of Emission Reductions/carbon sequestration.

The scope of work covered in the verification is described below:

- To verify whether the implemented project activities meet the requirements of VCS Standard v4.7/2/, VCS Validation and Verification Manual v3.2/3/, and VCS program guide 4.4 /1/.
- To evaluate whether the project as followed registered PD procedures with respect to monitoring plan are in conformance with the applied VCS methodology.
- To confirm that the information presented are complete, consistent, transparent and free of omission or material error.
- To confirm that the monitoring system is implemented and fully functional to generate Voluntary Emission Reductions (VERs/VCUs) without any double counting,
- to verify that reported GHG emission data is sufficiently supported by evidence.
- Background investigation and follow up interviews and site visit.
- Issuance of draft verification report with CARs, CLs & FARs, if any

¹ <https://registry.terra.org/app/projectDetail/VCS/2887>

- Final verification opinion
- Standard auditing methods for management systems.
- Good practice in the respective technology and sectoral scope, including environmental and social impacts and sustainable developmental goals.

Furthermore, the assessment team used additional documentation by third parties like reports referring to the project design or to the basic conditions and technical data available on public domain to assess the following: -

- Compliance with relevant law and regulations
- LULC data /15/
- Land title documents (issued by the competent authorities in the region /17/ and carbon agreements between the landowners/32/)
- Project database /9/
- AFOLU safeguards section in PDMR/7/.

The assessment team has checked all the above-mentioned details and confirms that all the information provided is accurate. Unless otherwise indicated, the assessment was performed against the most recent version of the relevant VCS guidance document.

The verification is not intended to give the client any consulting. However, clearly stated requests for clarifications and/or remedial action may provide opportunity for client for enhancing the project design and its applicability as per VCS requirements.

1.3 Level of Assurance

The assessment was conducted to provide a reasonable level of assurance of conformance against the defined audit criteria and materiality thresholds within the audit scope. Based on the audit findings, a positive evaluation statement reasonably assures that the project GHG assertions are materially correct and is a fair representation of the GHG data and information.

In accordance with Section 4.1.2 of the VCS Standard v4.7/2/, the level of assurance/ assumptions of this verification report is reasonable.

1.4 Summary Description of the Project

The proposed project aims to remove GHG from atmosphere by implementing sustainable grazing management practices along with few water management practices across over multiple grasslands of in Mexico. In the baseline scenario, ranchers in this region have traditionally followed practices such as continuous grazing, without any sustainable grazing management plans in place. This has resulted in overgrazing, leading to severe soil degradation and loss of vegetative cover. Loss of grasses due to continuous grazing in grassland ecosystems results in soil loss and erosion, soil carbon loss, reduced water filtration capacity, and reduced productivity of forage.

Through this project, ranchers are adopting new grassland management practices. These practices include rotational grazing and a variety of water conservation measures. In rotational grazing, livestock are rotated between different sections of a pasture over the course of days, weeks, or months, while other sections of the pasture are allowed to rest. These sections are known as “Paddocks”. This practice allows plants to recover and grow in the paddocks that are allowed to rest, and thus allows them to sequester carbon, gradually regenerating the land. In addition, for arid regions like northern Mexico, water conservation measures help increase the availability of water (which would otherwise be lost) for the growth of the biomass, contributing to the regeneration. The livelihoods of the communities utilizing these ranches are improved directly through the carbon credit payments, which provide an additional source of income, and indirectly through the increased productivity of their lands. The regenerated lands also become much less likely to undergo land use change, because the ranchers are better able to sustain their livelihoods. This in turn ensures that crucial habitats for the flora and fauna of the region are protected. This results in the sequestration of greenhouse gases from the atmosphere to the soil.

This project has been registered on 18/02/2025. During the registration process, in total 5 FARs have been raised by VVB. Out of five, one - FAR 02 was closed during the registration process.

The project has been designed as a ‘Grouped Project’ and plans to increase the number of project instances over a period of time. The first instance includes two major deserts – the Chihuahuan Desert and the Sonoran Desert. The first instance of this grouped project covers a fixed area of 553,486.55 hectares, spanning 104 private ranches and 15 community ranches (Ejidos), with the participation of 119 ranchers in total. The table below summarizes the hectares onboarded in this first instance of grouped project.

Ranch type	Number of Ranches included in the Instance 01	Number of ranches polygons included in the Instance 01 ²	Area Covered (in Ha)
Private	104	115	499,178.01
Community (Ejido)	15	24	54,308.54
Total	119	139	553,486.55

Table 1: Hectares onboarded in PAI 01

² The reported count reflects the number of sub-polygons derived from individual ranches, each linked to a unique Ranch ID and utilized for ER calculations. As confirmed during the review, ineligible areas have been excluded from this count in accordance with eligibility criteria. It was observed that certain ranches—such as San Pablo—are subdivided into multiple spatial units (e.g., San Pablo 2, San Pablo 4, etc.), which are treated as distinct sub-polygons for the purpose of ER estimation, despite being part of the same parent ranch entity. This approach is consistent with spatial disaggregation practices commonly applied in AFOLU carbon accounting.

The total GHG emission reductions (sequestered) in this monitoring period (4th September 2018 to 3rd September 2022) are 3,033,077 tCO_{2e}.

This project also contributes to UN SDG goals 2, 6, 8, 13 and 15. The project also aims to develop livelihood options and improve socio-economic conditions of the local communities within the project area by providing jobs and training opportunities.

2 VERIFICATION PROCESS

There is no validation activities performed as part of verification audit. As discussed in section 1.4 of this report, only FARs have been audited.

2.1 Method and Criteria

The project activity applies approved VCS methodology **VM0042 “Methodology for Improved Agricultural Land Management³”, Version 01 /20/**, categorized under sectoral scope 14. This verification was undertaken as per VCS Standard v4.7, and its associated modules and tools as well as applying standard auditing techniques and Validation and Verification Manual v3.2/3/.

The verification process is undertaken by the audit team that involves the following:

- Contract review and appointment of audit team.
- Publication of VCS project design/description document
- Completeness Check of the documents and templates used.

The desk review of documents and evidence submitted by the PP in context of the reference VCS rules and guidelines. (Example: Project conformance to the registered monitoring plan, implementation plan, rules and regulations of VCS, etc.)

- Design the sampling plan for audit.

Undertaking site visits, interviews, and interactions with the representative of the project proponent, project employees and local communities and other relevant stakeholders. The viewpoints collected in these interviews were considered by VVB along with onsite observation, objective evidence gathering, data production, and recorded analysis when reaching a verification opinion.

To ensure the risk of auditing error is minimized to a reasonable level and ensure effectiveness & efficiency, a project specific verification and sampling plan was developed to guide the

³ [https://verra.org/wp-content/uploads/imported/methodologies/VM0042 Methodology-for-Improved-Agricultural-Land-Management v1.0.pdf](https://verra.org/wp-content/uploads/imported/methodologies/VM0042_Methodology-for-Improved-Agricultural-Land-Management_v1.0.pdf)

verification process. The methodology of the verification and sampling plan is based on the VCS guidance documents and ISO 14064-3:2019. Any modifications applied to the plan were made based upon the conditions observed for monitoring to detect the processes with highest risk of material discrepancy. The samples were observed and audited in selected sample plots through on-site assessment and satellite imageries analysis.

Reporting audit findings with respect to clarifications and non-conformities and the closure of the findings, as appropriate.

- Preparation of final verification opinion.
- TR Comments and findings.
- Issuance of final verification report.

Sample Plan for audit

The VCS standard and applied methodology VM0042 do not mandate a specific sampling approach. Instead, the VCS standard states that when assessing each individual project activity instance is impractical due to their large number, the validation/verification body (VVB) must document and justify the sampling methods used for verification. These methods must be statistically sound, as outlined in VCS Standard, Version 4.4.

Boomitra Inc., the Project Proponent (PP) did not apply any sampling approach when quantifying GHG removals; instead, GHG removals were quantified and reported for each individual polygon. For this verification, the Validation/Verification Body (VVB) selected samples following the guidance provided in paragraph 27 of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 09.0)/34/. Random sampling was carried out considering a confidence interval of 95% and error of 30%. Specifically, sampling used to select grassland parcels to check their size and location, baseline practices and Right to Use and Enjoy of Land (land documents) and terms of references signed.

Accordingly, the VVB conducted random sampling for site visit interviews across the 12 existing ranch polygons. Using the 95/30 confidence/precision rule, the total number of samples required for sampling was determined. To ensure statistical reliability, the VVB utilized the Raosoft sample size calculator to identify the necessary sample size for each scope of assessment in both validation and verification.



Sample size calculator

What margin of error can you accept? %
5% is a common choice

What confidence level do you need? %
Typical choices are 90%, 95%, or 99%

What is the population size?
If you don't know, use 20000

What is the response distribution? %
Leave this as 50%

Your recommended sample size is **10**

The margin of error is the amount of error that you can tolerate. If 90% of respondents answer yes, while 10% answer no, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55.
Lower margin of error requires a larger sample size.

The confidence level is the amount of uncertainty you can tolerate. Suppose that you have 20 yes-no questions in your survey. With a confidence level of 95%, you would expect that for one of the questions (1 in 20), the percentage of people who answer yes would be more than the margin of error away from the true answer. The true answer is the percentage you would get if you exhaustively interviewed everyone.
Higher confidence level requires a larger sample size.

How many people are there to choose your random sample from? The sample size doesn't change much for populations larger than 20,000.

For each question, what do you expect the results will be? If the sample is skewed highly one way or the other, the population probably is, too. If you don't know, use 50%, which gives the largest sample size. See below under **More information** if this is confusing.

This is the minimum recommended size of your survey. If you create a sample of this many people and get responses from everyone, you're more likely to get a correct answer than you would from a large sample where only a small percentage of the sample responds to your survey.

Online surveys with Vovici have completion rates of 66%!

Alternate scenarios

With a sample size of	100	200	300	With a confidence level of	90	95	99
Your margin of error would be	5.21%	0.00%	0.00%	Your sample size would need to be	8	10	17

Save effort, save time. Conduct your survey online with Vovici.

More information

If 50% of all the people in a population of 20000 people drink coffee in the morning, and if you were repeat the survey of 377 people ("Did you drink coffee this morning?") many times, then 95% of the time, your survey would find that between 45% and 55% of the people in your sample answered "Yes".
The remaining 5% of the time, or for 1 in 20 survey questions, you would expect the survey response to more than the margin of error away from the true answer.

As per the software, only 10 samples are required. However, 12 samples are randomly selected for audit purposes.

The sequence of the verification is given in the table below:

Topic	Date
Contract signed	03/03/2025
Site Visits	02/04/2025 to 09/04/2025
Draft Findings first round ⁴	02/05/2025
Draft Findings second round	12/05/2025
Final verification report for TR Comments	18/05/2025
TR Comments on MR	26/05/2025
Technical review on final reporting finalised	02/06/2025
Final Corrections and Finalising the Verification report for Verra submission	05/06/2025
PRR Round 1	19/09/2025
PRR Round 2	01/11/2025
PRR Round 3	05/12/2025

Table 2: Verification Sequence

⁴ There are two external experts involved in this audit. One is an IME expert responsible for validating the requirements of VMD0053, and the other is a remote sensing expert who assessed the FAR raised during the validation audit. The audit findings were raised on different dates, which have been reflected accordingly in the findings section of this document. As a result, these dates may not align with those listed in Table 2.

Appointment of Verification Team: Based on a competence analysis and individual availabilities a verification team was appointed. Furthermore, also the personnel for the technical review and the final approval were determined.

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Team Leader (Validator and Technical Expert)	IR	Puratchikkanal	Ma Paa	4KES Central Office	X	X	X	X
2	Technical Expert (Models and remote sensing)	EI	Poppiel	Dr. Raúl Roberto	External Expert	X		X	X
3	IME (RothC Models)	EI	G. McConkey	Dr. Brian	External Expert	X	X	X	X
4	Local Expert	EI	Gonzalez	Dr. Francisco	External Expert	X	X	X	X

Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)
1	Technical Reviewer	IR	S	Stalin	4KES Central Office
2	TE for TR	EI	Hassan	Zainab	External Expert
3	Final Approver	IR	R	Chandrakala	4KES Central Office

2.2 Document Review

The project verification is conducted primarily through a document review of the VCS Monitoring Report (MR) /7/ and associated documents, as detailed in Appendix 2 of this report. The assessment is carried out by an audit team following established protocols, which include:

1. **Cross-Verification:** Cross-referencing data in the VCS MR with external sources (where available).
2. **Expert Review:** Leveraging the team's sectoral and local expertise.

3. **Model Validation:** Independent review of model validation and calibration reports by an independent third-party entity (IME) /27/45/.

This verification process focuses on evaluating documents submitted at various assessment stages. As part of this effort, 4K conducted a desk review as outlined below

- a) A review of the data and information presented to verify their completeness.
- b) Monitoring Plan: Evaluation of the methodology, including applicable tools and standardized baselines (where relevant).
 - a. Measurement Protocols
 - b. Frequency: Adequacy of measurement intervals.
 - c. Equipment: Quality of metering devices (if used), including calibration standards.
 - d. QA/QC: Quality assurance and control procedures to ensure data integrity
- c) An assessment of data management practices and quality assurance/quality control (QA/QC) systems, focusing on their role in ensuring the accuracy and reliability of emission reduction generation and reporting.

2.3 Interviews

Interviews were conducted with the PP (Boomitra Inc.), local communities, and other relevant stakeholders during the on-site visit to the project area from April 2 to 9th, 2025. Prior to the site visits, a virtual meeting was held with the PP and implementation partners to establish objectives and expectations.

Participant Selection Criteria

Individuals were selected for interviews based on:

- Involvement: Their direct role in project implementation.
- Impact: Their capacity to influence project outcomes at the local or regional level.
- Proximity: Their geographical or operational closeness to the project area.

Interviewee Composition

The final list included Boomitra Inc. (PP)'s employees and representatives from partner implementation organizations.

SI No	Name of the person Interviewed	Affiliation	Date	Subject	Auditing Team Member
1	Aadit Moorthy	CEO of Boomitra	01-04-2025	Host Country rule and regulations related to project activity, Project	
2	Chethan T. R	Director Carbon Projects Boomitra	28-03-2025		

SI No	Name of the person Interviewed	Affiliation	Date	Subject	Auditing Team Member
3	David Clark	Director of R&D, Geospatial	28-03-2025	description, Ownership, Project start date, Conditions prior to the Project initiation, Participation under other GHG programs, Non permanence risk analysis VCS PD, Excel Sheets, VER calculations, financials, Project Roles and Responsibilities allocated, Ownership and project details. Sampling and ecological survey points for data correction. Baseline emissions, computations, leakage and project emission assessments	Mr. Ma Paa Puratchikkanal Dr. Francisco Gonzalez
4	Dr. Cliserio Gonzalez	Director of Latin America, Boomitra	28-03-2025		
5	Octavio Andres	Project Manager, Mexico Project, Boomitra	01-04-2025		
6	Rosario Alvarez Gutierrez	Pronatura Noreste AC, (Representative from Implementation partner)	07-04-2025		
7	Rogelio Maciel	Pronatura Noreste AC, (Representative from Implementation partner)	05-04-2025		
8	Judith Galvan	Soluciones Ganaderas de Chihuahua SRLMI, (Representative from Implementation partner)	08-04-2025		
9	Aldo Diaz	Soluciones Ganaderas de Chihuahua SRLMI, (Representative from Implementation partner)	08-04-2025		
10	Diana Chavez	Manejo Regenerativo de Ranchos AC, (Representative from Implementation partner)	09-04-2025		
11	Servando Diaz	Manejo Regenerativo de Ranchos AC, (Representative from Implementation partner)	09-04-2025		

Table 3: List of team members interviewed from Boomitra (PP) and implementation partner on ground.

The below table outlines the details of the ranch visits during the audit process.

Name of the Rancher interviewed	Name of the ranch	Date	Subject	Auditing Team Member
Anays Blanco	Rancho Nuevo	02-04-2025	Project stakeholders, rancher issues, community benefits, participation, extent of implementation, continued progress scenario. Training programs provided,	Mr. Ma Paa Puratchikkanal Dr. Francisco Gonzalez
Anays Blanco	Potrero de San Luis	02-04-2025		
Eduardo Cázares	Carretas	03-04-2025		
Eduardo Cázares	El Vado	03-04-2025		
Alberto Terrazas	Plan de Álamos	04-04-2025		
Rodolfo Chacón	Dos Amigos	06-04-2025		
Luis Robles	Los Robles	05-04-2025		
Alejandro Loya	La Víbora	05-04-2025		
Ivan Loya	Rancho Viejo	06-04-2025		
Porfirio García	Colonia Ganadera Constitución	07-04-2025		
Francisco Javier Herrada	San José de los Álamos	08-04-2025		
Manuel Sandoval Venzor	El Quelite	09-04-2025	- Beneficiary requirements implementation, extent and future steps. - Grievances and its addressal.	

Table 4: List of the Ranchers interviewed

2.4 Site Visits

The site visit was conducted on 02/04/2025 to 09/04/2025. The following tasks were undertaken during the site visit.

- To understand and evaluate the project area/boundary, project emissions and leakage management aspects if any.
- To interact with the communities directly and indirectly dependent/impacting/impacted by the project and understand the socioeconomic dimension of the project.
- To discuss and confirm the project details, implementation strategy, monitoring plan, baseline scenario, and other project aspects,
- To understand the biodiversity dimension of the project.
- To check the project management, meet the management team, check the monitoring plan and on ground implementation practices.
- To check the grassland area as defined and mentioned in the PD.
- Legal ownership of the lands.
- Review the financials audits and fund flow.
- Review the grievance mechanism in place.

- Verification of the effectiveness of the quality assurance and quality control methods.

The local expert first met the implementation partners on the ground, followed by a site inspection in the ranches. The project's activities, project boundaries, monitoring, responsible parties, and all other features were audited during the site visits.

The audit included the following questions posed to all ranchers and ranching communities in the project area.

Land Ownership

- Has there been any change in landownership since the project's initiation? If yes, specify the date of transfer and the identity of the new owner.
- Have any disputes or conflicts arisen due to landownership changes? If yes, how were they resolved?

Sustainable Practices

- What specific sustainable grassland management practices have been implemented under this project?
- How have the project's sustainable practices impacted pasture productivity or grassland condition over time?

Rotational Grazing

- When was rotational grazing adopted by the rancher, and what documentation exists to verify its implementation timeline?

Livestock Management

- What is the current total livestock count recorded within the project area?
- How are livestock herds managed to align with sustainable grazing protocols?

Paddock Management

- How many paddocks have been established under the project, and what criteria were used to determine their size and distribution?
- What methods are used to create, manage, and monitor paddocks, and how is rotational grazing activity documented?

Livestock Trends to assess the productivity

- Has there been a significant reduction in livestock numbers compared to baseline years? If so, explain the reasons for this change.

Water Management

- Have water management activities been implemented as part of this project? If yes, provide details on their design, implementation, and monitoring.

Carbon Agreements

- Are ranchers aware of the carbon revenue-sharing agreements and their terms? Provide evidence of communication or training on this matter.

Grievance Mechanisms

- Are stakeholders informed about the project's grievance redressal mechanism? If yes, describe how awareness was raised.
- Have any grievances been formally reported related to this project? If yes, provide details of resolutions.

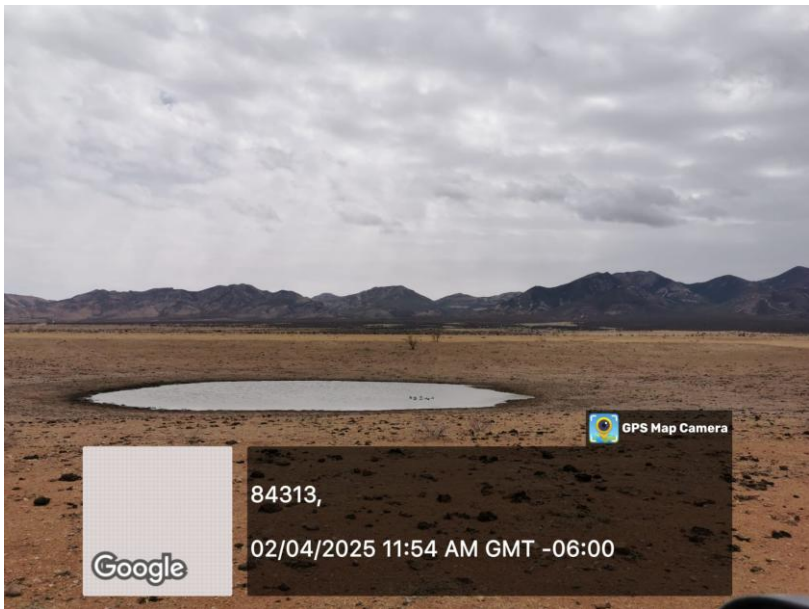
Environmental Impact

- Has the project demonstrated measurable improvements in soil health, water retention, or biodiversity? Provide supporting data.
- Has forage availability or quality improved since project implementation? If yes, provide evidence of monitoring results.

Capacity Building

- What training or resources were provided to ranchers to adopt sustainable management practices? Describe the methodology used for knowledge dissemination.

During the audit, the team documented all responses and verified that ranchers understand the carbon project and its revenue-sharing framework. Participants consistently reported that the project's sustainable grazing practices improve soil health.

Ranch Name	Images from Site Visit
Potrero de San Luis	

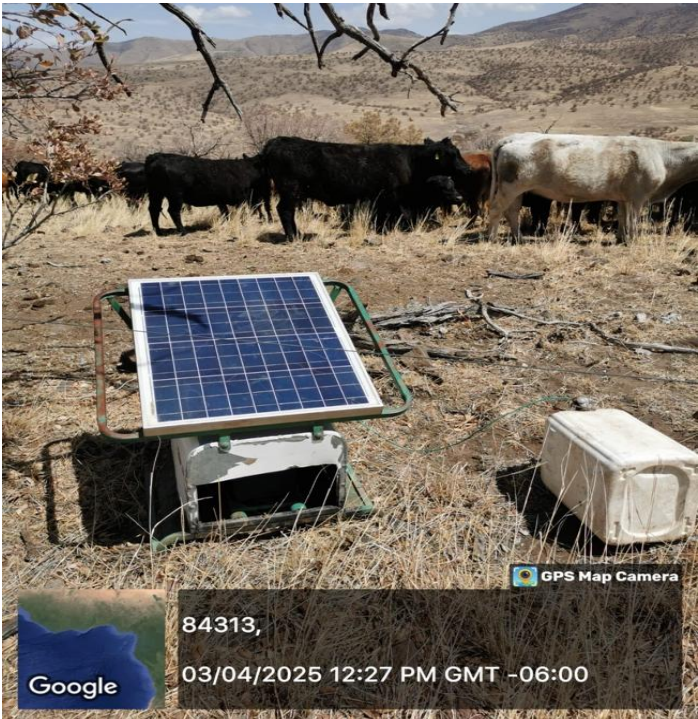
Ranch Name	Images from Site Visit
Rancho Nuevo	 

Ranch Name	Images from Site Visit
Alberto Federico Terrazas Seyffert/Plan D Alamos	 

Ranch Name	Images from Site Visit
	 RANCHO PLAN DE ALAMOS Escriba una descripción para su mapa. Google Earth
Carretas	 Latitud: 30.651502 Longitud: -108.794244 Elevación: 1549.9±1 m Precisión: 4.9 m Tiempo: 03-04-2025 16:22

Ranch Name	Images from Site Visit																																																																																																																																																																																																																
	PLAN DE PASTOREO PLAN DE PASTOREO DEL RANCHO CARRETAS MANADA DE VACAS MADURAS RANCHO: CARRETAS (2021-2022)ENCARGADO: NOE QUINTANA AMAR MANADA: VACAS MADURAS DE TERCER PARTO O MAS HASTA 10 AÑOS <table><tr><th>Nº</th><th>POTREROS</th><th>DENSIDAD CARGA INSTANTANEA</th><th># CAVIBIOS AL DIA</th><th>AREA PASTOREADA (HAS.)</th><th>TOTAL HECTAREAS POR DIA</th><th>Animales dia/ha</th><th>DIAS ESTIMADOS POR POTRERO</th><th>CONDICION CORPORAL</th><th>Vacas</th><th>Vaquillas</th><th>TOROS</th><th>CRIAS MADROS</th><th>CRIAS HEMBRAS</th><th>MUELTES</th><th>FECHA PASTOREO PLANIFICACION INICIO</th></tr><tr><td>1</td><td>EL RANCHO (7 FRANJAS)</td><td>500</td><td>4</td><td>201</td><td>6</td><td>100</td><td>34</td><td>3.2</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>15-Feb</td></tr><tr><td>2</td><td>LA MULA (13 FRANJAS)</td><td>500</td><td>4</td><td>125</td><td>6</td><td>100</td><td>21</td><td>3.2</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>22-Mar</td></tr><tr><td>3</td><td>LOS PILARES (13 FRANJAS)</td><td>500</td><td>4</td><td>144</td><td>7</td><td>86</td><td>21</td><td>3.4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>12-Apr</td></tr><tr><td>4</td><td>EL MONTOSO (10 FRANJAS)</td><td>500</td><td>4</td><td>222</td><td>7</td><td>86</td><td>32</td><td>3.4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>4-May</td></tr><tr><td>5</td><td>EL PEÑASCO (2 FRANJAS)</td><td>500</td><td>4</td><td>40.2</td><td>7</td><td>86</td><td>6</td><td>3.6</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>6-Jun</td></tr><tr><td>6</td><td>EL PINITO (5 FRANJAS)</td><td>500</td><td>4</td><td>116</td><td>7</td><td>86</td><td>17</td><td>3.6</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>13-Jun</td></tr><tr><td>7</td><td>LA LEONA (7 FRANJAS)</td><td>500</td><td>4</td><td>217</td><td>7</td><td>86</td><td>31</td><td>3.8</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1-Jul</td></tr><tr><td>8</td><td>LA SIERRA ALTA (12 FRANJAS)</td><td>500</td><td>4</td><td>158</td><td>7</td><td>86</td><td>23</td><td>4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>2-Aug</td></tr><tr><td>9</td><td>EL PERDIDO (8 FRANJAS)</td><td>500</td><td>4</td><td>280</td><td>7</td><td>86</td><td>40</td><td>4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>26-Aug</td></tr><tr><td>10</td><td>PUERTO DEL AIRE (8 FRANJAS)</td><td>500</td><td>4</td><td>102</td><td>7</td><td>86</td><td>15</td><td>4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>6-Oct</td></tr><tr><td>11</td><td>EL MEZQUITE (15 FRANJAS)</td><td>500</td><td>4</td><td>177</td><td>7</td><td>86</td><td>25</td><td>4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>22-Oct</td></tr><tr><td></td><td></td><td>500</td><td>4</td><td>117</td><td>7</td><td>86</td><td>17</td><td>4</td><td>600</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>17-Nov</td></tr></table> Latitud: 30.651521 Longitud: -108.794228 Elevación: 1549.9±1 m Precisión: 4.9 m Tiempo: 03-04-2025 16:18	Nº	POTREROS	DENSIDAD CARGA INSTANTANEA	# CAVIBIOS AL DIA	AREA PASTOREADA (HAS.)	TOTAL HECTAREAS POR DIA	Animales dia/ha	DIAS ESTIMADOS POR POTRERO	CONDICION CORPORAL	Vacas	Vaquillas	TOROS	CRIAS MADROS	CRIAS HEMBRAS	MUELTES	FECHA PASTOREO PLANIFICACION INICIO	1	EL RANCHO (7 FRANJAS)	500	4	201	6	100	34	3.2	600	0	0	0	0	0	15-Feb	2	LA MULA (13 FRANJAS)	500	4	125	6	100	21	3.2	600	0	0	0	0	0	22-Mar	3	LOS PILARES (13 FRANJAS)	500	4	144	7	86	21	3.4	600	0	0	0	0	0	12-Apr	4	EL MONTOSO (10 FRANJAS)	500	4	222	7	86	32	3.4	600	0	0	0	0	0	4-May	5	EL PEÑASCO (2 FRANJAS)	500	4	40.2	7	86	6	3.6	600	0	0	0	0	0	6-Jun	6	EL PINITO (5 FRANJAS)	500	4	116	7	86	17	3.6	600	0	0	0	0	0	13-Jun	7	LA LEONA (7 FRANJAS)	500	4	217	7	86	31	3.8	600	0	0	0	0	0	1-Jul	8	LA SIERRA ALTA (12 FRANJAS)	500	4	158	7	86	23	4	600	0	0	0	0	0	2-Aug	9	EL PERDIDO (8 FRANJAS)	500	4	280	7	86	40	4	600	0	0	0	0	0	26-Aug	10	PUERTO DEL AIRE (8 FRANJAS)	500	4	102	7	86	15	4	600	0	0	0	0	0	6-Oct	11	EL MEZQUITE (15 FRANJAS)	500	4	177	7	86	25	4	600	0	0	0	0	0	22-Oct			500	4	117	7	86	17	4	600	0	0	0	0	0	17-Nov
Nº	POTREROS	DENSIDAD CARGA INSTANTANEA	# CAVIBIOS AL DIA	AREA PASTOREADA (HAS.)	TOTAL HECTAREAS POR DIA	Animales dia/ha	DIAS ESTIMADOS POR POTRERO	CONDICION CORPORAL	Vacas	Vaquillas	TOROS	CRIAS MADROS	CRIAS HEMBRAS	MUELTES	FECHA PASTOREO PLANIFICACION INICIO																																																																																																																																																																																																		
1	EL RANCHO (7 FRANJAS)	500	4	201	6	100	34	3.2	600	0	0	0	0	0	15-Feb																																																																																																																																																																																																		
2	LA MULA (13 FRANJAS)	500	4	125	6	100	21	3.2	600	0	0	0	0	0	22-Mar																																																																																																																																																																																																		
3	LOS PILARES (13 FRANJAS)	500	4	144	7	86	21	3.4	600	0	0	0	0	0	12-Apr																																																																																																																																																																																																		
4	EL MONTOSO (10 FRANJAS)	500	4	222	7	86	32	3.4	600	0	0	0	0	0	4-May																																																																																																																																																																																																		
5	EL PEÑASCO (2 FRANJAS)	500	4	40.2	7	86	6	3.6	600	0	0	0	0	0	6-Jun																																																																																																																																																																																																		
6	EL PINITO (5 FRANJAS)	500	4	116	7	86	17	3.6	600	0	0	0	0	0	13-Jun																																																																																																																																																																																																		
7	LA LEONA (7 FRANJAS)	500	4	217	7	86	31	3.8	600	0	0	0	0	0	1-Jul																																																																																																																																																																																																		
8	LA SIERRA ALTA (12 FRANJAS)	500	4	158	7	86	23	4	600	0	0	0	0	0	2-Aug																																																																																																																																																																																																		
9	EL PERDIDO (8 FRANJAS)	500	4	280	7	86	40	4	600	0	0	0	0	0	26-Aug																																																																																																																																																																																																		
10	PUERTO DEL AIRE (8 FRANJAS)	500	4	102	7	86	15	4	600	0	0	0	0	0	6-Oct																																																																																																																																																																																																		
11	EL MEZQUITE (15 FRANJAS)	500	4	177	7	86	25	4	600	0	0	0	0	0	22-Oct																																																																																																																																																																																																		
		500	4	117	7	86	17	4	600	0	0	0	0	0	17-Nov																																																																																																																																																																																																		

El Vado	Plan de Actividades Rancho Carretas y El Vado <table><tr><th>DETALLE</th><th>Enero</th><th>Febrero</th><th>Marzo</th><th>Abril</th><th>Mayo</th><th>Junio</th><th>Julio</th><th>Agosto</th><th>Sep.</th><th>Oct.</th><th>Nov.</th><th>Dic.</th></tr><tr><td>Ciclo Biológico</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Periodo de lluvias</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Crecimiento Pastos Verano</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Crecimiento Hierbas Invierno</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sin crecimiento (Sequia)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Periodo de heladas</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Manejo Ganado</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Empadre vacas adultas (65 dias)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Empadre vaquillas (65 dias)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Diagnóstico preñez</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Nacimientos</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Herradero</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Desahije</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Prueba de fertilidad toros</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Ventas</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Venta toros desecho</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Venta becerros y becerras</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Venta vacas desecho</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Nutrición</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sal y minerales</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Suplementacion estrategica</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Suplementacion desahije</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Latitud: 30.651513 Longitud: -108.794229 Elevación: 1549.9±1 m Precisión: 4.8 m Tiempo: 03-04-2025 16:18	DETALLE	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Sep.	Oct.	Nov.	Dic.	Ciclo Biológico													Periodo de lluvias													Crecimiento Pastos Verano													Crecimiento Hierbas Invierno													Sin crecimiento (Sequia)													Periodo de heladas													Manejo Ganado													Empadre vacas adultas (65 dias)													Empadre vaquillas (65 dias)													Diagnóstico preñez													Nacimientos													Herradero													Desahije													Prueba de fertilidad toros													Ventas													Venta toros desecho													Venta becerros y becerras													Venta vacas desecho													Nutrición													Sal y minerales													Suplementacion estrategica													Suplementacion desahije												
DETALLE	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Sep.	Oct.	Nov.	Dic.																																																																																																																																																																																																																																																																																																
Ciclo Biológico																																																																																																																																																																																																																																																																																																												
Periodo de lluvias																																																																																																																																																																																																																																																																																																												
Crecimiento Pastos Verano																																																																																																																																																																																																																																																																																																												
Crecimiento Hierbas Invierno																																																																																																																																																																																																																																																																																																												
Sin crecimiento (Sequia)																																																																																																																																																																																																																																																																																																												
Periodo de heladas																																																																																																																																																																																																																																																																																																												
Manejo Ganado																																																																																																																																																																																																																																																																																																												
Empadre vacas adultas (65 dias)																																																																																																																																																																																																																																																																																																												
Empadre vaquillas (65 dias)																																																																																																																																																																																																																																																																																																												
Diagnóstico preñez																																																																																																																																																																																																																																																																																																												
Nacimientos																																																																																																																																																																																																																																																																																																												
Herradero																																																																																																																																																																																																																																																																																																												
Desahije																																																																																																																																																																																																																																																																																																												
Prueba de fertilidad toros																																																																																																																																																																																																																																																																																																												
Ventas																																																																																																																																																																																																																																																																																																												
Venta toros desecho																																																																																																																																																																																																																																																																																																												
Venta becerros y becerras																																																																																																																																																																																																																																																																																																												
Venta vacas desecho																																																																																																																																																																																																																																																																																																												
Nutrición																																																																																																																																																																																																																																																																																																												
Sal y minerales																																																																																																																																																																																																																																																																																																												
Suplementacion estrategica																																																																																																																																																																																																																																																																																																												
Suplementacion desahije																																																																																																																																																																																																																																																																																																												

Ranch Name	Images from Site Visit
	
Ej Col. Ganadera Constitucion	

Ranch Name	Images from Site Visit
	 

Ranch Name	Images from Site Visit
Ejido San Jose de los Alamos	 

Ranch Name	Images from Site Visit
	
El Quelite	 Latitud: 26.806961 Longitud: -106.620656 Elevación: 2251.7±8 m Precisión: 7.1 m Tiempo: 09-04-2025 12:46 Powered by No

Ranch Name	Images from Site Visit
	 Latitud: 26.807431 Longitud: -106.61823 Elevación: 2259.34±5 m Precisión: 4.7 m Tiempo: 09-04-2025 13:35 Powered by  Latitud: 26.804952 Longitud: -106.617199 Elevación: 2278.05±13 m Precisión: 17.2 m Tiempo: 09-04-2025 13:42 Powered by NoteCam

Ranch Name	Images from Site Visit
Los Robles	 Latitud: 28.59449 Longitud: -106.604512 Elevación: 1962.25±5 m Precisión: 7.6 m Tiempo: 05-04-2025 10:56  Latitud: 28.591547 Longitud: -106.594197 Elevación: 1875.74±5 m Precisión: 8.3 m Tiempo: 05-04-2025 10:01

Ranch Name	Images from Site Visit
Dos Amigos	 Latitud: 28.386886 Longitud: -107.553492 Elevación: 2208.3±13 m Precisión: 23.8 m Tiempo: 06-04-2025 11:14  Latitud: 28.394717 Longitud: -107.563772 Elevación: 2206.11±7 m Precisión: 16.5 m Tiempo: 06-04-2025 10:57

Ranch Name	Images from Site Visit
Las Viboras	 Latitud: 29.068811 Longitud: -106.963853 Elevación: 2058.09±14 m Precisión: 12.8 m Tiempo: 05-04-2025 17:33  Latitud: 29.071009 Longitud: -106.977048 Elevación: 2036.59±3 m Precisión: 3.2 m Tiempo: 05-04-2025 17:09

Ranch Name	Images from Site Visit
Viejo	Latitud: 27.803651 Longitud: -107.054062 Elevación: 2179.99±21 m Precisión: 21.9 m Tiempo: 06-04-2025 17:45
	Latitud: 27.80996 Longitud: -107.041554 Elevación: 2225.6±5 m Precisión: 4.8 m Tiempo: 06-04-2025 16:42

2.5 Resolution of Findings

In order to focus on high-risk concerns in the verification results without missing any of the required steps, 4KES uses a risk-based approach. During the audit, a few inconsistencies were discovered, and

the finding reports was sent to the project proponent with the titles corrective action requests (CARs) and clarification requests (CLs) attached.

CARs and CLs require the PP to take relevant actions. Criteria for judging items as CAR or CL are as follows:

CAR: - The PP have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions - the Voluntary Carbon Standard's requirements have not been met, or - there is a risk that emission reductions cannot be monitored or calculated.

CL: - Information is insufficient or not sufficiently clear to determine whether the applicable VCS requirements have been met.

FAR: To draw attention to project implementation issues that need to be reviewed during the initial project activity verification, FARs will be raised. FARs have no bearing on VCS registration requirements.

Until this data is made available to the team leader's satisfaction, the verification process may be put on hold. Information or clarifications provided as a result of a CL may also lead to a CAR.

There was a total of 35CARs, 14 CLs and 02 FARs raised during the verification process, all of which were successfully handled. The list of CARs/CLs raised, the response given, the method of verification, the justifications for their closure, and references to correction in the pertinent documents are all included in this report's Appendix 3.

2.5.1 Forward Action Requests

There were 02 FARs raised during this audit.

2.6 Eligibility for Validation Activities

VVB has not undertaken any validation activities as part of the verification.

3 VALIDATION FINDINGS

3.1 Methodology Deviations

There is no methodology deviations observed in this audit. Hence this section is not applicable.

3.2 Project Description Deviations

There is no PD deviations observed in this audit. Hence this section is not applicable.

3.3 New Project Activity Instances in Grouped Projects

There are no new project activity instances added in this grouped project. Hence this section is not applicable.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes

☒ No

4 VERIFICATION FINDINGS

4.1 Project Details

Item	Evidence gathering activities, evidence checked, and assessment conclusion:				
Audit history	This is the first verification event of this project.				
	Audit type	Period	Program	Validation/verification body name	Number of years
	Validation	18/03/2022 18/02/2025	VCS	4K Earth Sciences Private Limited	2 years 11 months
	Verification	15/03/2025 to 15/12/2025	VCS	4K Earth Sciences Private Limited	0.75 years (9 months)
Double counting and participation under other GHG programs	The VVB has evaluated the adequacy of the double-counting mitigation measures outlined in the validation report and has accordingly updated Section 3.23 of the VCS Standard v4.7.				
No double claiming with emissions trading programs or binding emission limits	The VVB has undertaken the following steps, including stakeholder consultations during the site visit, to confirm that there is no double counting.				

No double claiming with other forms of environmental credit	• Ensured that the geographical extent of the project area is explicitly defined in the PD and MR. • Cross-checked that the project area remains consistent across all project documents. • Compared the defined boundaries with publicly available land-use datasets and official records. • Ensured that the land ownership/tenure status is documented to prevent claims by other programs. • Verified agreements to confirm exclusive participation in this project. • Checked for any contractual conflicts that indicate that the same land is allocated to another carbon program. • The VVB has ensured there is no potential for double counting of impacts, particularly in cases of overlapping project areas or similar technologies/measures. To achieve this: verified that the project is not registered under any other voluntary or compliance standard (that are publicly available). • Ensured that the PP provides a signed declaration stating that the project is not registered elsewhere. The project is not registered under, nor seeking registration or issuance of credits from, any other GHG program. The project proponent has submitted declarations /52/ confirming that the project has not been registered, is not under consideration, and has not been rejected by any other GHG programs. The project proponent has also clearly stated that the project will not generate or receive any form of environmental credits from other mechanisms, and that the greenhouse gas emission removals will not be used for compliance under such programs. The validation body has cross-checked the submitted documents and declarations and confirmed that the claims are consistent with the VCS Standard v4.7 and that there is no risk of double counting. CL ID 03 was raised and resolved successfully. Refer Appendix 3 for the same.
Supply chain (scope 3) emissions double claiming	As part of the verification process, an assessment was conducted to determine whether the project proponent or any authorized representative is a buyer or seller of a product whose emissions footprint is impacted by the project activities, and whether appropriate measures are in place to prevent double claiming of emission reductions.

The project involves ranchers in Northern Mexico whose primary livelihood is derived from livestock rearing. The emissions footprint is potentially influenced by project activities aimed at improving soil carbon sequestration through grassland restoration practices. The livestock, as the main commodity, is sold by ranchers directly to local buyers. These buyers then distribute the livestock to various butcher units across the country. Based on direct communications with ranchers following the release of VCS Standard v4.7, it has been confirmed that the ranchers are generally unaware of the final downstream purchasers of their livestock.

At present, the project participants (ranchers) are not selling directly to any known or specific corporate entities that might claim Scope 3 emissions reductions based on livestock produced from project land. Thus, there is no indication of any direct risk of Scope 3 double claiming arising from these transactions.

To proactively mitigate any potential risks of double claiming in the future, Boomitra has instituted a monitoring mechanism in collaboration with its partners. This involves:

- Regular checks across applicable standards to detect any possible instances of double counting.
- Ongoing awareness campaigns and capacity building efforts for ranchers to educate them about the implications of double claiming.
- Internal supply chain oversight through email notifications sent to stakeholders who may be linked to the livestock supply chain, informing them about the issuance of VCUs and the related project activities.

Furthermore, in accordance with the VCS Program requirements, Boomitra has publicly posted a statement on its website indicating that VCUs may be issued for greenhouse gas emission reductions and removals associated with its projects. This fulfills the transparency requirement related to the possible involvement of the project in product supply chains.

Based on the evidence reviewed, including public disclosures and internal control measures described by the project proponent, the risk of Scope 3 emissions double claiming is

	currently considered low and appropriately managed within the scope of the project's operational and reporting framework. CL ID 03 was raised and resolved successfully. Refer Appendix 3 for the same.
Sustainable development contributions	An evaluation was conducted to determine whether the Boomitra Grassland Restoration Project has effectively implemented activities during the Monitoring Period (MP1) that correspond to the Sustainable Development (SD) contributions described in the Monitoring Report. The assessment confirms that the project has achieved meaningful progress toward multiple Sustainable Development Goals (SDGs), with supporting evidence provided for each targeted indicator. /25/31/32/33/35/36/37/38/39/40 SDG 2 – Sustainable Agriculture (Target 2.4, Indicator 2.4.1) Assessment: The project successfully implemented Improved Grassland Management (IGM) practices across 139 ranches, covering approximately 553,486.55 hectares. These activities included rotational grazing, paddock creation, and water conservation techniques, resulting in a demonstrable increase in soil organic carbon (SOC) from a baseline of 48.22 t/ha to 49.76 t/ha — a 3% improvement. The increase in SOC indicates improved soil health, fertility, and productivity, aligning with sustainable agriculture principles. All participating ranchers reported improved productivity following rotational grazing implementation, confirming the effectiveness of the practices. The activities contribute directly to achieving SDG target 2.4 by enhancing environmental sustainability and long-term agricultural resilience. SDG 6 – Protection of Water-Related Ecosystems (Target 6.6, Indicator 6.6.1) Assessment:

The project has implemented targeted water management interventions including the construction of gabions, ponds, keylines, and microbasins. These measures have improved soil structure, enhanced water infiltration, and reduced surface runoff.

A survey conducted across 8 ranches showed positive results: increased water availability, improved grazing conditions, and enhanced biodiversity (e.g., sightings of white-tailed deer, turkeys, jaguars, and migratory birds). Infrastructure such as pipelines, tanks, and pumps has further contributed to water conservation. The project has clearly delivered on its intended SDG 6.6 contributions in MP1, with high potential for expanded impact over the project lifetime.

- **SDG 8 – Youth Employment and Skills Development (Target 8.6, Indicator 8.6.1)**

Assessment:

The project has contributed to SDG 8.6 by generating employment opportunities for youth and local communities through implementation, monitoring, and land management activities. Ranchers and local youth were engaged in executing sustainable grazing practices and water infrastructure installation.

An employment record along with attestation for individual ranches/43/ provides evidence of workforce involvement. The project has not only created direct employment but has also provided training and skill-building opportunities, contributing to local economic development. Continued tracking of employment records will help assess cumulative impacts throughout the crediting period.

- **SDG 15 – Combat Land Degradation (Target 15.3, Indicator 15.3.1)**

Assessment:

Through rotational grazing and sustainable land management practices, the project has made significant contributions to restoring degraded grasslands and preventing desertification.

	A Participatory Rapid Appraisal (PRA) involving 66 ranchers, complemented by NDVI (Normalized Difference Vegetation Index) Analysis data, demonstrates marked improvement in vegetation cover and land productivity between the baseline period (2015–2016) and MP1 (2022). Ranchers reported visible benefits including increased forage quality, faster regrowth, and greater land resilience despite climatic challenges. These findings confirm the implementation of activities aligned with SDG 15.3. • SDG 13 – Climate Action (Tonnes of GHGs Avoided/Removed) Assessment: The project quantifies greenhouse gas removals using the VM0042 methodology. A total of 3,033,077 tCO₂e was removed over the first monitoring period. This confirms the project’s measurable and verifiable contribution to climate mitigation. The increase in SOC levels, combined with sustainable grazing practices, directly supports carbon sequestration and reinforces the project’s alignment with SDG 13. Based on the review of project documentation, monitoring reports, and supporting evidence provided by the project proponent, it is concluded that the Boomitra Grassland Restoration Project has effectively implemented the activities that result in the Sustainable Development contributions described in the Monitoring Report. The observed impacts across agriculture, water, employment, land restoration, and climate mitigation are consistent with the claims made, and appropriate supporting evidence has been submitted and verified during verification. CAR ID 02 was raised and resolved successfully. Refer Appendix 3 for the same.
Additional information relevant to the project	As part of the verification process, a review was conducted to assess whether any commercially sensitive information excluded from the public versions of the project documentation complies with the VCS Program requirements regarding permissible exclusions.

Based on the audit review of the project documentation and communications with the project proponent, audit team confirms the following:

- All information included in the public-facing version of the PD is openly accessible to stakeholders and contains no confidential or restricted data.
- Certain elements related to commercial operations including internal financial audit reports, business forecasting models, and cost structures associated with project development and implementation have been identified as commercially sensitive by the project proponent. These exclusions are in line with the VCS standard v4.7 provisions (section 3.5.2 and 3.5.3) that allow for the withholding of proprietary or commercially sensitive information, provided it does not compromise the transparency or integrity of the project documentation.
- For verification purposes, the VVB was granted full access to all internal documents, including those deemed commercially sensitive. This includes financial and operational data necessary for assessing the project's performance, conformance with methodology requirements, and contribution to greenhouse gas mitigation.
- The VVB can confirm that all relevant and material information is appropriately included in the submitted PD, and no essential data has been omitted that would otherwise affect the project's credibility, accounting procedures, or eligibility.

4.2 Safeguards and Stakeholder Engagement

4.2.1 Stakeholder Identification

As part of the project's verification process, an assessment was conducted to evaluate whether there have been any changes in the stakeholder makeup since the time of project validation, and to confirm the project's continued conformance with the applicable VCS Program requirements related to stakeholder identification and engagement.

Based on discussions with the project proponent and a review of supporting documentation, it has been confirmed that there have been no changes in the stakeholder composition since validation. The project continues to engage with the same stakeholders originally identified during the validation phase, and no new individuals, groups, or legal entities have been added as project participants or affected parties. This includes ranchers, local communities, and project implementation partners who were initially consulted and involved in project design and deployment.

Given that there have been no updates to stakeholder involvement, no additional evidence gathering activities such as new stakeholder mapping exercises, new community outreach events, or legal entity changes were deemed necessary during this monitoring period. The existing stakeholder engagement mechanisms and consultation structures remain valid and sufficient. Furthermore, there have been no recorded stakeholder concerns, feedback, or complaints post-validation that would necessitate a reevaluation of stakeholder roles or project impacts.

In conclusion, the project continues to adhere to the VCS Program's requirements regarding stakeholder identification. The original stakeholder structure established during validation remains unchanged and appropriate for the ongoing implementation and monitoring of the project. No further action is required in this regard for the current monitoring period.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Stakeholder identification	As part of the project assessment, an audit of stakeholder identification and categorization was conducted. The PP has appropriately classified stakeholders into three distinct categories: primary, secondary, and tertiary stakeholders, based on their level of engagement and influence over the project. Primary Stakeholders: The primary stakeholders identified by the PP are the ranchers. These individuals are directly engaged in the project's activities, particularly the implementation of sustainable grazing practices. They are the principal beneficiaries of the project's outputs and outcomes and play a critical role in contributing to the achievement of the project's environmental objectives. Secondary Stakeholders: The secondary stakeholders include local authorities, the country's Designated National Authority (DNA), non-governmental organizations (NGOs), research institutes, and local experts. These entities are responsible for providing technical assistance, governance oversight, and scientific expertise to ensure that the project remains effective, transparent, and compliant with national and international environmental and social standards. Tertiary Stakeholders: The tertiary stakeholder group comprises policymakers, government institutions, and media organizations. These stakeholders are essential in shaping enabling policy environments, offering institutional support, promoting public awareness, and enhancing the visibility and dissemination of the project's outcomes, best practices, and lessons learned.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	Based on the evidence reviewed which includes the attendance sheet, feedback forms, local stakeholder consultation report/25/, the stakeholder categorization appears comprehensive and well-structured, aligning with best practices for stakeholder engagement in development and environmental projects. The audit team observed ongoing engagement with all stakeholder groups, which helps ensure that their needs and contributions are adequately integrated and fosters ownership and sustainability of the project outcomes. Hence, it was concluded that the stakeholder identification process followed by the PP is in line with the requirements of 3.18.1 of the stakeholder engagement guidelines of the VCS Standard v4.7. CAR ID 03 was raised and resolved successfully. Refer Appendix 3 for the same.
Legal or customary tenure/access rights	As part of the verification for this monitoring period, an assessment was conducted to confirm that the project participants possess appropriate legal or customary tenure and/or access rights over the land areas included in the project boundary /10/11/17/. The project involves two categories of land ownership structures: privately owned ranches and community-owned lands known as Ejidos. Private landowners, including individual ranchers and organizations, hold legal title to their land, with ownership documented in the Public Property Registry of their respective states. All private landowners participating in the project were required to submit official land records as part of the enrollment process. These records were reviewed and verified by Boomitra, the project proponent, to ensure legal possession and proper land tenure rights before inclusion in the project area. In addition to private lands, the project includes community-managed lands under the Ejido system. Ejidos represent a customary and legally recognized form of communal land ownership, rooted in traditional Amerindian practices and formally governed by La Ley Agraria (The Agrarian Law) of Mexico. Rights to use and manage these lands rest collectively with the Ejido community. For all Ejido lands included in the project, documentation demonstrating the community's rights over the land was submitted and independently cross-verified /17/. Project partners, in

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	coordination with local representatives, confirmed the legitimacy of land tenure claims and the approval of the Ejido Councils for participation in the project. No disputes or conflicts over land access or ownership were identified during the assessment. The supporting evidence /41/ for stakeholder meeting records was cross-checked during the validation and verification process through a combination of desk-based review and discussions held with stakeholders during site visits. The PP's process for identifying any legal or customary tenure and access rights to land and resources, including collective and/or potentially conflicting rights was assessed and found to be consistent with the requirements outlined in Section 3.18.1 of the Stakeholder Engagement Guidelines under the VCS Standard v4.7.
Stakeholder diversity and changes over time	All lands included in the project are owned by individual ranchers and are currently free from any land tenure disputes, as detailed in the ownership section of the registered PD /53/. The primary stakeholder group—comprising rancher communities—exhibits limited internal variation in social, economic, and cultural characteristics. These stakeholders generally share common livelihood sources, land-use practices, and cultural norms centered around pastoral activities. No significant divisions or sub-groups exist within the community, and stakeholder interactions are reported to be cooperative and consistent. Furthermore, since project validation, there have been no reported changes in the composition of the stakeholder group, and no new stakeholders have been identified during the current verification period. The only change observed relates to a reporting error in the PD, where a few ejidos were incorrectly listed as private ranches. This has been corrected during the verification visit. However, this correction does not affect the project's additionality, baseline scenario, emission reduction estimations, or lead to any material error. . There are no substantial conflicts within the communities present in the area. /10/11/17/29/32/38.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Expected changes in well-being	The project contributes to several SDGs. Ranchers have gained access to sustainable grazing practices through targeted capacity-building trainings. In addition, project activities have supported improvements in water availability, employment generation, emission reductions, soil carbon enhancement, and livestock productivity. Supporting evidence /8//25//31//35//36//38/ and /39/ has been reviewed. Based on these documents and discussions held during the site visit with stakeholders, it is evident that the project is generating overall positive impacts on both community and environmental well-being.
Location of stakeholders	The project clearly identifies its location in Chihuahuan and Sonora and appropriately defines key stakeholders as private ranchers and ejido communities. Positive external impacts—such as reduced pressure on adjacent lands, improved vegetation cover, and enhanced wildlife connectivity—are well stated..
Location of resources	All lands included within the project boundary are individually owned and formally registered. Each participating landholder possesses legally recognized title, and enrollment in the project is based on voluntary agreements that are legally binding. The verification team confirms that there are no communal lands, customary tenure arrangements, or collective access rights applicable within the project area. No indigenous territories, pastoral commons, or shared resource zones fall within the project boundary. Land tenure status has been reviewed and verified through legal documentation and signed stakeholder agreements. Based on the evidence provided /17/, the project complies with the VCS Rules of land ownership (VCS Standard v4.7, section 3.7). .

4.2.2 Stakeholder Consultation and Ongoing Communication

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Ongoing consultation	The project proponent has taken appropriate and consistent measures to maintain communication with stakeholders throughout the monitoring period. In line with the validated plan for ongoing engagement, Boomitra conducted regular meetings, facilitated community engagement sessions, and maintained open feedback channels. Evidence reviewed includes consultation calendars, meeting agendas, and logs of communications with stakeholders. Boomitra executives interacted with the ranchers via telephone and visited them once a year. The ongoing consultation process has been robust, participatory, and aligned with the project's approved stakeholder engagement strategy /25/41/. Supporting evidence /41/ for the meeting records and ongoing communications were cross-checked during the verification process (desk review of supporting evidence and site visit discussions with the stakeholders). The ongoing communication channel established and maintained by the PP is in line with the requirements of sections 3.18.3, 3.18.5 and 3.18.6 of the stakeholder engagement guidelines of the VCS Standard v4.7.
Date(s) of stakeholder consultation	Stakeholder consultations were conducted on 31st January 2022, 13th November 2023, and 6th December 2023. These dates were confirmed through examination of event records, attendance sheets, and meeting minutes. The timing and frequency of consultations demonstrate the project's continued commitment to involving stakeholders in the implementation process. These engagements were used to inform stakeholders of project progress, gather feedback, and ensure local concerns were addressed. Supporting evidence /41/ for the consultations were cross-checked during both the validation and verification process (desk review of supporting evidence and site visit discussions with the stakeholders). The stakeholder consultations were conducted in line with the requirements of section 3.18.2 of the stakeholder engagement guidelines of the VCS Standard v4.7.
Communication of monitored results	The project reports that monitoring results were communicated using both in-person and digital modalities. In-person visits were prioritized

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	as the primary communication channel due to limited internet connectivity and literacy constraints among certain rancher groups. PP confirmed that during these visits, monitoring outcomes were conveyed using local languages and supported with visual aids to enhance comprehension. Ongoing communication was facilitated by the implementation partners throughout the monitoring period. Additional dissemination methods included stakeholder meetings, printed reports, email correspondence, a dedicated project dashboard, and social media platforms (e.g., LinkedIn), thereby accommodating varying stakeholder capacities for digital engagement. Supporting evidence for these communication activities has been referenced in Appendix 3 of the MR and provided for verification /25/. Based on the information provided and discussions during the audit site visit, the communication strategy is consistent with section 3.18.3 of the stakeholder engagement guidelines of the VCS Standard v4.7.
Consultation records	The project has maintained comprehensive records of stakeholder consultations, including meeting minutes, attendance sheets, signed acknowledgment forms, and digital communication records such as emails and survey responses. Given the limited internet access and varying literacy levels among ranchers, the project team appropriately prioritized in-person engagement to ensure inclusive and effective participation. During PP's routine visits and community meetings, information was disseminated in locally appropriate and accessible formats. Feedback collected through these engagements was systematically documented, reviewed, and integrated into project planning. Implementation partners facilitated continuous communication with ranchers, ensuring consistent dissemination and understanding of monitoring results and other project-related updates. Supporting evidence for these communication activities has been referenced in Appendix 3 of the MR and provided for verification /25/. Based on the information provided and discussions during the audit site visit, the communication strategy is consistent with section 3.18.3 of the stakeholder engagement guidelines of the VCS Standard v4.7.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	. These records were reviewed and confirmed to be complete and well-organized/25/. The documentation reflects a high level of transparency and traceability, providing verifiable evidence of stakeholder participation and the project's efforts to incorporate their views. CL ID 04 was raised and resolved successfully. Refer Appendix 3 for the same.
Stakeholder input	During the consultation process, stakeholders were invited to provide feedback and raise queries. The majority of questions focused on project activities and their impacts at the field level. The Boomitra team addressed these concerns during meetings and carefully considered all feedback received. While no feedback was received that required a change to the project design, the project maintains an active grievance mechanism. Any future feedback that may necessitate design amendments will be evaluated and incorporated in compliance with VCS Program requirements. The open consultation platform and responsiveness of the project team underscore a strong commitment to stakeholder engagement and adaptive management. Supporting evidence /25/ for these communication activities has been reviewed. Based on the information provided and discussions during the audit site visit, the communication strategy is consistent with section 3.18.3 of the stakeholder engagement guidelines of the VCS Standard v4.7.

4.2.3 Free, Prior, and Informed Consent

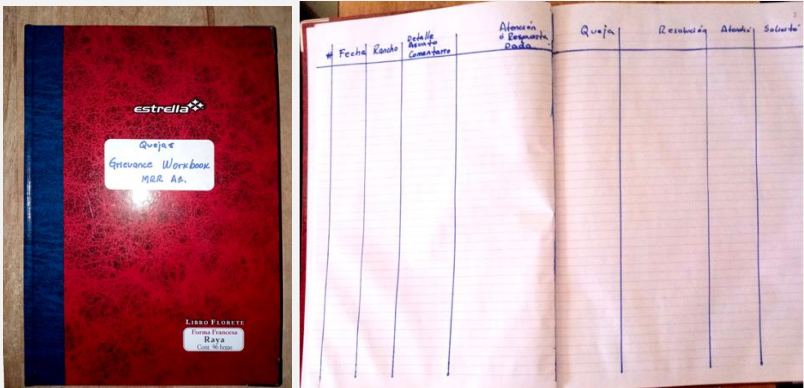
Item	Evidence gathering activities, evidence checked, and assessment conclusion
Consent	The project proponent has demonstrated that the rights of stakeholders to provide or withhold consent were fully respected during project design and implementation. Stakeholder consultation meetings were organized to ensure participatory engagement, and feedback was actively sought from participating ranchers. All ranchers provided their voluntary and informed consent to implement project activities. Signed carbon agreements and signed forms dedicated to FPIC confirmed /32/41/ their participation and acceptance of the project terms. These agreements include a clause where the landholders irrevocably assign their rights, title, and interest in the GHG reductions and removals generated on their land to Boomitra. The consent process was inclusive, with stakeholders acknowledged and their inputs duly considered, ensuring alignment with FPIC principles. As part of enrollment, all ranchers signed legally binding agreements that clearly stipulate the transfer of rights to GHG reductions to Boomitra. These agreements are enforceable and irrevocable and have been drafted in compliance with Section 3.7.1, Point 6 of the VCS Standard Version 4.5. Before signing, Boomitra's implementation partners conducted detailed sessions with ranchers to explain the terms and implications of the agreement. These sessions covered the scope of project activities, expected outcomes, duration, risks, and the auditing process. The transparency and clarity with which these agreements were communicated confirm that the stakeholders had full understanding before providing consent. In alignment with the FPIC methodology, Boomitra ensured that all communications with stakeholders were conducted in a clear and accessible manner. Legal agreements and supporting documentation were made available in both English and Spanish, and the project's field staff walked ranchers through each section of the agreement to ensure full comprehension. Verbal explanations were also provided where necessary, and care was taken to address any doubts or concerns raised by participants. This bilingual, participatory approach reinforced trust and enabled stakeholders to make informed decisions about their involvement.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	As part of the enrollment and consent process, Boomitra verified all land records to ensure that the land parcels included in the project were not subject to encroachment, disputes, or overlapping claims from other carbon projects. Special attention was given to avoid double counting by confirming that none of the enrolled land polygons had been previously registered under another carbon initiative. During site visits, the audit team verified this by interviewing ranchers, all of whom confirmed that they were well informed about the project requirements. This verification process ensured the integrity of project boundaries and reinforced stakeholders' confidence that their consent was based on accurate and exclusive land participation. Hence, it is concluded that the information provided in section 2.1.3 is satisfactory and in line with sections 3.18.7 and 3.18.8 of the VCS Standard v4.7.
Outcome of FPIC discussion	The final outcome of the FPIC process conducted by PP has been positive, with all participating ranchers providing informed consent and expressing understanding of the project's benefits and operational processes. The project proponent verified that no project activities involve the relocation of people or communities, and there have been no unresolved conflicts or grievances reported during the monitoring period. The FPIC process was executed in accordance with best practices – voluntary, transparent, inclusive, and respectful of stakeholder rights. The discussions are in alignment with the requirements outlined in Section 3.18.3 of the VCS Standard v4.7.

4.2.4 Grievance Redress Procedure

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Grievance received and steps taken to resolve the grievance including the outcomes of the resolution	As part of the verification process, the grievance redress mechanism implemented by the Boomitra Grassland Restoration Project was reviewed to assess its accessibility, transparency, and alignment with the relevant VCS Program requirements. This assessment included evaluating any grievances received during the monitoring period and the project's grievance management procedures in place.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	To determine whether any formal grievances were received during the monitoring period, the verification team reviewed grievance logs maintained at project partner offices, examined communication records (including emails and phone logs), and interviewed the project implementation teams and selected stakeholders. Evidence reviewed includes physical grievance registers maintained at regional offices of implementation partners, records of stakeholder consultations, and correspondence from ranchers. It was verified that no formal grievances were submitted during this monitoring period. However, some informal inquiries were raised by ranchers concerning the registration timeline and audit process of the project. Boomitra and its local partners addressed these queries during stakeholder meetings by explaining the multi-step validation and verification process. The response was received positively by the ranchers, and no further concerns were reported. No grievances requiring formal resolution were recorded during the monitoring period. The project team provided timely clarification to stakeholder queries, and the established grievance mechanism remained accessible to all stakeholders throughout. The absence of grievances indicates that the project has maintained good community relations, and the response to informal inquiries demonstrates the proponent's proactive and transparent communication approach. Here are some log books images captured during the site visit and also submitted by PP as evidence: 

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	
Grievance redress procedure	To assess the structure, accessibility, and functionality of the grievance redress procedure, the verification team reviewed grievance mechanism documentation, stakeholder consultation materials, and conducted interviews with project implementation partners to understand how the process is communicated and implemented on the ground. Boomitra has developed a multi-level grievance redressal system as per international best practices. The procedure was communicated during stakeholder consultations and is documented through various channels made available to all project participants. The mechanism includes – Physical grievance registers at implementation partner head offices for ranchers without digital access; provision of Telephonic hotlines for each key partners; Email access for digitally enabled ranchers. These mechanisms are well-documented and made publicly accessible. Additionally, Boomitra has established a formal response window of 20 business days for addressing any grievance. It was concluded that the grievance redressal mechanism developed is in line with section 3.18.4 of the VCS Standard v4.7. CL ID 05 was raised and resolved successfully. Refer Appendix 3 for the same.

4.2.5 Public Comments

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
During the verification, one comment was received in Sep 2025 from an anonymous submitter, and its content is below: 1. The Scientific Basis of Boomitra's Measurement Approach Boomitra's methodology diverges significantly from the current consensus in DSM literature. They claim to use a machine learning-based adjustment to Synthetic Aperture Radar (SAR) imagery to generate direct measurements of soil carbon. However, no peer-reviewed citations are provided to support this capability. The prevailing scientific understanding is that remote sensing data, particularly from satellites, can be used to correlate with on-the-ground measurements through digital soil mapping, not to directly measure soil carbon stocks. Furthermore, it is well-documented that SAR signal penetration into	The project proponent has provided a detailed response in the MR to the public comment, outlining the following: 1. The relevance of the scientific basis, existing associated peer-reviewed literature, and a commitment to publicly post more data-driven evidence of the scientific basis within the specific circumstances of the project, in order to provide global stakeholders with greater transparency 2. Regarding model performance, PP has provided detailed performance metrics and their calculations and derivations during this verification and has committed to posting the same publicly after the verification is completed in order to provide transparency 3.Regarding model uncertainty, PP has shown how their approach is compliant with VCS guidance and best practices in the geostatistics literature.	VVB Assessment: The VVB reviewed the public comment and the PP's formal responses in the MR. Evidence submitted by the PP included scientific references, uncertainty quantification details, and validation metrics consistent with the applied methodology.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
soil is significantly attenuated by soil moisture, limiting its reliability for sub-surface carbon estimation. 2. Model Performance The model performance reported in Boomitra's North Mexico PD appears unusually high given the intrinsic noise of soil carbon measurements. In contrast, a white paper associated with Boomitra's Urvara Social Carbon project, which appears to use a similar model, shows significantly weaker performance. Notably, Boomitra's other PDs do not appear to present any comparison between model predictions and independently sampled ground truth data. It is difficult to fully explain such wide discrepancies with the limited publicly available data, but this model instability and lack of generalizability calls into question the robustness of the methodology and the thoroughness of the analyses presented publicly at this time.	Consequently, no modifications to the project design, implementation plan, or stakeholder engagement strategies were required during this period. The established public consultation mechanism remained accessible throughout and continues to be aligned with best practice principles for transparency and responsiveness.	VVB reviewed the cited literature provided on the use of radar for soil carbon, consisting of two different lines of justification. First, VVB reviewed literature that showed that existing microwave sensors have been calibrated to measure soil carbon, and satellite-based microwave sensing also has a strong sensitivity to carbon. Second, VVB reviewed peer-reviewed literature that follows machine learning-based satellite data fusion approaches very similar to the approach that PP has used in this project, including literature that uses radar satellite data among inputs. The information shared by PP and available in the peer-reviewed literature were judged by the audit team and remote sensing expert to substantiate the ability of the project's approach to deliver acceptable results.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
Furthermore, no feature importance rankings or sensitivity analyses are included in the public documentation, making it impossible to determine which input variables are driving model outputs. This lack of transparency undermines confidence in the replicability and generalizability of the modeling approach. 3.Uncertainty The uncertainty methodology provided in the North Mexico PD and Urvara white paper differ markedly from those generated by Verra’s own DSM tool (VT0014). No comparative analysis is presented, and the uncertainty quantification method used by Boomitra does not appear to be grounded in any recognized DSM literature. The Urvara white paper justifies its alternative approach as a means of accounting for temporal correlation. However, Verra’s DSM VT0014 tool explicitly includes procedures for		Boomitra adequately supported the scientific basis of its methodology, framing it as a recognized extension of the Digital Soil Mapping (DSM) framework that leverages data fusion techniques integrating satellite and ground-truth observations. The PP successfully contextualized its approach as a DSM application correlating satellite measurements with field data, consistent with machine-learning frameworks (such as XGBoost, referenced in Wang et al.) that fuse radar (Sentinel-1) and optical/infrared (Sentinel-2) data to predict Soil Organic Carbon (SOC) — an approach widely validated in peer-reviewed literature.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
temporal correlation handling (via multi-timepoint validation samples), which were not followed in Boomitra's methodology. As such, it is unclear whether the reported uncertainty appropriately reflects the true predictive error.		SAR sensitivity and physical validation: The VVB reviewed literature mentioned in MR demonstrating that microwave/radar sensors are sensitive to and correlated with SOC content, confirming the physical principle underlying Boomitra's model. The PP also addressed concerns about SAR signal attenuation due to soil moisture, explaining that L-band radar signals can penetrate up to 30 cm or more under the semi-arid, low-to-moderate moisture conditions typical of the project region (Northern Mexico/Chihuahua desert). The model explicitly incorporates soil moisture as an auxiliary covariate, enabling the decoupling of its confounding effects from the backscatter signal to isolate the SOC contribution.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
		Under partial vegetation cover, the VVB noted that the project's model captures a composite radar-optical signal that reflects both soil and vegetation contributions, which can act as indirect indicators of soil attributes such as SOC and bulk density (BD). This approach was judged scientifically sound and consistent with accepted DSM practice. The PP clarified the applicability of SAR data for SOC estimation under dryland conditions and provided detailed validation metrics and justifications for the full monitoring period, which were reviewed during the audit.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
		Comparisons with other Boomitra projects are not relevant given differences in geography, datasets, and standards. For this project, the detailed validation dataset and performance metrics were made available to the VVB and assessed during the audit. The MR and supporting documents, serve as the valid record for monitoring. The data has also been verified by the VERRA designated IME. The VVB concludes that the remote sensing and MRV model has been appropriately trained, independently reviewed, and validated, with no evidence of overfitting. The VVB notes the intention to share validation results after issuance will enhance transparency.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
		The PP has explained that Boomitra's treatment of correlated prediction errors in digital soil mapping is consistent with the requirements of the newly released VCS VT0014 tool. Their approach incorporates kriging, a well-established geostatistical method that explicitly models spatial correlation between points and corresponds to one of the approaches described in Wadoux & Heuvelink (2023)⁵, which is recognized as acceptable under VT0014.⁶ VVB has also reviewed the literature provided on Bayesian kriging – the incorporation of Monte Carlo methods into the kriging process – and found it to be appropriately applied in this project. Also refer to CAR ID 26, which has been closed. • The VVB verified that the PP's approach aligns with VCS requirements and applicable geostatistical practices.

⁵ <https://besjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/2041-210X.14106>

⁶ Reference to Wadoux & Heuvelink (2023): That paper compared two ways to handle spatial correlation in uncertainty: Standard kriging (traditional, widely accepted). A newer Monte Carlo approximation method.

Comments received	Actions taken by the project proponent	Evidence gathering activities, evidence checked, and assessment conclusion
		• While the concerns reflect ongoing debates in the soil carbon scientific community, the PP's documentation, validation datasets, and uncertainty treatment were sufficient for verification. • The PP's commitment to publicly release additional performance metrics and references enhances transparency and is considered a positive step. Conclusion: The issues raised do not constitute a material non-conformance. The PP has adequately addressed the comment, and no corrective action request (CAR) or forward action request (FAR) is issued.

4.2.6 Risks to Local Stakeholders and the Environment

4.2.6.1 Management Experience

As part of this verification, an assessment was undertaken to evaluate the expertise, organizational structure, and operational capacity of the project's management team. The evaluation included a review of the management's experience in carbon project implementation, partnerships with local organizations, and systems in place to ensure effective project delivery.

The assessment involved reviewing organizational and team documentation submitted by Boomitra, conducting interviews with core project staff and local implementation partners, and evaluating training, operational planning, and monitoring protocols. The verification team also examined the CVs and qualifications of key project personnel provided during the audit/24/, and reviewed public-facing information (e.g., Boomitra's website: <https://boomitra.com/about/>) to corroborate global project experience and technological capabilities.

The evidence reviewed confirmed that the project is managed by a highly experienced team at Boomitra, supported by long-standing local implementation partners with over a decade of operational presence in the Northern Mexico region. The project benefits from a multi-disciplinary structure including – A Carbon Project Development Team with over 10 years of experience in third-party validation and verification under global standards such as CDM, Verra, and Gold Standard; Geospatial Data Science Team composed of specialists in GIS, satellite data, and machine learning, responsible for accurate and tech-driven carbon monitoring; Rancher Engagement Team with direct involvement in training and facilitating participation among local ranchers using digital tools; A Software Development Team that creates scalable tools to improve communication, transparency, and project data management.

Boomitra's organizational model integrates advanced satellite monitoring and artificial intelligence for data accuracy and scalable project implementation. These digital capabilities are coupled with strong in-country presence, with the management team operating from within Mexico or within a day's travel of the project area. Frequent site visits and day-to-day collaboration with local partners ensure real-time decision-making and consistent support to ranchers. The implementation partners themselves have a proven track record of working with ranching communities in the region. They employ well-trained field staff and have established trust among ranchers through long-term engagement. Their responsibilities include training ranchers, monitoring sustainable practices, and collecting data from the field, thus bridging local needs with project goals. Capacity-building programs are regularly delivered to further enhance the skills and awareness of participating stakeholders.

The project also demonstrates a clear recruitment strategy by leveraging both in-house and local expertise. Where skill gaps are identified – such as for remote sensing or digital infrastructure— Boomitra complements local capacity with global technical specialists, ensuring all functional areas are covered by qualified personnel. CVs /24/ of key team members were made available to the VVB and were reviewed as part of this assessment.

CAR ID 04 was raised and resolved successfully. Refer Appendix 3 for the same.

4.2.6.2 Risk Assessment

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Natural and human induced risks to stakeholders' wellbeing	During the review, no significant natural or human-induced risks to stakeholder wellbeing were identified. The PP team conducts regular monitoring and maintains ongoing communication with participating ranchers to detect and respond to any emerging concerns. Evidence reviewed included stakeholder consultation records, site visit feedback, and implementation partner reports. These confirm that proactive steps are in place to safeguard wellbeing, and that stakeholders feel supported and safe. The current mechanisms are appropriate and reflect a low-risk operating environment. The current risk management and communication mechanisms are deemed appropriate and hence there is LOW risk. Based on the review of evidence referenced under /30/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.4 of the VCS Standard v4.7.
Risks to stakeholder participation	The project proponent did not identify any risks related to stakeholder participation, and this was confirmed during the verification process. Interviews with the local implementation partners and review of stakeholder training attendance sheets and engagement logs showed that ranchers have consistently expressed strong interest in project activities. Continuous communication, capacity-building sessions, and the provision of timely updates have ensured stakeholder confidence and retention. Based on the evidence gathered, no barriers to participation were observed, and the stakeholder engagement strategy is functioning effectively. The current stakeholder engagement process and communication mechanisms are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.4 of the VCS Standard v4.7.

Working conditions	No risks associated with unsafe or unfair working conditions were identified by the project, and this conclusion was validated during the audit. The verification team reviewed the project's human resource policies, worker safety protocols, and employment documentation. It was confirmed that the project complies with applicable labor laws and provides fair and inclusive employment opportunities during implementation and monitoring phases. Interviews with on-ground staff and partner representatives revealed that safety measures are in place, and a respectful, secure work culture is maintained. The working environment is consistent with recognized labor standards. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29/ and /30/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.7 of the VCS Standard v4.7.
Safety of women and girls	The project proponent reported no risks to the safety of women and girls, which was corroborated by interviews with female field staff and review of HR and gender inclusion policies. Women are actively participating in various aspects of project delivery, particularly through local partner organizations. The HR policies reviewed included gender-sensitive clauses and commitments to safe, inclusive working conditions. Awareness programs and outreach efforts are also in place to ensure equitable access and participation for women and vulnerable groups. No incidents or concerns were raised during the monitoring period, and the existing framework effectively supports gender safety and inclusion. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Sections 3.19.7 and 3.19.8 of the VCS Standard v4.7.
Safety of minority and marginalized groups, including children	The project area was assessed to ensure that no adverse impacts could arise for minority or marginalized groups, including children. No risks were identified, and this was supported by a review of project area maps, social inclusion records, and the stakeholder grievance mechanism. None of the project activities pose harm or exclusion to these groups, and the engagement processes remain open and accessible to all community members. Based on consultation records and site-level observations, it is

	concluded that the project upholds principles of inclusivity and presents no foreseeable risk to these populations. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Sections 3.19.7, 3.19.8 and 3.19.9 of the VCS Standard v4.7.
Pollutants (air, noise, discharges to water, generation and release of hazardous materials and chemical pesticides and fertilizers)	No environmental risks such as pollution or hazardous waste generation were identified in the project's risk assessment, and this was confirmed through document review and site assessment. The project promotes regenerative grazing and sustainable land management practices, which improve soil structure, increase organic carbon content, and restore ecological balance. The project does not involve construction, industrial activity, or the use of chemical pesticides or fertilizers. Furthermore, the activities do not trigger the need for an Environmental Impact Assessment (EIA) under Article 28 of Mexico's Ley General del Equilibrio Ecológico y la Protección al Ambiente (LGEEPA). This was verified with reference to the SEMARNAT environmental regulation framework. Therefore, the risk of local co-pollutants, water discharge, or hazardous materials is non-existent. The project instead contributes positively to environmental regeneration and resilience. Based on the review of evidence /29//37/ and /39/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.10 of the VCS Standard v4.7.

4.2.7 Respect for Human Rights and Equity

4.2.7.1 Labor and Work

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Discrimination	The project proponent reported no risks related to discrimination, and this was confirmed through document review and stakeholder interviews. Evidence reviewed included Boomitra's HR policy/30/, stakeholder engagement records/25/41/, and training materials related to equity and inclusion. It was found that Boomitra and its

	implementation partners have established inclusive practices and adhere to both local labour laws and international standards prohibiting workplace discrimination. Awareness and training programs are conducted to reinforce fair treatment for all employees and participants, regardless of their background. The project fosters a work environment that encourages participation across diverse social groups, and no evidence of discriminatory behaviour was found during the monitoring period. Based on the review of evidence and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.11 of the VCS Standard v4.7.
Sexual harassment	No risks of sexual harassment were identified, and this was validated through interviews with employees and a review of internal HR procedures. The project has implemented a formal anti-harassment policy that includes confidential grievance and reporting mechanisms. These policies are discussed during employee onboarding and reinforced through regular training sessions. Project field staff, including representatives from implementation partners, confirmed that they had received guidance on maintaining a respectful and safe working environment. No incidents were reported during this monitoring period, and preventative measures in place are considered sufficient. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Sections 3.19.7 3.19.8 and 3.19.13 of the VCS Standard v4.7.
Gender equity in labor and work	The project is structured to provide equal opportunities for both women and men, with no gender-based restrictions or disparities in participation. Gender-inclusive policies are implemented at all levels, from field operations to management. The verification team reviewed hiring and training records, along with interview feedback from female staff and community representatives. It was observed that women have access to employment opportunities and decision-making roles, particularly within implementation partner organizations. No adverse impacts on gender equality were identified. The project upholds gender equity, and mitigation measures remain active to ensure inclusivity going forward.

	The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Sections 3.19.7 3.19.8 and 3.19.13 of the VCS Standard v4.7.
Forced labor	No instances or risks of forced labour were identified during the monitoring period. The verification team conducted interviews with ranchers and field workers and reviewed project compliance with national labour laws. Forced labour is prohibited under Mexican law, and the project operates in full alignment with both national and international labour standards. Boomitra conducts regular monitoring visits and maintains oversight to ensure that all labour is voluntary and fairly compensated. No concerns or red flags were raised in relation to coercive labour practices. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.15 of the VCS Standard v4.7.
Child labor	Strict policies prohibiting the use of child labour are in place and were verified through documentation review and field-level discussions. Employment records and stakeholder interviews confirmed that no minors are employed in any capacity by Boomitra or its implementation partners. The project has implemented clear guidelines and routine monitoring to ensure compliance with child labour laws. No violations were observed or reported during the verification period. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.15 of the VCS Standard v4.7.
Human trafficking	No risks or incidents related to human trafficking were identified. The verification team reviewed the awareness training materials distributed to project personnel and implementation partners and confirmed that anti-trafficking provisions are included in the project's labour and ethics

	policy framework. Ongoing awareness programs and compliance monitoring have been effective in maintaining ethical labour practices across all project operations. The current working conditions and company policies are deemed appropriate and hence there is LOW risk. Based on the review of evidence /29//30/ and /41/ and discussions held with the PP's management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Section 3.19.15 of the VCS Standard v4.7.
--	---

CL ID 06 was raised and resolved successfully. Refer Appendix 3 for the same.

4.2.7.2 Human Rights

As part of the verification process, an assessment was conducted to evaluate whether the project presents any risks to human rights. Based on a review of the PP's track record,⁷ as well as discussions held with employees and stakeholders during the site visit, the VVB concludes that the PP demonstrates adherence to human rights principles in line with the International Labour Organization's Declaration on Fundamental Principles and Rights at Work, as integrated into the project's design and implementation framework. In accordance with Section 1.14 of the registered PD, the PP is in compliance with all applicable international, national, and regional laws and regulations. The company's internal policies /30/ were reviewed and found to be respecting human rights and protections across operational domains, including hiring practices, day-to-day operations, supply chain, and stakeholder engagement.

During the verification audit, the VVB confirmed that these policies are actively monitored and effectively enforced. The implementation of these policies was found to mitigate risks of human rights violations and promote a workplace culture.

The verification team reviewed project boundary maps, stakeholder identification records, land tenure documentation, and national-level legal frameworks relevant to indigenous and customary rights. Interviews were conducted with project implementation partners, field staff, and participating ranchers to assess whether any individuals or communities involved in the project qualify as Indigenous Peoples or customary rights holders.

CL ID 06 was raised and resolved successfully. Refer Appendix 3 for the same.

Risks identified	Evidence gathering activities, evidence checked, and assessment conclusion
No Risk identified	The legal and customary rights over the project area are held by local ranchers who have voluntarily enrolled in the project through a FPIC

⁷ <https://boomitra.com/>

	process. No evidence of coercion, intimidation, or undue pressure on any farmer to participate was identified. The audit team reviewed the carbon agreement /32/ and conducted in-person interviews with beneficiaries and local stakeholders. Based on these assessments, it was concluded that the project respects cultural rights, promotes equity, and adheres to FPIC principles, thereby ensuring that community participation is both free and voluntary. The project also integrates traditional knowledge and practices into its design and implementation. Additionally, by including community in decision-making structures and providing capacity-building support, the project reinforces social rights and promotes community self-determination. No risks were identified related to interference with the autonomy or development priorities of the local communities.
--	---

4.2.7.3 Indigenous Peoples and Cultural Heritage

As part of the verification of the Project, an assessment was conducted in accordance with VCS Program requirements to determine whether the project has identified, managed, or mitigated any risks relating to Indigenous Peoples (IPs), Local Communities (LCs), customary rights holders, or cultural heritage. The review focused on whether project activities may impact cultural heritage assets or the rights of these groups, and whether appropriate measures are in place to protect such values during the monitoring period.

The verification team conducted a thorough review of project documentation, including the Project Description, stakeholder identification records, land ownership data, and public registries. Interviews were held with project implementation partners and community leaders to determine whether any enrolled lands were associated with Indigenous Peoples or recognized cultural heritage. The team also reviewed maps of the project area and consulted Mexico's environmental and cultural heritage guidelines to determine if any sites of significance may be present or affected.

Risks identified	Evidence gathering activities, evidence checked, and assessment conclusion
No risks have been identified	It was verified that the project area does not overlap with any territories associated with Indigenous Peoples, nor does it include any sites, structures, or objects that are designated or recognized as having historical, cultural, artistic, traditional, or religious value. The project activities take place entirely on lands that are legally owned by private individuals or community entities (Ejidos), and all land rights have been validated through the appropriate registries. Additionally,

	there is no physical or economic relocation of people involved in the project, and no infringement upon customary or traditional land rights has occurred. During the site visit, it was confirmed that no sacred sites are located within the project area. The land involved belongs exclusively to the beneficiaries, who have voluntarily participated in the project through the FPIC process. Therefore, no risks were identified regarding the rights of IPs or the protection of cultural heritage sites. Based on the evidence reviewed, no risks have been identified concerning the rights of Indigenous Peoples, Local Communities, or customary rights holders, nor to the protection of cultural heritage. The project operates exclusively on legally owned land and does not interfere with culturally sensitive sites or practices. Furthermore, the project proponent has demonstrated awareness of its obligations under relevant international norms, including UNDRIP and ILO Convention 169, and has confirmed its commitment to protecting these rights even in the absence of direct applicability in this case. Additionally, the PP has sensitized staff and local stakeholders on the importance of respecting local customs, beliefs, and traditions. The PP has ensured that project activities are conducted in a culturally respectful manner without disrupting traditional practices. In conclusion, based on the evidence /17//18/ and /29/ the project has complied with the VCS Standard v4.7 section 3.19.9 requirements regarding Indigenous Peoples and cultural heritage. No adverse impacts were identified, and no mitigation measures were required during the monitoring period. The project presents a low risk profile with respect to cultural and indigenous sensitivities, and the systems in place ensure continued alignment with both national and international safeguards.
--	--

4.2.7.4 Property Rights

Risks identified	Evidence gathering activities, evidence checked, and assessment conclusion
No risks identified	The verification team reviewed land tenure documentation provided by the project proponent /17/, including title deeds, enrolment records, and legal agreements signed between Boomitra and participating ranchers. Interviews were also conducted with project partners, local representatives, and participating landowners to

	understand the land acquisition process and the framework under which participation was secured. In addition, the team examined public property records and consulted national land registry systems to verify land status and ownership. It was confirmed that all lands enrolled under the project are either privately owned or community-managed under the Ejido system – both of which are legally recognized in Mexico. The PP requires that ranchers submit proof of land ownership, which is verified against records held in the Public Property Registry or, in the case of Ejidos, the Registro Agrario Nacional. No land enrolled in the project is subject to active litigation, conflicting claims, or unclear tenure arrangements. Furthermore, all participating ranchers have signed legally binding agreements that include clauses transferring the rights to greenhouse gas emission reductions to Boomitra. These agreements were reviewed during the audit and found to be consistent with national legal standards and the VCS Program requirements. The land involved is exclusively those of the beneficiaries, and their inclusion in the project is based on FPIC on a voluntary basis. Therefore, no risks have been identified concerning the property rights. Based on the evidence reviewed /17//18/ and /29/, no risks were identified concerning the violation or undermining of property rights, whether legal or customary. The lands involved in the project are clearly titled, free of dispute, and voluntarily enrolled through formal agreements. There are no Indigenous Peoples, Local Communities, or customary rights holders impacted by the project, nor are there any collective or overlapping claims on the project lands. Boomitra has demonstrated a clear commitment to respecting and preserving property rights and has implemented robust verification and documentation procedures to support this commitment. The project fully complies with VCS Standard v4.7, section 3.19.20 requirements on tenure and access rights, and no further mitigation measures are deemed necessary at this stage.
--	---

4.2.7.5 Benefit Sharing

Item	Evidence gathering activities, evidence checked, and assessment conclusion
------	--

Summary of the benefit sharing plan	The verification team reviewed the signed carbon credit agreements between Boomitra and participating ranchers, including both individual landowners and community representatives (Ejido heads). Additional interviews were conducted with implementation partners and selected ranchers to assess the level of stakeholder understanding and satisfaction regarding the benefit sharing arrangements. Records of stakeholder consultations, training sessions, and meeting minutes were also reviewed to understand the communication and negotiation process that preceded the agreement signing. Evidence confirmed that Boomitra, through its local implementation partners, carried out extensive consultations with participating ranchers prior to enrolment. These consultations were conducted in Spanish—the native language of the ranchers—and included a detailed explanation of the project objectives, carbon credit mechanisms, and benefit sharing terms. Legally binding agreements were then signed by each participant, outlining the assignment of carbon rights to Boomitra and specifying the terms under which revenues from carbon sales would be shared. Based on the review of evidence /17/ and /18/ and discussions held with the PP’s management team and local stakeholders during the site visit, the project was found to be in line with the requirements of Sections 3.19.22 and 3.19.24 of the VCS Standard v4.7.
Benefit sharing during the monitoring period	During the monitoring period, Boomitra provided technical support and training to participating ranchers to facilitate the adoption of improved grazing practices, which directly contribute to the generation of Verified Carbon Units (VCUs). The agreements confirmed that while Boomitra holds the rights to the GHG reductions and removals, a clearly defined revenue-sharing structure is in place. Once the carbon revenues are realized through VCS sales, the agreed-upon share is distributed back to the ranchers in accordance with the contractual terms. Based on the evidence reviewed, the benefit sharing plan for the Boomitra Grassland Restoration Project is well-structured, clearly communicated, and properly documented. Stakeholders were adequately informed prior to enrolment, and all agreements were developed with direct involvement from ranchers to ensure transparency and understanding. During the monitoring period, there were no recorded disputes or grievances related to benefit distribution, and the systems in place are sufficient to manage equitable sharing of carbon revenues once generated. It is therefore

	concluded that the benefit sharing plan has been appropriately implemented and is compliant with the VCS Program requirements. The BSM has been disclosed in Section 2.3.5 of the registered Monitoring Report. The BSM mentioned is as per the signed agreement /32/, the BSM is correctly stated as 55%, as mutually agreed between the PP and the ranchers/landowners.
--	---

4.2.8 Ecosystem Health

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Impacts on biodiversity and ecosystems	<u>Risk Category: Low</u> The project proponent identified potential risks to biodiversity, including the introduction of non-native species, proliferation of invasive species, and biodiversity loss from unsustainable grazing. Evidence gathering included field observations, review of the project's ecological management strategies, and interviews with implementation partners. The verification team also reviewed documentation related to rotational grazing practices and biodiversity monitoring data. It was confirmed that no invasive or non-native species were introduced through the project activities. Instead, the project has emphasized the regeneration and restoration of native vegetation. Rotational grazing was verified to be a key management tool in this regard, helping to reduce the risk of overgrazing, improve vegetative diversity, and enhance habitat conditions. The implementation partners are actively working to monitor and maintain habitat connectivity and ecological balance. Based on this evidence, the risk to biodiversity and ecosystem health is assessed as low, and the mitigation measures currently in place are considered effective and appropriate.
Soil degradation and soil erosion	The project proponent acknowledged potential risks of soil degradation resulting from overgrazing, compaction, and erosion due to unsustainable land use. Evidence gathering included the review of soil sampling data, SOC (Soil Organic Carbon) trends, field observations, and technical documentation on grazing management. The team also examined the design and outcomes of training programs provided to ranchers on sustainable land management. The evidence confirmed that the project has implemented effective erosion control and sustainable grazing practices, particularly through

	rotational grazing systems that reduce soil compaction and improve soil structure. Regular monitoring of soil conditions was evident through project logs and soil quality assessments. The implementation of these strategies has led to measurable improvements in soil health, including increases in SOC levels. The risk of soil degradation and erosion is therefore categorized as low, with appropriate preventative actions consistently implemented.
Water consumption and stress	The potential risk of water stress, especially in the face of erratic rainfall and regional drought conditions, was acknowledged by the project proponent. The verification team reviewed hydrological data, climate risk assessments, and on-ground water conservation initiatives implemented by the project. Field inspections were conducted to evaluate infrastructure such as gabions, keylines, ponds, and microbasins. The project's approach to sustainable water management includes both infrastructure development and behavior change strategies. Ranchers have been trained in rainwater harvesting and water-efficient grazing techniques. These measures help reduce dependence on seasonal rainfall and improve the region's overall water retention capacity. Monitoring activities confirmed that water consumption is being managed responsibly and that no overuse or exploitation of water resources has occurred. As a result, the risk of water stress or depletion is also considered low.

Based on the evidence reviewed, the Boomitra Grassland Restoration Project demonstrates a strong commitment to maintaining and enhancing ecosystem health. The project has identified potential environmental risks and implemented appropriate, site-specific mitigation measures during the monitoring period. The use of rotational grazing, native species restoration, erosion control, and water conservation techniques all contribute to sustainable landscape management. There were no significant adverse impacts identified in relation to biodiversity, soil integrity, or water resources. The overall risk to ecosystem health is low, and the project is operating in compliance with VCS environmental safeguard requirements

4.2.8.1 Rare, Threatened, and Endangered species

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Species or habitat	As part of the verification process, the presence and potential impact of project activities on rare, threatened, and endangered (RET) species within the Boomitra Grassland Restoration Project area were assessed. Evidence gathering included a review of ecological surveys, biodiversity monitoring data, field visit observations, and interviews with implementation partners and ecological experts /39/. The verification team confirmed that the project operates within a region of high biodiversity significance and is home to several notable RET species. Evidence confirmed that the project has not introduced any non-native or invasive species that could threaten local biodiversity. On the contrary, the implementation of rotational grazing, habitat regeneration, and improved water management has significantly contributed to maintaining and enhancing the quality of native ecosystems. Restored native grasslands have supported prey availability for carnivores, while amphibians and burrowing mammals have benefited from improved soil and water retention. Monitoring data did not indicate any adverse impacts to these species during the monitoring period, and the project's land management strategy has promoted a positive conservation outcome for local biodiversity.
Areas needed for habitat connectivity	An essential component of this assessment involved evaluating the project's impact on areas critical for habitat connectivity – natural corridors that enable the free movement, migration, and genetic exchange of wildlife species. Evidence gathering included GIS-based landscape analysis, field observations, and a review of grazing maps and vegetation restoration plans/33/35/37/38/39/. The verification team assessed whether the project had disrupted or supported connectivity within key ecological zones. The findings confirmed that the project has implemented landscape-level strategies that actively preserve and enhance habitat connectivity. Grazing controls and the restoration of vegetation cover have played a crucial role in maintaining uninterrupted corridors used by species. For example, vegetative corridors maintained through rotational grazing practices continue to allow for the safe movement of jaguars through their native ranges. Similarly, enhanced grassland health and prey abundance support the predator species' hunting and breeding territories.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	For aquatic and semi-aquatic species, improvements in surface water availability, facilitated through gabions, microbasins, and other water infrastructure, have sustained vital riparian and wetland zones. These efforts have preserved hydrological connectivity and ensured uninterrupted habitat conditions. Continuous ecological monitoring confirmed that no negative impacts were observed in areas critical for wildlife movement, and no fragmentation of habitat occurred as a result of project activities. The project's design and grazing management strategies are conducive to long-term ecological resilience and have enhanced both terrestrial and aquatic connectivity across the landscape.

Item	Evidence gathering activities, evidence checked, and assessment conclusion
Habitats for rare, threatened, and endangered species	The verification team assessed the project's potential risks to habitats supporting rare, threatened, and endangered (RET) species, with particular attention to sensitive wildlife such as prairie dogs, Bolson tortoise, jaguar, Mexican grey wolf, and more. Identified risks included the potential trampling of burrows and resting sites due to livestock movement, and possible predator-prey imbalances resulting from ecosystem changes. Evidence gathering included review of biodiversity monitoring reports, species distribution maps, and interviews with field-level staff and local ecological experts /37/38/39/. Field observations and site records confirmed that the project has implemented rotational grazing strategies specifically designed to reduce disturbance in high-sensitivity zones, and habitats. Grazing in areas with dense burrow populations is limited or restricted, and livestock movements are carefully managed to minimize ecological pressure on ground-dwelling species. The project has also incorporated biodiversity monitoring protocols to track wildlife and ensure that key predators have access to adequate prey populations. There were no recorded instances of habitat degradation or adverse species impacts during the monitoring period. In conclusion, the project's preventative measures are appropriate and

Item	Evidence gathering activities, evidence checked, and assessment conclusion
	effective, and the project is operating in accordance with best practices for wildlife protection and habitat conservation.
Areas for habitat connectivity	The verification also evaluated risks related to habitat degradation and fragmentation, particularly in areas essential for wildlife movement and connectivity. Key risks identified included degradation due to unsustainable grazing and reduced water availability during dry periods, which could impact the movement and survival of amphibians and other species reliant on wetland and riparian habitats. Evidence reviewed included environmental monitoring records, grazing plans, and infrastructure development documentation. Interviews with implementation partners confirmed that all participating ranchers were trained in sustainable grazing techniques aimed at maintaining vegetative cover, soil moisture, and corridor integrity. Additionally, the construction of water management infrastructure such as keylines, gabions, and microbasins – has improved water availability throughout the landscape, supporting species survival during drier months. The project does not include any activities such as fencing, road construction, or land-use conversion that would fragment critical habitat corridors. On the contrary, the design of the project supports ecological connectivity through habitat restoration and low-impact grazing. Monitoring by implementation partners continues to ensure that no unintended fragmentation or degradation occurs, and the project remains aligned with local and regional conservation goals. In conclusion, the project has adequately assessed and addressed the risks related to habitat connectivity. Its ongoing training, infrastructure development, and monitoring protocols are sufficient to ensure the long-term viability of movement corridors for RET species. CAR ID 05 was raised and resolved successfully. Refer Appendix 3 for the same.

4.2.8.2 Introduction of Species

Species introduced	Evidence gathering activities, evidence checked, and assessment conclusion
Not Applicable	The verification team reviewed the site management protocols, biodiversity monitoring reports, and consulted with local implementation partners and ecological specialists. Field visits were conducted to confirm the composition of vegetation and any active interventions related to species management. It was confirmed that the project does not involve the planting or introduction of any new species. Project activities are focused exclusively on improved grassland management practices, such as rotational grazing and natural regeneration of native vegetation. No exotic or genetically modified species have been introduced at any stage of the project. The vegetation observed on-site aligns with native grassland species indigenous to the region. However, the project proponent has reported the existing presence of certain invasive species in some parts of the project area. While these species were not introduced by the project, their impact is recognized. A separate invasive species management strategy has been developed to monitor and mitigate their spread. The implementation team has integrated sustainable grazing patterns to naturally suppress the dominance of these invasive species and promote the recovery of native plant communities.

As part of the environmental assessment, the verification team evaluated the presence and management of existing invasive species within the Boomitra Grassland Restoration Project area. Although the project does not introduce any new species, several invasive species were identified as part of the existing landscape—namely Buffelgrass (*Cenchrus ciliaris*), Red Brome (*Bromus rubens*), and certain species of Lovegrass (*Eragrostis spp.*). The assessment reviewed mitigation measures designed to prevent the spread or ecological dominance of these species and to promote restoration of native plant communities.

Existing invasive species	Evidence gathering activities, evidence checked, and assessment conclusion
Buffelgrass (<i>Cenchrus ciliaris</i>)	Buffelgrass, originally introduced as a forage grass in the 1970s, has since become a major invasive species in arid and semi-arid ecosystems of Mexico. It aggressively outcompetes native grasses

Existing invasive species	Evidence gathering activities, evidence checked, and assessment conclusion
	and alters natural fire regimes, creating high-risk conditions for native flora and fauna. During the verification, it was confirmed that the project has not contributed to the spread of this species. Instead, rotational grazing practices central to the project's grassland management strategy have been implemented to promote native species recovery, reducing habitat favorability for Buffelgrass. Ranchers have been trained to identify and control Buffelgrass presence through grazing rotation schedules that allow for sufficient rest and regrowth of native vegetation, making it more resilient to invasion.
Red Brome (<i>Bromus rubens</i>)	Red Brome is another fast-spreading grass species present in desert regions such as the Sonoran Desert. Its dense growth and dry biomass increase fire frequency, posing ecological risks. The project's Grazing Management Plan, which includes paddock-based rotational systems, helps limit the unchecked growth of Red Brome. By resting grazed areas, the project improves conditions for native grasses to thrive, suppressing Red Brome's competitive advantage. These practices also reduce biomass accumulation, thereby minimizing fuel for potential wildfires. Evidence confirmed that this mitigation strategy has been implemented consistently by trained ranchers.
Lovegrass (<i>Eragrostis spp.</i>)	Certain Lovegrass species, although originally introduced for forage or erosion control, can behave invasively under certain ecological conditions. The project has not planted or encouraged the spread of Lovegrass. Instead, by encouraging soil health through managed grazing and nutrient cycling, the project creates more favourable conditions for native grasses to re-establish dominance. The presence of diverse native species, supported by improved soil fertility from livestock manure and controlled grazing pressure, helps suppress the potential expansion of Lovegrass.

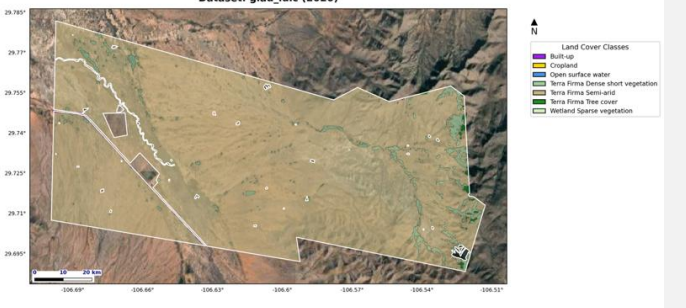
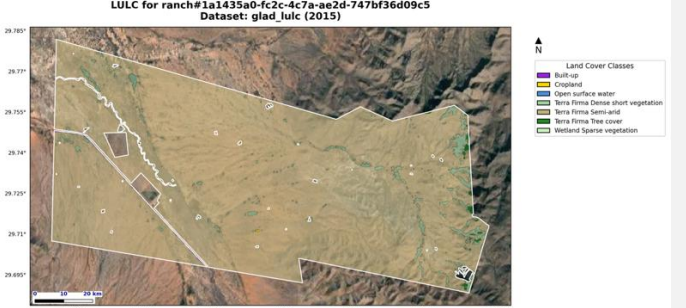
Item	Evidence gathering activities, evidence checked, and assessment conclusion
Invasive species	The verification team reviewed field monitoring data, project implementation strategies, grazing management plans, and training materials provided to ranchers /25/33/. Interviews with

	local implementation partners and ranch owners were conducted to assess the on-ground implementation of control measures and the effectiveness of awareness programs concerning invasive species. The project proponent has identified key invasive grasses within the project landscape which are known to rapidly colonize disturbed areas, displace native flora, alter fire regimes, and contribute to long-term ecological imbalance if not properly managed. To mitigate these risks, the project has implemented a combination of controlled rotational grazing, restoration of native vegetation, and ranch-level training programs. Rotational grazing is central to the project's land management strategy. By dividing each ranch into well-organized paddocks and enforcing grazing/rest cycles, the project limits continuous pressure on any single area, thereby giving native grasses an opportunity to regenerate. This approach not only strengthens native plant root systems but also disrupts the habitat conditions preferred by invasive species. Ranchers have been trained on how this system improves ecosystem resilience and reduces the opportunity for invasives to establish dominance. Additionally, controlled grazing practices promote soil enrichment through livestock manure, improving conditions for native species and making it more difficult for invasive grasses to spread. Regular monitoring is conducted to detect the spread of invasive species, and in areas where infestations are noted, targeted eradication and habitat restoration efforts are undertaken in collaboration with local stakeholders. Based on the evidence reviewed, the Project has demonstrated a proactive and ecologically responsible approach to managing the threat of invasive species. The mitigation measures, including rotational grazing, paddock-based systems, native grass restoration, and stakeholder capacity-building, are effective and appropriate for the landscape and species at risk. The risks posed by invasive species are being well-managed, and the project remains compliant with the VCS Program's environmental safeguards. Ongoing monitoring and adaptive management are
--	---

	in place to ensure these measures continue to be effective over the project's lifetime.
--	---

4.2.8.3 Ecosystem conversion

Item	Evidence gathering activities and evidence checked
Ecosystem conversion	The verification team reviewed high-resolution satellite imagery spanning over a decade (2007–2021), including data from platforms such as MODIS/Terra and GLAD Global Land Cover /15/. In addition, land tenure documentation submitted by ranchers was reviewed to confirm long-standing use of the land as grasslands. Interviews with implementation partners and site-level observations further informed the assessment. Based on the satellite data and remote sensing analysis, the project area has consistently remained as natural grassland both before and during the monitoring period. There has been no evidence of deforestation, wetland drainage, or other forms of ecosystem conversion associated with project implementation. The project does not involve any activities that would alter the natural land cover, nor has any land clearing occurred in the 10 years prior to project commencement. Land tenure verification further supports this finding, with all project areas confirmed to be privately or communally owned grazing lands that have historically been used for livestock rearing. Screenshots of the LULC analysis conducted for the project ranches are provided below. Appendix 7 of the Monitoring Report includes LULC maps for a randomly selected ranch. The PP has submitted the full LULC analysis for all participating ranches as supporting evidence under reference /15/. Below are sample screenshots of the LULC maps for three time intervals: 2010, 2015, and 2020:

Item	Evidence gathering activities and evidence checked
	LULC for ranch#1a1435a0-fc2c-4c7a-ae2d-747bf36d09c5 Dataset: glad_lulc (2010)  LULC for ranch#1a1435a0-fc2c-4c7a-ae2d-747bf36d09c5 Dataset: glad_lulc (2020)  LULC for ranch#1a1435a0-fc2c-4c7a-ae2d-747bf36d09c5 Dataset: glad_lulc (2015)  Hence, it is concluded that there is no risk of ecosystem conversion associated with the Boomitra Grassland Restoration Project. The project is implemented exclusively on existing grasslands, and all evidence including long-term satellite imagery and verified land ownership records, confirms that the natural state of the land has remained unchanged. The project complies fully with the VCS requirement prohibiting ecosystem conversion and has implemented regular monitoring procedures to ensure continued conformance throughout the crediting period.

CAR ID 06 was raised and resolved successfully. Refer Appendix 3 for the same.

4.3 Accuracy of Reduction and Removal Calculations

Please see the below table 5 for a detailed assessment of data and parameters used for GHG calculations.

The project uses the combination of the RothC model and remote sensing to estimate emissions reductions/removals, PP has used the VMD0053 v1 tool/21/ in addition to the equation provided in the VM0042 methodology/20/. The audit team checked the applicability conditions of both the VM0042 and VMD0053 tool and it was confirmed that this project meets the applicability conditions set out in the methodology and tool applied to the project. The PP submitted the Final Model Validation Report /27/ at the time of verification, which is now considered final and has been fully verified by the VVB. During the validation stage, the audit team reviewed the draft version of this report and confirmed that the methodologies applied were in accordance with the requirements of VMD0053. However, as the report was not yet finalized at that time, FAR 01 and FAR 04 were raised to address specific outstanding issues. FAR 05 was also raised regarding the addressed deficiencies in the quantification of uncertainty in the SOC stock estimates generated using both remote sensing AI and biogeochemical models. These FARs have since been resolved and officially closed as part of this verification. However,

VVB's assessment accepted the justifications provided and confirmed that the updated Model Validation Report, reviewed and verified by the by VCS empanelled Independent Model Experts (IME) Dr. Brian (IME – RothC Models), as per VMD 0053 requirement and Dr. Raúl Roberto Poppiel (Technical Expert – Models and remote sensing). Both experts provided positive assessments of the modelling approach. Based on the VVB's comprehensive review and the supportive evaluations from the IMEs, it is concluded that the emission reductions and removals generated by the project are quantifiable, verifiable, and meet the applicable VCS program requirements. Additional details and justifications related to the closure of FARs are provided in Appendix 3 of this report.

During the validation audit, FAR 02 was raised regarding the use of remote sensing to estimate Soil Organic Carbon (SOC) stock and bulk density – two critical inputs for soil carbon modelling. In response, the PP submitted a document titled “Mexico SOC Remote Sensing Technical Summary (first verification)” (/26/44/), which presents a comprehensive methodology for estimating both parameters using remote sensing technologies. The Algorithm Theoretical Basis Document (ATBD) provides a detailed explanation of the data sources, modelling procedures, and validation approaches used, thereby demonstrating the credibility and applicability of the technology in measuring SOC increments. Following a thorough review of the ATBD and supporting evidence, the VVB found the justification to be technically sound, and consequently, FAR 02 was resolved and closed during the validation audit.

The PP has followed the exact steps mentioned in the latest version of the applied methodology/20/. The steps have been applied correctly to calculate baseline emissions, project emissions, leakage and net GHG emission reductions and removals for the baseline period. With 139 sample units in the first monitoring period (MP 01), the final uncertainty deduction calculation has 138 degrees of freedom, and the project appropriately uses the 5% significance value of the t-distribution with 138 degrees of

freedom, as required in the Equation 46 of the methodology/20/. The quantification of related emissions is described in detail in the validated PD.

The audit team can confirm that the MR/7/ and the ERR excel sheets/8/ contains a very high level of detail regarding the calculation of GHG emission reductions, such that the following are true:

- All relevant assumptions and data are listed in the PD and MR/7/, including their references and sources.
- All data and parameter values used in the MR are considered reasonable in the context of the project.
- All uncertainty calculations are traceable and properly justified, starting from input errors through to the project-scale SOC stock change variances and uncertainty deduction determinations.
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PD and the MR/7/.

Data and parameters monitored (section 5.2 of VCS PD)

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
AR	Percent	Weighted average adoption rate	Whenever new instances are added	10%	Expert Opinion and common practice assessment for project area.
VVB Assessment: The frequency of monitoring of this parameter is whenever a new instance is added to the grouped project. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR /7/ and methodology /20/. The verification team confirmed that the value of the parameter to be determined is in line with applied methodology by checking through the expert opinion/42/ and the calculation provided in the common practice sheet of the Mexico_MR_MP1_V4.xlsx/8/. This has been verified by the audit team during the on-site visit, hence considered satisfactory. Total project area by the end of MP1: 553,486.55 ha					
Activity Name	% of adoption rate	Total production area in Mexico (ha)	Adopted area in baseline (ha)	Adopted area in after project initiation (ha)	Weighted average adoption rate
Rotational grazing	5%	11,235,755 ⁸	561,788	1,115,274	10%
Keylines	1%		112,358		

⁸ de, Nacional. "Agricultural Census (AC) 2022." Inegi.org.mx, 2022, en. www.inegi.org.mx/programas/ca/2022/#tabular_dat

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
Gabions	5%		561,788		
Ponds and Microbasin	5%		561,788		
The PP has justified the reported 10% adoption rate primarily through the dominant contribution of rotational grazing, which is identified as the core promoted activity within the project. The adoption rate calculation is presented through a comparison of the total grassland area in Mexico and the estimated area under rotational grazing before and after the project began. The difference in the baseline adoption area and the post-project adoption area reflects the increased uptake attributed to the project. When this increase is expressed as a percentage of the total national grassland area, it results in a 10% adoption rate for rotational grazing. This is consistent with the weighted average adoption rate shown in the table. The PP has correctly documented the increase in rotational grazing adoption from 5% to 10% during MP01, demonstrating effective project implementation. The evidence provided includes detailed monitoring data from field surveys, geospatial analysis of grazing areas, and livestock management records. Additionally, soil carbon measurements and pasture condition assessments support the reported environmental benefits, confirming the reliability and accuracy of the reported outcomes. Although other water management practices are included, they are adopted on a much smaller scale. In the current MP 01, instance, only 19 out of 139 ranches have implemented these practices, and no post-project adoption figures are provided for them. These activities were not considered substantial enough to affect the weighted average. The decision to base the AR calculation mainly on rotational grazing is therefore methodologically sound, given its wide adoption and consistent implementation across the project. CAR ID 09 was raised and resolved successfully. Refer Appendix 3 for the same.					
$Area_{an}$	Unit area (hectares or acres)	Area of proposed project-level adoption of each activity	Whenever a new instance is added	553,486.55 Ha	As per methodological requirements. (Rancher records and project activity commitments)
VVB Assessment: The area of each grazing ranch was estimated prior this MP 01 verification. The frequency of the monitoring of the parameter is done whenever a new instance is added to the grouped project. In the current MP 01, there is only one instance present and the area of all the onboarded ranch lands was assessed using a combination of GIS coverages, ground survey data, and remote imagery (satellite or aerial photographs) /10/. GIS datasets used are geo-registered referencing corner points, with clear landmarks and other intersection points. The rancher records and project activity commitments were used to determine the area of sample unit added. The verification team confirmed that the value of the parameter determined is in line with applied methodology/20/. This has been verified by the verification team during the on-site visit, hence considered valid.					
EA_{an}	Percent	Adoption rate of the n largest most	Whenever a new instance is added	10%	As per methodological requirements

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
		common proposed project activity in the region			Field data is collected
VVB Assessment: PP has substantiated this parameter by providing the Expert Opinion along with the Qualification of the expert /42/. The frequency of the monitoring of this parameter is done whenever a new instance is added to the grouped project. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The PP has justified the reported 10% adoption rate primarily through the dominant contribution of rotational grazing, which is identified as the core promoted activity within the project. The verification team confirmed that the value of the parameter determined is in line with applied methodology /20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
A_i	Unit area	Area of sample unit /	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years.	553,486.55 Ha	Determined in project area as part of monitoring plan.
VVB Assessment: The area of each ranch was calculated using GIS tools. The frequency of the monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. 553,486.55 Ha is the total area under the 1st instance of the project.					
i	Dimensionless	Sample unit: defined area that is selected for measurement and monitoring, such as a field	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	553,486.55 Ha	Determined in project area as part of monitoring plan. Delineation of the sample unit area may use a combination of GIS coverages, ground survey data, remote imagery (satellite or

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
					aerial photographs), or other appropriate data. Any imagery or GIS datasets used must be geo-registered referencing corner points, clear landmarks or other intersection points.
VVB Assessment: The value of the parameter is calculated using GIS tools. The frequency of the monitoring of this parameter is to be conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The verification team confirmed that the value of the parameter to be determined is in line with applied methodology /20/. This has been verified by the verification team during the on- site visit, hence considered valid. The total area under the first instance of the project is 553,486.55 hectares. This entire area of the first instance (100%) has been sampled, measured, and monitored.					
L	Dimensionless	Type of livestock	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	A separate excel sheet is provided with all details /36/	Determined in sample unit <i>i</i>
VVB Assessment: A separate Excel spreadsheet detailing the count and types of livestock was provided to the VVB during audit /36/ The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The verification team confirmed that the value of the parameter to be determined to be in line with applied methodology /20/. This has been verified by the verification team during the on- site visit, hence considered valid. CAR ID 10 was raised and resolved successfully. Refer Appendix 3 for the same.					

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
•	Dimensionless	Gas or pool	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	CO ₂ (Soil Organic Carbon – SOC)	Determined in sample unit <i>i</i>
VVB Assessment: The project quantifies carbon removals using the Soil Organic Carbon (SOC) pool as the primary reservoir for CO₂ sequestration. The frequency of the monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The verification team confirmed that the value of the parameter to be determined to be in line with applied methodology /20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
$fSOC_{bsl,i,t}$	t CO _{2e} /unit area	Modelled soil organic carbon stocks pool in the baseline scenario for sample unit <i>i</i> at time <i>t</i>	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	Please see attached ERR Calculations - excel workbook ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch./8/	Modelled in the project area (RothC model) using Calculation method noted in the Model Validation Report
VVB Assessment: The excel workbook for ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch/8/ was provided to the VVB at the time of this verification audit. The value of the parameter is determined through Soil Organic Carbon Stocks pool. The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
$SOC_{bsl,i,t}$	t CO _{2e} /unit area	Areal-average soil organic carbon stocks in the baseline scenario for sample unit <i>i</i> in year <i>t</i>	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	Please see attached ERR Calculations - excel workbook ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch./8/	Modelled in the project area (RothC model) using Calculation method noted in the Model Validation Report

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
VVB Assessment: The excel workbook for ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch/8/ was provided to the VVB at the time of this verification audit. The value of the parameter is determined through areal-average SOC stocks in the baseline scenario. The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
$SOC_{wp,i,t}$	t CO _{2e} /unit area	Areal-average soil organic carbon stocks in the project scenario for sample unit i in year t	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	Please see attached ERR Calculations - excel workbook ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch./8/	Modelled in the project area (RothC model) using Calculation method noted in the Model Validation Report
VVB Assessment: The excel workbook for ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch/8/ was provided to the VVB at the time of this verification audit. The value of the parameter is determined through areal-average SOC stocks in the project scenario. The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid. In accordance with the methodology's Quantification Approach 1, the value of this parameter comes from the output of the RothC model that is run for the project scenario, generating outputs on a yearly basis. The RothC model is also re-calibrated/true upped with repeat measurements of the soil carbon levels with a frequency of 5 years or more frequency, as confirmed in the monitoring plan of the project.					
$\Delta\bullet, t$ and $\bar{\bullet}, t$	t CO _{2e} /unit area	Average emission reductions from pool or source $\bullet$, or stock of pool $\bullet$, in year t	Calculations and recording must be conducted at least every five years, or prior to each verification event if less than five years	Please see attached ERR Calculations - excel workbook ERR Calculations - Mexico_MR_MP1_V4.xlsx.	Calculated values in the project area
VVB Assessment: The excel workbook for ERR Calculations - Mexico_MR_MP1_V4.xlsx. for values for each ranch/8/ was provided to the VVB at the time of this verification audit. The value of the parameter will be calculated. The frequency of monitoring (calculating and recording) of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented					

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
$P_{wp,l,i,t}$	Head	Population of grazing livestock in the project scenario of type l in sample unit i in year t	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	A separate excel sheet is provided with all details /36/	Project participant survey once every 2 years
VVB Assessment: A separate Excel spreadsheet detailing the count and types of livestock was provided to the VVB during audit /36/ The value of the parameter was determined by direct consultation through survey once every 2 years. The frequency of monitoring (calculating and recording) of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid. CAR ID 10 was raised and resolved successfully. Refer Appendix 3 for the same.					
$Days_{wp,l,i,t}$	Days	Average grazing days per head in the project scenario inside sample unit i for each livestock type l in year t	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	365 days (The complete ranch is considered as a sample unit)	Project participant survey
VVB Assessment: PP has reported that, 365 days (The complete ranch is considered as a sample unit). The value of the parameter will be determined by direct consultation through survey once every 2 years. The frequency of monitoring (calculating and recording) of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.					
LE_t	tCO2e	Leakage in year t ;	Monitoring must be conducted at least every five years, or prior to each	0 (zero)	Project participant survey

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source																		
			verification event if less than five years																				
VVB Assessment: The value of the parameter taken is 0 in line with the methodology section 8.4 /20/. The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the PD/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.																							
ΔP	Percent	Change in productivity	Every 10 years	Not applicable	Project participant survey																		
VVB Assessment: The frequency of the monitoring of data is every 10 years. This will be monitored during the next verification event. The procedure is cross-checked. This has been verified by the verification team during the on- site visit, hence considered valid.																							
$P_{wp,p}$	Productivity (e.g., kg) per hectare	Average productivity for product p during the project period	Each growing season	Please refer the table below:	Project participant survey																		
<table border="1"> <thead> <tr> <th colspan="6">Productivity of Project Area (Survey Data)</th></tr> <tr> <th>Livestock No. (@bsl/2017)</th><th>Livestock No. (@wp/2021)</th><th>Grassland area in Ha</th><th>P (wp)</th><th>P (bsl)</th><th>Change in productivity</th></tr> </thead> <tbody> <tr> <td>60,323</td><td>64,193</td><td>553,486.55</td><td>0.12</td><td>0.11</td><td>6.42</td></tr> </tbody> </table>						Productivity of Project Area (Survey Data)						Livestock No. (@bsl/2017)	Livestock No. (@wp/2021)	Grassland area in Ha	P (wp)	P (bsl)	Change in productivity	60,323	64,193	553,486.55	0.12	0.11	6.42
Productivity of Project Area (Survey Data)																							
Livestock No. (@bsl/2017)	Livestock No. (@wp/2021)	Grassland area in Ha	P (wp)	P (bsl)	Change in productivity																		
60,323	64,193	553,486.55	0.12	0.11	6.42																		
VVB Assessment: PP has presented a table that focuses on the project area, shows an increase in total livestock productivity – representing a 6.42% increase in MP01 i.e., in 2021/2022. This upward trend in productivity supports the conclusion that the project activities, particularly the promoted grassland management practices, have contributed to an improvement in productivity. The value of the parameter is determined through surveys and direct measurement. The value of the parameter will be calculated at each growing season. Measuring and reporting frequency is in accordance with the monitoring plan, as documented in the MR/7/ and methodology/20/. The verification team confirmed that the value of the parameter to be determined is in line with the applied methodology /20/. CAR ID 11 was raised and resolved successfully. Refer Appendix 3 for the same.																							
p	Numbers	Livestock count	Recorded every month	A separate excel sheet is provided with all details /36/	Project Rancher Survey																		
VVB Assessment:																							

Parameter	Unit	Description	Frequency and monitoring equipment	Monitored value	Source
A separate Excel spreadsheet detailing the count and types of livestock was provided to the VVB during audit /36/ The value of the parameter will be calculated at each growing season.					
<i>Buffer_t</i>	tCO _{2e}	Number of buffer credits to be contributed to the AFOLU pooled buffer account in year <i>t</i>	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years	453,220	The number of buffer credits to be contributed to the AFOLU pooled buffer account must be determined by applying the latest version of the VCS AFOLU Non-Permanence Risk Tool
VVB Assessment: VVB has assessed the VCS AFOLU Non-Permanence Risk Tool v4.0 presented by the PP /5/. Based on this assessment, the buffer pool contribution was calculated at 13%, resulting in a corresponding allocation of 453,220 tCO_{2e} to the non-permanence risk buffer as buffer credits. The value of the parameter was be calculated according to the VCS AFOLU Non-Permanence Risk Tool v4.0. The frequency of monitoring of this parameter is conducted at least every five years, or prior to each verification event if less than five years. Measuring and reporting frequency is in accordance with monitoring plan, as documented in the MR/7/ and methodology/20/. The QA/QC procedures were found to be in place. The verification team confirmed that the values of the parameter to be determined is in line with the applied methodology/20/. This has been verified by the verification team during the on- site visit, hence considered valid.					

Table 5: Data and Parameters Monitored

The VVB has verified section 5.1 and 5.2 of the PD and found that the monitoring plan comprises all parameters required by the methodology, including those defined at verification – those that were observed and verified at the time of ex-post monitoring.

4.4 Quality of Evidence to Determine Reductions and Removals

The VVB reviewed and assessed all evidence used to determine the GHG emission reductions and carbon dioxide removals reported in the MR/8/. The primary evidence supporting the quantification of removals includes the implementation of project activities, monitoring, estimation of ERRs, field sampling data for Soil Organic Carbon (SOC), modeled outputs from RothC simulations calibrated at the sample unit level, and geospatial datasets derived through remote sensing-based analysis. Additional supporting

documentation includes the Carbon Monitoring Protocols, Standard Operating Procedures (SOPs) for sampling and data handling,

To assess the sufficiency and quality of evidence, the VVB examined the completeness of data across all project instances and reviewed the procedures used to aggregate, record, and transpose field and modeled data into the final monitoring report. The information flow was traced from raw data generation (e.g., field measurements, remote sensing outputs), through processing and calculation stages (e.g., RothC model configuration), up to the final quantification of removals in the ERR. A documented and auditable trail was confirmed for all data points reviewed.

Cross-checks were performed between field logs, laboratory reports, model outputs, and values reported in the monitoring report to ensure consistency and prevent transcription or aggregation errors. In cases involving modeled SOC inputs via remote sensing, the VVB verified that the applied models were peer-reviewed, validated by qualified independent experts i.e., IMEs (as per VMD0053), and appropriately calibrated using locally relevant parameters. The Applied Technical Basis Document (ATBD) for remote sensing methods was also reviewed in detail to confirm methodological transparency and replicability.

With respect to the satellite data inputs used for the remote sensing model, VVB verified that the data was correctly used and any spatial and temporal misalignments with underlying soil data were appropriately managed and their effects on uncertainty minimized. PP has substantiated in detail the strategies for using each satellite data source while minimizing associated errors. PP has shown that the same consistent remote sensed inputs (eg. radar, visible, infrared, soil moisture) to the RS model are used during calibration and project-scenario usage for the project polygons. For example, when certain satellites were decommissioned, PP has appropriately used successor satellites that utilize the same exact measurement instruments – in the case of ALOS, ALOS-2 was used for recent years up to the present whereas ALOS1 was used for calibration; in the case of Landsat, Landsat 7 was used during calibration and Landsat 8 is used for recent years up to the present. Likewise, in the case of soil moisture, PP achieved temporal continuity of the dataset by using the best available harmonized dataset available from the ESA that combines measurements across multiple satellites to achieve continuity and coherence from 1978 to present. VVB has verified that these satellite data choices are appropriate and enable spatial and temporal continuity throughout the model calibration phase and its present usage in the project scenario. In cases where coarse resolution input data was used for the models, PP substantiated and VVB verified that the usage was appropriate and relevant to the North Mexico project conditions. VVB also verified that any errors from the quality of data used for the satellite modeling are correctly propagated to the SOC stock calculations and subsequently through to the uncertainty of biogeochemical model outputs that are used for the calculation of reductions and removals associated with SOC.

With respect to the calibration soil data used by PP for the satellite modeling, PP has used government soil datasets from INEGI in Mexico, which the audit team has crosschecked for quality. PP removed outliers from this dataset consisting of those samples with greater than 5% SOC. Less than 1% of samples in the dataset had SOC values in this range, and it was verified from other literature that SOC greater than 5% is not expected in semi-arid grassland regions such as the project region. PP analyzed the effect of this exclusion of samples to be a reduction in overall uncertainty and improved generalizability for the

project location, and the audit team has also reviewed this argument and found it to be reasonable. Similarly, for the creation of the bulk density (BD) model (PTF), PP removed outliers consisting of samples whose BD was outside of the range 1.0-1.6 ton/m³. It was verified by audit team from literature that this is an appropriate range for BD in native grassland soils like the project region (since it is not peatland/sod and not compacted from cropping practices/machinery etc). PP also analyzed the effect of this exclusion to be an improvement in generalizability for the main range of BD in soils and a shift in favor of model conservativeness as SOC stock values would shift downwards (as there were more high-BD outliers than low-BD ones). Beyond these justified exclusions of outliers that reduce overall uncertainty and improve generalizability in a conservative manner, audit team verified that PP has not conducted any other data filtering for the calibration of the remote sensing model. This ensures that the full calibration dataset is the model's domain that it is trained for.

PP has also presented trends in the calibration data between satellite covariates, SOC and BD for informative purposes, separate from the actual model calibration and validation. PP has shown a weak negative correlation between SOC and radar backscatter on the scale of the full calibration dataset. On its own, this single-variable relationship would not provide strong predictive power, due to many confounding variables that need to be controlled. PP has identified several of these key variables (soil moisture, vegetation, radar incidence angle etc.). For informative purposes, PP has shown how stronger SOC and radar single-variable correlations manifest when different specific ranges in soil moisture are considered, along with controlling incidence angle, and Landsat bands (eg. NIR band, and LWIR/land surface temperature band) closely related to vegetation. The audit team finds the scientific basis for these variables affecting backscatter to be valid based on reviewed radar literature – soil moisture does affect microwave measurements; incidence angle differences can lead to fluctuation in the measured radar backscatter; and vegetation, and its water content, which are related to NIR and LWIR bands, can have attenuating affect on radar signal.

However, ultimately, PP does not use a physical model of scientific relationships between these variables but rather uses a data-driven machine learning model. Thus, the audit team determined that the QA/QC of the project's monitoring data must be based on the model's outputs and not on the basis of single-variable relationships in the calibration data. PP has presented results on the calibrated model's feature importances and relative strength of each input variable in determining the outputs of the model, and audit team found that these results corroborate the calibration data trends that PP showed for information purposes. The calibrated model was shown to be trained on the full calibration dataset without any filtering other than the aforementioned SOC and BD outliers, and audit team verified that all model performance/validation metrics are computed from this full-trained model. Model validation is discussed further below.

In the case of the SOC and bulk density data, PP has similar shown for informative purpose that there is a weak overall single-variable negative relationship between SOC and bulk density in INEGI data (bulk density values tend to weakly decrease as SOC increases), and shows that this single-variable relationship (SOC vs BD) gets strong when the dataset is segmented by soil texture for major soil texture groups in the project. The audit team finds this to be a suitable basis for utilizing a PTF model that utilizes both SOC and soil texture information as covariates, and this is substantiated in the performance of the

final PTF during training and testing, wherein it shows much higher performance (eg. high R2) than the single variable (SOC vs BD) trend. Audit team confirms that the PTF created in this manner using soil data from the project region and multiple covariates including SOC and soil texture variables will provide a suitable and reliable PTF for use in the project.

Audit team has also assessed the validation dataset used by the PP to validate the remote sensing model within the monitoring period, and the associated validation metrics calculated on the dataset. PP has conducted validation for 2022 using data collected by PP from project sites and for 2018 using data collected by Mexico agriculture ministry from project sites. Both PP's sampling SOP and agriculture ministry's approach follow latest Verra and global guidelines for soil sampling, including 30cm minimum sampling depth, proper sampling design, bulk density measurement etc., and hence the audit team found the validation data to be valid and appropriate to be used in this context. The satellite covariates used by PP for model validation (and prediction) were shown by PP to match the same data sources and product versions as used during the model calibration. Furthermore the audit team verified that the procedures for matching soil data spatial and temporally to satellite data were the same across calibration, validation and prediction (refer to Tables 3 and 5 in the ATBD document), and ensured the matching of soil data to the spatially and temporally closest satellite covariates (as described in section 2 and 9 of the ATBD document), based on review of code shared by PP. This allows for consistent application of the model across calibration/validation/predictions. PP additionally conducted a model domain coverage analysis for the satellite data used for making model predictions from 2018 to 2022 in this project for all ranches – they demonstrate that 99%+ of the satellite covariates used for model predictions fall within the domain of the model's calibration, indicating that the model is not being used for extrapolation and is only making predictions within its trained domain. With the SOC stock validation data passing metrics (FAR 5) at the start and end of the monitoring period, and the domain coverage analysis for the full monitoring period, the audit team is able to conclude that the remote sensing model (including both SOC% and BD estimations) is valid for the whole monitoring period 2018-2022. Below is a detailed assessment:

Remote Sensing Model Validation:

Boomitra has adequately addressed the need for full monitoring period validation and data gap clarity.

Validation at T=0 (2018): Direct empirical validation was provided using 135 independent soil samples collected by SAGARPA in 2018 (t=0). The results demonstrate compliance with key validation metrics, including a 91% Prediction Interval Coverage Probability (PICP) for 90% confidence, an R2 of 0.37, and non-significant bias. This validation substantiates the model's performance at the baseline initialization year required for the biogeochemical model.

Applicability for intermediate years (2019-2021): Boomitra demonstrated applicability for intermediate years through two complementary analyses:

Domain applicability: A Mahalanobis distance analysis confirmed that over 99% of the satellite covariate inputs for all prediction years (2018–2022) fall within the calibration domain, indicating that the model is generally operating in interpolation rather than extrapolation mode. The use of a tree-based ensemble model further minimizes divergence risk for the small fraction of out-of-domain pixels (<1%).

Change sensitivity: An independent change-sensitivity test using matched-pairs t-test on Sentinel-1 backscatter (May 2018 vs. May 2022) confirmed a plausible, statistically significant link between SOC change and microwave measurements ($p=0.0144$). This evidence supports the validity of the space-for-time substitution hypothesis necessary for applying the model across the temporal monitoring period.

The PP stated that all required input data sources (ALOS-2, Landsat-8, ESA CDS) were reliably available throughout the 2018–2022 period, ensuring no missing data prevented the generation of remote sensing outputs.

Soil Moisture Data use

The project adequately addressed concerns regarding the temporal and spatial resolution of soil moisture data by clarifying that neither SMAP nor SMOS data were used directly. Instead, the project relies exclusively on the state-of-the-art ESA Copernicus Climate Data Store (CDS) satellite soil moisture dataset, which provides a merged, coherent longitudinal product spanning from 1978 to the present.

- **Pre-2009 data and justification:** The CDS product resolves the issue of pre-2009 calibration samples (INEGI data, 2005–2012) predating SMAP/SMOS availability by incorporating data from earlier satellites (e.g., TRIMM, AQUA) via a multi-sensor algorithm outlined in the product's Algorithm Theoretical Basis Document (ATBD). This ensures consistent data retrieval across the entire calibration period. Satellite-derived soil moisture was used solely as an auxiliary covariate in the machine learning model to isolate the effect of soil organic carbon (SOC) on the radar backscatter signal. It was included alongside other variables (e.g., radar incidence angle, surface temperature, vegetation cover) within an ensemble of gradient-boosted trees, allowing the model to decouple/separate/solve the influence of soil water content on the dielectric constant and backscatter response. Since soil moisture was not a target variable, no validation was required, its uncertainties are inherently propagated through the modeling framework. This approach ensures that soil moisture acts as a key control variable enabling the model to robustly attribute variations in backscatter specifically to SOC.
- **Coarse resolution justification:** The methodological justification for using coarse-resolution data (up to 40km) is robust within the context of the project design: the project area consists of large ranches (average 4,000 ha), native arid grassland without irrigation, and consistent vegetation. These environmental and management factors minimize highly localized moisture fluctuations, making the coarse-resolution input manageable. Furthermore, any residual error introduced by the resolution mismatch is explicitly captured within the Bayesian uncertainty framework (PPDs) and validated by passing the PICP test on independent samples.
- **Validation data source:** The same CDS product is consistently utilized (as covariate/predictor) for both model training and for generating predictions used in the 2022 validation.

Statistically Validity and Transparency of the relationships presented in the figures mentioned in ATBD Document:

Boomitra addressed the transparency concerns related to Figures mentioned in ATBD.

Missing R2: Although the revised Figure 8 of the ATBD document includes a full dataset plot (panel a), this analysis was not part of the methodology applied to the project area. The PP included it only to

provide contextual information about environmental factors affecting SAR backscattering from soils and their relationship with SOC. Consequently, the influence of mixed factors resulted in a *weak correlation*, which slightly improved when the data were filtered and stratified, serving merely to visually illustrate the complex interactions that the machine learning model needed to handle. The proponent effectively clarified that Figure 8, panels (b), (c), and (d), are intended solely for didactic purposes, to visually demonstrate the theoretically inverse relationship between SOC and radar backscatter when key confounding (influencing) variables are controlled through filtering. Figure 8 thus serves only to illustrate the complex relationships among soil components that the model accounts for. This clarification addresses concerns about “selective data use” by confirming that the operational machine learning model (Section 6) does not apply such filtering during inference. The model’s actual performance is evaluated using independent, unfiltered validation samples from 2018 and 2022.

Scientific basis: Scientific justification for controlling variables (soil moisture, incidence angle, land surface temperature, vegetation cover) is appropriate, aligning with established remote sensing principles, particularly the effects of L-Band attenuation due to vegetation and moisture on the backscatter signal.

Reliability of PTF

Boomitra adequately addressed the reliability concerns regarding the Pedotransfer Function (PTF).

The confusion stemmed from comparing the model's performance to the single-variable, linear regression trend illustrated in Figure 10(a), which exhibits a low R^2 (0.1871 shown in background section).

Model differentiation: The PP clearly stated that the actual operational PTF is a separate Gradient-Boosting Model utilizing multiple soil attributes as covariates, specifically SOC, sand percentage, and silt percentage. This multi-variate approach captures the non-linear relationship informed by soil texture, which is known to be inversely proportional to Bulk Density (BD).

Reliability metrics: The actual PTF demonstrates moderate to strong performance, achieving an R^2 of 0.60 and an RMSE of 0.11 ton/m³ on the test dataset. These metrics establish the reliability and validity of the PTF, particularly when compared against the didactic single-variable plot.

Outlier exclusion: The exclusion of BD outlier samples (1.0-1.6 ton/m³ range used for fitting) is justified as a conservative measure to prevent skewing the model, thereby improving generalization and conservatively estimating SOC stock, which ultimately reduces the project's overall uncertainty.

Overall, the audit team found the approach to meet the transparency and uncertainty requirements of the VCS Standard.

With respect to reliability and the nature of the evidence, the VVB found that the evidence was primarily documented and originated from internal systems and procedures implemented by the PP, with certain critical elements externally verified such as laboratory analyses, third-party model validation, and

independent quality assurance reviews. Where applicable, oral clarifications were provided and documented during the audit process to support interpretation.

Category	The reliability of the evidence, and the source and nature of the evidence (external or internal, oral, or documented) for the determination of reductions or removals.	The information flow from data generation and aggregation, to recording, calculation and final transposition into the MR	Appropriateness of implemented calibration frequency.
Implementation of project activities	Documented evidence reviewed by VVB including signed participation agreements, photographs, GPS logs of paddock demarcation, and ranch-level activity schedules. /10/11/17/18/24/28 /32/33/35/36/37/38/	Project start date verified through a combination of signed agreements, site visit evidence, and dated activity logs. Paddock demarcation was triangulated using GPS maps, photographic evidence, and field records.	Not applicable – Activity implementation does not require physical calibration, but VVB assessed spatial accuracy of GPS tools.
Monitoring procedures	SOPs for field data collection, photographic monitoring, and digital recordkeeping are well-documented. Internal documentation reviewed by VVB./12/34/	SOPs followed by trained staff. Photos, GPS data, and written logs entered into centralized database. Data reviewed and summarized in the monitoring report. Cross-checked against field visits and GIS data.	Field instruments used (e.g., GPS, soil probes) were calibrated as per SOP; calibration records were reviewed and found adequate.
Estimation of ERRs	Based on RothC modeling fully reviewed and verified by VCS Independent Model Experts (IME)/45/. All inputs documented and traceable. Internal development with external expert verification.	Inputs (soil data, climate data, land use) were sourced from field and lab data, aggregated by ranch, modeled with RothC, and the outputs tabulated in the ERR /8/ and monitoring report. Cross-verified by VVB.	RothC model is subjected to instrument calibration as explained in the Model Validation Report/27/. Parameter validity reviewed by external experts.
GIS and Remote Sensing data	Based on CarbonFocus ATBD model/26/44/; externally reviewed. SOC estimates documented with	SOC and bulk density estimates generated via remote sensing models, assigned to spatial units,	Not applicable – Model calibration parameters reviewed and

Category	The reliability of the evidence, and the source and nature of the evidence (external or internal, oral, or documented) for the determination of reductions or removals.	The information flow from data generation and aggregation, to recording, calculation and final transposition into the MR	Appropriateness of implemented calibration frequency.
	metadata. Internal generation, externally validated.	and input into RothC. Documented in ATBD and MR/8/. VVB confirmed consistency with field samples and model runs.	confirmed. No physical equipment used.
Soil sampling Standard Operating Procedures (SOPs), Field protocols	Internal SOPs for soil sampling, lab processing, and measurement techniques/12/. VVB reviewed documentation and implementation during site visit.	/34/Samples collected per defined stratification, labeled, tracked, and analyzed in labs. Results aggregated to sample units, modeled, and reported in the MR. SOP adherence verified via sampling logs and site audit.	Physical sampling tools (such as augers, scales) calibrated on schedule. Logs were reviewed and verified.
Laboratory Analysis Reports	Third-party accredited laboratories provided full QA/QC documentation/46/. Source is external and documented.	Sample chains-of-custody maintained. Data reported to project developers, entered into modeling and MR. VVB reviewed test reports and QA controls such as standard samples and repeats.	Lab equipment subject to routine ISO-based calibration. Frequency and traceability confirmed through lab reports.
Stakeholder Interviews / Rancher Records	Oral account supplemented by written records. Internal and partially documented. Used for triangulation.	Used to confirm timing and extent of implementation. Not a primary data source, but supportive. Interview insights compared with Rancher logbooks, photographs, and digital maps. /11/25/29/39/	Not applicable – No calibration relevant. Interviews used only for triangulation, not quantification.

4.5 Non-Permanence Risk Analysis

The proponent used the "AFOLU Non-Permanence Risk Report Calculation Tool v4.0" in line with VCS specifications to analyze the risk in terms of internal risk, external risk, natural risk, and risk mitigation strategies. The non-permanence risk report and the Excel risk tool are provided by the project proponent.

The VCS recommendations were used to calculate each risk category. Through document analysis, actual visits to the project area, and interviews, the material was verified and cross-checked. The evaluation's specifics are listed below.

Risk Rating	Quality of the data and assessment of quality	Audit Conclusion
Internal Risk and rating: 11		
Project Management (Rating: -4)	The audit team completed the project risk analysis in line with AFOLU Non permanence risk tool, v4⁹. This is a grouped project which involves improved agricultural land management practices. The project does not engage in planting activities of any non-native species /37/. Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting under the VCS Program or other approved GHG programs /24/. The management team was met and consulted during the site visit and in subsequent conversations during the validation. The VVB found that the management team has a sound and robust understanding of project development, implementation,	PP has provided enough information for this parameter. Mitigation plan detailed in the section is found satisfactory and hence audit team finds risk rating is appropriate. CL ID 08 & 09 was raised and resolved successfully. Refer Appendix 3 of this document for the same.

⁹ Per the VERRA publication on 18th Feb 2025 regarding CLARIFICATION TO VCS PROGRAM RULES AND REQUIREMENTS, - [Clarification-to-Verra-Program-Rules-and-Requirements-AFOLU-NPRT-v4.pdf](#)
Under clarification: AFOLU Non-Permanence Risk Tool, v4.2, Appendix 1 Document History, pages 2 and 3

* Projects may continue to use the AFOLU NPRT, v4.0, where all of the following apply:

- The project requested registration on or before 29 August 2023
- The project is requesting verification approval for a verification period that includes vintages of 2022 and earlier only

The project is requesting verification approval for a verification period that includes vintages of 2022 and earlier only – the MP is 04/09/2018 to 03/09/2022. Hence it was concluded that PP can apply v4 of the NPRT for MP1 per the VERRA's guidelines.

clarification number 1.1 clearly mentions the following:

Risk Rating	Quality of the data and assessment of quality	Audit Conclusion
	management, and monitoring. Implementation partners all belong to the project area, and they have been working in the area for over 10 years. The risk has been rated -2 as a part of the adaptive management plans. The management activities were also confirmed during site inspection conducted by the audit team. .	
Financial Viability (risk rating: 1)	The applicable financial viability risk categories are c). The project cash flow breakeven point is between 4 and up to 7 years from current risk assessment. VVB has checked the summary cash flow data. Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven. There are no activities that require Boomitra to buy any big equipment or land that requires more money. All the project activities are happening on individual grasslands. The NPR report version 1 includes the justification of the scores assigned to conditions (h) and (i) of the financial viability. The documentation provided is a financial analysis that allowed for assessment by the audit team and is therefore of good quality	PP has provided enough information for this parameter. Information provided in the section is found satisfactory and hence audit team finds risk rating is appropriate. PP has submitted the financial stability report of Boomitra/49/ to suffice the claim. CL ID 10 & 12 was raised and resolved successfully. Refer Appendix 3 for the same.
Opportunity cost (risk rating: -2)	NPV of the most profitable alternative land use activity is expected to be 20 percent or less than that of project activities. In line with section 2.2.3 of the AFOLU Non-Permanence Risk Tool v4, "Where the majority of baseline activities over the length of the project crediting period are subsistence-driven, hence NPV analysis is not required, but an assessment of the net impacts of the project on the social and economic well-being of the communities who derive livelihoods from the project area shall be undertaken." Project proponent is a for-profit organization. Boomitra is the only project proponent and the legal agreements between the PP and the partners has been checked. PP holds 80% of the ownership of the project area through the legally binding agreement with the project owners. The information provided in this section meets the requirements and found is of good quality.	As mentioned in tool section 2.2.3 (2) Where most baseline activities over the length of the project crediting period are subsistence-driven, an NPV analysis is not required, but an assessment of the net impacts of the project on the social and economic well-being of the communities who derive livelihoods from the project area (see Section 0) shall be undertaken. PP has updated the report with satisfactory details about the analysis of opportunity cost. Risk rate is appropriate. CL ID 11 was raised and resolved successfully. Refer

Risk Rating	Quality of the data and assessment of quality	Audit Conclusion
		Appendix 3 for the same.
Project longevity (risk rating: 16)	The project longevity is 40 years and renewable till 100 years. PP confirmed that the project is protected by legally binding commitment through a legal agreement between PP and Partner for 40 years. The agreement with the ranchers is for 10 years renewable. Since, there is no agreement in place for the entire project crediting period, PP has chosen option a. The agreements/32/ were reviewed and found to be satisfactory and robust enough to ensure the project's enforcement throughout the duration of 40 years. Hence the PP has scored 16 for this parameter. (Considering the below equation) $=24 - (\text{Project Longevity} / 2)$ $=16 \text{ (Risk rating)}$	PP has provided enough information and evidence for this parameter. Information provided in the section is found satisfactory and hence audit team finds risk rating of 16 is appropriate.
External risk rating: 0		
Land Tenure and Resource Access/Impacts (Risk rating: 0)	The category b) Ownership and resource access/use rights are held by different entities. the land ownership and user rights except the complete carbon revenue is held by the ranchers/landowners /17/ and the carbon revenue is shared with the PP by valid agreements/32/. Through a legal carbon rights agreement between the rancher—whether an individual private landowner or the ejidal commissioner representing an ejido—and Boomitra, the ranchers assign the rights to market and sell the resulting Greenhouse Gas Reductions and Removals (GGRs) to Boomitra. Therefore, no mitigation measures are required for this risk as the risk rating is given based on mitigation category where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims. The conditions (f) and (g) of the Land Tenure and Resource Access/Impacts table are rated 0 and the justification provided in the NPR was checked. The condition (f) is mitigation activity when project area is protected by legally binding commitment to continue management practices that protect carbon stocks over the length of the project crediting period. Here, the risk is rated 0. The condition (g) is mitigation activity where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify	PP has provided enough information and evidence for this parameter. Information provided in the section is found satisfactory and hence audit team finds risk rating of 0 is appropriate. CAR ID 35 was raised and resolved successfully. Refer Appendix 3 for the same.

Risk Rating	Quality of the data and assessment of quality	Audit Conclusion
	overlapping claims. Since, in this project, PP confirmed that new project activity areas with existing disputes over land tenure, ownership or access/use rights are considered ineligible for inclusion into the project, so no disputes can be identified or documented or can be supported with evidence and therefore risk rating 0 was found appropriate.	
Community engagement (Risk rating: -5)	The ranching community are directly involved in this project. The risk rating is provided on category mitigation - the project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area. Additionally, from the documents review and site visit assessment, it was confirmed that 100% of the households living within the project area who are reliant on the project area have been consulted. Documents provided by the PP on the consultations were checked and found of good quality.	PP has provided enough information and evidence for this parameter. Information provided in the section is found satisfactory and hence audit team finds risk rating of -5 is appropriate.
Political Risk: (Risk rating: 2)	PP has calculated governance score from the mean of Governance Scores across the six indicators of the World Bank Institute's Worldwide Governance Indicators (WGI). The governance score for this project is -0.49. The audit team checked the documentation and explanation provided on the mitigation plan and found of good quality. ¹⁰	Risk rate of 0 is appropriate.
Natural Risk rating: 1.5		
Natural Risk Assessment (Fire; Pest and Disease outbreaks; Extreme Weather; Geological Risk)	- Incidences of wildfire in the project is categorized as insignificant. The fire risk has been analyzed cross all the regions. Explanation given by PP in this section is found satisfactory. The occurrence of fire incidents in Mexico has been noted over recent years but it was due to induced fire.¹¹ - Incidences of pest and disease outbreaks is categorized as insignificant. The significance of pest and disease outbreak in the project boundary is insignificant as there is no plantation activities. However, as per Non-Permanence Risk Tool v4.0 para 2.4.1.4 (a) and (b), the risk is calculated to be 1 due to	The risk rating is in accordance with the Non- permanence Risk Tool v4.0. The audit team for an independent analysis of natural risk such as fire, pest & disease outbreaks. to check the rating claimed for the risk assessment by the PP and found the risk assessment and score appropriate.

¹⁰ <https://www.worldbank.org/en/publication/worldwide-governance-indicators>

¹¹ Fire in the Deserts and Desert Grassland of North America

<https://www.resolutionmineeis.us/sites/default/files/references/humphrey-1974.pdf>

<https://jornada.nmsu.edu/files/bibliography/JRN00328.pdf>

Restoring fire to Native Grasslands. The Nature Conservancy. (2018, September 14). <https://www.nature.org/en-us/about-us/where-we-work/united-states/stories-in-mn-nd-sd/restoring-fire-to-native-grasslands/>

¹¹ Morales, A. N. (2017, December 4). Mexico's National Forest Fire Management Program. World Bank Blogs. <https://blogs.worldbank.org/endpovertyinsouthasia/mexico-s-national-forest-fire-management-program>

Risk Rating	Quality of the data and assessment of quality	Audit Conclusion
	minor incidence of the risk. Explanation given by PP in this section found satisfactory. The emergence of new pests and pandemics may persist in the project area, but science-driven global cooperation and collaboration will significantly mitigate their impact. During the site visit also it was concluded that the risks of pest and disease attacks are low in the project parcels and it is further reduced due to effective grassland management. Incidences of extreme weather in the project is categorized as insignificant. The risk associated has been analysed by PP across the region. Explanation given by PP in this section is found satisfactory. Incidences of geological risk in the project is categorised as insignificant. The project area is not prone to major earthquakes, tsunamis, volcanic activity or other geological risks. Earthquakes are common in Mexico since it is located in one of the most seismically active regions in the world. Project area is located in the low to medium risk area where the earthquakes are either have significant effect or minimal effect on the soil. So, the earthquakes do not have any impact on SOC in the project boundary. This is in line with VCS NPR tool section 2.4 Therefore, the risk rating calculated is 0.5¹².	CAR ID 13 & CL ID 13 was raised and resolved successfully. Refer Appendix 3 for the same.
Overall Risk rating from the report is 13%		

The calculation has been verified using the VCS tool, which was used to calculate the non-permanence risk. The calculated overall risk rating was **13%**.

For the current project activity all the parameters in different risk category are same though project areas are in different regions of Mexico. Therefore, the calculated risk rating will be same for the entire project area. As a result, the value taken into account is according to the suitable tool, and a conservative value has been taken into account for the project. By multiplying the risk factor by the calculated net emission reductions in accordance with the excel calculation sheets, the total tradable VCUs are determined. The risk rating should only be utilized to reserve buffer credits and determine VCUs in accordance with the VCS permanence criteria. The risk will be reassessed at the time of the next verification as per VCS standard as the risk rating may change.

¹² World Bank Climate Change Knowledge Portal
<https://climateknowledgeportal.worldbank.org/country/mexico/climate-data-historical>
<https://www.worldwildlife.org/places/chihuahuan-desert>
The Geologic Origin of the Sonoran Desert https://www.desertmuseum.org/books/nhsd_geologic_origin.php
Chihuahuan Deserts Ecoregion https://pubs.usgs.gov/pp/1794/a/chapters/pp1794a_chapter27.pdf

CAR 19 and 69 as raised and resolved successfully. Refer Appendix 2 for the same.

5 VERIFICATION OPINION

5.1 Verification Summary

The project satisfies the VCS project verification standards. The project was designed in line with the project description that had been validated during the registration process. The greenhouse gas (GHG) statement is the responsibility of the project proponent. 4KES, as the International Accreditation Forum (IAF)-accredited validation and verification body, has conducted the verification in accordance with ISO 14064-3:2019.

The verification audit assessed whether the project conforms with the verification criteria set out in the VCS Standard, Version 4.4, including requirements for GHG emission reductions and/or carbon dioxide removals. The project has been implemented in full accordance with the validated and registered project description, and no deviations or modifications were observed. This verification event does not include any validation activity.

Based on the assessment, the audit team concludes with a reasonable level of assurance that the GHG statement is free from material misstatement and that the reported net GHG removals for the verification period have been fairly and accurately quantified in accordance with the applied methodology and VCS requirements.

The project activity is eligible under Sectoral Scope 14 and meets all relevant VCS criteria for verification and validation. Therefore, 4KES recommends the project for successful registration and issuance of Verified Carbon Units (VCUs).

5.2 Verification Conclusion

Based on the verification process conducted in accordance with ISO 14064-3:2019 and relevant program rules, the Verification and Validation Body (VVB) provides a reasonable level of assurance that the greenhouse gas (GHG) emission reductions and carbon dioxide (CO₂) removals reported in the project's GHG statement for the verification period are free from material misstatement and have been quantified in accordance with the applied methodology and program requirements.

The data and information supporting the GHG statement were determined to be historical in nature, derived from project activity records and monitoring data collected during the verification period. As part of the verification process, the audit team assessed the implementation of the project activities, the applied baseline and monitoring methodology, and compliance with relevant VCS program requirements and host country regulations.

The verification team conducted a detailed review of the project's Monitoring Report (MR)/7/, PD/53/, supporting documentation, and emission reduction calculations to determine conformity with the applied methodology VM0042, Version 1.0 and the AFOLU Non-Permanence Risk Tool, Version 4.0.

Based on the verification activities, including document review, data sampling, and site visit interviews, the audit team concluded the following::

- **The monitoring plan** has been implemented transparently and adequately. It is consistent with the applied baseline and monitoring methodology (VM0042 v1.0) and meets the VCS standard requirements. The use of the AFOLU Non-Permanence Risk Tool v4.0 to estimate buffer credits is appropriate and in accordance with VCS guidelines.
- The calculation methods and use of parameters in estimating GHG emission reductions are transparent, correctly applied, and consistent with methodological requirements. The emission reduction estimates are conservative, appropriate, and supported by verifiable data and records.
- The verification assessment confirms that the project activities, as implemented and reported during the verification period, conform to all applicable VCS requirements and methodological criteria.

As a result, 4KES concludes that the Monitoring Report (MR)/7/ and associated GHG emission reduction calculations meet all requirements for verification under the VCS Standard. The verified GHG benefits are consistent with expectations, and future GHG removals are likely achievable if current management practices and monitoring continue as described.

Verification period: From 04-09-2018 to 03-09-2022

Verified GHG emission reductions and carbon dioxide removals in the above verification period:

For projects required to assess permanence risk:

i) *Provide a conclusion on the following information:*

The non-permanence risk rating (%)	13%
If applicable, the Long-term Average (LTA), whether it has been properly updated, and if it has been reached.	NA, There are no ARR and IFM activities involved in this project.
Whether a loss has been appropriately accounted for, in accordance with the VCS Program rules, if applicable.	There is no such event occurred in this monitoring period.

ii) Complete the table below:

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Buffer pool allocation (tCO ₂ e)	Reductions VCU (tCO ₂ e)	Removals VCU (tCO ₂ e)	Total VCU issuance (tCO ₂ e)
04-Sep-2018 to 31-Dec-2018	-	-	0	-	0	-	-
01-Jan-2019 to 31-Dec-2019	(564,295.57)	(24,789.73)	0	52,598	0	352,001	352,001
01-Jan-2020 to 31-Dec-2020	216,979.34	545,837.43	0	23,582	0	157,817	157,817
01-Jan-2021 to 31-Dec-2021	357,844.18	865,426.27	0	50,278	0	336,468	336,468
01-Jan-2022 to 03-Sep-2022	(236,996.97)	2,276,556.62	0	326,762	0	2,186,791	2,186,791
Total	(226,469.02)	3,663,030.60	0	453,220	0	3,033,077	3,033,077

5.3 Ex-ante vs Ex-post ERR Comparison

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
04-Sep-2018 to 31-Dec-2018	-	-		No ex-ante or achieved reductions/removals; not applicable.

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Jan-2019 to 31-Dec-2019	1,275,037	352,001	-72%	Baseline RothC propagation was revised during IME review to correct an identified issue with input variables, and to ensure conservativeness. The adjustment showed a lower SOC decline under business-as-usual, particularly in the first year. Furthermore, the project-scenario RothC model was revised during verification to align with VMD0053 requirements by calibrating against literature rather than fitting directly to re-measurements. This led to slightly conservative sequestration estimates. These RothC corrections decreased credit generation for this vintage.
01-Jan-2020 to 31-Dec-2020	999,661	157,817	-84%	Variation due to adjustments made to both project-scenario and baseline RothC models during the IME review at first verification. Combined with a relatively higher proportional effect of uncertainty deductions, these RothC corrections resulted in reduced credit issuance.
01-Jan-2021 to 31-Dec-2021	1,398,426	336,468	-76%	The project-scenario RothC model was revised to align with VMD0053 requirements by calibrating against literature rather than fitting directly to re-measurements. This led to slightly conservative

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
				sequestration estimates. Combined with a relatively higher proportional effect of uncertainty deductions, this resulted in reduced credit issuance.
01-Jan-2022 to 03-Sep-2022	1,270,186	2,186,791	72%	With the revised with-project scenario RothC model underpredicting sequestration, remote sensing SOC re-measurements conducted in 2022 served to “true-up” the estimates. This led to a higher-than-expected issuance for this year.
Total	4,943,310	3,033,077	-39%	Overall, the IME-driven baseline correction to ensure conservativeness reduced predicted SOC losses under business-as-usual, thereby decreasing net credits. Combined with project RothC adjustments and SOC re-measurements, the total achieved reductions/removals were lower than ex-ante estimates by 39%.

The review of ex-ante and achieved GHG emission reductions and removals for the project vintages from 2018 to 2022 indicates that the observed differences are methodologically justified, transparently documented, and supported by empirical evidence.

(i) Key assumptions at validation (ex-ante estimates):

At validation, the ex-ante estimates of GHG ERRs were based on RothC modeling under the following key assumptions:

- **Baseline Scenario:** Business-as-usual (BAU) management was represented using RothC parameters that reflected conservative soil organic carbon (SOC) loss trajectories derived from training on baseline samples and validating on field trial literature. Validating with literature-

based field trial data was found to be the best approach given that the project itself does not collect multi-timepoint longitudinal data for the baseline scenario SOC levels as the project uses Quantification Approach 1, and hence does not have the necessary direct soil sample data. The literature-based approach best meets the requirements of VMD53 in this context.

- **Project Scenario:** Modeled with adoption of improved practices and RothC outputs fitted to SOC re-measurements, projecting incremental sequestration above BAU.
- **Error Considerations:** Model relative error was assumed to remain constant across vintages, with proportional impact varying depending on the level of sequestration.

These assumptions provided the basis for ex-ante projections of reductions/removals, but were subject to recalibration as new data became available.

(ii) 2. Ex post estimations: changes made based on the IME review - impacting baseline and project estimates:

During verification, methodological updates were applied following the IME review and the availability of first-period SOC measurements. The principal changes were:

1. **Baseline Adjustments:** The RothC baseline model was revised to better capture SOC dynamics under BAU by correcting an implementation error identified during IME review and ensuring conservativeness in model outputs. Specifically, there was a weather data input error (unit mismatch) at validation which understated BAU SOC losses. This correction and ensuing improvements for conservativeness resulted in lower projected SOC losses across all vintages, making the achieved reductions/removals more conservative compared to ex-ante. In order to implement the conservativeness, the training and validation framework for the baseline RothC was changed to a leave-one-out cross-validation based on literature field trials, after approval by IME to ensure conservativeness, as opposed to the earlier approach of baseline samples for training and field trial data for validation (as used during the ex-ante estimates), which was resulting in less conservative predictions at the project-level.
2. **Project Scenario Calibration:** The project RothC model was recalibrated to align with literature-based parameters instead of being fitted in a ranch-specific manner to ranch-specific SOC re-measurements. This was in response to a FAR raised by Verra during validation – FAR04 – which requires the project to have a project-scenario calibration that has independent validation following the requirements of VMD53. The earlier calibration could not be considered to be independent because it was validated with the same ranch-level data as used for training. In this context, the PP adopted literature-based field trial data to validate the project-scenario RothC model, and the audit team and IME review found this literature data source to be the best suited for the project for the chosen monitoring period. Project-specific physical soil samples taken at the same coordinate location across different time points (ie longitudinal site-specific physical sampling) are yet to be available, but as part of future soil sampling to be conducted, the PP has confirmed plans to take such repeated soil samples at the same locations. Thus in future monitoring periods, it may be more relevant to calibrate the project-scenario RothC with the

repeated physical soil sample data, but for this monitoring period, literature-based field trials following VMD53 requirements are found to be the most high quality source. Ultimately, this project-scenario model adjustment reduced estimated sequestration in certain vintages (notably 2021), explaining negative deviations.

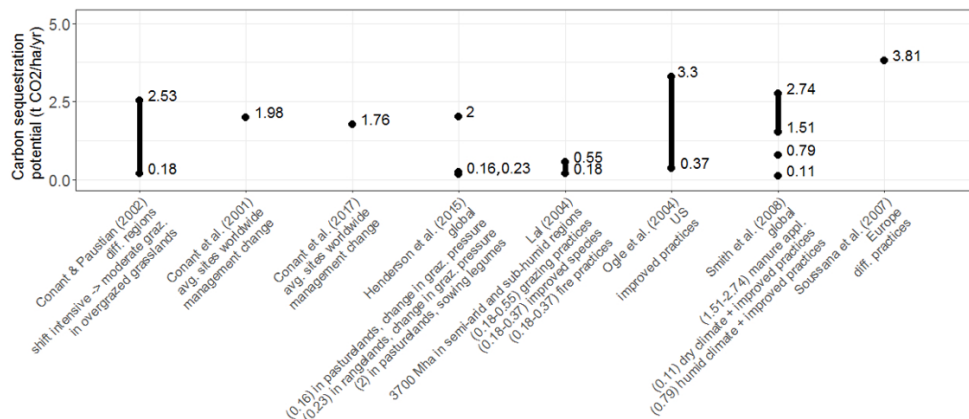
3. **Integration of SOC Re-Measurements:** Beginning in 2022, observed SOC re-measurements were incorporated to “true-up” the model predictions. This reconciliation, combined with the conservative project scenario RothC model, yielded a strong positive deviation for 2022. Field and laboratory protocols were reviewed and concluded to be satisfactory.
4. **Uncertainty Considerations:** Standard error values remained constant, but their proportional effect was larger in lower sequestration years (e.g., of 2021). For example, the same uncertainty represented 45% of net removals in 2020 but it is less than 24% in 2021 due to higher sequestration. This behaviour aligns with RothC modelling behaviours¹³ and demonstrates that uncertainty treatment was transparent and conservatively applied in line with requirements. .

Overall assessment: While annual deviations ranged from -84% to +72%, the cumulative difference across the monitoring period (-39%) is explained by systematic revisions to baseline dynamics, conservative project calibration, and empirical SOC integration. The combination of ex-ante assumptions, verification refinements, and measurement-based adjustments demonstrates a transparent and robust approach. After these changes, based on the ERR sheet reviewed, the project reports 1.7 ton CO₂/ha/yr in net emission reduction/removal. This value can be broken into two constituent elements: 1.6 ton CO₂/ha/yr corresponding to SOC increase in project scenario, and 0.1 ton CO₂/ha/yr corresponding to anticipated SOC decreases in the baseline scenario. Since the project and methodology measure the total emissions benefit of the project based on the project scenario increases in the context of a dynamic baseline scenario, the overall project emission results combines these two elements. Each of these two values may be analysed in the context of relevant published literature on sequestration rates in similar environments.

According to a recently published review¹⁴ of soil carbon sequestration in grazing systems, a meta analysis of field trials gives a 20-year averaged rate of 1.76 ton CO₂/ha/yr for project-scenario sequestration. It is crucial to note that this number only incorporates the carbon sequestration from the practice change and does not incorporate a dynamic baseline scenario, and thus the number is only applicable to the project-scenario estimates. Furthermore the review consolidates results across other scenario-specific review papers in the following figure:

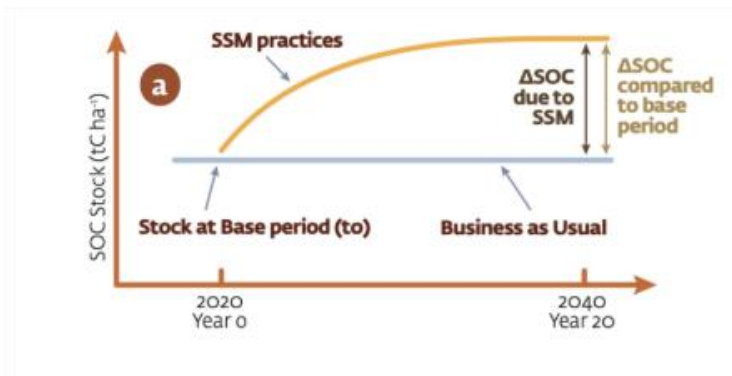
¹³ <https://www.sciencedirect.com/science/article/abs/pii/S2352938522001847>

¹⁴ Godde, C.M., de Boer, I.J.M., Ermgassen, E.Z. *et al.* Soil carbon sequestration in grazing systems: managing expectations. *Climatic Change* **161**, 385–391 (2020). <https://doi.org/10.1007/s10584-020-02673-x>



Given the semi-arid nature of the northern Mexico project sites, an average of 1.76 ton CO₂/ha/yr is likely not achievable over 20 years. For example, as seen in the figure, Lal (2004) finds that 0.18-0.55 ton CO₂/ha/yr are possible from semi-arid and sub-humid regions in sequestration from improved practices over long term averages. As noted earlier, this project reports 1.6 ton CO₂/ha/yr across the first monitoring period (which is much shorter than the long-term studies quoted).

As is widely recognized, SOC dynamics are non-linear: most accumulation occurs in the first decade after implementation, with annual rates declining as soils approach a new equilibrium (see Figure, FAO, 2020). This is why models such as RothC and DayCent represent annual SOC sequestration with a decay-type response over time. In this project, the PP uses RothC, so this dynamic is explicitly included in PP estimates, and they expect the annual sequestration rate to decrease substantially over the 20-year project duration:



Most synthesis papers on grazing (e.g., Conant & Paustian, 2002; Conant et al., 2017; Henderson et al., 2015) therefore report long-term averages over 15–40 years, which naturally smooth out higher short-term rates. Conant et al. (2017), for instance, show that shorter-term grazing management studies tend to report higher sequestration rates, whereas longer-term studies (mean duration ~38.5 years) show lower annualized values. Godde et al. (2020) explicitly note that sequestration rates diminish towards zero as soils approach a new carbon equilibrium, underscoring that sequestration must always be interpreted together with the timeframe of analysis. Conant et al. (2001) report SOC stock changes

ranging from 0.11 to 3.04 tC/ha/year (0.40–11.12 tCO₂/ha/year), with a median treatment duration of 17 years, and also show that annual SOC accrual declines over time (from 0.88 to 0.17 tC/ha/year over five decades).

Importantly, semi-arid grazing systems follow the same pattern. Short-term studies such as Hamido et al., report 0.1–11.47 tCO₂/ha/yr accrual with a 3-year duration, in a farm in Missouri (US) with improved grazing practices, even considering that those lands have been recently cleared from native vegetation and therefore they don't have a long history of continuous grazing management such as the lands in our project. Carrascosa et al. report SOC stock increases of 0.56–0.84 tCO₂/ha/year over 10–15 years after changing from continuous to rotational grazing in a semi-arid region of Spain. Rotich et al. worked in a commercial ranch in semi-arid Makueni County, Kenya, comparing continuous grazing, rotational grazing and an ungrazed control. They measured SOC stocks and calibrated RothC, estimating an accrual of 2.23 tCO₂/ha/year under improved grazing management. These studies are directly relevant to semi-arid grazing systems and clearly demonstrate that short- to medium-term sequestration rates in the order of 1–2 tCO₂/ha/year are plausible when management is improved from degraded baseline conditions.

Taken together, these results show that (i) short-term rates can be substantially higher than those long-term averages; and (ii) published SOC stock changes for semi-arid grazing systems (e.g., Carrascosa et al.; Rotich et al.) include values similar to or exceeding 1.6 tCO₂/ha/year. Therefore, the project SOC increase of 1.61 tCO₂e/ha/year is consistent with the scientific literature on improved grazing in semi-arid regions, especially for the initial years after management change, and is likely to decline over time as represented in the project's RothC modelling.

PP shares simulated results in the ATBD document that show that the yearly rate will likely decrease over time, and the 20-year average would be 0.5 ton CO₂/ha/yr, falling in the range of expectations based on long-term averages for a semi-arid environment. Audit team has reviewed these results and associated literature, and thus found the project-scenario estimate of 1.6 ton CO₂/ha/yr to be appropriate for the first monitoring period.

For the case of the baseline scenario decrease, the audit team has looked at separate literature that quantifies the loss in SOC in semi-arid regions due to the unsustainable grazing practices (eg. overgrazing) that occur in the baseline scenario. The audit team finds that review papers show that overgrazing has the greatest ongoing and sustained soil carbon loss effect in dry climates and sandy soils¹⁵, such as the types of regions in this project, reducing soil carbon levels by 16% compared to less grazing-stressed soils.

The 0.1 ton CO₂/ha/yr reported by the project is conservative compared to the RothC baseline literature validation data used for continuous grazing (which has an average loss rate of ~0.17 tC/ha/year = 0.62

¹⁵ Dlamini, P., Chivenge, P., & Chaplot, V. (2016). *Overgrazing decreases soil organic carbon stocks the most under dry climates and low soil pH: A meta-analysis shows*. *Agriculture, Ecosystems & Environment*, 221, 258–269. <https://doi.org/10.1016/j.agee.2016.01.026>

tCO₂/ha/year), but also considering the limited direct SOC-stock observations for continuous grazing in Mexico.

Medina-Roldán et al. (2008) conducted a study in the shortgrass steppe of Central Mexico (380 mm annual precipitation; silty clay to sandy-loam soils; dominant C₄ grass *Bouteloua gracilis*), an ecosystem analogous to the project area. They report that 75 years of permanent overgrazing result in an annual decline of 0.29% of the soil C pool. For semi-arid grasslands with typical SOC stocks on the order of 48 t C/ha (0–30 cm), this corresponds to: 0.14 t C/ha/year $\approx$ 0.51 t CO₂/ha/year.

Audit team also studied flux-tower based eddy covariance studies. Specific to the Chihuahua Desert region, flux tower measurements averaged over a 5 year time period (1996-2001) for a location without improved grazing management occurring report a 1.4 Mg C/ha/yr (5.3 ton CO₂/ha/yr) in yearly net CO₂ release into the atmosphere¹⁶. Chihuahua Desert flux tower measurements averaged across a later time period (2007-2011), show 0.31 Mg C/ha/yr (1.14 ton CO₂/ha/yr) average loss¹⁷. These studies, although measuring net CO₂ and not SOC specifically, provide regional reference that unmanaged Chihuahuan Desert grasslands function as persistent net carbon sources.

Taken together, these evidences support that the updated baseline estimated—now averaging -0.11 t CO₂/ha/year—is conservative relative to the magnitude and direction of carbon losses observed in the region.

Together, the literature data and accompanying analyses show that, within the context of the project's location within the Chihuahua desert region, both 1.6 ton CO₂/ha/yr increase in the project scenario and 0.1 ton CO₂/ha/yr decrease in the baseline scenario are plausible estimates for the first monitoring period of the project, and thus the audit team finds the combined emission estimate of ~1.7 ton CO₂/ha/yr to be plausible.

VVB Conclusion:

- The reported reductions/removals are credible, conservative, and methodologically sound, and fall within the ranges suggested by published literature on rates of sequestration from improved practices and baseline rates of carbon loss in semi-arid grasslands.
- Deviations from ex-ante estimates are fully justified by baseline recalibration, conservative project scenario adjustments, and SOC re-measurement integration.

¹⁶ Mielnick, P. C., Dugas, W. A., Mitchell, K., & Havstad, K. M. (2005). Long-term measurements of CO₂ flux and evapotranspiration in a Chihuahuan desert grassland. *Journal of Arid Environments*, 60, 423-436

¹⁷ Petrie MD, Collins SL, Swann AM, Ford PL, Litvak ME. Grassland to shrubland state transitions enhance carbon sequestration in the northern Chihuahuan Desert. *Glob Chang Biol*. 2015 Mar;21(3):1226-35. doi: 10.1111/gcb.12743. Epub 2014 Nov 7. PMID: 25266205.

- Proper documentation of IME review findings, RothC recalibration procedures, and SOC data has been reviewed and maintained for audit purposes.
- Subject to verification of the supporting documents, the project's reported reductions/removals can be considered reliable for credit issuance.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

Section	Information	Justification	Assessment method and conclusion
	Details of ranch ownership and financial audit plans are removed from the public version of this document to protect landowner privacy. The description given by PP in Section 1 of the PD is true to form, comprehensive, and gives insight into the scope of the project. Additionally, the audit team certifies that all activities detailed in the registered PD and MR are supported by data from the project design document		

APPENDIX 2: LIST OF DOCUMENTS REFERRED

Ref. No	Title of Document	Version	Date
1	VCS Program Guide	4.4	29 August 2023
2	VCS Standard	4.7	16 April 2024
3	VCS Validation and Verification Manual	3.2	19 October 2016
4	VCS Verification report template	4.4	Updated: 16 April 2024
5	AFOLU Non-Permanence Risk Tool (both Excel and template)	4.0	Updated: 3 May 2024
6	VCS Monitoring template	4.4	Updated: 16 April 2024
7	Monitoring report (MR)	V1	10/03/2023
		V2	18/05/2025
		V3	15/05/2025
		V4	16/09/2025
		V5	28/10/2025
8	ERR Calculations - Mexico_MR_MP1	V1	10/03/2023
		V2	18/05/2025
		V3	15/05/2025
9	VERRA webpage with global consultation (https://registry.terra.org/app/projectDetail/VCS/2887)	NA	NA
10	Project Polygon KMLs	NA	NA
11	Maps showing location of Ranchers	NA	NA
12	SOP	01	NA
13	Website - UN Sustainable Development Goals	NA	NA
14	Final Non-Permanence Risk Analysis Report.doc	02	NA
15	LULC analysis documents	NA	NA
16	VCS-Risk-Report-Calculation.xlsx	NA	NA
17	Land ownership legal documents	NA	NA
18	MoU between the PP and partners	NA	NA
19	Boomitra Inc. Website www.boomitra.com	NA	NA
20	VCS methodology VM0042	1.0	NA
21	VMD 0053 Module: Model calibration, validation, and uncertainty guidance for the methodology for improved agricultural land management	01	NA
22	Mexican Government Law	NA	NA
23	Google earth - https://www.google.com/earth	NA	NA
24	CVs of management team and technical experts	NA	NA
25	Continuous Training and capacity building records and photographs	NA	NA
26	Mexico SOC Remote Sensing Technical Summary (first verification), also called as CarbonFocus Algorithm Theoretical Basis Document (ATBD)	01	NA
		02	NA
		03	NA
27	Mexico Grassland Model Validation Report	NA	NA
28	Start date evidence (Project Start Date and All Ranches)	NA	NA
29	Grievance Expression Process Book	NA	NA
30	Boomitra HR policy and Ethics policy	NA	NA

Ref. No	Title of Document	Version	Date
31	Employment records	NA	NA
32	Carbon revenue sharing agreements	NA	NA
33	Grassland Management Plans	NA	NA
34	Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities	9.0	NA
35	Paddock Management records	NA	NA
36	Livestock management data	NA	NA
37	Grassland management plans	NA	NA
38	SDG Survey Data and Biodiversity survey data	NA	NA
39	Participatory Rapid Appraisal (PRA) report	NA	NA
40	Adaptive Management Plan	NA	NA
41	Ongoing consultations and FPIC evidence	NA	NA
42	Expert Opinion (Additionality assessment) and CVs of the experts	NA	NA
43	Employee List of Partners_Mexico	NA	NA
44	Supporting Document (ATBD). (DICCIONARIO DE DATOS DE EROSION DEL SUELO.pdf)	1.5	NA
45	Independent review of model validation and calibration reports by an independent third-party entity (IME)	NA	NA
46	Laboratory Analysis Reports	NA	NA
47	Monitoring Plan SOP	NA	NA
48	NMEX_Monitoring_data_Ranch-wise	NA	NA
49	Financial Stability Sufficing document	NA	NA
50	Project IRR Sheet	NA	NA
51	NDVI Analysis	NA	NA
52	Declaration	NA	NA
53	Registered PD	NA	NA
54	IME Report	NA	NA
55	2018 samples validation metrics calculations.xlsx 2022 soil sampling validation metrics calculations.xlsx NMX_soc_calibration_set_covariates_limcol.xlsx	NA	NA

APPENDIX 3: FAR FROM PREVIOUS AUDIT

During previous audits, the VVB raised a total of five FARs. FAR 02 was closed during the validation process, and no further action was required. A detailed assessment of FARs 01, 03, 04, and 05, which is applicable for this verification audit is provided below.

FAR 01:

This FAR was raised due to the unavailability of the model validation report at the time of validation. The concern revolved around the use of a single average baseline Soil Organic Carbon (SOC) accumulation rate from literature ($-0.69 \text{ tCO}_2/\text{acre}/\text{year}$), which, though deemed reasonable, lacked stratification. The VVB advised that the PP should apply appropriate stratification (e.g., by soil type, management practices) and bin baseline SOC accumulation rates accordingly. This was especially important for verification, where transparency in data and stratification would be necessary.

In response, the PP clarified that rather than using literature values, they applied a calibrated RothC model for baseline SOC estimation. This model integrates local climate variables, soil texture, and site-specific conditions, allowing for robust, ranch-specific modeling. Each sample unit was treated individually, with no binning required, as RothC was executed separately per unit. This approach aligns with the methodology and enhances the resolution and accuracy of the baseline assessment.

VVB's assessment concluded that the model-based approach is appropriate and consistent with the methodological requirements, and the level of stratification down to individual sample units was deemed sufficient.

FAR 03:

This FAR was raised in response to Section 3.1.4 of the VCS Standards, which mandates that projects must comply with all applicable laws. The VVB highlighted a potential future risk, as the project falls under the scope of Mexico's Nationally Determined Contributions (NDCs). Although there is currently no binding legal framework for voluntary carbon markets in Mexico, the VVB recommended that the PP be prepared to obtain an official letter from the Mexican government allowing the project and enabling VCU trading, should a legal framework be established in the future.

The PP explained that, under the existing legal framework, no such letter is currently required. Mexico does not have specific laws governing voluntary carbon projects, and therefore, there is no obligation to obtain official approval. However, the PP acknowledged the evolving policy environment, noting that draft regulations are under development and may introduce formal processes for project registration and Article 6 compliance. The PP committed to monitoring these developments and securing the necessary documentation if new regulations require it.

VVB's assessment recognized the PP's proactive stance and commitment to compliance, considering the FAR addressed for the current regulatory context, with the understanding that ongoing legal monitoring will continue. However, given the evolving regulatory context, the FAR is not considered closed and will

be carried forward to future verification periods to ensure continued monitoring and compliance with any new legal requirements that may emerge.

FAR 04:

This FAR was issued based on concerns identified during the VCS PRR review related to the technical validation of the RothC model use in the project scenario. Key issues included the absence of a harmonization procedure between soil carbon analytical methods (Walkley-Black vs. dry combustion), lack of justification for the RothC version used, an assumption of continuous soil cover, and questions about the role of RothC in modeling SOC stocks.

The PP provided a comprehensive response. First, they clarified that literature-derived data had been harmonized using established correction factors, notably a 1.3 multiplier to adjust for incomplete oxidation in Walkley-Black measurements, ensuring consistency with dry combustion results. The RothC model version was identified as 26.3, the latest official version while the earlier “2cla6.3” naming was a typographical error. Regarding soil cover, the PP explained that the project involves native grasslands, with continuous cover throughout the year, matching the conditions under which RothC was calibrated. Lastly, they corrected the approach for the improved project-scenario RothC used to model SOC stock changes, by calibrating and validation with field trial data from literature in a manner that is consistent with the requirements of VMD53 to keep validation and calibration data separate. Given that multi-time point physical soil sampling data from the same repeated locations has not been collected by the project, literature-based field trial data were found to be the most suitable source of data for RothC model for the improved project-scenario. PP has not made changes to the baseline scenario RothC model structure from the structure presented during validation as the baseline scenario RothC model was found to be compliant with VMD53 requirements.

VVB’s assessment accepted the justifications provided and confirmed that the updated Model Validation Report, reviewed by the IME, satisfactorily addressed all methodological requirements and closed the FAR.

FAR 05:

This FAR addressed deficiencies in the quantification of uncertainty in the SOC stock estimates generated using both remote sensing AI and biogeochemical models. Specifically, VCS identified a gap in how spatial uncertainty was handled when extrapolating point measurements to pixel-based predictions. The PP was required to demonstrate prediction quality, fit, and bias, and to adopt a more robust Monte Carlo (MC) simulation approach that accounts for spatial covariance.

In response, the PP incorporated extensive updates into the Monitoring Report. They performed three key statistical validations using in-situ samples collected during the August 2022 campaign: (1) at least 90% of validation data fell within the 90% prediction intervals, (2) the model demonstrated a positive R^2 value, and (3) bias in prediction errors was statistically insignificant using a two-tailed t-test. PP provided a detailed worksheet showcasing these calculations, which was also cross-checked by the audit team for accuracy. 2022 corresponds to the end of this monitoring period. Similarly, PP also provided detailed worksheets for a validation using the same 3 statistical checks (PICP, R^2 , bias) conducted for 2018

utilizing independent third party sampling data from Mexico agricultural ministry. 2018 is the first year of this monitoring period. Lastly, PP conducted a model domain coverage analysis for the satellite data used for making model predictions from 2018 to 2022 in this project for all ranches – they demonstrate that 99%+ of the satellite covariates used for model predictions fall within the domain of the model's calibration, indicating that the model is not being used for extrapolation and ensuring that the calibration and validation of the model remain valid for the whole monitoring period. These results are the QA/QC checks done to ensure that the SOC remote sensing outputs are of sufficient quality to be transferred to inputs to the biogeochemical model, and the audit team has found them to be appropriate to use.

Furthermore, they refined the MC simulation by extending the Posterior Predictive Distribution propagation to the project-level beyond the ranch-level, allowing uncertainty propagation to reflect spatial interdependence between sample units. The report demonstrated that this approach transitions from averaging independent uncertainties to a more realistic model that adjusts for varying levels of spatial correlation.

VVB's assessment concluded that all requirements for uncertainty quantification had been met. Both the remote sensing and biogeochemical model uncertainties were fully accounted for, and the IME confirmed that input and propagated uncertainties were properly treated.

APPENDIX 4: LIST OF FINDINGS

CAR ID	01	Section no.	MR All Sections	Date:	02/05/2025
Description of CAR					
PP is requested to ensure that all sections of the MR are aligned with the template requirements.					
Project participant response				Date :	10/05/2025
This has been addressed in the revised MR, with all sections now aligned to the template requirements.					
Documentation provided by project participant					
Revised MR					
DOE assessment				Date :	12/05/2025
The edits made by the PP are correct, and all sections of the MR are now aligned with the template requirements. This CAR is therefore closed.					

CL ID	01	Section no.	1.4 & 1.5	Date:	12/05/2025
Description of CAR					
PP is requested to share the agreement with the partners, as the registered project description indicates a 30-year agreement, while the Monitoring Report version 1 refers to a 40-year agreement. The audit team requires the agreement for verification and reference.					
Project participant response				Date :	14/05/2025
Partner-Level Agreement (PLA) has been revise to 40-year to meet the requirement of the latest revised AFOLU NPR template which is v4.2. The PLA has been attached as evidence for reference.					
Documentation provided by project participant					
PLA Mexico					
DOE assessment				Date :	18/05/2025
PP has updated the Partner-Level Agreement (PLA) to a 40-year duration to meet the requirements of the AFOLU NPR v4.2 template. The revised PLA has been reviewed and confirms the updated duration. This update is found satisfactory as it aligns with the latest requirements and ensures consistency across project documentation. The finding is closed. However, based on the clarification published by VERRA on 18 February 2025 https://verra.org/wp-content/uploads/2025/02/Clarification-to-Verra-Program-Rules-and-Requirements-AFOLU-NPRT-v4.pdf it was concluded that the PP is permitted to continue using version 4 of the AFOLU NPR for this monitoring period. Accordingly, the PP submitted the NPRR under v4, which was reviewed, and found to be in line with the VCS Rules.					

CL ID	02	Section no.	1.6 Start Date	Date:	02/05/2025
Description of CL					
PP is requested to provide the start date evidence of the following ranch IDs ranches part of the 1 st Instance of the project.					
Ranch ID ranch#d83e05a8-9153-4d06-a6a9-48ba1c40f9b2 ranch#bd8b932d-8c66-4149-86f8-8af6ea322043 ranch#ff63f6b0-d429-47d0-913b-dade3e0fa1b5 ranch#1a1435a0-fc2c-4c7a-ae2d-747bf36d09c5 ranch#5e01b78d-f1ef-4ae9-b579-1d3a4029ea8d ranch#de2de059-6278-480d-b587-798b468135bc ranch#42a25589-0aeb-485f-9e18-25b60ea903f9 ranch#22ef8dab-179d-4671-aa74-d759fcc89917 ranch#1452d0d3-6da4-49d9-b05a-bce0e66c0ba1					

CL ID	02	Section no.	1.6 Start Date	Date:	02/05/2025
ranch#6996984c-e841-4fa9-a0c6-03d35b1539ad					
Project participant response				Date :	10/05/2025
A complied list of the start date evidence of the 139 ranches supported by cash memo, invoices and activity logs.					
Documentation provided by project participant					
Start Date Evidences					
DOE assessment				Date :	12/05/2025
The VVB has reviewed the submitted evidence and confirms that start dates of the ranches provided are clearly documented and supported. However, clarification is required for one ranch—Ranch ID: 6996984c-e841-4fa9-a0c6-03d35b1539ad (Mendoza)—where the provided start date is listed as 31/09/2018, which is not a valid calendar date. The project participant is requested to verify and correct this discrepancy. The PP is also requested to ensure that the documented start dates are fully aligned with the corresponding start dates in the Emission Reduction (ER) calculation sheet. This finding remains open.					
Project participant response				Date :	14/05/2025
The revised and corrected start date evidence of Ranch Mendoza has been submitted for review.					
Documentation provided by project participant					
Start Date – Ranch Mendoza					
DOE assessment				Date :	18/05/2025
The VVB has reviewed the start date evidence submitted by PP. The documentation for Ranch ID: 6996984c-e841-4fa9-a0c6-03d35b1539ad (Mendoza) has been revised and is now found to be satisfactory. The corrected start date is valid and consistent with the data in the Emission Reduction (ER) calculation sheet. Furthermore, the ER sheet start dates have been verified and are aligned with the documented start dates for all ranches. Accordingly, this clarification is accepted, and the finding is closed.					

CL ID	03	Section no.	1.10 & 1.11	Date:	02/05/2025
Description of CL					
PP is requested to submit the following documents as evidence to suffice the MR. 1. Declarations for double counting and Participation under Other GHG Programs 2. Scope 3 emissions					
Project participant response				Date :	10/05/2025
The requested documents, including Declarations for Double Counting and Participation under Other GHG Programs as well as Scope 3 Emissions, have been attached in the designated folder for your review. Kindly find them enclosed for further verification. These documents are the same copy submitted during the validation process and hereby confirm that there has not been any changes to the document.					
Documentation provided by project participant					
- Declarations for double counting and Participation under Other GHG Programs - Scope 3 emissions					
DOE assessment				Date :	12/05/2025
The VVB has reviewed the evidence submitted by the PP, including the Declarations for Double Counting and Participation under Other GHG Programs and Scope 3 Emissions documents. The provided documentation is deemed satisfactory, and the submission aligns with the requirements of the monitoring report (MR). Accordingly, the finding is considered closed.					

CAR ID	02	Section no.	1.12	Date:	02/05/2025
Description of CAR					
PP is requested to provide the SDG survey conducted and analysis for the project instances. PP has provided several details in Table 3 of the MR, however PP is requested to clarify the following:					

CAR ID	02	Section no.	1.12	Date:	02/05/2025
1. PP is requested to exclusively mention the Net Impact on SDG indicator on whether the implemented activities' impact to project has increased or decreased. 2. SDG 2.4: PP is requested to re-check the total area under the each year under the column Current Project Contributions as the ranchers have start dates in 2019 and 2020 and the area under Improved Grazing Management varies. 3. SDG 6.6: It is unclear if all the participating ranchers are practicing the water management activity. PP is request to provide clear details on how many ranchers are practicing the water management activities and which activities in specification. 4. SDG 8.6: PP is requested to provide the mentioned evidence - Employee List of Partners_Mexico.xlsx for review. Additionally, details in numeric value has to be provided on number of employments generated during the current monitoring period. 5. SDG 15.3: PP has to provide the NDVI analysis data points for further assessment.					
Project participant response				Date :	10/05/2025
The following are updated in the MR and the documents are submitted for further reference: 1. Net Impact on SDG Indicators: PP has updated Table 3 in the Monitoring Report to explicitly state the <i>Net Impact</i> on each relevant SDG indicator. The net impacts are now clearly marked as either "Increased" or "Decreased" based on the comparative assessment of project implementation over the monitoring period. 2. SDG 2.4: PP has re-verified the area figures under "Current Project Contributions" for each year. The variability in improved grazing area reflects the phased enrolment of ranchers starting in 2019 and 2020. A revised table with disaggregated area data by rancher and year is added referring to the start date of each ranch of current project instance. 3. SDG 6.6: PP confirms only 19 participating ranches out of 139 ranches implement water management activities. This has been evidenced from the survey conducted and specific details are added in the Table 3 of the revised MR for more clarification. 4. SDG 8.6 – Youth Employment and Training: The referenced file <i>Employee List of Partners_Mexico.xlsx</i> is attached for VVB review. During the current monitoring period, the project generated full-time and part-time employment opportunities, with new hires aged between 18–45 years from the partner and Boomitra end. Numeric data is summarized in Table 3 of the revised MR. 5. SDG 15.3: PP provides NDVI analysis data points in the evidence folder for review which includes: • Baseline NDVI values from 2018 • Annual NDVI trend analysis from 2019 to 2022 • Site-specific improvements linked to project interventions The data demonstrates positive trends in vegetative cover across participating ranches.					
Documentation provided by project participant					
SDG Survey Data and Report Employee List of Partners_Mexico.xlsx NDVI Analysis Data Points					
DOE assessment				Date :	12/05/2025
Upon review of the updated MR and supporting documentation submitted by the PP, the VVB provides the following assessment: 1. Net Impact on SDG Indicators: PP has updated Table 3 in the MR to explicitly state the Net Impact on each relevant SDG indicator. The impacts are now clearly indicated as either "Increased" or "Decreased," based on comparative assessment over the monitoring period. This addresses the clarification request and improves the transparency of SDG reporting. 2. SDG 2.4: PP has re-verified the area figures under "Current Project Contributions," with adjustments reflecting the phased enrolment of ranchers beginning in 2019 and 2020. The revised table,					

CAR ID	02	Section no.	1.12	Date:	02/05/2025
disaggregated by ranch and year, aligns with start dates of each ranch and appropriately reflects variability in improved grazing area. The submission is considered satisfactory.					
3. SDG 6.6: PP confirms that only 19 out of 139 ranchers implement water management activities. This is evidenced by the SDG survey, and details of the specific practices have been incorporated into Table 3 of the revised MR. The information is sufficiently detailed and meets the requirement for clarification.					
4. SDG 8.6: PP has submitted the referenced Employee List of Partners\Mexico.xlsx and included numeric employment data in Table 3 of the revised MR. The information covers full-time and part-time positions, with age-specific figures for new hires aged 18–45. The evidence is complete and adequately addresses the finding.					
5. SDG 15.3: PP has submitted NDVI analysis data points in the evidence folder, including baseline data from 2018 and annual trend analysis from 2019 to 2022. The submission shows positive trends in vegetative cover and provides site-specific insights into project impacts. The evidence meets expectations for SDG 15.3 reporting.					
Based on the review of the revised MR and supporting documentation, VVB concludes that all requested clarifications have been sufficiently addressed. The finding is therefore closed.					

CAR ID	03	Section no.	2.1.1	Stakeholder Identification	Date:	02/05/2025
Description of CAR						
PP has provided elaborate explanation and justification regarding the stakeholder identification but it is requested to clearly mention if the stakeholder make up has changed since validation or if new stakeholders were identified during this verification event.						
Project participant response					Date :	10/05/2025
The stakeholder make up has not changed since validation and this has been updated in the revised MR.						
Documentation provided by project participant						
Revised MR						
DOE assessment					Date :	12/05/2025
The PP has satisfactorily revised the Monitoring Report, and the issue has been closed accordingly.						

CL ID	04	Section no.	2.1.2	Stakeholder Consultation and Ongoing Communication	Date:	02/05/2025
Description of CL						
PP is requested to provide the feedback form from the stakeholders, the attendance sheet, photographs, etc of every consultations conducted as a supporting evidence.						
Project participant response					Date :	10/05/2025
The feedback form, attendance sheet and photographs from the stakeholder of every consultations conducted has been submitted for review.						
Documentation provided by project participant						
Feedback Form, Attendance Sheet, LSC Photographs						
DOE assessment					Date :	12/05/2025
The evidence submitted suffice the requirement. This finding has been closed.						

CL ID	05	Section no.	2.1.4 Grievance Redress Procedure	Date:	02/05/2025
Description of CL					
PP is required to submit the Grievance Redress log books as mentioned in the report to suffice as the evidence. Also, PP has requested to provide more information on how they have resolved the grievance raised.					
Project participant response				Date :	10/05/2025
The grievance redressal log book has been submitted as supporting evidence. There were no major grievances registered from the ranchers, except for the timelines of registration and issuance of the project. Mail Screenshots are provided in the evidence folder for more details.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
PP has submitted the grievance redressal logbook as supporting evidence. Upon review, it is noted that no major grievances were recorded from the participating ranchers. The only concern raised related to the timelines for project registration and credit issuance, which PP addressed through continuous communication with stakeholders. Email screenshots have been included in the evidence folder to provide further clarification. The documentation demonstrates that the grievance redressal mechanism is in place and functioning effectively, ensuring stakeholder concerns are adequately captured and managed.					

CAR ID	04	Section no.	2.2 Risks to Stakeholders and the Environment	Date:	02/05/2025
Description of CAR					
Management experience mentions about the team capabilities and the expertise required to run the project smoothly. Hence, PP is requested to provide the expert's CV for review and to suffice as an evidence.					
Project participant response				Date :	10/05/2025
The CV of the expert in-house is attached in the evidence folder for review.					
Documentation provided by project participant					
Management experience CV					
DOE assessment				Date :	12/05/2025
The evidence provided suffices the requirement. This finding is closed.					

CL ID	06	Section no.	2.3 Respect for Human Rights and Equity	Date:	02/05/2025
Description of CL					
PP is required to provide the HR Policy to suffice as an evidence for section 2.3 Labor and Work.					
Project participant response				Date :	10/05/2025
In response to the requirement under Section 2.3 Labor and Work, the HR Policy document has been attached as evidence in the designated folder.					
Documentation provided by project participant					
HR Policy and Ethic Policy					
DOE assessment				Date :	12/05/2025
The PP has provided the HR Policy document as evidence to address the requirement under Labor and Work. The submitted document sufficiently demonstrates compliance with the relevant criteria. Therefore, the finding is considered closed.					

CL ID	07	Section no.	MR	Date:	02/05/2025
Description of CL					

CL ID	07	Section no.	MR	Date:	02/05/2025
PP is required to provide the mentioned excel sheet with the details of project activities implemented by each rancher.					
Project participant response				Date :	10/05/2025
The project activities implemented by each ranch has been updated in the attached excel and provided for review. All the ranchers involved in the project practice rotational grazing as part of their land management approach among which 19 of the participating ranchers have implemented water management practices to further enhance soil health and pasture productivity.					
Documentation provided by project participant					
Project Ranch Database with Activities					
DOE assessment				Date :	12/05/2025
The evidence provided has all the details required for the activities practices by the ranchers along with other details of the ranch. This is closed satisfactorily.					

CAR ID	05	Section no.	2.4.1 Rare, Threatened, and Endangered species	Date:	02/05/2025
Description of CAR					
PP is requested to provide further details on the basis for selecting the RET species listed in the section, along with supporting evidence to substantiate the selection.					
Project participant response				Date :	10/05/2025
The RET (Rare, Endangered, and Threatened) species listed in the section were selected based on a biodiversity inventory shared by project partners, supplemented with validation from the IUCN Red List of Threatened Species (https://www.iucnredlist.org/). Each species was cross-referenced against the IUCN database to confirm its conservation status under threatened categories such as Vulnerable (VU), Endangered (EN), or Critically Endangered (CR). The selection prioritized species that are both ecologically significant to the project area and globally recognized for their conservation concern.					
Documentation provided by project participant					
Biodiversity list in the MR attached as an Appendix.					
DOE assessment				Date :	12/05/2025
The PP has adequately addressed the finding. RET species were identified using a partner-shared biodiversity inventory and validated against the IUCN Red List, confirming their status as VU, EN, or CR. The selection reflects both local ecological relevance and global conservation priorities. The approach is methodologically sound and aligned with recognized standards. This finding is closed.					

CAR ID	06	Section no.	2.4.3 Ecosystem conversion	Date:	02/05/2025
Description of CAR					
PP is required to provide the LULC analysis to substantiate the section.					
Project participant response				Date :	10/05/2025
LULC analysis is attached to substantiate the evidence to suffice that the ecosystem has not been changed in the last 10 years.					
Documentation provided by project participant					
LULC Analysis					
DOE assessment				Date :	12/05/2025
The PP has provided the LULC (Land Use Land Cover) analysis as evidence to demonstrate that there has been no significant change to the ecosystem over the past 10 years. The submitted analysis is adequate and supports the claim of ecosystem stability. Therefore, the finding is considered closed.					

CAR ID	07	Section no.	3. Implementation Status	Date:	02/05/2025
Description of CL					
PP is required to provide detailed information on the implementation status of the proposed project activities, supported by relevant evidence. The status of each proposed activity should be individually described, including a table outlining the number of participating ranchers and the area currently under each activity. The current operational status of each project activity must be clearly stated. Additionally, PP is requested to submit the management plans, paddock demarcation for individual ranches, along with the corresponding livestock population for each ranch.					
Project participant response				Date :	10/05/2025
Details regarding the implementation status has been added in section 3.1 of the MR along with images. The current status of each proposed activities in individual ranches has been updated in section 3.1 of the MR stating the current operational status of all activities. The management plans, paddock demarcation of individual ranches along with corresponding livestock population for each ranch has been provided as an attachment in the evidence folder.					
Documentation provided by project participant					
Project Database, Paddock Demarcation Maps, Management plans					
DOE assessment				Date :	12/05/2025
The Project Proponent (PP) has reported the implementation status of project activities in Section 3.1 of the Monitoring Report (MR), including images and updates on the operational status of activities across individual ranches. Management plans, paddock demarcations, and livestock population data per ranch have also been provided as attachments in the evidence folder. However, it is unclear whether the evidence (e.g., images) can be independently traced to specific ranches and corresponding activities; clear cross-referencing or a traceability table is recommended. Additionally, confirmation is required on whether paddock and livestock data have been provided for all ranches or if any gaps exist. The VVB will also review the consistency between the MR and supporting documentation to ensure alignment. This finding is open for further clarification and cross-referencing required.					
Project participant response				Date :	14/05/2025
A cross-reference table has been added to the evidence folder, linking each image and document to the respective ranch and activity outlined in Section 3.1 of the Monitoring Report. Paddock demarcation maps and livestock population data have been provided for all ranches. All supporting documentation has been reviewed for consistency with the MR and updated.					
Documentation provided by project participant					
Project Database, Paddock Demarcation Maps, Management plans					
DOE assessment				Date :	18/05/2025
The audit team has reviewed the additional documentation provided by the PP, including the cross-reference table linking images and evidence to specific ranches and activities, as well as the updated paddock demarcation maps and livestock population data. The information is complete, clearly organized, and consistent with the implementation status described in Section 3.1 of the Monitoring Report. Based on the review of the submitted evidence, the DOE concludes that the issue has been satisfactorily addressed. This finding is therefore considered closed.					

CAR ID	08	Section no.	3. Implementation Status	Date:	02/05/2025
Description of CAR					
During the review of the MR section 1.13, the VVB observed from the image regarding the NDVI analysis that the reported net changes in vegetation cover and soil organic carbon (SOC) stocks across certain strata appear to show minimal or negative accumulation relative to the project scenario. While variability in sequestration rates is expected, such results may indicate a potential loss event or underperformance in soil carbon accrual compared to expectations set during validation.					
The PP has stated that no carbon loss event occurred during this monitoring period. However, observed variation, additional clarification is required to support this claim.					

CAR ID	08	Section no.	3. Implementation Status	Date:	02/05/2025
1. Could the PP explain how it was determined that no loss event occurred in the project area? 2. What measurement or model validation steps were taken to confirm that the results reflect expected project performance rather than a reversal or disturbance? 3. Were any natural or anthropogenic factors (e.g., drought, pest pressure, grazing, tillage, land use deviation) present in the project area that may have influenced SOC dynamics? 4. Has the proponent applied the uncertainty deduction and significance testing (as per VM0042 Section 9.2 to rule out that the decline represents a material loss? Please provide supporting documentation (model output, sampling data, weather or field records, management logs) that substantiates the reported outcomes and confirms the absence of a loss event.					
Project participant response				Date :	10/05/2025
1. A thorough review of field conditions, management activity, and remote sensing data confirmed that no loss event occurred during the monitoring period. All strata continued to be managed in accordance with the project's approved grazing and land management protocols, with no observed deviation in land use or evidence of degradation such as erosion, fire, or vegetation dieback. The areas showing minimal or negative SOC stock changes were closely assessed and found to reflect short-term natural variability rather than any form of carbon loss. These results were supported by consistent NDVI values indicating stable or improving vegetative cover, and by field monitoring reports confirming that livestock density, movement, and grazing rotations were in line with planned activities. No physical indicators of disturbance or reversal were identified during the monitoring period across any of the affected strata. Based on these lines of evidence, the conclusion that no carbon loss event occurred is robust and well-supported. 2. SOC stock changes were estimated using the validated model applied throughout the project lifecycle. The model was run with updated inputs for this monitoring period and underwent analysis to compare predicted and observed trends. Outputs were consistent with historical land behaviour. In addition, NDVI data were reviewed in conjunction with field observations, confirming that areas with lower SOC change still maintained vegetation cover and management integrity. No patterns indicative of systemic underperformance or reversal were observed. 3. Some areas experienced slightly below-average rainfall during the monitoring period, which may have contributed to reduced vegetation growth and, in turn, lower SOC accumulation. However, this was a minor deviation and did not reach drought conditions. Grazing intensity was kept within the limits of the established rotational grazing plans, and no pest outbreaks, tillage activities, or land-use deviations occurred. All ranches remained under active management, with no external disturbances reported that could materially influence SOC dynamics. 4. Yes, uncertainty deductions and significance testing were applied following the procedures outlined in VM0042 Section 9.2. The SOC stock change data were assessed for statistical significance, and all observed fluctuations were found to be within the allowable uncertainty thresholds which is detailed in the Model Validation Report and CarbonFocus ATBD Document. Please refer FAR 5 justification for more details. The results did not exceed materiality criteria, confirming that the slight declines in some strata do not constitute a material loss. The evidences to suffice the above claim are attached in the evidence folder.					
Documentation provided by project participant					
NDVI Analysis Data points, ER sheet, Model Validation Report, CarbonFocus ATBD Document, Management Plans, Paddock & Livestock and Grassland monitoring records.					
DOE assessment				Date :	12/05/2025
The audit team reviewed the PP response regarding the observed low or negative SOC stock changes in certain strata, as flagged in MR section 1.13 and associated NDVI imagery. The justification provided includes ranch monitoring evidence, management logs, NDVI analysis, and model validation steps. The DOE confirms that the proponent has demonstrated continuous compliance with the planned grazing management practices, with no reported deviation in land use or occurrence of disturbances (e.g., erosion, fire, overgrazing) that would trigger a carbon loss event. Additionally, model calibration and residual analysis procedures were appropriately applied, and the explanation for minor SOC variability due to localized rainfall deficits is considered reasonable and supported by field data.					

CAR ID	08	Section no.	3. Implementation Status	Date:	02/05/2025
The proponent also applied uncertainty deductions and significance testing in line with VM0042 Section 9.2, and results fall within acceptable confidence intervals, confirming that the changes do not represent a material loss. The audit team has verified the availability of supporting documentation including field records, model outputs, NDVI overlays, and all the documents submitted. These collectively substantiate the claim that no carbon loss event occurred during the monitoring period. Conclusion: Based on the evidence and justification provided, the DOE considers the clarification to be adequate. The finding is closed.					

CAR ID	09	Section no.	4.2 Data and Parameters Monitored	Date:	02/05/2025
Description of CAR					
AR (Data/Parameter): The basis for the 10% value applied to this parameter is unclear. Kindly clarify the steps used to calculate the weighted average adoption rate, including the data sources, assumptions, and calculation steps that led to this percentage in the table.					
Project participant response				Date :	10/05/2025
The 10% adoption rate used for this parameter is derived from a weighted average based on data from the Agricultural Census (AC) 2022 by INEGI (De, Nacional, 2022), as well as relevant studies and consultations with ranchers involved in the project. Adoption rates were determined regionally, taking into account the specific practices relevant to grassland management and ranching. The adoption rate was then weighted by the area of grassland managed by each ranching operation. Each regional adoption rate was multiplied by its corresponding share of the total project area, and the sum of these weighted values resulted in the 10% adoption rate. A detailed breakdown of the data, assumptions, and calculation steps is provided in the attached Excel sheet for transparency.					
Documentation provided by project participant					
ERR Calculations - Mexico_MR_MP1 V2.xlsx					
DOE assessment				Date :	12/05/2025
The assessment was carried out by reviewing the PP's explanation of the methodology and the data sources used to derive the 10% adoption rate. I examined the reference to the Agricultural Census (AC) 2022 by INEGI (De, Nacional, 2022) to verify the data's relevance and accuracy. Additionally, I evaluated the weighted average approach, ensuring it accounts for regional variations and rancher-specific practices. I reviewed the attached Excel sheet, which outlines the detailed calculation steps, assumptions, and regional adoption rates, ensuring full traceability and transparency. Based on this review, I confirmed that the methodology is sound, the calculations are accurate, and the 10% adoption rate is well-supported by the provided evidence. The finding is now closed.					

CAR ID	10	Section no.	4.2 Data and Parameters Monitored	Date:	02/05/2025
Description of CAR					
L, $P_{wp,i,t}$ (Data/Parameter): PP is required to provide the Ranch_Data.xlsx excel sheet and NMEX_Monitoring_data_Ranch-wise.xlsx to assess the surveys conducted and check on the type of livestock grazed in the project area, Population of grazing livestock in the project scenario of type I in sample unit i in year t.					
Project participant response				Date :	10/05/2025
The details are provided in the attached documents, including the Ranch_Data.xlsx and NMEX_Monitoring_data_Ranch-wise.xlsx excel sheets. These files contain the data needed to assess the surveys conducted in the project area, specifically focusing on the type of livestock grazed, as well as the population of grazing livestock in the project scenario, categorized by type (I), sample unit (i), and year (t). These datasets will support the evaluation of the livestock populations within the scope of the project.					
Documentation provided by project participant					

CAR ID	10	Section no.	4.2 Data and Parameters Monitored	Date:	02/05/2025
NMEX_Monitoring_data_Ranch-wise.xlsx, Ranch_Data.xlsx					
DOE assessment				Date :	12/05/2025
The VVB assessed the provided Ranch_Data.xlsx and NMEX_Monitoring_data_Ranch-wise.xlsx files to verify the type and population of livestock grazed across all ranches in the project area, categorized by type (l), sample unit (i), and year (t). The monitoring data was reviewed for accuracy, consistency, and completeness, confirming that it aligns with project requirements and covers all ranches. Based on this assessment, the VVB verifies that the monitoring data is correct and meets the validation criteria. The finding is closed.					

CAR ID	11	Section no.	4.2 Data and Parameters Monitored	Date:	02/05/2025
Description of CL					
P _{wp,p} (Data/Parameter): PP is requested to provide the reference for the table provided under the value applied section.					
Project participant response				Date :	10/05/2025
The reference for the table on productivity of project area is added.					
Documentation provided by project participant					
Revised MR v2					
DOE assessment				Date :	12/05/2025
The revisions are made correctly and this finding is closed.					

CAR ID	12	Section no.	4.3 Monitoring Plan	Date:	02/05/2025
Description of CAR					
PP has to include the following points in the section to comply with the requirements: 1. The process and schedule followed for obtaining, compiling, and analyzing the monitored data and parameters, set out in Section 4.2 of the MR. 2. The methods used for measuring, recording, storing, aggregating, collating and reporting on monitored data and parameters. 3. The organizational structure of the personnel that carried out the monitoring activities. 4. The processes used for handling any internal auditing performed and any non-conformities identified. 5. Include line diagrams or any other flow chart process to display the GHG data collection and management system. PP has included details on water conservation activities in this section, which are not required as per the scope of this section. PP is kindly requested to transfer this information to Section 3: Implementation Status of the PD.					
Project participant response				Date :	10/05/2025
The information required under this section has been addressed in detail in Section 4.3 of the Monitoring Report (MR). This includes a description of the process and schedule followed for obtaining, compiling, and analyzing the monitored data and parameters, as outlined in Section 4.2 of the MR. The section also describes the methods used for measuring, recording, storing, aggregating, collating, and reporting on monitored data, along with a clear explanation of the organizational structure of the personnel responsible for carrying out monitoring activities. Furthermore, the procedures for conducting internal audits and handling any non-conformities identified during the monitoring period have been included. A flow diagram has been provided to illustrate the GHG data collection and management system, ensuring transparency and traceability of the monitoring process.					

CAR ID	12	Section no.	4.3 Monitoring Plan	Date:	02/05/2025
It is noted that details on water conservation activities have been included in this section. As these activities fall outside the scope of Section 4.3, this information is relocated to Section 3: Implementation Status of the Project Design Document (PD) of the MR, where such implementation details are more appropriately addressed.					
Documentation provided by project participant					
Revised MR v2					
DOE assessment				Date :	12/05/2025
The audit team assessed Section 4.3 of the MR through document review and interviews with monitoring personnel. The data collection schedule, methods, and organizational structure were verified against the monitoring plan and methodology. Supporting documents such as data forms, audit logs, and organizational charts were reviewed to confirm compliance. The internal audit process and management of non-conformities were found to be appropriate, and the GHG data management system flow diagram accurately represents the monitoring workflow. The Project Proponent acknowledged the inclusion of water conservation activities in this section and agreed to relocate them to Section 3 of the PD. The monitoring system is deemed compliant, and the finding is closed.					

CL ID	08	Section no.	NPRR – Internal Risk	Date:	02/05/2025
Description of CL					
PP is requested to provide the Adaptive Management Plan document as supporting evidence for the Project Management section under Internal Risk.					
Project participant response				Date :	10/05/2025
The Adaptive Management Plan document has been submitted as supporting evidence for the Project Management section under Internal Risk.					
Documentation provided by project participant					
Adaptive Management Plan Document					
DOE assessment				Date :	12/05/2025
The submitted Adaptive Management Plan document has been reviewed and found to be satisfactory. The Clarification Request is hereby closed.					

CL ID	09	Section no.	NPRR – Internal Risk	Date:	02/05/2025
Description of CL					
PP is requested to provide the latest report on stakeholder engagement and training activities conducted as part of the mitigation plan for this monitoring period, to serve as supporting evidence for the Project Management section under Internal Risk.					
Project participant response				Date :	10/05/2025
The latest report detailing stakeholder engagement and training activities conducted is part of the Monitoring Report (Appendix 03) and has been submitted as supporting evidence for the Project Management section under Internal Risk.					
Documentation provided by project participant					
Revised NPRR					
DOE assessment				Date :	12/05/2025
The submitted report on stakeholder engagement and training activities has been reviewed and found to be satisfactory and is hereby closed.					

CL ID	10	Section no.	NPRR – Internal Risk	Date:	02/05/2025
Description of CL					
PP has to provide more information on the project's financial viability, stating clearly the funding that the project has secured relative to what is needed, demonstrated per the IRR spreadsheet.					
Project participant response				Date :	10/05/2025

CL ID	10	Section no.	NPRR – Internal Risk	Date:	02/05/2025
This project acknowledges the CAR raised regarding the demonstration of the project's financial viability. In response, the IRR spreadsheet has been updated to clearly present both the secured and anticipated funding sources. A declaration has also been submitted to suffice this.					
Documentation provided by project participant					
Declaration					
DOE assessment				Date :	12/05/2025
The evidence has been reviewed the revised IRR spreadsheet and accompanying declaration provided by the PP. The breakdown of secured and anticipated funding is now clearly presented, and the documentation submitted has been found to be authentic and consistent with the figures reported. This finding is now closed.					

CL ID	11	Section no.	NPRR – Internal Risk	Date:	02/05/2025
Description of CL					
Opportunity cost – Q4: It is unclear how the project applies the mitigation in point i, considering that the agreement between ranchers and Boomitra is only for a period of 10 years, renewable for 5 more, and is not legally binding for the entire crediting period.					
Project participant response				Date :	10/05/2025
The mitigation point has been revised in the updated NPRR to address this finding and choose the correct rating.					
Documentation provided by project participant					
Revised NPRR					
DOE assessment				Date :	12/05/2025
The revised mitigation measure and the updated risk rating are not accurate, and the issue cannot be considered satisfactorily closed at this stage.					

CL ID	12	Section no.	NPRR – Internal Risk	Date:	02/05/2025
Description of CL					
Financial Viability: There is still insufficient justification for the risk score for point (i) stating that 'There are no activities that require PP to buy any big equipment or land that requires more money'. The financial viability should assess the project activities and not just the PP requirements. The IRR sheet provided shows that the project received levies and payments from farmer and partners starting in 2025 but does not describe this in demonstration of meeting 80% of funding for the project. The project also claims that there are investment barriers to project implementation. It is unclear how the project has secured more than 80% of the funds required for successful project.					
Project participant response				Date :	10/05/2025
Boomitra has provided a declaration submitting the diversified funding/investments received and cleared justified in the report regarding the secured funding available. Point i of the Financial Viability table in NPRR report has been updated with clear explanation.					
Documentation provided by project participant					
Boomitra Financial Stability Declaration					
DOE assessment				Date :	12/05/2025
The evidence provided by PP suffices the requirement to showcase the 80% secured funding. The NPRR has been revised and aligns with the requirements. Hence, it is closed.					

CAR ID	13	Section no.	NPRR – Natural Risk	Date:	02/05/2025
Description of CAR					
Future Climate Impact: PP has identified the reference region as South Central America; however, this appears to be inaccurate, as Mexico is more appropriately aligned with North Central America. PP is					

CAR ID	13	Section no.	NPRR – Natural Risk	Date:	02/05/2025
requested to re-evaluate this designation and provide justification for all associated parameters accordingly.					
PP is also required to provide justifications for the identified project impacts wherever required, supported by appropriate references.					
Project participant response				Date :	10/05/2025
The reference region has been change to North Central America accurately align with the geography. All the associated parameters are revised accordingly with clear references. Justification for identified project impacts is updated.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
The reference region has been accurately updated to North Central America to align with the project geography. All related parameters have been revised consistently, with clear references provided. The justification for identified project impacts has been appropriately updated. No further action required; the finding is closed.					

CL ID	13	Section no.	NPRR – Natural Risk	Date:	02/05/2025
Description of CL					
PP is required to provide details on the selected adaptive management criteria and how it has been adapted in the project instances.					
Project participant response				Date :	10/05/2025
The adaptive management plan includes 6 criteria as per the AFOLU NPRR requirements and this has been described in the Adaptive Management Plan Document attached.					
Documentation provided by project participant					
Adaptive Management Plan					
DOE assessment				Date :	12/05/2025
The attached evidence is found satisfactory and aligns with the requirement. This is closed.					

Model Validation Report

CAR ID	14	Section no.	Model Validation Report	Date:	23/04/2025
Description of CAR					
Validation Data					
1. Has a statement been included confirming the absence of suitable validation data for dry tropical climates for the baseline?					
2. Does the report clarify that the use of validation data from adjacent climate zones does not imply an expansion of the project domain?					
Texture and Depths					
3. Is all the necessary information for validation, including depth and texture data, presented directly in the MVR instead of being split with a separate spreadsheet?					
4. Does the validation data cover a range greater than the 15% VMD0053 requirement?					
C-input Calibration					
5. Does the MVR clearly state whether a single equation could be used across both vegetation types, with or without the same parameters?					
6. Is there a rationale provided for the lack of a direct influence of precipitation on C input to grasslands with PC?					
7. Is there a detailed description of how the c_input_norm parameter was derived, including validation of its methodology?					

CAR ID	14	Section no.	Model Validation Report	Date:	23/04/2025
8.	Is it confirmed that the c_input_norm parameter was derived independently from the validation dataset?				
9.	Are the parameter symbols (A–D) distinguished between baseline and project, preferably using subscripts such as bsl and wp?				
Project participant response				Date :	10/05/2025
Validation Data					
1.	Yes, the MVR has been revised to explicitly state that no suitable validation data was available for dry tropical climates corresponding to the baseline condition. This acknowledgment has been made to transparently communicate this known data gap, which is a recognized limitation in the literature. The inclusion of this statement strengthens the justification for using data from adjacent climate zones and aligns with best practices in methodological disclosure, especially given that the reviewer—who contributed to the IPCC 2019 Refinement—confirmed the lack of relevant data even at the global synthesis level.				
2.	Yes, the report now clearly states that the use of validation data from adjacent climate zones is strictly for model validation purposes and does not indicate any expansion of the project domain. This clarification has been added to prevent any misinterpretation and to align with the expectations outlined in the review feedback, ensuring methodological rigor and domain consistency.				
Texture and Depths					
3.	Yes, the MVR has been updated to include all necessary validation information—specifically soil depth and texture data—directly within the main body or as an appendix, rather than referencing or relying on a separate spreadsheet. This revision ensures that all essential data required for validation is accessible in one location, as requested. Output tables from the previously used spreadsheet have been incorporated as an appendix to improve transparency and ease of review, in line with the preference that the spreadsheet's functionality is not essential for validation.				
4.	Yes, the MVR now includes a clear and simple statement confirming that the validation data spans a range of variability greater than the 15% threshold required by VMD0053. This ensures compliance with the methodology and provides confidence in the robustness of the data set used for validation.				
C-input Calibration					
5.	Yes, the MVR has been updated to include a clear statement that a single equation could not be applied effectively across both vegetation types—neither with shared parameters nor with individualized ones. This clarification aligns with the allowance under VMD0053 for different parameterizations across vegetation types within the project domain and enhances the transparency of the modeling approach.				
6.	Yes, the MVR now acknowledges the surprising absence of a direct influence of precipitation on carbon input to grasslands under practice change, despite its well-known importance for grass growth. The report highlights that this outcome underscores the significant role played by the c_input_norm parameter in estimating carbon input under PC scenarios. This insight is explicitly addressed to reflect the reviewer's concern and contextualize the modeling approach.				
7.	Yes, the MVR now includes an expanded and detailed explanation of how the c_input_norm parameter was derived. This includes the methodological steps, the data sources, assumptions, and validation process. Special emphasis is placed on demonstrating that c_input_norm can be consistently reproduced using identical methods during project implementation, as was done during model validation.				
8.	Yes, the documentation clearly confirms that the derivation of the c_input_norm parameter maintained strict independence between calibration and validation datasets. This assurance addresses a key concern of the MVR assessment and reinforces the integrity of the parameter estimation process.				
9.	Yes, the parameter symbols A through D have now been revised to include distinct subscripts—bsl for baseline and wp for with-practice change scenarios—consistent with the convention used				

CAR ID	14	Section no.	Model Validation Report	Date:	23/04/2025
in VM0042. This change improves clarity and ensures that the distinction between baseline and project conditions is immediately apparent throughout the report.					
Documentation provided by project participant					
Revised MVR					
DOE assessment				Date :	12/05/2025
Validation Data 1 & 2. The MVR now explicitly states that no suitable validation data was available for dry tropical climates for the baseline, addressing a known and acknowledged gap in global datasets. This transparency aligns with best practices in methodological disclosure and is supported by the reviewer's own experience in compiling IPCC 2019 Refinement data. Furthermore, the MVR clearly specifies that the use of validation data from adjacent climate zones is solely for validation purposes and does not imply expansion of the project domain. This clarification is sufficient and effectively closes both comments related to validation data limitations and domain integrity. Texture and Depths 3 & 4. The MVR has been revised to fully incorporate depth and texture information within the report body or appended tables, eliminating reliance on external spreadsheets and improving the auditability of the submission. Additionally, the MVR now includes a clear statement that the validation data covers a range exceeding the 15% requirement under VMD0053, confirming methodological compliance. These actions fully address the review comments and are deemed acceptable. C-input Calibration 5. The MVR clearly explains that a single equation could not be used across both vegetation types, and parameterization was therefore handled separately, consistent with VMD0053 guidelines. 6. The lack of direct precipitation influence on C input under practice change is acknowledged, and the MVR provides context for this result, highlighting the central role of the c_input_norm parameter. 7 & 8. The MVR now includes a comprehensive explanation of how c_input_norm was derived, ensuring transparency in methodology and confirming that the same approach will be used during implementation. Independence between calibration and validation datasets has also been explicitly stated, ensuring methodological soundness. 9. Lastly, the parameter symbols (A–D) are now distinguished using subscripts (bsl and wp), consistent with conventions in VM0042, enhancing clarity in model interpretation. These revisions collectively demonstrate responsiveness to the review and compliance with methodological requirements. The VVB considers all issues raised under validation data, texture/depths, and C-input calibration to be adequately addressed and all associated comments are closed.					

CAR ID	15	Section no.	Model Validation Report	Date:	02/05/2025
Description of CAR					
File Repository					
1. Has it been confirmed that the final model code, model parameters, and calibrated C input parameters are included in a secure file repository?					
2. Is there a statement confirming the availability and accessibility of these files for auditing purposes?					
Validation of Δ SOC					
3. Does the validation assess Δ SOC values rather than final SOC stock values at time 2?					
4. Are the required scatter plots presented for Δ SOC rather than for final stock values?					
PMU (Pooled Measurement Uncertainty)					
5. Has a worked example of the PMU calculation been provided, as required by VMD0053?					

CAR ID	15	Section no.	Model Validation Report	Date:	02/05/2025
6.	Does the report confirm that the PMU is calculated as a pooled standard error across both baseline and project datasets?				
7.	Is a rationale provided for whether or not ΔSOC can be measured with equal precision in baseline and project conditions?				
Goodness of Fit and Model Prediction Uncertainty					
8.	Has the goodness of fit been assessed for ΔSOC values individually, rather than for the difference between ΔSOC across treatments?				
9.	Is the model prediction uncertainty calculated as the pooled variance of modeled vs. observed ΔSOC, weighted by the number of observations?				
10.	Are separate variances reported for baseline and project data, and if so, is justification provided for this?				
11.	Has the standard deviation (model prediction error) derived from the pooled variance been reported?				
12.	Are the confidence limits for modeling derived from the pooled variance shown, and is goodness of fit demonstrated?				
Project participant response				Date :	10/05/2025
File Repository					
1.	It has been confirmed that the final model code used, the model parameters applied, and the calibrated C input parameters will be included in a secure file repository. This ensures that all modeling components can be verified against what was used in the project. The report clearly states that this will be done, and details will be provided as they become available to support traceability and transparency.				
2.	A statement has been included confirming that the final model code, model parameters, and calibrated C input parameters will be made available in a secure repository for auditing purposes. The report affirms that access to these files will be provided, allowing independent reviewers to verify their consistency with project implementation, and that details will be shared as they become available.				
Validation of ΔSOC					
3.	It is essential that the validation be conducted for ΔSOC values rather than for SOC stocks at time 2, and this requirement has been addressed. The validation process has been revised accordingly to ensure it focuses on the change in SOC (ΔSOC), aligning with methodological expectations and ensuring that the assessment reflects actual carbon sequestration attributable to the project.				
4.	The required scatter plots have been revised to present ΔSOC values instead of the final SOC stocks that were previously shown in the figures in the MVR. This correction ensures that the visual data representation supports a proper validation of ΔSOC, which is the key metric for assessing project impact.				
PMU (Pooled Measurement Uncertainty)					
5.	VMD0053 requires a worked example of the calculation of PMU; however, this had not been provided initially. This has now been addressed, and a clear, step-by-step worked example has been included in the report to meet the standard's requirements and to support transparent calculation of uncertainty.				
6.	The PMU has been correctly defined and calculated as the pooled standard error of all measured ΔSOC values, encompassing both baseline and project datasets. This approach ensures that the uncertainty estimate reflects the full range of observations, in line with the definition provided in VMD0053.				
7.	There is no justifiable rationale for assuming that ΔSOC cannot be measured with equal precision in either the baseline or the project conditions. As such, no rationale is needed for pooling, and the pooled approach has been appropriately applied. This treatment of PMU is not expected to				

CAR ID	15	Section no.	Model Validation Report	Date:	02/05/2025
impact the ability to meet the mean bias criteria, as the measurement precision is assumed to be consistent across both conditions. Goodness of Fit and Model Prediction Uncertainty - VMD0053 is written with the assumption that validation data includes side-by-side baseline and with-project treatments, enabling a direct measurement of the difference in ΔSOC between the two. However, in this MVR, such paired data are not available. Therefore, the goodness of fit must be determined for ΔSOC values individually, rather than for the difference in ΔSOC. This approach aligns with the nature of the model and the available data, and has been correctly applied in the revised analysis. - The model prediction uncertainty has been recalculated as the pooled variance of the differences between modeled and observed ΔSOC values, in accordance with VMD0053 Figure 6. This pooled variance is appropriately weighted by the number of observations in both the baseline and project datasets, reflecting the true structure of the available data. - While earlier versions of the analysis reported separate variances for baseline and project datasets, this has been corrected. Reporting separate values would require a strong rationale or evidence to justify differing uncertainties. The revised report now includes the required pooled variance, calculated using proper weighting, and adheres to the methodology described in both VMD0053 and VM0042. - The standard deviation, calculated as the square root of the pooled variance ($\sigma^2_{\text{model_error}}$ or $s^2_{\text{model}, \bullet}$), has been reported as the model prediction error. This is a required output for the MVR and supports a complete and consistent uncertainty analysis. - Confidence limits for modeling have been calculated using the pooled variance, as required for demonstrating the goodness of fit. While it is not anticipated that the model will have difficulty meeting the goodness of fit criteria, the analysis now clearly presents this evaluation using the proper statistical treatment, ensuring compliance with validation standards.					
Documentation provided by project participant					
Revised Model Validation Report					
DOE assessment				Date :	12/05/2025
File Repository The initial report did not clearly confirm whether the final model code, model parameters, and calibrated C input parameters were stored in a secure file repository, nor was there a clear statement regarding their availability for audit. This has now been addressed. The report confirms that all final model components will be stored in a secure repository and will be accessible for auditing purposes. It is also stated that these materials will be provided as they become available, ensuring transparency and traceability. All findings under this section are closed. Validation of ΔSOC The original validation approach and graphical outputs focused on final SOC stock values at time 2 rather than on ΔSOC values, contrary to methodological requirements. This has been revised to ensure the validation assesses ΔSOC, which reflects actual change and impact due to project activities. Additionally, the scatter plots have been updated to display ΔSOC instead of final stock values. These corrections align with the requirements and demonstrate proper application of validation protocols. All findings under this section are closed. Pooled Measurement Uncertainty (PMU) A worked example of the PMU calculation, as required by VMD53, was initially missing and has now been added. PMU is properly defined and calculated as the pooled standard error across both baseline and project datasets. The report correctly explains that there is no rationale for assuming unequal precision between baseline and project ΔSOC measurements, making pooling appropriate. This also aligns with the intent of the standard, and the pooled approach supports an unbiased uncertainty estimate. All findings under this section are closed.					

CAR ID	15	Section no.	Model Validation Report	Date:	02/05/2025
Goodness of Fit and Model Prediction Uncertainty The original assessment incorrectly treated goodness of fit based on the difference in ΔSOC between treatments, assuming side-by-side comparisons. Given that this MVR lacks such paired data, the analysis has been revised to evaluate ΔSOC values individually. The model prediction uncertainty is now calculated as the pooled variance of modeled vs. observed ΔSOC, weighted by the number of observations. Although separate variances were initially reported, the corrected approach uses pooled variance unless evidence is provided otherwise—which it was not—so the pooling is appropriate. The standard deviation (i.e., model prediction error) derived from this variance is now correctly reported. Furthermore, confidence limits have been derived from the pooled variance, and goodness of fit is demonstrated as per VMD53 guidance. The methodology applied now conforms with both VMD53 Figure 6 and VM0042 Section 8.6.1.1.1. All findings under this section are closed.					

CAR ID	16	Section no.	Soil Sampling SOP	Date:	02/05/2025
Description of CAR Please, provide clarification for: 1. Reference to international standards: There is no citation of established soil sampling guidelines (e.g., ISO standards). 2. Sampling design: Details on developing a sampling plan—defining the number of sites, their geographic locations, and the equations or algorithms used—are missing. Which literature support these methodologies? This is important to achieve accurate results. 3. Zig-zag sampling distribution (Figure 1): the text lacks clarity on how plot radius and distances between sampling sites are defined. - o How are these distances calculated within the plot? - o Where should geographic coordinates be recorded within the plot? - o Which literature supports this approach? 4. Georeferencing of sampling sites: - o Is georeferencing mandatory? If so, why, how to do it and using which devices? - o Which is the minimal spatial precision required for accurate soil prediction? - o How does this relate to the spatial resolution of the remote sensing data? 5. Exclusion zones: excluding areas near infrastructure (ditches, roads, trees, fences, water bodies) lack justification. 6. Sampling depth: What percentage of SOC is typically found in the topsoil, and which studies support this? 7. Sample homogenization: How many mixing and subsampled iterations/times are required to obtain a composite sample? Which standards or studies supports this protocol? The description is incomplete. 8. Sample registration form: What mandatory information must be recorded during field sampling? How should registration be conducted, and what tools or devices are required? 9. Bulk density measurement: - o If the target soil layer (e.g., 0-30 cm) exceeds the sampling cylinder height (e.g., 10 cm), how should sampling be conducted to ensure full representation of the layer? - o When performing composite sampling, how many sites should be included for BD, and where within the plot should they be located? 10. Testing process: which literature supports the described laboratory methodology? 11. Ambiguous terminology: the phrase “...and the volume refers to the fabric less than 2 mm in diameter.” is unclear and requires clarification. 12. Laboratory accreditation: It is unclear whether analyzes are conducted in ISO-certified laboratories. No explicit mention of accreditation.					

CAR ID	16	Section no.	Soil Sampling SOP	Date:	02/05/2025
13. Sampling routes and budget: this section appears unrelated to methodology. Should it be included in the document?					
Project participant response				Date :	10/05/2025
1. The citation of soil sampling guidelines is now added in revised doc. FAO SOILS PORTAL and ISO standards¹⁸ serve as references for established soil sampling guidelines and the basis for this SOP development. 2. The sample collection design used in the first verification is given in the RS technical summary document, and not in the generic Soil Sampling SOP document. As stated in the technical summary, we do stratification by soil texture (via SoilGrids data), followed by selection of random site locations within each strata, through the use of GIS software. This is known as a 'stratified random sampling' in the soil literature. The number of sites is chosen based on an analysis of the number of samples needed to statistically meet the set validation metric requirements defined by Verra to utilize RS technology to measure SOC – specifically, the $R^2 > 0$ requirement. Calculations show that, given the test data outcomes ($R^2 = 0.6$) seen in the technical summary document, at least 11 samples of validation data need to be collected in each stratum to meet $R^2 > 0$ with the validation sampling. For sufficient buffer and better statistics, we have collected double this amount in each stratum. 3. The details regarding the distance calculation within the plot and plot radius have been added in the revised version. The geographic coordinates should be recorded at the centre of the circular plot. Zig-zag is a recommended technique for uniform and flat soils¹⁹. 4. These details have been added in the revised version. Georeferencing is mandatory with handheld GPS devices, and the spatial resolution of GPS (3-5m) aligns well with the resolution of remote sensing data (10-30m). Having a much greater location resolution than the GPS standard does not confer any benefits when the remote sensing resolution is lower than that of GPS. 5. These details have been added in the revised version. Areas near physical obstructions or disturbances often exhibit localized alterations in pH, organic matter, moisture retention, or compaction, which do not represent the true field conditions. 6. The document has been updated - numerous studies confirm that a substantial proportion of total SOC, typically between 50% to 70% is stored within the top 30 cm of the soil profile. 7. At least 5 subsamples, taken in the zig-zag configuration, are homogenized to be a composite sample, following literature guidance on composite sampling. 8. This is now in the document, as Annex 1. 9. These details have been cited in the revised version. The sites for BD are the same as the sites for SOC% - the same location must be used to ensure that the BD and SOC% are self-consistent and relate to correct SOC stock values. If the sampling cylinder height is 10cm and the soil layer is 30cm, then the team will do a layered sampling – 0-10cm, followed by 10-20, followed by 20-30, and analyze the weight of all together. However, ideally, the sampling cylinder height and soil layer are aligned and kept the same (30 cm depth) when carrying out the SOP. 10. These details have been cited in the revised version. 11. This has been clarified in the revision. The < 2 mm fraction is known as the fine earth fraction, and it is the standard component used for bulk density measurements and most laboratory soil analyses. 12. The RS technical summary, and the Project Design Document (PDD) of the project mention the certifications – Agrolab, the lab used in the validation sampling, is currently accredited by multiple organizations including FDA (of the USA), CONAGUA, A2LA, SENASICA, COFEPRIS and EMA. Agrolab is also part of the FAO GLOSOLAN lab network that engages in regular exercises to					

¹⁸ ISO 18400-100, Soil quality – Sampling – Part 100: Guidance on the selection of sampling standards

¹⁹ Ackerson, J. P. (2018). Soil sampling guidelines. Purdue University, Purdue Extension: Lafayette, IN, USA.

CAR ID	16	Section no.	Soil Sampling SOP	Date:	02/05/2025
improve data harmonization and reproducibility across labs. All Boomitra projects intend to only use labs that are part of the FAO GLOSOLAN network.					
13. The sampling routes and budget has been removed.					
Documentation provided by project participant					
FAO SOILS PORTAL and ISO standards document, RS technical summary document, Soil Sampling SOP					
DOE assessment				Date :	12/05/2025
1. The revised document cites the FAO Soils Portal and relevant ISO standards as references for soil sampling guidelines, adequately supporting the SOP's development. This finding is now closed. 2. The sampling design is clearly outlined in the RS technical summary and aligns with stratified random sampling principles using SoilGrids and GIS tools. Sufficient sample size per stratum (double the minimum required for $R^2 > 0$) has been collected; finding closed. 3. The revised version satisfactorily includes the distance calculation and plot radius details. Coordinates are correctly recorded at the centre of the circular plot, and the zig-zag technique recommendation is acknowledged for uniform and flat soils. Based on this clarification and inclusion, the issue has been addressed and resolved—no further action required. 4. The revised version includes the georeferencing details, confirming that the spatial resolution of the GPS (3-5m) is compatible with the remote sensing data (10-30m). Higher location resolution does not provide additional benefits given the lower resolution of the remote sensing data. The issue is considered closed. 5. The revised version appropriately includes the required details. It is acknowledged that areas near physical obstructions can exhibit atypical soil characteristics not representative of the broader field conditions. This finding is now resolved. 6. The document has been updated – numerous studies confirm that a substantial proportion of total SOC, typically between 50% to 70% is stored within the top 30 cm of the soil profile. 7. The updated document specifies that at least 5 subsamples are collected in a zig-zag pattern and homogenized into a composite sample, consistent with established literature on composite sampling techniques. The finding is closed. 8. This is now in the document, as Annex 1. 9. The revised document now includes the necessary clarification that BD and SOC% measurements are from the same locations to ensure consistency in SOC stock calculations. It also outlines the layered sampling approach for 30 cm depth when using a 10 cm sampling cylinder, aligning with SOP best practices. The finding is closed. 10. These details have been cited in the revised version. 11. The revised document appropriately clarifies that the <2 mm fraction, referred to as the fine earth fraction, is the standard used for bulk density measurements and most soil analyses. The finding is closed. 12. The RS technical summary and PDD confirm that Agrolab, used in the validation sampling, holds accreditations from recognized bodies such as FDA, A2LA, and is part of the FAO GLOSOLAN network. The commitment to using GLOSOLAN-participating labs ensures data quality and harmonization. The finding is closed. 13. The document has been updated to remove the sampling routes and budget, in accordance with the project's revised approach. The finding is closed.					

CAR ID	17	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Description of CAR					

CAR ID	17	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Please, provide clarification for this section in the document Project boundary definition: 1. How was the project boundary determined? What criteria and methodologies were used, and how was the appropriateness of its size assessed? 2. Given that many calibration sites (orange points in Figure 5) are spread over distant areas from the ranches (green points), how do you evaluate their appropriateness for ranch predictions? 3. How were the number and size of strata determined? What stratification criteria or methodology were used?					
Project participant response				Date :	10/05/2025
1. The project spatial boundary consists of the specific ranches that are enrolled in the project, with all ineligible areas (eg. roads, buildings, water bodies, forests, croplands etc.) removed. This was carried out and validated by the VVB and Verra during the validation and registration of this project. Please refer to the Verra registry link for the registered polygons: https://registry.terra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=127691&IDKEY=fiofj09234rm9oq4jndsma80vcalksdjf98cxkja90823nmq3n176085889. The grouped project boundary (the area where ranches can be added today and in the future) is determined by which states are stated in the registered PDD to be included in the project. However, it should be noted that this particular verification audit only applies to the ranches currently enrolled in the project, which is the project spatial boundary noted in the paragraph above. 2. The calibration sites are studied for their appropriateness and coverage of the currently enrolled ranches in terms of all climate zones and soil textures present in the ranches enrolled. It should also be noted that all sites fall within the same ecoregions as the project, as they fall within the grouped project boundary. You may also refer to the Verra project review finding #9 during the project's validation and registration that is identical to this question. Please refer to the PRR document posted in the Verra registry, and look for the words that say "Section 4.1 does not provide a sufficient demonstration of how the primary dataset utilized to train the remote sensing model to quantify baseline emissions is comparable and appropriate for the initial project activity instance and how it correlates to the sample units.", and the subsequent detailed response from VVB/Boomitra. 3. Given that the remote sensing system collects data at the pixel level across all the ranches, the stratification of the remote sensing results themselves are directly to the pixel level (30m x 30m in this work). Stratified soil sampling is separately employed for the ongoing validation of the model, wherein, as noted in the document, USDA soil textures classifications were used for stratification. USDA soil textures were used as the strata because, from the theoretical basis, it is believed that soil texture will have a significant effect on soil dielectric, and as a result, it is important to ensure the model is calibrated to the potential range in the soil dielectric, which occurs from both soil texture variation and soil carbon variation.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
1. The project spatial boundary, which excludes ineligible areas, was validated by both the VVB and Verra during the project's validation and registration. The finding is closed. 2. The calibration sites have been evaluated for their appropriateness and coverage, ensuring representation of all climate zones and soil textures present in the enrolled ranches, with alignment to the project's ecoregions. The finding is closed. 3. Why was the anthropic factor (such as management, practices) not taken into account during spatial stratification, as it influences SOC and BD and both affect the dielectric constant? PP needs to clarify this, hence this finding remains open.					

CAR ID	17	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Project participant response					Date : 10/05/2025
3. It is true that the anthropic factor influences SOC and BD significantly. Note that all areas are covered by the native vegetation of the region and are grazing areas (hence, there is no relevant stratification by crop types that is possible). The calibration dataset from INEGI was collected in a time frame that is representative of the baseline scenario of the project, since it predates the project, and the adoption rates of the improved practices promoted by the project are low outside the project. Thus, the business-as-usual practice, continuous grazing, is the key practice being carried out, and there is no further stratification of practices themselves. On the other hand, the ongoing validation sampling that is carried out after the project is started is only carried out in the ranches that are within the project, as per Verra's guidelines of validation sampling within the project. (And note that the purpose of soil sampling is to measure the carbon within the project, not outside it). Then, by definition, these ranches are in the improved practice scenario – which is the implementation of rotational grazing. All the validation sampling is done in ranches with rotational grazing. Given the diversity in the specifics, and dynamic nature of the implementation of rotational grazing from ranch to ranch, it is difficult to do a further stratification for the ranches beyond their adoption of rotational grazing. For example, theoretically, one could stratify further by binning livestock stocking rate per paddock and the numbers of paddocks. However, during the implementation of management in a semi-arid environment such as that in the Chihuahua desert in Mexico, these all become dynamic variables. Individual ranchers scale their livestock levels up and down based on season conditions on their specific ranch, and they also switch the number and size of their paddocks on a regular basis (in particular, those ranchers that use temporary electric fences that are shifted across the ranches as needed). Thus, carrying out a stratification by these parameters may not be appropriate as it is difficult to group similar ranches together to develop the strata on this basis. It is only feasible to stratify on the basis of continuous vs rotational management, which we are already doing implicitly.					
Documentation provided by project participant					
DOE assessment					Date : 12/05/2025
The response clarifies that the anthropic factor, while influential on SOC and BD, is not further stratified due to the uniformity of grazing practices (continuous vs. rotational) across the project area, with ranches in the improved practice scenario under rotational grazing. Given the dynamic nature of management variables in the semi-arid region, additional stratification beyond grazing management is not feasible. The finding is closed.					

CAR ID	18	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Description of CAR					
Please, provide clarification for this section in the document Representativeness of the soil dataset: - How was the representativeness of the soil dataset for the project area evaluated? - Which methods were used to confirm that the regional soil data (train set) is appropriate for SOC and BD predictions at ranch scale? - How does the train dataset's spatial density align with the 30m spatial resolution and with the intended prediction error?					

CAR ID	18	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
Given that soil texture and IPCC climate-zone maps are regional/country scale, how was their suitability for ranches-level predictions assessed?						
Project participant response					Date :	10/05/2025
- The calibration sites are studied for their appropriateness and coverage of the currently enrolled ranches in terms of all climate zones and soil textures present in the ranches enrolled. It should also be noted that all sites fall within the same ecoregions as the project, as they fall within the grouped project boundary. You may also refer to the Verra project review finding #9 during the project's validation and registration that is identical to this question. Please refer to the PRR document posted in the Verra registry, and look for the words that say "Section 4.1 does not provide a sufficient demonstration of how the primary dataset utilized to train the remote sensing model to quantify baseline emissions is comparable and appropriate for the initial project activity instance and how it correlates to the sample units.", and the subsequent detailed response from VVB/Boomitra. - This has also been addressed in the previous point. - Note that the training dataset is used to learn a relationship between different satellite-based input covariates to produce soil carbon levels as a prediction output. The satellite data resampled to 30m resolution is then used to produce pixel-level predictions at the 30m resolution. The prediction error is calculated from the validation set based on pixel level comparison to the conventionally-measured validation set value. The model that is learned is not a geostatistics model that would learn a spatial interpolation. Rather it is a pixel-level machine learning model that only has the satellite info associated with the given pixel to learn from – thus the specific spatial density of the training dataset is not directly known by the model. On the other hand, it is important that the calibration dataset used for training has full coverage of the possible spread in the potential inputs and targets for the trained model. For this reason, we check the coverage of the soil texture types and IPCC climate zones found within the project. Given that the training dataset is within the same region as the project, these factors become easily covered, along with other ones, such as ecoregion etc.						
Documentation provided by project participant						
DOE assessment					Date :	12/05/2025
- The PP has demonstrated that the calibration sites appropriately represent the enrolled ranches by covering all relevant climate zones and soil textures, and by being located within the same ecoregions and grouped project boundary. Reference to Verra Project Review Finding #9 and the corresponding VVB response further supports the representativeness of the dataset. The finding is closed. - The response refers to the previous point, which confirms that calibration sites were evaluated for their appropriateness, covering relevant climate zones, soil textures, and ecoregions within the project boundary. The finding is closed. - The response outlines the use of a pixel-level machine learning model trained on satellite-derived inputs with adequate regional coverage; however, it does not address whether the spatial distribution and density of training samples capture fine-scale heterogeneity within individual ranches. Given the importance of short-range spatial variability for accurate soil carbon prediction, additional justification is required to confirm representativeness at ranch scale. The finding remains open. —Soil attributes exhibit spatial variability at both fine (short-range/distance) and broad (long-range/distance) scales that are unique to each zone, and these non-linear (difficult to interpolate) patterns are critical inputs for ML models. Since you aim to make predictions at a ranch scale, how did you assess whether the spatial distribution and density of your training samples adequately captured the ranch's fine scale heterogeneity? In						

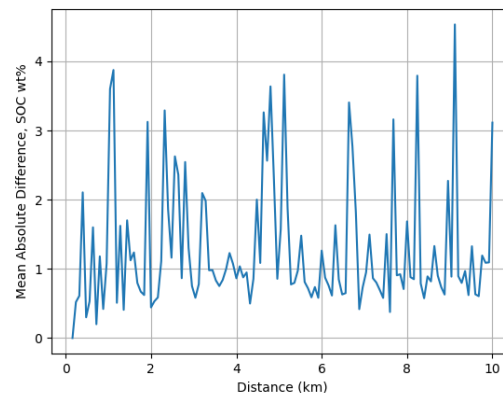
CAR ID	18	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
--------	----	-------------	-----------------------------------	-----------	-------	------------

other words, how can you demonstrate that your training dataset reliably represents the short range spatial variability within the ranch?

Project participant response

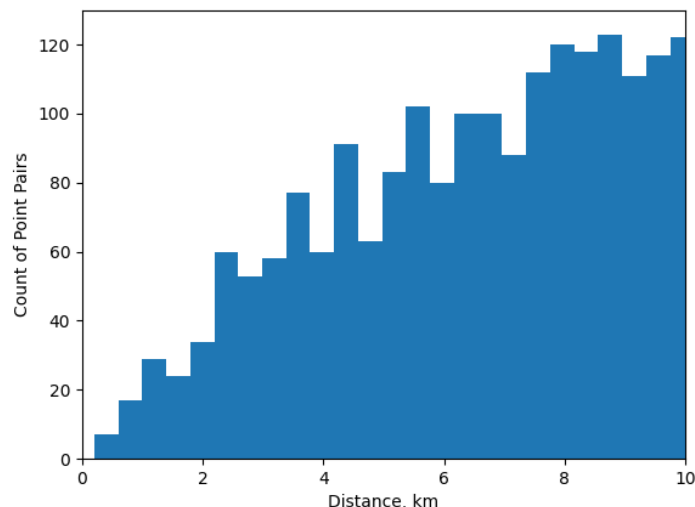
Date : 10/05/2025

3. It is true that there are both short-range and long-range scales that are important for soil attributes. In particular, there may be heterogeneity at within-ranch scales that is only captured in a lesser manner than the overall long-range heterogeneity, which is well captured by the spatial spread of the training data. However, we can say that some short-range heterogeneity is indeed captured. This can be seen from a spatial correlation analysis:



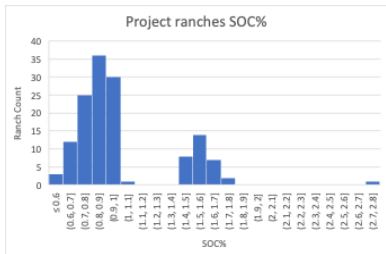
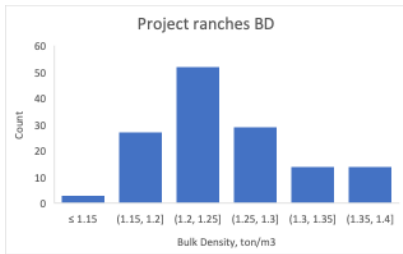
Northern Mexico soil data spatial correlation plot of mean absolute difference between organic carbon soil samples as a function of separation distance. Observe that the Mean Absolute Difference is somewhat consistent across the distance ranges from 0 to 10km.

Furthermore, we can study the exact number of datapoints that cover close ranges in the dataset (the point pairs with less than 10km between them):

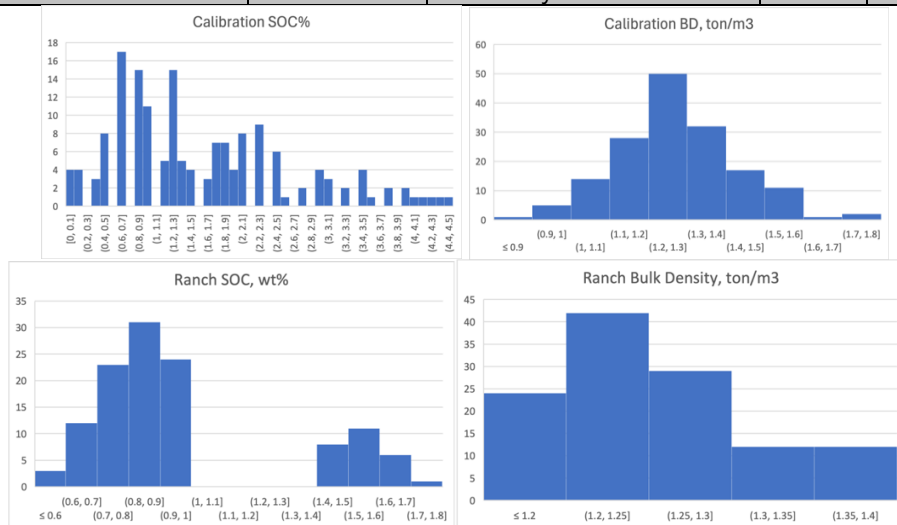


We find that there are indeed several point pairs at these distances, including some points that are less than 1km away from each other. Thus, at least some aspects of the short range variation are being covered.

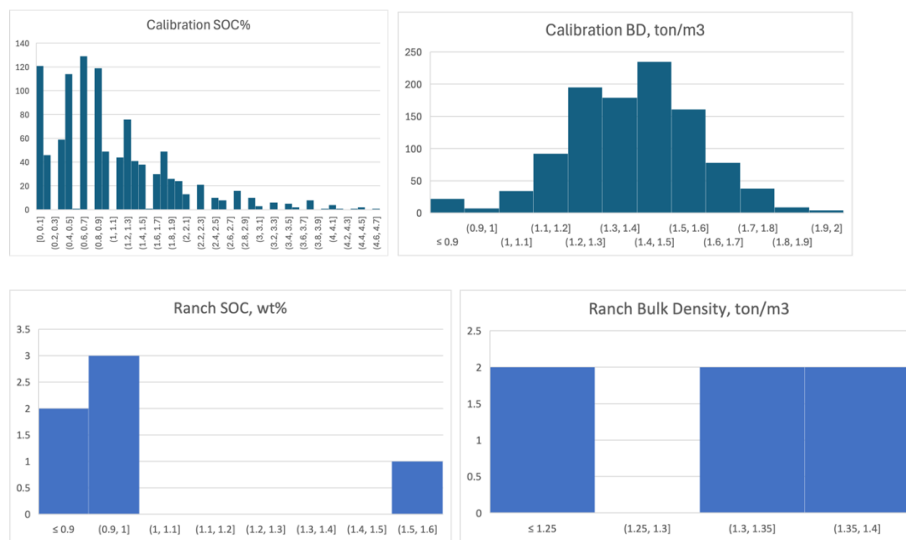
CAR ID	18	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
Any lack of coverage translates into prediction error in the model's outputs. This error is fully accounted in a number of ways: It can be noted that the analysis in this work is done on the project level, which involves aggregation from the pixel level to the ranch level, followed by ranch level to project level. The averaging taking place is itself an error reduction mechanism. Furthermore, the uncertainty analysis considers the spatial correlations in prediction errors through the use of semivariograms – this technique ensures that our model errors due to any potentially insufficient coverage of short-range variation are appropriately accounted. The ongoing validation sampling, which also feeds into the the semi variogram takes place only within the ranches of the project, and thus enables much greater measurement of the short range variations, as the sampling is not spread out randomly across the whole region – only within our ranches. Many ranches have multiple validation samples, and some ranches have 20+ validation samples, allowing for a lot of local variation to be captured in the validation sampling, and thus the short-range errors captured downstream in the semi variogram and uncertainty propagation.						
Documentation provided by project participant						
Revised Mexico SOC Remote Sensing Technical Summary						
DOE assessment					Date :	12/05/2025
3. The response demonstrates that while long-range spatial heterogeneity is well captured by the training dataset, short-range variability is also represented through spatial correlation analysis and presence of closely located datapoints. The modelling framework incorporates averaging and semi variogram-based uncertainty analysis to account for residual short-range variability. The finding is closed.						

CAR ID	19	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
Description of CAR						
Please, provide clarification for this section in the document: Statistical distribution comparisons: Provide comparative distributions (e.g., histograms) of SOC, BD and soil texture from ranches versus: 1. The entire calibration dataset. 2. Data stratified by soil texture class.						
Project participant response					Date :	10/05/2025
Histogram of SOC% and BD in the ranches (produced directly from the emission removal excel spreadsheet):   Histogram of SOC% and BD in Calibration data are just Fig 7 in the document provided. Soil textures of ranches vs calibration dataset is directly present in the table before Figure 6. Stratified results by soil texture Sandy Clay Loam:						

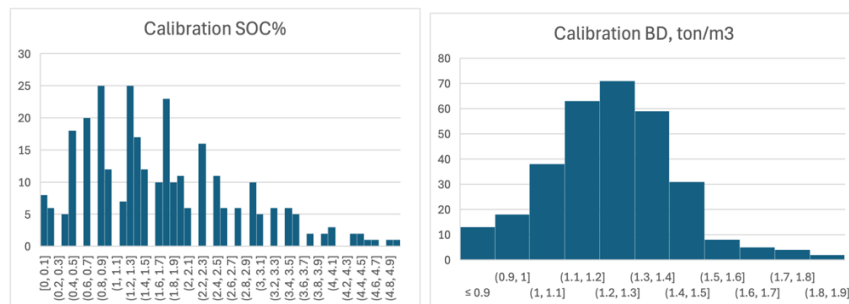
CAR ID	19	Section no.	Mexico SOC Sensing Summary	Remote Technical	Date:	02/05/2025
--------	----	-------------	----------------------------	------------------	-------	------------



Sandy Loam:

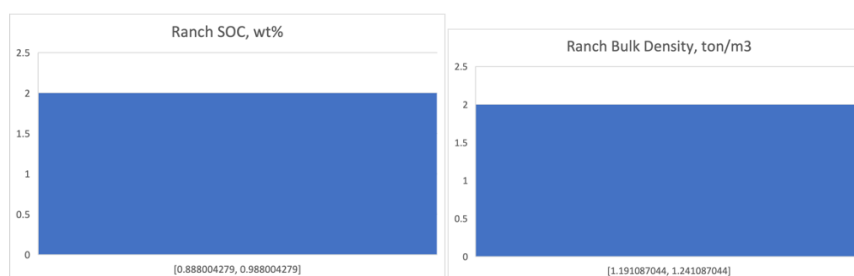
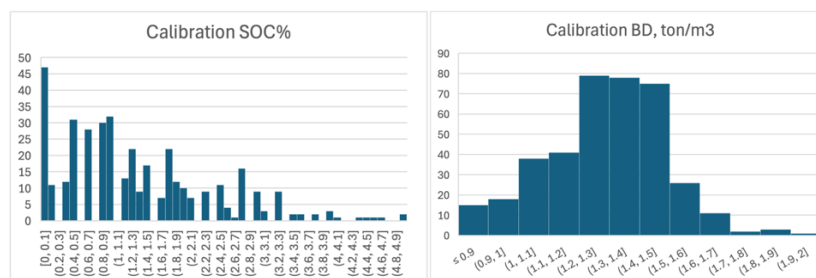
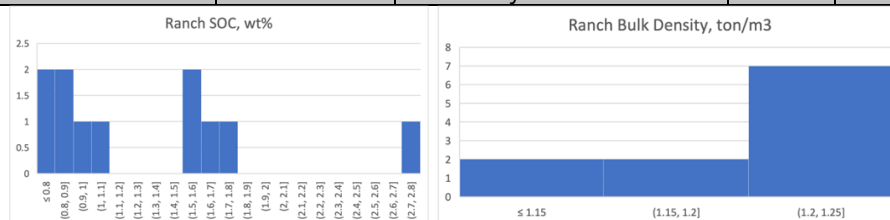


Clay Loam:



CAR ID	19	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
--------	----	-------------	---	-------	------------

Loam:



Documentation provided by project participant

DOE assessment

Date : 12/05/2025

The finding has been addressed through the provision of comparative distributions (e.g., histograms) of SOC, BD, and soil texture from ranches versus both the entire calibration dataset and data stratified by soil texture class. This finding is closed.

CAR ID	20	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
--------	----	-------------	---	-------	------------

Description of CAR

Please, provide clarification for this section in the document:

INEGI soil laboratory and standardized protocols:

1. Which protocols the INEGI soil laboratory followed?
2. Are these protocols compatible with Agrolab's protocols, and how were they harmonized to ensure consistency in soil properties (e.g., SOC) quantification?

Project participant response

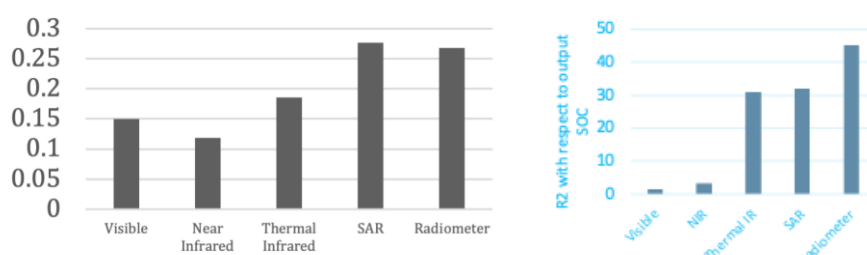
Date : 10/05/2025

1. INEGI's overall process is described in the citation Krasilnikov et al given in the document. Dry combustion was used for SOC, and oven drying and weighing for bulk density.

CAR ID	20	Section no.	Mexico SOC Remote Sensing Summary Technical	Date:	02/05/2025
2. These protocols are compatible with Agrolab's protocols (same analytical technique, same units etc), and specific harmonization was not deemed necessary after examination during the validation audit/registration project review. Please refer to the PRR document linked on the Verra registry, to Finding 11, and where it says "No demonstration of harmonization (e.g., corrections of soil depths, different SOC content analytical methods) of the data used for remote sensing." and the accompanying answer in the section below that.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
The finding has been adequately addressed with confirmation that INEGI's protocols align with those of Agrolab, both employing compatible analytical techniques and units. As noted in the Verra Project Review Report (Finding 11), no further harmonization was required referring to this reference (https://registry.verra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=127677&IDKEY=olsjoiuwqowrnoiuomnckjashoufifmln902309ksdfiku0981176066583). This finding is answered and closed.					

CAR ID	21	Section no.	Mexico SOC Remote Sensing Summary Technical	Date:	02/05/2025
Description of CAR					
Please, provide clarification for this section in the document: Remote Sensing (RS)covariates: 1. How was the RS dataset's suitability evaluated for soil predictions? 2. What criteria were used to assess the appropriateness of the 30 m target pixel size? 3. Clarify the phrase "30 m resolution translates to 11 pixels per hectare". 4. Why were SMAP/SMOS pixel sizes not resampled to match the target resolution? 5. What is the expected continuity (availability) of annual ALOS-SAR mosaics beyond 2024? 6. How would the discontinuity (lack of availability) of RS data impact the feasibility of the method and predictions? 7. In the text, was stated: "If a given sample location pixel is covered by clouds or shadows, the next closest Landsat image to the ALOS SAR image's date is used." How are persistent cloud/shadow in Landsat imagery mitigated when predicting SOC?					
Project participant response				Date :	10/05/2025
1. Please see the section on the theoretical basis and associated validation of each assumption – microwave backscatter is shown to be suitable for soil carbon prediction through the data that is collected within the project region. The rest of the satellite covariates are there to ensure reduction in noise arising from sparse vegetation, moisture etc. 2. 30m was used because the Landsat data, which forms a large number of covariates, forms a significant part of the covariates used. The ALOS has a slightly smaller pixel size at 25m. Downsampling ALOS to 30m reduces some random noise in ALOS, while upsampling Landsat to 25m might introduce more random noise into Landsat, so downsampling ALOS was chosen instead of the latter, and a 30m pixel size used. 3. 30m x 30m = 900m². 10000m² are in a hectare. 10000/900 = 11.11. 4. They were not resampled because they are much larger in pixel size and thus resampling would not be very effective when going from 9km resolution to 30m resolution. Furthermore, as noted later in the document, in order to minimize soil moisture effects, final measurements are made					

CAR ID	21	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
only during the driest months in the region (Eg. May). Temperatures are high and there is minimal rain, keeping the soil moisture levels very low. 5. Continuity is almost certain – the ALOS-4 satellite was successfully launched in 2024, which has the same SAR instrument as ALOS-2 and ALOS-1. The ALOS-2 has been operational since 2014. If we assume the same for ALOS-4, it should be operational until at least 2034. However, note that the project itself will undergo re-validation and baseline reassessment before that point, at which time the satellite model may be revised. Furthermore, these are not issues for the current verification of this project, which only spans 2018-2022. 6. The systems are built with a strong degree of redundancy. For example, later this year, the NASA/ISRO NISAR satellite will provide a similar dataset as that captured by the ALOS PALSAR. Likewise, the visible and infrared data from Landsat can be supplemented from Sentinel-2. In a case where a discontinuity happens, a spatiotemporal transfer function must be learned – which maps the pixel values of one satellite to those of another, for a collocated image in space and time. Discontinuity is not a current issue, however, as all the necessary satellites are still available. It is not an issue for the full period of the first verification, which is the time frame covered by this audit, from 2018-2022. 7. Within the context of this project's verification (2018-2022), we have not found persistent cloud/shadow to be an issue. Note that the project is located in a semi-arid region of Mexico where there are minimal rains and clouds for most of the year, except for the rainy season that is centered around July-September. Thus, it is possible to consistently get cloud-free images in the April-May timeframe when these analyses are done.						
Documentation provided by project participant						
DOE assessment					Date :	12/05/2025
1. You have detailed the suitability of the radar imagery, ok. However, the evaluation of suitability for all other remote sensing datasets remains unresolved.						
Project participant response					Date :	10/05/2025
Beyond radar backscatter, our model incorporates a diverse set of satellite-derived covariates—including multispectral (Landsat), visible (Landsat), thermal (Landsat), and radiometer (SMAP/SMOS)—each selected based on documented relevance to soil and carbon dynamics. To evaluate their suitability: 1. Theoretical Justification: Each covariate was selected based on its capacity to reflect environmental drivers that influence SOC. For instance: ○ Vegetation bands reflect primary productivity and biomass, which are linked to organic matter inputs into the soil ○ Thermal bands help control for evapotranspiration and microclimate variation, which affect decomposition and carbon turnover. 2. Empirical Contribution to Model Performance We conducted feature importance analysis during model training, which demonstrated that these non-radar RS covariates have contributed significantly to predictive accuracy—especially in disambiguating the effects of vegetation cover and soil moisture on radar signals. Here are the feature importances of our gradient boosting model:						

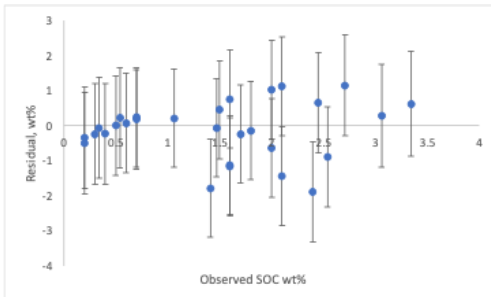
CAR ID	21	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
 Feature importance of each band type used in the machine learning model (above) and R2 score of each band type with respect to the output SOC (below). Observe that SAR and microwave radiometer, the microwave-based bands, have the largest importance, followed by thermal infrared. Thermal infrared plays an interesting role in improving the models due to negative correlations between surface temperature and SOC. 3. Redundancy and Noise Reduction The inclusion of optical and thermal data allows the model to reduce noise from transient conditions (e.g., vegetation cover or soil moisture) that may otherwise obscure the SOC signal in radar data. This multimodal [multi-source, multi-sensor...] input strategy improves model robustness across variable landscape conditions.					
Documentation provided by project participant					
Revised Mexico SOC Remote Sensing Technical Summary					
DOE assessment				Date :	12/05/2025
PP has provided a detailed and well-substantiated explanation for the use of satellite-derived covariates beyond radar backscatter in the SOC modeling approach. The response outlines a clear theoretical basis for selecting multispectral (Landsat), visible, thermal (Landsat), and radiometer (SMAP/SMOS) data, citing their relevance to key environmental drivers of SOC such as primary productivity, evapotranspiration, and microclimate variation. PP also presented empirical evidence through feature importance analysis in a gradient boosting model, demonstrating that these covariates significantly enhance model performance by helping differentiate vegetation and soil moisture effects on radar signals. Additionally, the use of multimodal inputs is shown to improve robustness by reducing noise from transient landscape conditions. The justification provided is adequate and addresses all concerns regarding the inclusion and role of non-radar remote sensing data in the model. All findings are hereby closed.					

CAR ID	22	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Description of CAR					
Theoretical basis: Assumption 1: - How do the vegetation cover percentage and the incidence angle affect the linear relationship between SOC and the backscatter (Figure 8)? Are these variations accounted for? - Why set of covariates used for soil predictions are different from set used for matching ranches to control plots? - The paragraph before Figure 9 is unclear. Clarify how Sentinel-1 was used, for what purpose, and why it was chosen? How does it contribute to the overall methodology, and how does it compare to ALOS in terms of its role in the analysis?					

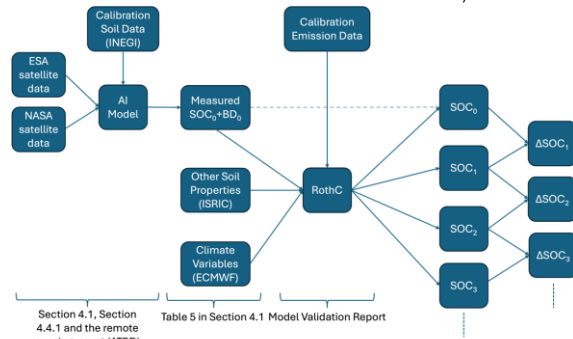
CAR ID	22	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
4. What does "net change in backscatter" refer to in this context? Does it represent an absolute difference, a relative change, or a normalized variation in backscatter values over time or across different conditions? How is it calculated, and what is its significance in the analysis?						
Project participant response					Date :	10/05/2025
1. Incidence angle does not affect the relationship that is shown in Fig 8, because the backscatter value that is used has already corrected for incidence angle. The correction involves switching the cross-sectional area that the backscatter covers from its viewport incidence angle to an area across the surface of the earth (also known as the conversion to sigma0). The ALOS data has already undergone preprocessing to that stage from JAXA before it is used in our model. The vegetation cover has an attenuating effect on the like-polarized backscatter (HH). In Figure 8, this is not accounted for directly. However, it is important to note that the degree of attenuation is related to the wavelength. With L-Band wavelengths (25cm for ALOS), the attenuation posed by short grass vegetation (which is the scenario in the project) is minimal (attenuation would be greater if the size and width of the grass was more comparable in size to the microwave wavelength). Furthermore, this is a semi-arid region where the vegetation cover is itself sparse, allowing for the microwaves to directly reach the soil with minimal to no other interactions. Additionally, although not accounted in Figure 8, the vegetation interaction can be understood from the cross-polarized backscatter (HV). As per microwave scattering theory, when there is more vegetative attenuation to HH (like-polarized), there is an increased signal for HV. Thus, when our machine learning model takes both measured polarizations as covariates, the model can appropriately learn to account for vegetation cover, if any. Additionally, the model also takes in visible and infrared wavelengths that allow for further vegetation cover accounting. 2. The covariates for soil predictions are purely remote sensed covariates, which feed into the machine learning model. On the other hand, the similarity criteria used for matching ranches to control plots are broadly based on the criteria found for control plots in VM42 v2.0. This set of criteria ensure that the effects of a practice change can be thoroughly isolated from many external variables, such as environmental conditions, climate, soil textures etc. Note that this project does not use control plots as its baseline scenario monitoring mechanism – it instead uses biogeochemical model models (Quantification Approach 1 in the methodology). The project originally planned to use control plots, and the control plots' data is now used as a demonstration for how the radiowave data is affected by the practice change-induced SOC increase. 3. The purpose of this study involving the control sites is to demonstrate how the improved practice and soc increase causes microwave backscatter to change. In order to ensure a proper degree of control and reduce noise, we also wanted to fix the exact time of year when backscatter images are compared, thereby increasing the statistical power of the study. Note that ALOS does not image every single location at the same time each year – it collects a few images for each location per year but does not return at the exact same time each year. On the other hand, Sentinel-1 collects images every 6-12 days, which guarantees that we have data for the same location at the same time this year, for the purpose of this specific study. Thus in this study, for each polygon, we collected all the Sentinel 1 like-polarized data in May 2018 and averaged it to produce a value for '2018' and did the same for May 2022. Then we subtracted the '2018' and '2022' value to produce a change value for each polygon. After subtracting a similar calculation for the matched control site, these values for each polygon are used to populate the histogram of Fig 9. Note that Sentinel-1 is a C-band radar, and ALOS is an L-band radar. L-band radar is used later for the model calibration and has a greater penetration depth than C-band, but showing the result of backscatter change with C-band is still appropriate for showing that the microwave backscatter changes in a statistically significant manner. 4. The net change in backscatter is the difference between change in backscatter for the project site and the corresponding change for the associated control site. Essentially, $(s_{i,t1} - s_{i,t0}) -$						

CAR ID	22	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
(s _{c,t1} -s _{c,t0}), where i is the project site and c the corresponding control site. It is not normalized, nor is it a relative change. The significance is simply to show how much the backscatter is changed in the project scenario from the improved practices/soc increase, after any baseline change (the control site) is deducted. This allows us to isolate how much the specific practice affected the backscatter.						
Documentation provided by project participant						
DOE assessment					Date :	12/05/2025
The PP has provided a detailed and technically sound response that sufficiently addresses all previous findings regarding remote sensing methodology, backscatter signal interpretation, control site usage, and statistical comparison approaches. 1. Incidence Angle and Vegetation Attenuation (Fig. 8): The PP has clarified that the ALOS L-band data used has already undergone preprocessing by JAXA, including conversion to sigma⁰, effectively correcting for incidence angle. This confirms that the angle does not impact the observed backscatter values. Further, the PP's explanation of minimal attenuation due to sparse, short-grass vegetation in a semi-arid region, combined with L-band's higher penetration, supports the reliability of the HH backscatter signals in representing soil properties. The explanation of HV channel behavior, and its role in the machine learning model to infer vegetation effects, adds confidence to the model's robustness. 2. Covariates and Matching Criteria: The PP has clarified the distinct roles of remote sensing covariates (for model prediction) and matching criteria (based on VM0042 v2.0) used for control site selection. While the baseline monitoring relies on biogeochemical modeling (Quantification Approach 1), the use of historical control plot data enhances model interpretation and validation. This clear separation of functions ensures methodological consistency with the applied Verra methodology. 3. Use of Sentinel-1 Data for Temporal Comparison (Fig. 9): The justification for using Sentinel-1 C-band radar data (frequent revisit cycle) to perform temporal analysis of backscatter change is valid, especially in the context of demonstrating statistical backscatter change due to SOC improvements. The method of averaging May 2018 and May 2022 data ensures seasonally consistent comparisons. Although C-band has lower penetration than L-band, its use here is appropriate for demonstrating temporal trends at a coarser level, complementing ALOS's deeper soil sensitivity used in final model calibration. 4. Calculation of Net Backscatter Change: The response clearly explains that the net change is the absolute difference between project and control site backscatter differences over time, not normalized or relative. This method effectively isolates the signal change attributable to the practice implementation by controlling for broader temporal environmental effects. The PP's comprehensive technical clarifications are consistent with radar remote sensing theory and the methodology requirements. The use of both ALOS and Sentinel-1 data is justified in their respective roles, and the data handling methods are rigorous and transparent. All outstanding concerns regarding data preprocessing, vegetation interaction, model covariates, and comparative backscatter analysis have been adequately addressed. Therefore, all related findings are now considered closed.						

CAR ID	23	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025												
Description of CAR																		
SOC model training:																		
1. Please, provide additional global performance metrics (e.g. MAPE, CCC, RPIQ), and stratified by textural class if possible. 2. Indicate whether strata were used as a covariate and how they were incorporated into the analysis or models. 3. The model appears to overestimate SOC for values above 2% in figure 11. Please, provide external validation with independent data (different from the train and test sets) and display the SOC distributions for both datasets. 4. Please, report the percentage of predictions (coverage) within the prediction interval (count number of points inside/outside of predicted interval), and provide a residual prediction plot sorted by prediction interval.																		
Project participant response					Date :	10/05/2025												
1. Note that it is common for models to have better performance on training data than test data – this is the purpose of having a test dataset: Accuracy Epoch Training Set Accuracy Test Set Accuracy Overfitting Early Stopping Epoch We have carried out an extensive model selection process to minimize mean squared error on the test data. We have tried techniques including – random forest, support vector machines, kernel ridge regression, neural networks and more. After experimentation, it was found that gradient boosting with the given hyperparameters achieved the best results on the test dataset, and as a result, it was used in this work. On the additional metrics requested, we have added them here: <table><tr><th>Metric</th><th>Train</th><th>Test</th></tr><tr><td>MAPE</td><td>0.0912</td><td>52% (Fair)</td></tr><tr><td>CCC</td><td>0.985</td><td>0.693 (Moderate/Good)</td></tr><tr><td>RPIQ</td><td>9.11</td><td>1.86 (Good)</td></tr></table> 2. Strata were not used as a covariate, to avoid overfitting to such strata, which would cause the model to have reduced ability to measure changes in SOC. Strata are a spatially-varying feature							Metric	Train	Test	MAPE	0.0912	52% (Fair)	CCC	0.985	0.693 (Moderate/Good)	RPIQ	9.11	1.86 (Good)
Metric	Train	Test																
MAPE	0.0912	52% (Fair)																
CCC	0.985	0.693 (Moderate/Good)																
RPIQ	9.11	1.86 (Good)																

CAR ID	23	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
but not a temporally-varying feature. Our model focuses on covariates that vary both spatially and temporally, so that we do not reduce our ability to measure SOC change by overfitting to a variable that does not vary temporally. On the other hand, as noted earlier, we have used strata to check representation of the calibration datasets, and for guiding the collection of the validation datasets. 3. This is the same as the ongoing validation section below in the technical summary document. See there. Also, on the overestimation – note that the slope of the predicted vs observed scatter is nearly 1. There is overestimation for some points over 2% observed SOC, but also underestimation for some points – it is almost equally likely. 4 points are overestimated and 5 points are underestimated, for >2% observed SOC. This indicates the presence of a growing noise as the observed SOC% is increased. This noise is factored into the subsequent uncertainty propagation steps and is incorporated into the final carbon removal results. 4. Prediction interval coverage is provided for the validation dataset, but it can be provided for the test dataset as well. The 90% PICP is 89.7% for the test data. 						
Documentation provided by project participant						
Revised Mexico SOC Remote Sensing Technical Summary						
DOE assessment					Date :	12/05/2025
1. When computing the Mean Absolute Percentage Error (MAPE), do you multiply the raw result by 100 to express it as a percentage? Most of packages (or libraries) computes MAPE in unite scale (0-1). 2. According to the SCORPAN model, soil properties result from the simultaneous interaction of static factors (e.g., parent material, relief, age, position) and dynamic factors (e.g., climate, organisms, anthropic). Your digital soil-mapping workflow relies exclusively on dynamic covariates, omitting the static ones. How do you justify excluding static covariates. It can be a source for low prediction performances from test set. 3. The findings remain open till the closure of 1 and 2.						
Project participant response					Date :	10/05/2025
1. The number we gave in the table is in unit scale, so it can be multiplied by 100 to give a percentage. Either 0.520 or 52% is correct. (It is not 0.52%). 2. It is true that soil properties result from the simultaneous interaction of static and dynamic factors. Our workflow excludes static factors because our model is designed not only to predict absolute SOC levels but to detect changes in SOC over time, which is essential for carbon accounting and verification. Static covariates do not vary over time and would not contribute meaningful signal to SOC change modeling. Including them risks introducing model bias or overfitting to spatial structure, which would reduce the model's ability to track SOC dynamics. Furthermore, note that any error in the SOC estimate for a given location resulting from the lack of incorporation of the static features manifests as a systematic error in time (eg. measurements						

CAR ID	23	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
at t1 and t2 for the same location are shifted by the same bias attributable to static features at that location). The reason for this error being systematic is that we have shown full coverage of the feature space for SOC with the covariates that are used, along with the physical mechanism of SOC measurement (radar backscatter affected by SOC level) that has been empirically demonstrated. Then, the lack of inclusion of static features causes a systematic error for that specific location. When we then calculate the change in SOC, this systematic error is reduced because it is present in both absolute values that are then subtracted to produce the change. Observe that the uncertainty propagation accounts for this – one of the final uncertainty steps is the subtraction of the ranch-level SOC PPDs at different time points to produce the ranch-level SOC change PPD. This action leads to the portion of the systematic error that are shared at both time points to cancel out.						
Documentation provided by project participant						
DOE assessment					Date :	12/05/2025
1. Can you identify which factors might be causing performance metrics to degrade from the training set to the test set? Could this be due to differences in the statistical distribution between datasets, or a lack of representativeness in the training set? 2. OK. Thank you for the explanation. I understand that, since your goal is to model changes in SOC over time, static covariates (which don't vary temporally) add little direct signal to that task. That said, in my experience with spatio-temporal DSM, incorporating static predictors (properly balanced against dynamic ones) can improve overall model performance by anchoring the spatial structure of the predictions. For now, you can proceed with your current workflow, but keep this discussion in mind for future works.						
Project participant response					Date :	10/05/2025
1. Given that the train and test sets are randomly partitioned from the same calibration dataset (INEGI dataset), the observed degradation in performance is not due to distributional shift, representativeness, or sampling campaign differences. Instead, the reduction in performance from train to test is expected and attributable to the following: 1. Noise in Soil Data: Soil data inherently includes high natural variability and measurement error, even within small spatial areas. Since both train and test sets contain noisy measurements, the model may inadvertently learn spurious correlations in the training set that do not generalize well to the test set. 2. Model Generalization vs. Memorization: The performance difference reflects the model's generalization capability. On the training set, the model captures idiosyncrasies specific to the training data. The test set, being unseen, provides a more honest assessment of how well the model captures underlying patterns rather than specific instances. 3. Heteroscedasticity and Non-linear Interactions: The prediction task involves complex, non-linear interactions between features (e.g., infrared vegetation measurements, radar backscatter), and potentially heteroscedastic errors—where prediction uncertainty increases at higher SOC levels. These characteristics limit model performance even when training and test data are drawn from the same population. 4. High Dimensional Covariate Space: The remote sensing input space is high-dimensional, and although the training and test sets are from the same distribution, the model's performance can vary due to local sparsity in covariate space. In some areas of the feature space, the density of training samples may be lower than in other parts of the feature space, resulting in differing test accuracy in these areas of the feature space. For example, this is a known issue for higher ranges of soil organic carbon (most of which may also be above the relevant range for predictions in this project's ranches). Soil organic carbon data is known to be skewed, particularly in arid regions and degraded regions – there are much larger numbers of soil samples at low soil carbon levels than						

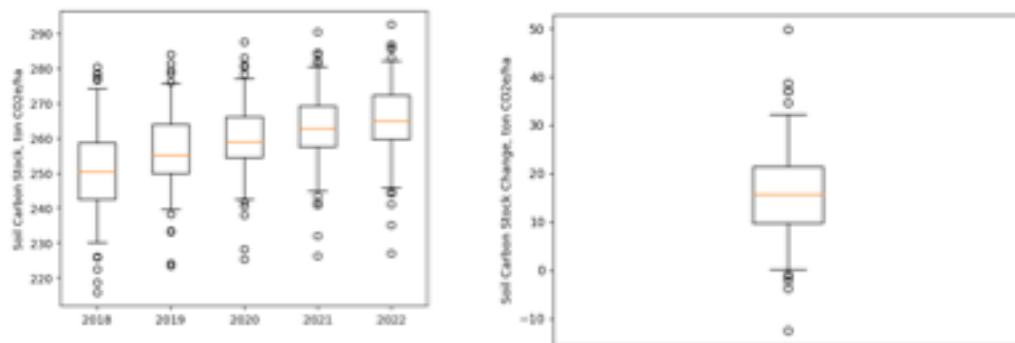
CAR ID	23	Section no.	Mexico SOC Remote Sensing Summary	Date:	02/05/2025
at higher soil carbon levels (eg. see the distributions of the soc that have been shared, above, and in the original document).					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
2. The response is satisfactory but could you please provide more details on how you validated the Δ SOC (the SOC change) between time points (e.g., by comparing Δ SOC _{observed} vs. predicted Δ SOC)? Additionally, how can you be confident that the systematic errors present in the absolute SOC predictions at each time point are effectively canceled out when the values are subtracted? Is this an assumption, or did you actually quantify and verify the error cancellation?					
Project participant response				Date :	10/05/2025
2. On the first point on validating ΔSOC: This is happening in a multitude of ways. For starters, the project itself is designed to be able to validate the SOC change through the ongoing implementation – it takes validation soil samples on an ongoing basis every few years, which serve effectively as a ΔSOC validation, if the model successfully passes validation with both the latest validation set and the preceding validation sets. In the case of the first monitoring period, this happens through the comparison of model predictions on the 2022 validation set, and to the pre-implementation test dataset. The mean SOC increases between these 2 datasets from 2.17wt% to 2.31wt%, and by virtue of passing the validation metrics (given in the main doc), we essentially show that the model is able to predict this change. This same type of analysis will be repeated next between the 2022 validation set and a yet-to-be-collected 2025 validation set for the next verification of the project, anticipated to be 2022-2025. In this way, the project is validating ΔSOC. Additionally, there is another form of validation, outside the scope of the remote sensing technical report but within the scope of the overall project, enabled by a process-based model. Note that this project utilizes a RothC biogeochemical process-based model for modeling the baseline and project scenarios for the intervening period between remote-sensed measurements, as seen below:  The RothC model is calibrated exclusively on field trial data from around the world that measures SOC change and is described in a document known as the “Model Validation Report”. This RothC model is thus a model that is calibrated and validated completely independently from the remote sensing machine learning model. Typically, these types of process-based models have high uncertainties and are heavily dependent on the quality of input data. However, when this RothC model is run for the ranches in the project, we find that it predicts a mean SOC increment of 0.58 ton C/ha/yr over 2018-2022. At the same time our remote sensing model predicts a 0.54 ton C/ha/yr mean increase over 2018-2022. The difference between these rates is just 6.9%, and this is within the error in the results. On individual predictions, the RothC model has a standard error of 0.70 tonC/ha/yr, which reduces to 0.059 ton C/ha/yr at the aggregate scale of 139 ranches in the project. The standard error of just the RothC prediction is larger than the difference between the averages of the RothC increment and remote sensing					

CAR ID	23	Section no.	Mexico SOC Remote Sensing Summary	Date:	02/05/2025
--------	----	-------------	-----------------------------------	-------	------------

increment. Thus, the 6.9% difference (0.04 ton C/ha/yr) is not statistically significant, and the remote sensing prediction closely matches the independently developed RothC SOC change prediction based on field trial literature. This also independently validates the ability of the remote sensing to measure soc change.

On the second point on systematic errors canceling out: we see this theoretically and empirically in our approach. From the Bayesian regression kriging approach, the systematic error is factored in through the validation residuals that are built into the residual semivariogram, and then used with kriging to determine a simulated residual that contains the systematic error at that point location, in addition to some random errors. This is, of course, dependent on the quality of the semivariogram – we showed that in a separate response in this document.

We then empirically see the significant drop in standard error after subtraction of the PPDs across time. You can see this in the example provided in the main document where the uncertainty drops with subtraction:



The half-width of the boxplot (90% confidence interval) has gone from +/- 20 tonCO2e/ha in the SOC stock to +/- 15 tonCO2e/ha in the SOC change. If the variances were independent and did not have this systematic error contribution then we would have $\text{SQRT}(20^2 + 20^2) = 28$ ton CO2e/ha as the error in the difference, but the actual error is nearly half of this. This is due to the systematic upward or downward deviations of individual MC simulations, which, when subtracted, drop out, as described in an earlier response. These systematic deviation include in them the effect of the static variable exclusion. This does not guarantee, however, that ALL the effects of the static variable exclusion are cancelled out. If there is any uncanceled residual error remaining arising from the static variable exclusion, it ultimately remains in the final uncertainty calculation. Thus, it makes its way to the project-level uncertainty deduction and final carbon credit quantification, and the integrity of the project is maintained.

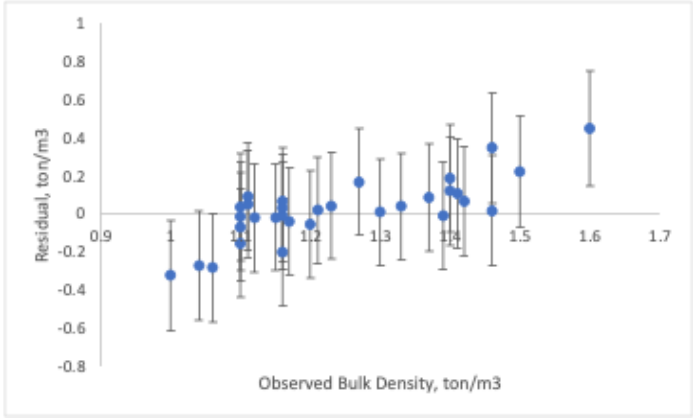
Thus, since we are interested in the SOC change, which is the final output of this work, static variables are not included and the effect of their exclusion on the uncertainty is also mitigated.

Documentation provided by project participant

DOE assessment	Date :	12/05/2025
1. The model selection process involved multiple techniques, with Gradient Boosting achieving the best performance on the test data. Additional metrics show acceptable performance, with MAPE at 52%, CCC at 0.693 (moderate/good), and RPIQ at 1.86. The drop in performance from train to test is expected due to inherent soil data noise and complex feature interactions. This finding is closed. 2. Strata were excluded as covariates to prevent overfitting to spatial patterns and to focus on temporal changes in SOC. The PP used strata for dataset representativeness but ensured model performance was not hindered by static variables. The exclusion of strata is justified,		

CAR ID	23	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
as systematic errors from this exclusion are mitigated when calculating SOC change. This finding is closed. 3. The observed overestimation for SOC >2% is due to increased noise, not bias. Validation using independent datasets confirmed that the model meets Verra's criteria (90% prediction interval coverage, $R^2 > 0$, and low bias). The model's predictions align closely with the independent RothC model (6.9% difference), validating SOC change estimates. This finding is closed. 4. The model's 90% prediction interval coverage is 89.7% for the test data, meeting Verra's threshold. Residual analysis shows that systematic errors cancel out in SOC change calculations, reducing uncertainty. This finding is closed.					

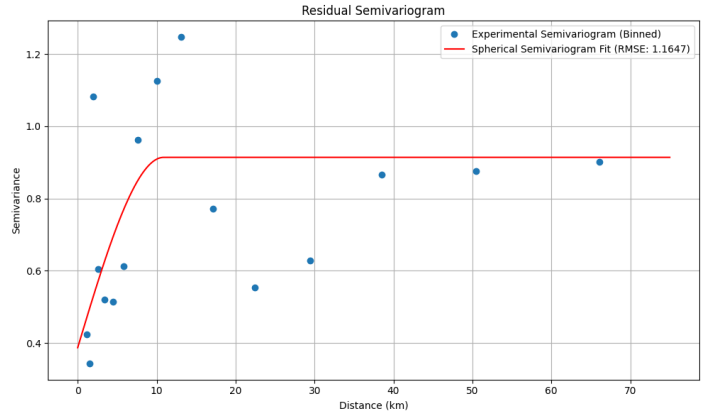
CAR ID	24	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025												
Description of CAR																	
Pedotransfer function (PTF): 1. Please, provide additional global performance metrics (e.g. MAPE, CCC, RPIQ), and stratified by textural class if possible. 2. Figure 12 indicates bias in BD predictions (overestimation at low BD, underestimation at high BD. Please, provide external validation with independent data (different from the train and test sets) and distribution for both datasets. 3. Please, report the percentage of predictions (coverage) within the prediction interval (count number of points inside/outside of predicted interval), and provide a residual plot sorted by prediction interval.																	
Project participant response				Date :	10/05/2025												
1. See the similar response in the section above. In the case of the PTF, we also tried many model architectures including random forests, support vector machines and ridge regression, before settling on gradient boosting with 30 estimators, which minimized error on the test dataset. We can also provide the additional performance metrics below, but note that Verra has narrowed down on 3 specific validation metrics (stated in FAR05 in validation report, R2, PICP and bias). Additional Metrics:<table><tr><th>Metric</th><th>Train</th><th>Test</th></tr><tr><td>MAPE</td><td>0.0292</td><td>9.07% (Excellent)</td></tr><tr><td>CCC</td><td>0.956</td><td>0.271 (Fair agreement?)</td></tr><tr><td>RPIQ</td><td>4.41</td><td>1.76 Good)</td></tr></table> 2. This is the same as the ongoing validation section below. Originally, a previous reviewer during this project’s validation was more specifically focused on seeing validation data for SOCwt%, and wanted us to remove the bulk density charts to avoid cluttering the document for him. I’ve reincluded them now below in the validation section. Also, note that overestimation at low BD and underestimation at high BD will end up as systematic prediction errors propagated into the uncertainty present in the final carbon removal results. Furthermore, note that bulk density changes very slowly as soil organic carbon increases – in any given monitoring period of the project (eg. 4 years), the change in bulk density is largely						Metric	Train	Test	MAPE	0.0292	9.07% (Excellent)	CCC	0.956	0.271 (Fair agreement?)	RPIQ	4.41	1.76 Good)
Metric	Train	Test															
MAPE	0.0292	9.07% (Excellent)															
CCC	0.956	0.271 (Fair agreement?)															
RPIQ	4.41	1.76 Good)															

CAR ID	24	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
negligible. Thus any overestimation/underestimation of BD ways in as a systematic error in the SOC stock change calculation and related carbon credits. The project's uncertainty deduction includes this error and thus ensures the project's credit issuance remains conservative. 3. In the validation section, this is provided at the SOC stock level. It can also be provided here for the test BD data. The 90% PICP is 90.6%, on the test data 					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
1. Can you identify which factors might be causing performance metrics to degrade from the training set to the test set? Could this be due to differences in the statistical distribution between datasets, or a lack of representativeness in the training set? 2. This is the same as the ongoing validation section below. Initially, a previous reviewer requested the exclusion of bulk density charts to avoid unnecessary clutter in the document. These charts have now been reincluded in the validation section. It's important to note that overestimation at low bulk density (BD) and underestimation at high BD could result in systematic prediction errors, which may influence the uncertainty in the final carbon removal results. However, since bulk density changes gradually as soil organic carbon increases, the change within any given monitoring period (e.g., 4 years) is minimal. As such, any BD-related overestimation or underestimation becomes a systematic error in the SOC stock change calculation and consequently affects the carbon credits issued. The project's uncertainty deduction accounts for this, ensuring conservative credit issuance. This finding is now closed. 3. The relevant data for the validation section is provided at the SOC stock level, and can also be included here for the test BD data. The 90% prediction interval coverage probability (PICP) for the test data is 90.6%, demonstrating strong performance. This finding is now closed.					
Project participant response				Date :	10/05/2025
1. Given that the train and test sets are randomly partitioned from the same calibration dataset (INEGI dataset), the observed degradation in performance is not due to distributional shift, representativeness, or sampling campaign differences. Instead, the reduction in performance from train to test is expected and attributable to the following: - Noise in Soil Data: Soil data inherently includes high natural variability and measurement error, even within small spatial areas. Since both train and test sets contain noisy measurements, the model may inadvertently learn spurious correlations in the training set that do not generalize well to the test set. - Model Generalization with the chosen covariates: The performance difference reflects the model's generalization capability. On the training set, the model captures					

CAR ID	24	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
idiosyncrasies specific to the training data. Also note that the PTF model has very few covariates (soil texture, soc, etc.). With this set of covariates, the reported test metrics are likely the best that are possible. In order to improve the test metrics further, we would likely require inputs on the land management history for each data point, which is the other key factor, as seen from the theoretical basis, that affects the bulk density.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
Also, could you clarify how this explanation relates to my previous question about the role of the "anthropic factor"?					
Project participant response				Date :	10/05/2025
1. Yes, the anthropogenic factor is the land management history. The bulk density at a certain point in time is a function of the sand, silt, clay, soil organic matter, and the land management history, as detailed in the theoretical section of the main document. In particular, the land management history that is of importance is any activity that leads to compaction. A common example of such an activity in agriculture is the transition from tillage to no-till, which leads to soil compaction in the short term. However, in this native grassland project, there is no tillage in both baseline and project scenarios, so this is not an important effect. The more likely anthropogenic effect underpinning the bulk density in this work is simply the level of grazing stress experienced by the land over the course of decades. For example, land that has been severely overgrazed compared to the average situation in the region is more likely to have exposed soil that is then eroded and ends up exposing deeper more-compacted soil layers, artificially causing the top 30cm to become "more compact" because the less compact layers have eroded. In this situation, we would technically also see a lower soil organic carbon level (as SOC typically decreases with depth), so the effect is partially captured by the incorporation of soil organic carbon as a PTF input. However, there may be a component that is not fully captured by soil organic carbon (for example, imagine an extreme case where the soil organic carbon profile with depth in the original soil before degradation was relatively constant, so the PTF is unable to calculate a higher bulk density). Note that this source of error would only occur when the degree of anthropogenic land degradation is different from the average scenario in the region that is already represented in the calibration data. This remaining anthropogenic degradation variable is unaccounted for in the PTF, because it is hard to precisely quantify, particularly for the INEGI samples collected in the past, so it may explain some part of the performance metric reduction from train to test set. Given the difficulty in gathering this information for each INEGI soil samples taken from 2005 to 2012, or finding an alternative bulk density dataset with sufficient data points that also has this information, we are unable to add this as a parameter into our model, and have to settle for what the current covariates are able to provide.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
The anthropogenic factor affecting bulk density is primarily land management history, particularly grazing stress. While soil compaction from tillage is not relevant here due to no-till practices, overgrazing can cause erosion, exposing deeper compacted soil layers. This effect is partially captured by soil organic carbon in the PTF, but there may be unaccounted degradation, particularly if original SOC profiles were uniform. The lack of detailed historical data for INEGI samples limits the ability to incorporate this variable, which could explain the performance metric reduction from training to test sets. This finding is now closed.					

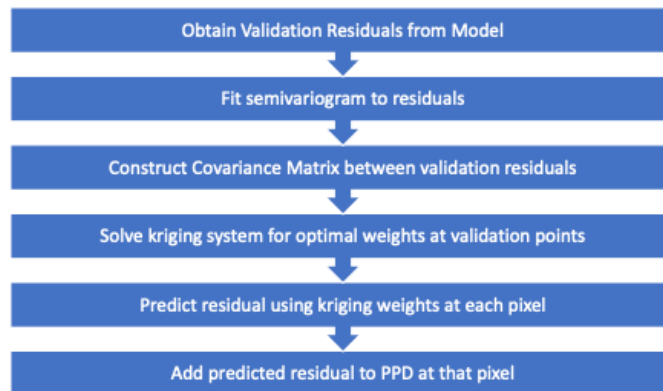
CAR ID	25	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Description of CAR					
SOC Stock calculations: - Detail the input data, equations, assumption, conversion factor and literature used to derive SOC stock. - Clarify whether SOC stock outputs are pixel-based or area-based, specifying spatial resolution and/or aggregation methods.					
Project participant response				Date :	10/05/2025
- SOC Stock is calculated as the product of bulk density and SOC%, followed by appropriate unit conversions. Taken from our emission reduction/removal calculation excel spreadsheet, it is defined as $[SOCwt\%]/100 \times [Bulk\ Density, ton/m^3] \times [10000\ m^2/ha] \times [0.3m\ measurement\ depth]$, resulting in units of SOC stock in ton C/ha. This is a standard calculation method for SOC stock, and is directly defined in the VM0042 methodology used by this project (eg. see Eq 5 in VM42 v2.0). This project does not deviate from the method already prescribed in the Verra methodology. To convert to ton CO₂/ha, we further multiply by 44/12. - SOC stock outputs are generated at a pixel-level and then aggregated to the sample unit (ranch) level, before being inputted into the biogeochemical model in the next part of the quantification process. The aggregation method is just taking the simple arithmetic mean of all the pixel-level values found within the sample unit. The uncertainty is not as trivial as a simple average, and this is discussed further in the uncertainty section.					
Documentation provided by project participant					
Revised Mexico SOC Remote Sensing Technical Summary					
DOE assessment				Date :	12/05/2025
- The SOC stock is calculated using the formula defined in the VM0042 methodology. The calculation involves the product of bulk density and SOC%, followed by unit conversions, with the final output being in units of ton C/ha. The method follows standard practices prescribed by the Verra methodology and does not deviate from these guidelines. The further conversion from SOC stock (ton C/ha) to CO₂ equivalent (ton CO₂/ha) is done by multiplying by a factor of 44/12. This ensures consistency with the established calculation methods. This finding has been closed. - SOC stock outputs are generated at a pixel level and then aggregated to the ranch level, using a simple arithmetic mean of all the pixel-level values within the sample unit. This method provides a representative measure of SOC stock at the ranch level. However, it is important to note that the uncertainty in SOC stock estimates is more complex than a simple average, and a detailed uncertainty analysis is provided in the uncertainty section of the report. This finding has been closed.					

CAR ID	26	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
Description of CAR					
The Model's Uncertainty: - Clarify whether the Monte Carlo method uses predicted SOC stock values, observed values, or both. - Explain how spatial autocorrelation was accounted for (e.g., include a semi variogram example) and how pixel-level PPDs are aggregated to derive ranch-level PPD. - Explain how temporal correlations were incorporated into the Monte Carlo approach. Was any time-series modelling or dependency structure incorporated?					

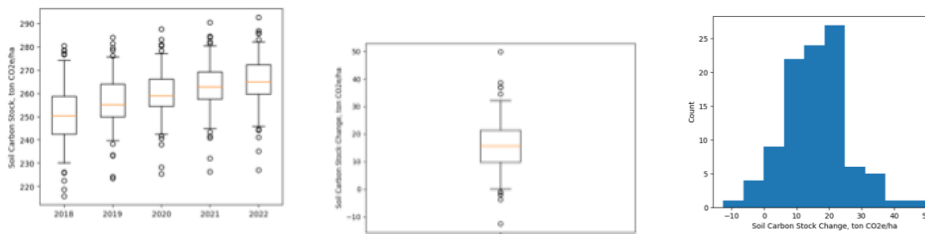
CAR ID	26	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
4. Provide the equations for each step in Figure 13. Provide a detailed breakdown of the methodology, specifying the formulas (e.g., simplified equations to illustrate the steps) and statistical techniques applied. The presentation of steps that do not belong to the proposed method (e.g., RothC) confuses the reader. 5. Specify the soil depth used in the example calculation.						
Project participant response					Date :	10/05/2025
1. The uncertainty propagation uses the prediction errors of the SOC stock values on the validation dataset, meaning that it uses both the prediction for the validation dataset and the observed value, as their difference is the prediction error. To model the Predictive Posterior Distribution, as indicated in the text, N predictions of the model are made by varying the training of the model through Bayesian simulation. Then, the PPDs are corrected with the semi variogram built on the prediction errors, which brings in the aspect of spatial autocorrelation in the underlying real SOC distribution and allows the validation prediction errors to be accounted for in the uncertainty. 2. Pixel-level PPDs are aggregated to ranch level through simple averaging of all pixels within a given ranch for each simulation. It is equivalent to the SOC stock aggregation method given in the previous section. A semi variogram is produced for the residuals of the model with respect to the validation dataset. Thus, this semi variogram enables the simulation of spatially correlated residuals, which are then added onto the predictions produced by the model in a given simulation of the Bayesian MC process. In general, the semivariogram is given by: $\gamma(h) = \frac{1}{2} \times \text{Var}[Z(x) - Z(x + h)]$ Where: $\gamma(h)$ is the semivariance at distance (lag) h $Z(x)$ is the value of the variable at location x $Z(x + h)$ is the value at a location h units away $\text{Var}[\]$ denotes the variance Here is a semi variogram of the validation dataset in our case, with a spherical fit: 						

CAR ID	26	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
Observe that the points at low semivariance are also at low distance – there is an element of spatial correlation. However, this correlation is not very strong – which is visible directly from the noise in the experimental semivariogram. With a spherical fit, the fitted nugget is 0.387, the sill 0.914 and the range 10.9 km. The nugget-to-sill ratio is $0.387/0.914=0.423$, indicating a moderate correlation. Note that the error in the semivariogram fit is factored into our process via the Bayesian simulations – each simulation will produce a different semivariogram fit based on the trained model of that simulation, resulting in coverage of the variation of the semivariogram parameters as well in the final results. With the fitted semivariogram, we now carry out ordinary kriging. We construct the covariance matrix between validation data points using: $C(h) = \text{sill} - \gamma(h)$, Where: • $C(h)$ is the covariance at distance h • $\gamma(h)$ is the semivariance from your variogram model • sill is the total variance plateau from the model We solve the kriging system to find the optimal weights (λ_i) for the known data points. We make the prediction at a new pixel (x_0) using: $Z(x_0) = \sum \lambda_i \times Z(x_i)$ Where: • $Z(x_0)$ is the predicted value at the new point • λ_i are the kriging weights • $Z(x_i)$ are the known values at locations x_i The resultant prediction is then added to the model simulation value at the pixel of interest, and thus becomes a part of the pixel-level PPD. - Temporal correlations are included when the Bayesian simulation is extended to not just one timepoint but 2 different time points (in this project, these are the start and end of a monitoring period, 2018-2022 for the first one). In each Bayesian simulation, we simulate the training of the model, and then run it for the 2 timepoints (eg. May 2018 and May 2022). Then, the PPD of May 2018 is later subtracted from the PPD of May 2022, resulting in a SOC “change PPD” from 2018 to 2022. This “change PPD” has the temporal correlation incorporated – the individual Bayesian simulations allow for the preservation of a temporal structure. For example, a given Bayesian simulation may result in a model that consistently overestimates SOC. Then, in May 2018 and May 2022, the SOC value from that model is overestimated. When the two values are subtracted in the change PPD calculation, this consistent overestimation would cancel out in the change calculation for this Bayesian simulation. In this way, the temporal correlation was factored into the system. The main outcome of the temporal correlation accounting is a decrease in the final uncertainty of the calculations when systematic overestimation/underestimation within given simulations drops out. - This answer is in following points: - For each simulation 70% random sampling is conducted on the calibration dataset using a function like <code>numpy.random.sample</code>						

CAR ID	26	Section no.	Mexico SOC Remote Sensing Technical Summary	Date:	02/05/2025
2) ML model trained on this sample using sklearn.ensemble.gradientboostingregressor model.fit – separately for both SOC% and BD, but in the subsequent steps below, the values are always combined and referred to in terms of SOC stock. 3) Use model.predict on the validation dataset and compute all validation residuals. The validation residuals follow the process and equations given in the semivariogram response above, to produce simulated spatially-correlated prediction residuals 4) Model predicts SOC stock at the given ranch pixel 5) The spatially correlated prediction residual is added (normal addition) to the ml model prediction at the given ranch pixel 6) The above steps are repeated 100 times, so there are now 100 values at each pixel that include both the ml model prediction and semivariogram output – these 100 values collectively represent a pixel-level Predictive Posterior Distribution (PPD). 7) For all the pixels found within the given ranch, the PPDs are averaged to produce the ranch level PPD: $SOC_{PPD,ranch} = \frac{\sum_{i=1}^{\# \text{ of pixels}} SOC_{PPD,pixel i}}{\# \text{ of pixels}}$ Where, the $SOC_{PPD,pixel i}$ represents the full distribution of 100 simulations for pixel i. 8) All the steps above are carried out at multiple time points. Specifically, in the first verification (2018-2022), they are carried out for May 2018 (i.e. the models are inputted with satellite data from May 2018) and May 2022. Thus, at this point, for each ranch, we have $SOC_{PPD,ranch,2018}$ and $SOC_{PPD,ranch,2022}$ 9) Our overall calculation process includes a RothC step to be compliant with VM42 Quantification Approach 1 (measure & model), but it may be outside the scope of this document, as it forms the scope of the separate RothC Model Validation Report audited by a separate Independent Modeling Expert (IME) 10) We take the difference of the PPDs at the two time points to get SOC stock change, and this enables a factoring in of the temporal correlations, since the individual simulations being carried out preserve the temporal structure. In the first verification: $\Delta SOC_{PPD,ranch} = SOC_{PPD,ranch,2022} - SOC_{PPD,ranch,2018}$ 11) The variance of the distribution $\Delta SOC_{PPD,ranch}$, or $Var[\Delta SOC_{PPD,ranch}]$, gives the standard error at the ranch level, inclusive of the spatial and temporal correlations, SOC prediction errors, satellite input errors, modeling error etc. 12) To go to the project level with the incorporation of spatial correlations between ranches, we extend this analysis with weighted averaging of the ranch PPDs – $\Delta SOC_{PPD,project} = \frac{\sum_{i=1}^{\# \text{ of ranches}} A_{ranch i} * \Delta SOC_{PPD,ranch i}}{\sum_{i=1}^{\# \text{ of ranches}} A_{ranch i}}$ Where, $A_{ranch i}$ is the area of each ranch, and $\Delta SOC_{PPD,ranch i}$ is the ranch-level SOC stock change PPD for ranch i. The variance of $\Delta SOC_{PPD,project}$ is the project-level variance, inclusive of the spatial and temporal correlations, SOC prediction errors, satellite input errors, modeling error etc. 5. All calculations are to 30cm depth in this work – aligning with the VM42 requirement.					

CAR ID	26	Section no.	Mexico SOC Remote Sensing Summary	Date:	02/05/2025
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
1. PP is required to provide additional details on the PPD correction. Did you generate residual maps via kriging and then apply raster algebra to adjust the PPD? Including a detailed flowchart of each of these steps would be extremely helpful. 2. I do not know if I understood it correctly. Imagine one Monte Carlo draw happens to overestimate SOC everywhere (say, +2 t/ha). It will overestimate both 2018 and 2022 by about +2 t/ha. When you subtract, the +2 cancels out, so that systematic “bias” doesn’t inflate your change estimate. Please, provide an example and update the text. 3. I understand that residuals at each point should be spatially interpolated to correct predictions at the pixel level. However, since the quality of Kriging is highly dependent on the density of input data, how does this influence the accuracy of interpolation in areas with sparse coverage? I raise this point because covariate-based machine learning methods are specifically designed to maximize the predictive power of the available input data. 4. The summary confirms that all calculations are performed to a 30 cm depth, in alignment with the VM0042 methodology requirement. This approach ensures consistency with the standard for assessing soil carbon stocks. No issues were identified, and the finding is closed as compliant.					
Project participant response				Date :	10/05/2025
1. You may see the full description below. As you mentioned, we generate a residual “map” via the Kriging – but actually, a full “map” is not necessary as it is only required for the pixels within each ranch, which is where the PPD is being generated. Then the residuals are added to the PPD in each pixel – this is equivalent to a “raster algebra”. The flowchart below summarizes:  <pre> graph TD A[Obtain Validation Residuals from Model] --> B[Fit semivariogram to residuals] B --> C[Construct Covariance Matrix between validation residuals] C --> D[Solve kriging system for optimal weights at validation points] D --> E[Predict residual using kriging weights at each pixel] E --> F[Add predicted residual to PPD at that pixel] </pre> 2. Your understanding is correct. Thus, when such systematic biases cancel out for a given draw, they result in the SOC change PPD distribution’s width shrinking relative to the original SOC PPD distribution’s width. We observe this in the real example with the boxplots shared in the original document, which I copy over here for reference.					

CAR ID	26	Section no.	Mexico SOC Remote	Sensing Technical	Date:	02/05/2025
			Summary			



Example ranch-level soil carbon stock Predictive Posterior Distributions (PPDs) from 2018 to 2022 in boxplots (top, a), the soil carbon stock change PPD from 2018 to 2022 as a boxplot (bottom left, b) and histogram (bottom right, c).

Observe that the 2018 and 2022 PPDs have a prediction interval that has a ± 20 tonCO₂e/ha (± 5 tonC/ha) half width. On the other hand, the change PPD, upon subtraction of 2018 and 2022, has a half-width of ± 15 ton CO₂e/ha (± 4 tonC/ha). This decrease from 2 distributions of ± 5 tonC/ha to one distribution of ± 4 tonC/ha is due to these systematic biases that occur across time (eg. in both 2018 and 2022) canceling out and shrinking the distribution.

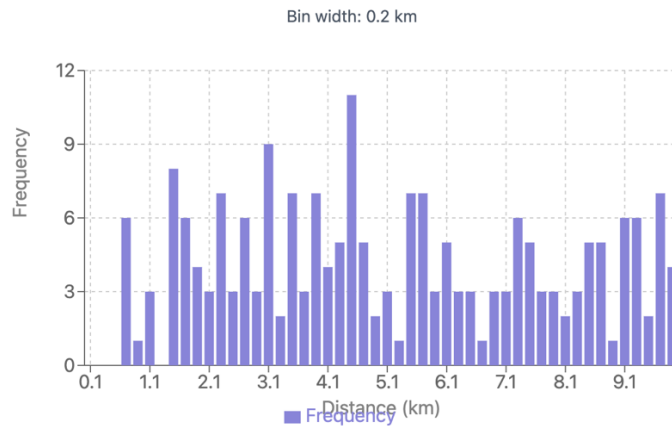
- It is true that the quality of the Kriging is highly dependent on the density of the input data. However, it is not about regions with sparse-coverage versus those with denser coverage. It is more about having a sufficient number of observation that have pairwise distances that are close to one-another, in addition to those that are very far of away from one another, to fit the semivariogram. Note that we use a single semivariogram for a given ML model's residuals – we don't create a different semivariogram for each area within the project. The key challenge for us is to ensure that the semivariogram, which ultimately determines the Kriging weights and thus the Krigged residuals at each point, is of sufficient quality. This is achieved by having a sufficient number of pairwise distances in the validation data that are close to one another in addition to far from one-another. Typically, the challenge is not in having points far from one another but rather points that are close enough to allow for an accurate calculation of the range and nugget of the semivariogram.

For this purpose, we ensure that we have sufficient validation samples that are close enough to each other (i.e. lesser than the range of the estimated semivariogram), such that the range and nugget can be computed properly.

You can see in the response above that the semivariogram here has a range of ~ 10 km. We have 202 pairwise distances in the validation data of less than 10km in our data, shown in the histogram below:

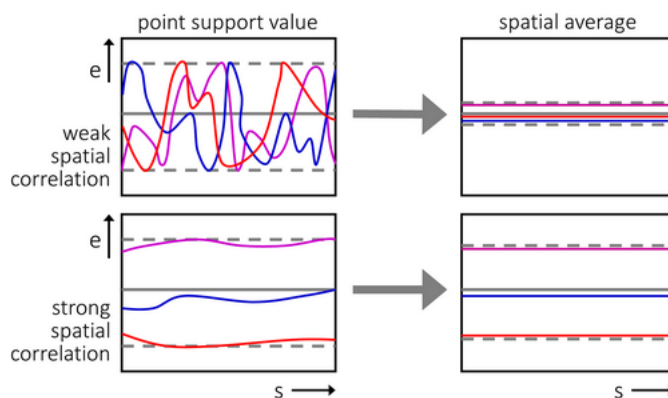
CAR ID	26	Section no.	Mexico Sensing Summary	SOC	Remote Technical	Date:	02/05/2025
--------	----	-------------	------------------------------	-----	---------------------	-------	------------

Histogram of Pairwise Distances (0-10 km)



Thus, we feel there is sufficient coverage of the portion of the semivariogram smaller than its range, so its fit can be of sufficient quality.

Now, you may be wondering what hypothetically happens when we need to simulate a residual for 2 given pixels and both are next to each other but really far away from the validation points (thus, an area with 'sparse coverage'). We can show that this results in a conservative overestimation of the ranch-level variance and thus the total uncertainty. Assuming that the semivariogram is of sufficient quality, as outlined by the check above, we have kriging weights generated for the known points, but given the 2 pixels are near each other but far from the known points, they will have very similar simulated residuals from the kriging. Thus, when they undergo averaging during the computation of the ranch-level average, the simulated residual does not help to reduce the variance in the ranch-level average. This can be seen in the figure from Wadoux et al.

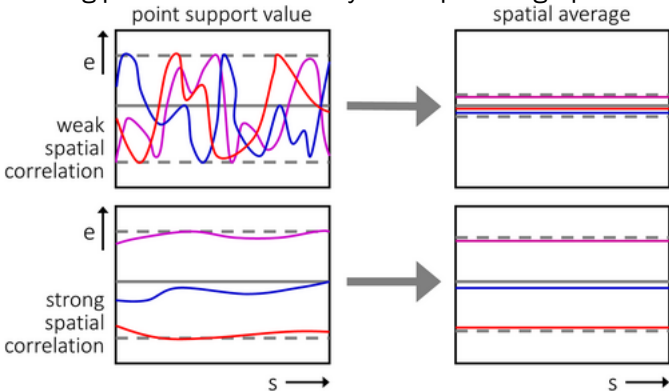


The situation of 2 pixels near each other but far away from the validation points leads to an erring on the side of strong spatial correlation, leading to the spatial average to have a larger variance.

When this larger variance is passed through the remaining steps in the process, we end up with a scenario wherein the total uncertainty is effectively overestimated, and thus the final

CAR ID	26	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
uncertainty deduction to the credits is larger and thus the credit calculation is conservative, as required by the Verra standard (to avoid over-crediting). If the validation sampling level is increased, then the results will move in the direction of being less conservative but more accurate.						
Documentation provided by project participant						
DOE assessment					Date :	12/05/2025
1. The Kriging method generates residuals for specific pixels within each ranch, not a full map. These residuals are added to the Predictive Posterior Distributions (PPD) for each pixel, equivalent to raster algebra. This approach ensures accuracy at the ranch level, as shown by the observed change in the SOC PPD distribution's width over time. This finding is closed. 2. The width of the SOC change PPD distribution shrinks relative to the original SOC PPD distribution, as systematic biases from both 2018 and 2022 cancel out. The example shows a reduction in the distribution width from +/- 5 tonsC/ha to +/- 4 tonsC/ha due to these cancellations. This finding is closed. 3. The quality of the Kriging is highly dependent on having sufficient validation samples with both close and distant pairwise distances to fit the semivariogram. With 202 pairwise distances under 10km, the semivariogram fits well and ensures accurate residuals. This finding is closed. 4. When two pixels are close to each other but far from validation points, it results in a conservative overestimation of variance, leading to a larger total uncertainty and a conservative credit calculation. This overestimation helps to avoid over-crediting. This finding is closed. 5. The ranch-level PPD is calculated by averaging the PPDs of individual pixels within the ranch, incorporating all 100 simulations for each pixel. This provides a comprehensive representation of the ranch's SOC stock distribution. This finding is closed. 6. The SOC stock change from 2018 to 2022 is calculated by subtracting the PPD of May 2018 from the PPD of May 2022. This allows for factoring in temporal correlations and provides a ranch-level estimate of SOC change. This finding is closed. 7. The variance of the SOC change PPD at the ranch level incorporates spatial and temporal correlations, prediction errors, and modeling uncertainties, giving a comprehensive measure of uncertainty for each ranch. This finding is closed. 8. At the project level, SOC change is calculated by weighted averaging of ranch-level changes, considering ranch size. The variance at the project level includes all the same errors as the ranch-level variance, ensuring that spatial and temporal correlations are considered. This finding is closed.						

CAR ID	27	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
Description of CAR						
Ongoing validation:						

CAR ID	27	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
1. Confirm whether the validation dataset is an external set that remained hidden for the ML algorithm during training. 2. Low R^2 of 0.13 from validation dataset indicates poor predictive performance. A low R^2 value can be problematic when accurate and precise predictions are needed. This is a critical point that the author must be clarify. 3. Please verify the calculations I performed in the attached Excel file. I computed the Mean Absolute Percentage Error (MAPE) between observed and predicted SOC values and, even excluding values near zero, found it to exceed 50%. This indicates substantial relative errors. 4. Given the validation metrics reported, and the fact that your training dataset covers a vast area across multiple Mexican states—far larger than the ranches areas, where distant observations could bias local (ranches) soil predictions—what rationale led you to adopt a single global prediction model for the entire project area instead of building models specific to each spatial stratum? Did you evaluate alternative approaches, such as weighting training data by the inverse Euclidean distance from the target strata to sites in other strata? Finally, which results or criteria support the decision to use a global model?						
Project participant response						Date : 10/05/2025
1. Yes. It is also from a completely different sampling campaign (one that was carried out specifically on our project farms, nearly a decade after the calibration dataset), and is tested by a different lab (Agrolab). All these factors contribute to noise – which manifests in the lower ability of a model trained on data from a completely different sampling campaign and lab to predict outcomes on this dataset. That said, there is a statistically significant signal still being observed, and the rest of the observed error in the validation set is ultimately included in the subsequent uncertainty propagation so the final carbon credit calculation remains conservative. See uncertainty section above as well. 2. Firstly, note that the requirement threshold set by Verra for R^2 is being greater than 0 (see Verra guidance in FAR05 and also copied in a section above). R^2 greater than 0 guarantees that there is a non-zero signal being picked up by the model (i.e. it performs better than a simple prediction of the mean value of the dataset). Also, as seen in the response above, there are noise contributions in the validation dataset from being from a different sampling and testing campaign compared to the original calibration dataset. The R^2 and accompanying prediction intervals do suggest that there are important uncertainties to be accounted for. However, it must be noted that these calculations are all at the pixel level, and there are indeed reductions in uncertainty when we aggregate from pixel-support to ranch-support and then to the project level. Finally, at the project level, the results are good enough to conclude that real statistically-significant soil carbon change has occurred due to the project. A good paper to refer to on this topic of map uncertainty aggregation is Wadoux and Heuvelink, 2023 [1]. Alexandre Wadoux is also the expert tapped by Verra to advice on remote sensing prediction uncertainty. An important graph from his work is the Figure 1 in the paper.						
 As seen in this image, when the point support errors have weak correlation between nearby pixels, the spatial average exhibits a significant reduction in error, and vice versa. The paper also has a simulated example in Fig 2, and a real worked example for SOC in Fig 3, showing the same. In the						

CAR ID	27	Section no.	Mexico SOC Remote Sensing Summary	Technical	Date:	02/05/2025
case of our models, in a similar fashion, the machine learning models are trained on a pixel basis, and thus tend to have only weak correlation in the results of nearby pixels, resulting in a decrease in uncertainty when aggregated. 3. The MAPE is calculated correctly – it is slightly higher than the 52% MAPE found for the test dataset, which is expected given that the validation samples are from a different sampling and test campaign than the test data. The validation RPIQ is 1.44 (acceptable), slightly lower than the test data RPIQ. However, as seen in the previous responses, note that there are 3 other specific metric thresholds that Verra has set as requirements, which were stated in an earlier response and in FAR05 by Verra ($R^2 > 0$, 90% PICP and zero bias). Also, note that these are all pixel-level errors that experience reduction when aggregated to the ranch level using spatial correlation accounting techniques like those given in Wadoux & Heuvelink. The ranch-level error as shown in the example in the doc, is much lower than that at the pixel-level. 4. There is not enough data available in northern Mexico to build a custom model for each spatial stratum, particularly for any strata that are extremely small. However, it should be noted that the project mostly covers sandy clay loam and sandy loam soil textures, and is present in a semi-arid ecoregion region whose only wet season is July-September, with the rest of the year very dry. These factors provide a degree of consistency. The model is not built for all parts of Mexico, but for only these specific parts included in the project. The validation metrics show that the model is unbiased on the model-level (the total dataset bias is not significant from 0), and that the model is able to measure a non-zero signal on the validation dataset ($R^2 > 0$). Furthermore, the discussion in the document and in the answer just above with the paper from Wadoux et al shows how the uncertainty experiences a decrease with aggregation from pixel to ranch level and then to project level. We have not tried weighting training data by the inverse Euclidean distance to the project sites. However, we have tried a K-Nearest Neighbors (KNN) analysis, which reveals that a spatial localization of the modeling does not necessarily improve the ability to predict the validation SOC. This is likely due to the high spatial variability in SOC between nearby points, which is well-known in the SOC literature (just see Fig 3 in Wadoux and Heuvelink, the top row) and also the noise introduced by the different sampling and testing campaign between the calibration data and the validation data, as noted previously. On the basis of these results, we conclude that a pixel-based machine learning model that utilizes representative data from the full ecoregion of interest and has an underlying physical basis for measurement (eg. the statistically significant change in radar backscatter from the soil due to the change in SOC) is the best approach.						
Documentation provided by project participant						
Revised Mexico SOC Remote Sensing Technical Summary						
DOE assessment					Date :	12/05/2025
1. Although the validation data originates from a different sampling campaign and lab, which introduces some noise, the model still exhibits a statistically significant signal, as shown by the R^2 value. This noise is effectively accounted for in the uncertainty propagation process, ensuring that the final carbon credit calculation remains conservative. Additionally, the aggregation of uncertainty from pixel to ranch and project levels, supported by the work of Wadoux and Heuvelink, reduces error and strengthens the model's predictive ability. Despite the data differences, the model performs better than a simple mean prediction, and the signal remains valid for carbon credit calculations. 2. Does spatial averaging of predictions lead to improved generalization of true values by decreasing both prediction error and associated uncertainties? The other findings remain open till this is closed.						
Project participant response					Date :	10/05/2025
2. Yes, it does. That is the result of the Wadoux et al paper and the real-world examples given in that paper. The prediction error goes down because the random noise between pixels is reduced by the						

CAR ID	27	Section no.	Mexico SOC Remote Sensing Summary	Date:	02/05/2025
averaging. The validation prediction error is the combined effect of the noise associated with model inputs, model imperfections, and any differences in the coverage of the domain by the training data versus the validation data. Of these different sources of prediction error, the former 2 (model inputs and model imperfection) have the greatest room for reduction from averaging as they are almost wholly random in nature. The latter (different coverage of train vs validation) also has a certain, lower potential, for reduction from the averaging, via the simulated validation residuals generated from the kriging used in the uncertainty propagation. The uncertainty associated with the average (i.e. the extent to which the prediction error goes down) is highly non-trivial to calculate, and that is the purpose of the Bayesian Kriging method and its associated geostatistics used in our work. Wadoux also gives an equivalent pairwise integration method to calculate the same, and to show the associated uncertainties being decreased. Ultimately, the implication is that the predicted ranch-level SOC average is much closer to the true ranch-level SOC average than the typical pixel prediction is to the true value at that pixel. This is supported by substantial geostatistics literature. This is seen visually in Figure 14 in our document where the boxplot ranges become visibly smaller than the observed prediction errors in the validation data scatterplot (Figure 16) (We are aware the ordering of the sections may be a bit confusing, but the error aggregation uses the prediction errors from the validation dataset, so all errors are propagated).					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
Yes, spatial averaging of predictions improves the generalization of true values by reducing both prediction error and associated uncertainties, as supported by the findings of Wadoux et al. Averaging mitigates random noise between pixels, primarily addressing errors from model inputs and imperfections. While differences in the coverage of training and validation data contribute to prediction error, spatial averaging further reduces this through simulated validation residuals generated by kriging. The uncertainty reduction achieved through averaging is complex to quantify, but the Bayesian Kriging method effectively accounts for it, demonstrating that the ranch-level soil organic carbon (SOC) average is closer to the true value than pixel-level predictions. This is visually confirmed in Figure 14, where the error ranges for aggregated predictions are smaller than those observed in the validation dataset scatterplot (Figure 16). A clearer structure and improved organization of the document are essential for better understanding. Hence, this finding will be closed once the document structure is refined.					
Project participant response				Date :	10/05/2025
Our methods for spatial aggregation (Bayesian Regression Kriging as noted in the section above) are aligned with the Wadoux and Heuvelink work, and are showing statistically significant SOC increase at the project level within the first verification period (2018-2022). [1] Wadoux, A. M. C., & Heuvelink, G. B. (2023). Uncertainty of spatial averages and totals of natural resource maps. <i>Methods in Ecology and Evolution</i>, 14(5), 1320-1332.					
Documentation provided by project participant					
DOE assessment				Date :	12/05/2025
The response provided by the PP confirms that their methods for spatial aggregation, specifically Bayesian Regression Kriging, are consistent with the methodology outlined in the Wadoux and Heuvelink (2023) paper. This approach effectively accounts for spatial uncertainties and has led to a statistically significant increase in soil organic carbon (SOC) at the project level during the first verification period (2018-2022). Given that the aggregation method is aligned with established geostatistical practices and the results demonstrate a meaningful SOC increase, it supports the conclusion that spatial averaging improves model generalization and reduces uncertainty. Therefore, this finding is addressed and closed.					

CL ID	14	Section no.	5.5 GHG Emission Reductions and Carbon Dioxide Removals	Date:	12/05/2025
Description of CL					
The table presents notable discrepancies between ex-ante estimated and achieved GHG reductions/removals across several vintage years—for instance, 155% achievement in 2019, 52% in 2021, and 197% in 2022. While some explanation appears to have been provided, it is either incomplete or insufficiently detailed to justify the extent of the variances. To ensure transparency and credibility, the PP should strengthen the justification by providing clear, year-wise explanations supported by data or relevant contextual factors, and assess whether methodological or operational changes contributed to the deviations.					
Project participant response				Date :	14/05/2025
The table has been revised with the updated values making it clear on the difference in ex-ante estimated and achieved GHG reductions/removals across the vintage years of the 1 st PAI. The explanation has also been updated to justify the variation.					
Documentation provided by project participant					
ERR Calculations - Mexico_MR_MP1_V4					
DOE assessment				Date :	18/05/2025
The finding is considered closed. PP has addressed the concern by revising the table to clearly present the differences between ex-ante estimated and achieved GHG reductions/removals across the vintage years of the first PAI. The explanation has also been updated to provide year-wise justifications for the observed variances, supported by relevant data and contextual factors. This enhanced clarity and transparency adequately address the original concern and support the credibility of the reported results.					

RothC Model Validation CL/CARs and Responses

CAR ID	28	Section no.	Clarification on Carbon Unit "tons" usage	Date:	29/04/2025
Description of CAR					
The term "tons" used in the Model Validation Report (MVR) is ambiguous because it can mean either metric tons (1,000 kg) or Imperial short tons (907.18 kg). Please clarify the exact unit used by adding a note specifying the conversion factor to kilograms to avoid confusion. No changes to graphs are necessary if this clarification is added as a note.					
Project participant response				Date :	30/04/2025
A clarification note was added in the MVR explicitly defining "ton" as metric ton (1 ton = 1,000 kg) to avoid ambiguity. No changes to figures were required.					
Documentation provided by project participant					
Revised MVR (version dated 30/04/2025)					
DOE assessment				Date :	12/05/2025
The PP has addressed the finding by adding a clarification note in the Model Validation Report (MVR) explicitly defining "ton" as metric ton (1 ton = 1,000 kg), thereby resolving the ambiguity regarding the unit of measurement. This clarification aligns with standard carbon accounting practices and ensures consistency in interpretation. As the figures and calculations were already based on metric tons, no changes to graphs or data visualizations were necessary. The response is satisfactory, and the finding is closed.					

CAR ID	29	Section no.	Terminology adjustment for carbon input description	Date:	29/04/2025
Description of CAR					
In the MVR, in the description of carbon inputs (page 13), remove the word "farmyard" before "manure" since "manure" alone sufficiently covers all relevant forms of organic inputs. This change aligns with prior discussions and maintains clarity.					
Project participant response				Date :	30/04/2025
The term "farmyard manure" was replaced with "manure" throughout the MVR as requested. The rationale for excluding explicit farmyard manure inputs was maintained as sound.					
Documentation provided by project participant					
Revised MVR (version dated 30/04/2025)					
DOE assessment				Date :	12/05/2025
The PP has replaced the term "farmyard manure" with "manure" throughout the MVR as requested, ensuring consistency with prior discussions and maintaining clarity. The rationale for excluding explicit references to farmyard manure inputs is sound and aligns with the broader definition of manure as an organic input. The change has been appropriately implemented, and the finding is closed.					

CAR ID	30	Section no.	File repository terminology and spin-up details	Date:	29/04/2025
Description of CAR					
- Change the label "fine" to "final" in the versioned file repository description for clarity. - Provide detailed documentation on the model spin-up procedure used to normalize carbon inputs at the start of the simulation (c_input_norm_t0). This includes specifying the proportions of decomposable plant material (DPM), resistant plant material (RPM), and humified organic matter (HUM), their monthly distribution, and the criteria used to determine a "match" during spin-up. - Include the code used for the spin-up process in the file repository and update the repository description accordingly. - Clarify whether the spin-up procedure and c_input_norm_t0 derivation are identical for baseline and project scenarios or if differences exist, for transparency.					
Project participant response				Date :	01/05/2025
- The file repository description was updated to replace "fine" with "final." - Detailed spin-up criteria and methodology were added to the file repository documentation. - The spin-up code used to achieve c_input_norm_t0 matching was included in the repository. - It was confirmed that the spin-up procedure and c_input_norm_t0 derivation are the same for both baseline and project scenarios, and this was explicitly stated in the documentation.					
Documentation provided by project participant					
Updated file repository and description					
DOE assessment				Date :	12/05/2025
The PP has addressed the finding by updating the file repository description to replace "fine" with "final" for clarity. Detailed documentation on the model spin-up procedure, including the proportions of decomposable plant material (DPM), resistant plant material (RPM), and humified organic matter (HUM), as well as their monthly distribution and the criteria for "match" during spin-up, was added. The spin-up					

code used to achieve c_input_norm_t0 matching has also been included in the repository. Additionally, it was clarified that the spin-up procedure and c_input_norm_t0 derivation are identical for both baseline and project scenarios, with this explicitly stated in the documentation. The response is satisfactory, and the finding is closed.

CAR ID	31	Section no.	PMU (Prediction Model Uncertainty) calculation methodology	Date:	29/04/2025
Description of CAR					
- The current PMU calculation in the spreadsheet is incorrect. According to VMD0053 equation (2), pooling of uncertainty should only be done across studies that provide measured standard deviations, not by assigning measured values from one study to another. - Pool uncertainty across baseline and project observations since their measurement uncertainties appear similar. - Provide an example calculation of PMU in the MVR appendix (not just in the spreadsheet) to meet VMD0053 requirements and facilitate independent assessment.					
Clarify that the spreadsheet is supplementary and was not part of the formal evaluation					
Project participant response				Date :	01/05/2025
- PMU calculations were corrected to pool uncertainty properly across baseline and project observations within studies that have measured standard deviations. - An example PMU calculation was added to the MVR appendix for clarity and compliance. - The spreadsheet was maintained as supplementary material and noted as not part of the formal assessment.					
Documentation provided by project participant					
Revised MVR appendix and updated spreadsheet (dated 01/05/2025)					
DOE assessment				Date :	12/05/2025
The PP has addressed the finding by correcting the PMU calculations to properly pool uncertainty across baseline and project observations within studies that have measured standard deviations, in line with VMD0053 equation (2). Additionally, an example of the PMU calculation has been included in the MVR appendix to enhance clarity and ensure compliance. The spreadsheet has been maintained as supplementary material and clearly noted as not part of the formal assessment. The response is satisfactory, and the finding is closed.					

CAR ID	32	Section no.	Confidence Interval figure accessibility and labelling	Date:	29/04/2025
Description of CAR					
- The confidence interval figure is difficult to interpret for colour-blind users due to reliance on color alone. - Suggest numbering the Y-axis from Study 1 onwards and including study numbers and labels for each data point to improve readability. - Ensure all study labels indicate whether data points correspond to baseline or project conditions, especially for studies like Allen et al. (2013) which include both.					

CAR ID	32	Section no.	Confidence Interval figure accessibility and labelling	Date:	29/04/2025
Project participant response				Date :	30/04/2025
- The Y-axis of the confidence interval figure was updated to include study numbers and labels for each data point. - Labels now explicitly indicate baseline or project status for all studies, including the two points from Allen et al. (2013), which were confirmed to both be improved practice sites. - These changes improve accessibility and clarity for all users, including those with colour vision deficiencies.					
Documentation provided by project participant					
Updated MVR Figure 3 (version dated 01/05/2025)					
DOE assessment				Date :	12/05/2025
The PP has addressed the finding by updating the Y-axis of the confidence interval figure to include study numbers and labels for each data point, improving readability. Additionally, labels now explicitly indicate whether data points correspond to baseline or project conditions, with clarification provided for both points from Allen et al. (2013), confirming them as improved practice sites. These changes enhance accessibility and clarity, particularly for users with color vision deficiencies. The response is satisfactory, and the finding is closed.					

CAR ID	33	Section no.	Validation Data Alignment and Comparison Methodology	Date:	29/04/2025
Description of CAR					
- Clarify that validation uses individual site data (Site_ID) rather than multiple samples within a paddock to avoid inappropriate data aggregation. - For studies like Pineiro et al. (2009) with multiple dispersed baseline sites having different soil/climate inputs, the current approach averages model predictions but not observations, causing misalignment in goodness-of-fit comparisons. - Recommend either averaging both predicted and observed values across the study or comparing predictions and observations on a per-location basis to ensure alignment. - For Allen et al. (2013), label baseline and improved practice points distinctly to enable bias and fit evaluation by condition. - Note that Long and King paper inclusion should follow consistent methodology as above.					
Project participant response				Date :	30/04/2025
- The label "Sample_ID" was changed to "Site_ID" in tables and text to clarify that data points represent different sites, not sub-samples. - The Pineiro et al. (2009) data was re-analyzed by comparing model predictions and observations on a per-location basis to align the comparison properly. - Allen et al. (2013) points were confirmed and labelled as improved practice sites; baseline vs. project distinctions were reviewed and documented. - The approach for Long and King paper inclusion was noted for future consistency.					
Documentation provided by project participant					

CAR ID	33	Section no.	Validation Data Alignment and Comparison Methodology	Date:	29/04/2025
Revised validation spreadsheet and updated MVR (dated 01/05/2025)					
DOE assessment				Date :	12/05/2025
The PP has addressed the finding by making the following clarifications and revisions: The label "Sample_ID" was changed to "Site_ID" in tables and text to clearly distinguish data points representing individual sites rather than sub-samples. The Pineiro et al. (2009) data was re-analyzed by comparing model predictions and observations on a per-location basis to ensure proper alignment in the goodness-of-fit comparisons. For Allen et al. (2013), baseline and improved practice points were confirmed, labelled distinctly, and reviewed to support bias and fit evaluation. The PP also noted that the approach for the Long and King paper inclusion will follow a consistent methodology in the future. These actions resolve the finding, and the finding is closed.					

CAR ID	34	Section no.	Independence of calibration and validation data	Date:	11/04/2025
Description of CAR					
- Concern raised that the carbon input model for the project scenario is calibrated using SOC values from the validation data, leading to non-independence between calibration and validation datasets. - Suggest alternatives such as using biomass production data independent of SOC measurements or other data sources for calibration to maintain independence. - Request clarification on how the calibration and validation independence issue is addressed in the MVR.					
Project participant response				Date :	24/04/2025
- The project team revised the MVR to clarify the calibration approach, emphasizing the use of independent data sources where possible. - They adopted a cross-validation strategy using peer-reviewed field trial data to calibrate project carbon inputs, aiming to maintain independence from validation SOC data. - The MVR now includes detailed explanation of the calibration-validation relationship and the true-up procedure applied per Verra guidance.					
Documentation provided by project participant					
Revised MVR and accompanying spreadsheet (24/04/2025) This detailed CL/CAR summary captures the main RothC-related questions and responses, showing the iterative improvements made to the MVR, validation spreadsheets, figures, and file repository documentation, with clear references to dates and supporting documents.					
DOE assessment				Date :	12/05/2025
The PP has addressed the concern by revising the MVR to clarify the calibration approach, emphasizing the use of independent data sources where possible. They adopted a cross-validation strategy using peer-reviewed field trial data to calibrate project carbon inputs, ensuring independence from validation SOC data. Additionally, the MVR now includes a detailed explanation of the calibration-validation relationship and the true-up procedure applied in accordance with Verra guidance. The response satisfactorily resolves the issue, and the finding is closed.					

CAR ID	35	Section no.	NPRR – External Risk	Date:	02/05/2025
Description of CAR					
Land Tenure – The PP is requested to provide additional details regarding land ownership and carbon ownership within the project scenario. Specifically, the PP is asked to submit evidence of the carbon agreement as referenced, to facilitate further assessment.					
Project participant response				Date :	10/05/2025
The land and carbon rights associated with the project are owned by the rancher. As the primary stakeholder, the rancher holds both the legal rights to the land and the carbon credits generated through the project's activities. A formal carbon agreement has been established between the rancher and Boomitra, which permits Boomitra to sell the carbon credits generated by the project on behalf of the rancher. Under the terms of the agreement, a significant portion of the proceeds from the sale of these carbon credits is returned directly to the rancher, ensuring that the rancher benefits financially from the carbon offset program. This arrangement allows Boomitra to manage the carbon credit sales while ensuring the rancher retains a substantial share of the financial returns.					
Documentation provided by project participant					
Revised NPRR, Carbon Agreement					
DOE assessment				Date :	12/05/2025
Based on the information provided by the PP, the land and carbon rights ownership is clearly defined, with the rancher retaining both the land and carbon rights. The carbon agreement between Boomitra and the rancher establishes a clear legal framework for the sale of carbon credits, where the rancher has granted Boomitra the opportunity to sell the credits generated by the project. Furthermore, the agreement ensures that the rancher receives the majority of the proceeds from the sale of these credits. This arrangement aligns with the principles of transparency and fair benefit-sharing. The VVB has reviewed the provided carbon agreement and confirms that it adequately supports the claims regarding carbon credit ownership and revenue distribution. Therefore, this finding is considered resolved, and no further action is required. The PP has sufficiently addressed the land tenure and carbon ownership concerns, and the finding is now closed.					

FAR

FAR ID	01	Section no.	General - Compliance with the Law	Date:	15/09/2025
Description of FAR					
Section 3.1.4 of the VCS Standards v4.7 document requires that “Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not the law is enforced.”					
In section 1.14 of the Registered PD, PP claims that there will be no double counting and the PP is allowed to develop the project. From the description provided in section 1.14 of the Registered PD it is also understood that the project area falls under the scope of Mexico NDCs.					
As of now there is no Mexico’s regulatory framework for carbon market. However, in future (before the verification) if the host country proposes a regulatory framework then the PP is required to request an official letter from the Mexican government that allows the PP to develop the carbon project in the project area as well as trade Verified Carbon Units (VCUs) in the voluntary carbon market.					
Note: This issue was assessed for the 1st Monitoring Period, with details provided in Appendix 3 of this document. However, the FAR remains open and has been raised again for future monitoring periods.					
Project participant response				Date :	
NA					
Documentation provided by project participant					

FAR ID	01	Section no.	General - Compliance with the Law	Date:	15/09/2025
DOE assessment				Date :	
NA					

FAR ID	02	Section no.	NA	Date:	02/02/2026
Description of FAR					
In the next verification, it shall be ensured that the project achieves full compliance with VT0014 as the project proponent intends to migrate the project to the most recent version of VM0042, which incorporates VT0014.					
Project participant response				Date :	
NA					
Documentation provided by project participant					
DOE assessment				Date :	
NA					

APPENDIX 5: COMPETENCE OF TEAM MEMBERS

<u>Certificate of Competence</u>							
Name	☒ Mr. ☐ Ms.	Ma Paa Puratchikkanal					
Qualification Procedure	Fulfil the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GCC/GHG Projects.						
Appointed to work as:							
	Validator/ Verifier	Team Leader	Trainee	Technical Expert	Technical Reviewer	Financial Expert	Approver
<i>Appointed</i>	Yes	Yes	No	Yes	Yes	Yes	Yes
<i>Appointed Date</i>	28-08-2023						
Authorized to work as Technical Expert for:							
Authorized Technical Area	Sectoral Scope		TA Code		Technical Area within the scope		
	Energy industries (renewable - / non-renewable sources)		1.1		Thermal energy generation		
	Energy industries (renewable - / non-renewable sources)		1.2		Renewables		
	Energy demand		3.1		Energy demand		
	Construction		6.1		Construction		
	Waste handling and disposal		13.1		Solid waste and wastewater		
	Waste handling and disposal		13.2		Manure		
	Agriculture		15.1		Agriculture		

<i>Authorized to work as Local Expert for:</i>	
<i>Country/Countries</i>	India and Sri Lanka
<u>Compliance check by:</u>	Anand S. R.

<u>Certificate of Competence</u>							
<i>Name</i>	☒ Mr. ☐ Ms.	Dr. Francisco Gonzalez					
<i>Qualification Procedure</i>	Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GCC/GHG Projects.						
<i>Appointed to work as:</i>							
	Validator/ Verifier	Team Leader	Trainee	Technical Expert	Technical Reviewer	Financial Expert	Approver
<i>Appointed</i>	No	No	No	Yes	No	No	No
<i>Appointed Date</i>	29-08-2023						
<i>Authorized to work as Technical Expert for:</i>							
<i>Authorized Technical Area</i>	Sectoral Scope		TA Code		Technical Area within the scope		
	Afforestation and reforestation		14.1		Afforestation and reforestation		
	Agriculture		15.1		Agriculture		
<i>Authorized to work as Local Expert for:</i>							
<i>Country/Countries</i>	Mexico						
<u>Compliance check by:</u>				Anand S R			
<u>Certificate of Competence</u>							

Name	☒ Mr. ☐ Ms.	Dr. Raúl Roberto Poppiel					
Qualification Procedure		Fulfil the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GCC/GHG Projects.					
Appointed to work as:							
	Validator/ Verifier	Team Leader	Trainee	Technical Expert	Technical Reviewer	Financial Expert	Approver
<i>Appointed</i>	No	No	No	Yes	No	No	No
<i>Appointed Date</i>	05-03-2025						
Authorized to work as Technical Expert for:							
<i>Authorized Technical Area</i>	Sectoral Scope		TA Code		Technical Area within the scope		
	Afforestation and reforestation		14.1		Afforestation and reforestation		
	Agriculture		15.1		Agriculture		
Authorized to work as Local Expert for:							
<i>Country/Countries</i>	-						
<u>Compliance check by:</u>				Anand S R			

<u>Certificate of Competence</u>		
Name	☒ Mr. ☐ Ms.	Stalin S

Qualification Procedure	<i>Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GCC/GHG Projects.</i>						
Appointed to work as:							
	Validator/ Verifier	Team Leader	Trainee	Technical Expert	Technical Reviewer	Financial Expert	Approver
<i>Appointed</i>	Yes	Yes	No	Yes	Yes	Yes	Yes
<i>Appointed Date</i>	30-08-2023						
Authorized to work as Technical Expert for:							
<i>Authorized Technical Area</i>	Sectoral Scope		TA Code		Technical Area within the scope		
	Energy industries (renewable - / non-renewable sources)		1.1		Thermal energy generation		
	Energy industries (renewable - / non-renewable sources)		1.2		Renewables		
	Energy distribution		2.1		Energy distribution		
	Energy demand		3.1		Energy demand		
	Waste handling and disposal		13.1		Solid waste and wastewater		
	Waste handling and disposal		13.2		Manure		
Authorized to work as Local Expert for:							
<i>Country/Countries</i>	India						
Compliance check by:							
				Anand S. R.			

<u>Certificate of Competence</u>		
Name	☐ Mr. ☒ Ms.	Zainab Hassan

Qualification Procedure	<i>Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GCC/GHG Projects.</i>													
Appointed to work as:														
	Validator/ Verifier	Team Leader	Trainee	Technical Expert	Technical Reviewer	Financial Expert	Approver							
<i>Appointed</i>	Yes	No	No	Yes	No	No	No							
<i>Appointed Date</i>	28-08-2023													
Authorized to work as Technical Expert for:														
<i>Authorized Technical Area</i>	Sectoral Scope		TA Code		Technical Area within the scope									
	Afforestation and reforestation		14.1		Afforestation and reforestation									
Authorized to work as Local Expert for:														
<i>Country/Countries</i>	India													
Compliance check by:				Anand S. R.										

APPENDIX 6: ABBREVIATIONS

4KES	4K Earth Science Private Limited
AFOLU	Agriculture, Forestry and Other Land Use
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
EB	Executive Board
ER	Emission Reductions
FAO	Food and Agricultural Organization of United States
FAR	Forward Action Request
FSC	Forest Stewardship Council
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel for Climate Change
ISO	International Organization for Standardization
KML	Keyhole Markup Language
MoU	Memorandum of Understanding
MP	Monitoring Period
MRV	Monitoring, Reporting and Verification
NDC	Nationally determined contributions
PD	Project Description
PP	Project proponent
QA/QC	Quality Assurance/Quality Control
SDG	Sustainable Developmental Goals
SOC	Soil Organic Carbon
tCO ₂	Tonnes of Carbon Dioxide
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard