YACUMAMA FOREST CARBON PROJECT

Document Prepared By Conservation Management Institute at Virginia Tech-College of Natural Resources and Environment

Project Title	Yacumama Forest Carbon Project
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PROJECT DETAILS

1.1 Summary Description of the Project

The overall goal for the Yacumama Forest Carbon Project ("Project") is to protect and conserve the tropical lowland floodplain forest on Yacumama for long-term carbon sequestration, avoidance of GHG emissions from deforestation and degradation, and conservation of biodiversity. Yacumama is a privately held, former eco-tourist lodge and forestland located in the Amazon Basin of Peru whose current ownership ("project proponent") chose to alter its mission from tourism, supplemented by forest resource exploitation and agriculture, to ecological research, education, and conservation.

A majority of Yacumama would, by economic necessity, be harvested by the project proponent in the absence of funding from carbon financing in order to maintain ownership of the property. The project proponent began implementing the harvest of forest resources based upon an approved 12 month harvest Plan *Operativo Anual Para Permiso Forestal De Propiedad Privada* (Annual Operating Plan Forest Permit on Private Property). However, before pursuing a more aggressive approach to harvest the timber,

Yacumama management became aware of and investigated pursuing carbon offsets as an alternative income stream. The Yacumama management team ceased timber harvesting operations by 2011 and began to investigate carbon financing as a sustainable long-term solution to their financial situation. Yacumama began contacting various technical experts in late 2011 and sent the Virginia Tech Conservation Management Institute maps, a forest harvest plan, ownership documents, tax receipts, export licenses, photographs etc. to review for the purpose implementing a forest carbon project. The Project will use carbon financing to protect the forest and avoid harvesting of the forest for the valuable timber and conversion to agriculture. The primary methods employed to achieve the desired result is maintaining and increasing a robust presence both at the main facility and implementing regular patrols of the property to prevent incursions and illegal logging. An estimated 729,827 tons of CO_2 emissions will be avoided if the project is successfully implemented.

1.2 Sectoral Scope and Project Type

This Project will be verified to the Verified Carbon Standard Version 3.5 as Agriculture, Forestry, or Land Use (AFOLU) Project using a strategy of reducing emissions from deforestation and degradation (REDD) from avoided planned deforestation. This Project is not a grouped project.

1.3 Project Proponent

Organization name	Yacumama
Contact person	Lawrence Bishop
Title	Owner
Address	PO Box 1098, Nashville, Indiana, 47448-1098
Telephone	812-988-2056
Email	laal.bishop@gmail.com

1.4 Other Entities Involved in the Project

Organization name	Yacumama
Role in the project	Site Manager
Contact person	Mr. Norman Walters
Title	Director Yacumama S.R. Ltda. Peru SA
Address	644 NW 18th St. Homestead, FL 33030
Telephone	786-376-1072
Email	newaltersdesigns@gmail.com

Organization name	Virginia Tech Conservation Management Institute
Role in the project	Technical Lead
Contact person	Verl Emrick
Title	Research Scientist-Ecologist
Address	1900 Kraft Drive, Suite 250, Blacksburg Va
Telephone	540-231-8851
Email	vemrick@vt.edu

Organization name	Virginia Tech Conservation Management Institute
Role in the project	Field Team Lead
Contact person	Aaron Teets
Title	Research Scientist-Ecologist
Address	1900 Kraft Drive, Suite 250, Blacksburg Va
Telephone	540-231-7348
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1.5 Project Start Date

Project start date is based upon a series of decisions made by the Yacumama management team during 2010 and 2011 (personal communication Lawrence Bishop December 2011) to cease pursuing timber harvesting operations and pursue carbon financing as a sustainable long-term solution to their financial situation. Verl Emrick (Virginia Tech- Conservation Management Institute) spoke with Mr. Bishop in December of 2011regarding the potential for a forest carbon project. After this conversation Mr. Bishop sent the Virginia Tech Conservation Management Institute maps, a forest harvest plan, ownership documents, tax receipts, export licenses, photographs etc. to review for the purpose of assessing the suitability of a forest carbon project. The documents were received early January 2012. Because CMI as the project technical lead received documents from Mr. Bishop in January 2012 specifically for the purpose of pursuing a Forest Carbon Project, the project is using **January 1, 2012** as the project start date.

1.6 Project Crediting Period

Project crediting period start date is January 1, 2012 with an end date of December 31, 2041 resulting in a Project length of 30 years.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Total GHG emission reductions were estimated 729,827 $mtCO_2e$ (Table 1).

Project	*
Large project	

Table 1: Summary of estimated 10 year ex ante yearly GHG emission reductions (mt CO_2 e).

Years	Estimated GHG emission reductions or removals ($mtCO_2e$)
2012	66,978
2013	68,313
2014	69,647
2015	70,981
2016	72,316
2017	73,650
2018	74,984
2019	76,319
2020	77,653
2021	78,987
Total estimated ERs	729,827
Total number of crediting years	10
Average annual ERs	72,982

1.8 Description of the Project Activity

The Project will use carbon financing to protect the forest and avoid harvesting of the forest for the valuable timber and conversion to agriculture. The primary methods employed to achieve the desired result is maintaining and increasing a robust presence both at the main facility and implementing regular patrols of the property to prevent incursions and illegal logging. In addition, an integrated monitoring program that addresses both carbon and biodiversity will be implemented to insure permanence for the climate and biodiversity benefits. Furthermore, the need to staff the facility, patrol the forest and river and monitor the forest biomass and biodiversity will require hiring and training of additional staff from the local community of Puerto Miguel. Finally, Yacumama management will be able to continue supporting health

care for local communities by providing facilities for Amazon Promise[1] and furnishing monetary support to the local clinic in Puerto Miguel. Project is not covered by a jurisdictional REDD+ program.
Lawrence Bishop will be responsible hiring contractors for future monitoring, carbons sales, and finances in the United States. Mr. Bishop has served as the primary United States fiscal manager for Yacumama lodge since inception in the 1990's. Mr. Bishop is also a licensed commodities broker and will be responsible for marketing, selling, and managing funds derived from carbon offsets sales. Mr. Lawrence Bishop contracted the Virginia Tech Conservation Management Institute to support the development of the project design document, collect data supporting the Project, design the project monitoring plan and implement the project monitoring plan. Implementation decisions regarding Project activities are the sole responsibility of Lawrence Bishop (Yacumama Lodge).

The Virginia Tech Conservation Management Institute (CMI) serves as technical support for Project design and monitoring. CMI is a research center within the College of Natural Resources and Environment at Virginia Tech in Blacksburg, VA. CMI has extensive experience in the development and implementation of carbon offset projects in addition to experience in monitoring protocol development and implementation for natural resources throughout North America with additional experience in Belize, Dominican Republic, Peru, and Nepal.

Mr. Norman Walters will be responsible for management of the infrastructure, forest protection at Yacumama, and business matters within the country of Peru. In addition, Mr. Walters is the diplomatic liaison between Yacumama and the local communities because of his fluency in the local Spanish dialect. Mr. Walters has extensive experience working in the Peruvian Amazon and was the manager who hired hire 90 local village workers and taught them skills pertinent to construction in the Amazon Jungle. Mr. Walters was the local manager for Yacumama Lodge, and managed all aspects of construction, employee relations, banking, liaison for all Peruvian Government actions and interactions. Mr. Walters will be responsible for the day to day operations at Yacumama during the course of the project.

[1] Amazon Promise is a U.S. based, non-profit organization founded to provide desperately needed medical and dental care to remote populations living in the Upper Amazon Basin of Northeastern Peru. (http://www.amazonpromise.org/).

1.9 Project Location

The Yacumama Forest Carbon Project is located in the Peruvian Amazon Basin approximately 15 km straight line upstream from the confluence of the Rio Marañon and Rio Ucayali which join to form the Amazon River. The entire Yacumama property encompasses (3,202 ha) of tropical rainforest in three parcels: Yacumama (202 ha), Yacurana (1425 ha), and Santuario Privado (1575 ha)[2] of which the latter two parcels will be made available for conversion to agricultural uses in the absence of carbon financing. The Project area is located at latitude -4° 34' 03.26'' North, and at longitude -73° 27' 04.64'' East in the Loreto District, Peru roughly 90 km south of the city of Iquitos (Figures 1, 2, 3).

[2] The three parcels are collectively referred to as "Yacumama."

Figure 1: Yacumama Forest Carbon Project location at a continental scale.

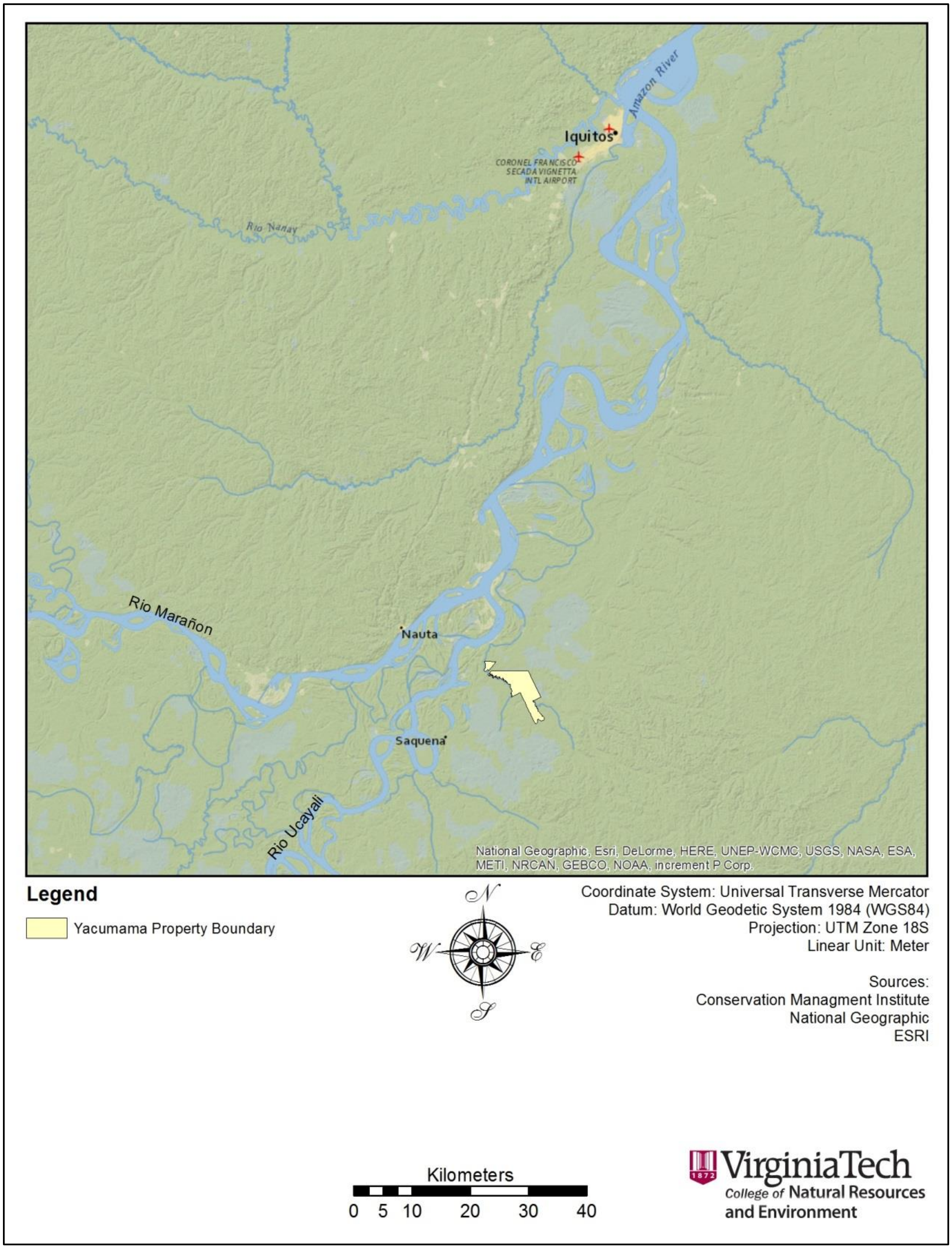

Figure 2: Yacumama Forest Carbon Project location at a regional scale.

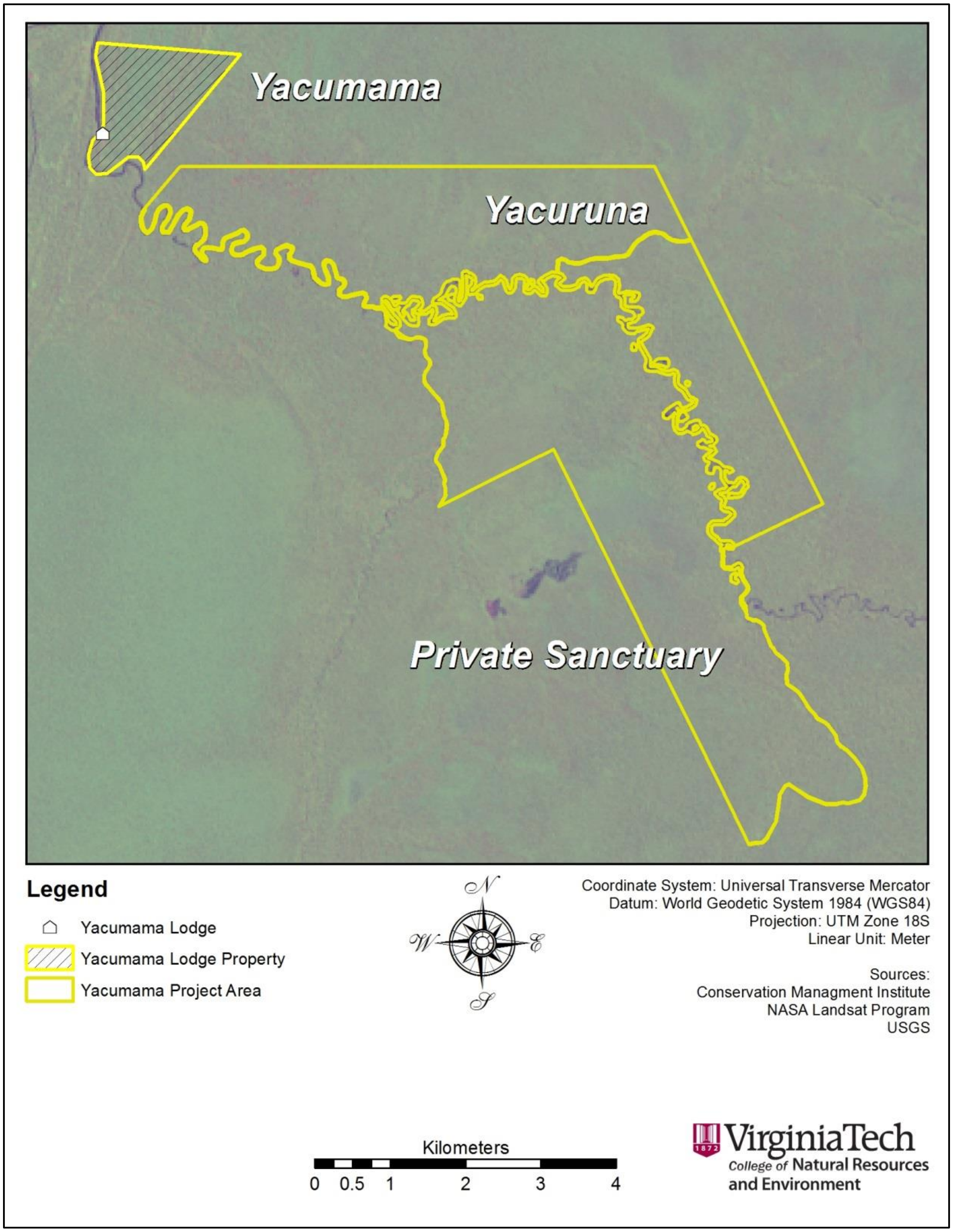

Figure 3: Yacumama Forest Carbon Project boundary at a local scale.

1.10 Conditions Prior to Project Initiation

The three parcels, now known as Yacumama, were purchased in in 1992 with the intent of developing a lodge and private conservation area to support ecotourism and promote education, research, and the conservation of biodiversity. From 1992-1994 lodge buildings and other infrastructure were constructed to support the ecotourism operation. In addition, the relationship with the local village of Puerto Miguel began in earnest as workers were hired and local goods and services were procured. By 1995 the lodge was fully operational and being promoted internationally. From 1995-2001 business was running smoothly for Yacumama and there were continued improvements to infrastructure and expanded lodge facilities to support additional tourism were constructed. During this time period, Yacumama management built and supplied a health care clinic in Puerto Miguel and assisted in the development of a local women's cooperative to sell local arts and crafts to visitors. In September 2001 the terrorist attacks in the United States caused an immediate cessation of new reservations and cancellation of all previously booked guests. Because of the absence of business, the lodge was forced to close and the facilities were 'mothballed' from 2002-2004 leaving only a skeleton staff to provide security and limited maintenance. During 2005-2006 the lodge underwent renovations and updates in anticipation of re-opening. By 2007 as the world economy experienced recession, the management of Yacumama began to promote and focus on conservation education and scientific research instead of tourism as a strategy to expand their clientele. However in 2008, a fire in the main lodge damaged much of the building and other infrastructure prompting the management to again close Yacumama. By 2009 Yacumama management had determined that the ecotourism model for maintaining the property was unsustainable and a different approach was required. Because of the cost of maintaining the facility, Yacumama management decided to undertake logging operations and develop agriculture on the two parcels encompassing the project area and consulted on the development of a harvest plan with the Government of Peru (Appendix B). An initial 12 month harvest Plan *Operativo Anual Para Permiso Forestal De Propiedad Privada* (Annual Operating Plan Forest Permit on Private Property) was developed for Yacumama to implement using their own manpower and sawmill. After initial limited logging and exporting of lumber, Yacumama management came to the conclusion that to make sufficient income to maintain the lodge property a large-scale logging operation, which was beyond their current means, was required. Yacumama management began to investigate increasing their manpower and/or subcontracting a logging company to cut, mill and export the lumber and convert the logged area to agricultural purposes. However, before pursuing a more aggressive approach to harvest the timber Yacumama management became aware of and investigated pursuing carbon offsets as an alternative income stream. As a result, by late 2011, management concluded that there were two economic options: 1) sell the timber and develop agriculture on the property which would result in the large-scale logging, or 2) pursue carbon financing to maintain and protect the property and the associated biodiversity and ecosystem services[3]. Verl Emrick (Virginia Tech-Conservation Management Institute) spoke with Mr. Bishop in December of 2011regarding the potential for a forest carbon project. After this conversation Mr. Bishop sent the Virginia Tech Conservation Management Institute maps, a forest harvest plan, ownership documents, tax receipts, export licenses, photographs etc. to review for the purpose of assessing the suitability of a forest carbon project. The documents were received early January 2012. Because CMI as the project technical lead received documents from Mr. Bishop in January 2012 specifically for the purpose of pursuing a Forest Carbon Project, the project is using **January 1, 2012** as the project start date.

Table 2: Summary history of Yacumama lodge and property.

Year	Event	Notes
1992-1993	Purchase of property	Property was purchased from the Government of Peru for the purpose of developing an ecotourism lodge to provide income to conserve the property. Official land survey was conducted.
1993-1994	Infrastructure development	Building of lodge, bungalows and infrastructure to support ecotourism operation. Interaction with local communities begins in earnest (i.e. local workers, purchasing agricultural goods etc.).
1994-1995	Opening of Yacumama lodge	Promotion and client development focusing on educational tourism.
1995-2001	Yacumama lodge operation	Expansion of lodge facilities to meet the needs of larger groups. Continued improvement in infrastructure.
2001-2002	Tourism declines substantially	The terrorist attacks of September 11, 2001 caused an immediate cessation of tourism for Yacumama. All previously booked groups cancel. Lodge closes due to lack of bookings and is mothballed.
2002-	Yacumama lodge	Skeleton staff is maintained for security and maintenance of lodge

[3] See table 1 for summary.

2004	closed	facilities. Core infrastructure is maintained by cannibalizing other superfluous facilities.
2005-2006	Yacumama lodge refurbishment	Based upon improving economic conditions and the potential for increased tourism Yacumama refurbishes and updates lodge facilities in anticipation of re-opening. During this period Yacumama also funds the building of a health clinic in the village of Puerto Miguel.
2007-2008	Yacumama lodge refocus	Because of the international economic slowdown bookings were reduced. Yacumama management decides to increasingly focus on education and scientific research.
2008	Partial destruction of lodge facilities by fire	Fire partially destroys lodge facilities and results in closure as a tourist lodge. Lodge is mothballed and skeleton staff is maintained for security and maintenance of lodge facilities.
2009	Alternative income from logging	Due to the cost of maintaining the lodge facility Yacumama and the surrounding property would have to generate income from forest harvest and/or agricultural activities. Yacumama management undertakes logging operations and obtains necessary permits from Government of Peru. After initial logging and exporting of lumber Yacumama management came to the conclusion that to make sufficient income to maintain the property a large-scale logging operation was required.
2009-2011	Forest management decisions	By 2011 management decided that there were two economic options:1) engage in the large-scale logging and agricultural development of the property, or 2) pursue forest carbon financing to maintain the property.
2012-Present	Forest carbon project	Yacumama explicitly begins a forest carbon project.

Yacumama Climate, Soils and Hydrology

The upper Peruvian Amazon basin (Figure 2), where the Project is located, has a lowland tropical climate characterized by high heat / humidity and substantial rainfall throughout the year. Mean annual temperature at nearby Jenaro Herrera[4] is 25.9°C with a mean annual rainfall of 2715 mm (Kvist and Nebel 2001). While precipitation occurs throughout the year April typically has the highest rainfall and July the lowest rainfall.

Soils of Yacumama are classified as entisols which are soils of recent origin that developed from unconsolidated parent material and show little development of pedogenic horizons except an “A” horizon. Within the Project area there are two identified soil subgroups Typic Hydraquents and Typic Fluvaquent (Nebel et al. 2001b). Each subgroup has an upper “A” horizon 5–10 cm thick above an incipient “B” horizon extending to approximately 150 cm. The “B” horizon has a high clay content (generally exceeding 50%), but the fraction of sandy material increases with depth (Nebel et al. 2001b).

[4] The closest town with climate information available is Jenaro Herrera, a small river town situated on the Rio Ucayali, approximately 44 km southwest of the Yacumama Lodge.

The upper Peruvian Amazon Basin, defined as the region above the confluence of the Rio Ucayali and Rio Marañon (Figure 2), is affected by yearly flooding events that temporarily inundate large tracts of tropical forest. On average, flood stages peak in April and drop to their lowest in August (Lamotte 1990), but can be quite variable from year to year (Kvist and Nebel 2001). It is estimated that about 12% of the region (over 60,000 km^2) are exposed to annual flooding in the Peruvian Amazon Basin (Kvist and Nebel 2001, Salo et al. 1986). Water levels on the Ucayali can shift 9-10 m per year from its lowest to highest points (Lamotte 1990). The annual flooding is a natural part of the system and a key component of local ecosystem processes. Flood waters originating in the Andes Mountains carry large sediment loads that deposit essential plant nutrients as the flood waters recede. During the highest peak of flooding, almost the entire Yacumama property can be inundated. Thus, depending upon the time of year, the forest at Yacumama provides critical habitat for not only terrestrial species but aquatic species as well.

Streams in the Amazon basin are classified as either white-water, black-water, or clear-water.
This functional classification, based on the color of the streams and rivers, provide important clues to the origin, nutrient content, and even fish species assemblages (Kvist and Nebel 2001, Saint-Paul et al. 2000). White-water rivers are turbid, nutrient rich, and muddy in color due to the large amount of suspended sediment from runoff originating in the Andes (Kvist and Nebel 2001). White-water rivers are the most common type in the Peruvian Amazon Basin, including the two major tributaries forming the Amazon River, the Rio Ucayali and the Rio Marañon. Clear-water rivers originate in geologically older regions with low rates of erosion, hold little suspended sediments, are nutrient poor, and are a fairly uncommon river type in Peru. Black-water rivers, which are common in the Amazon basin, get their color from slowly degrading phenolic substances in leaves (e.g. tannins) originating in poorly drained swampy areas (Kvist and Nebel 2001). The Rio Yarapa on which Yacumama in located and which bisects much of the Project Area (Figure 3) is considered a black-water river. However, streams and rivers may also change water types during different times of the year which is true of the Rio Yarapa (Kvist and Nebel 2001). A river that is black-water for the majority of the year can become white-water during the annual flood stage due to the increased sediments collected during high-water periods. Portions of the

Yacumama property are influenced by white-water coming from the nearby Rio Cumaceba and Rio Ucayali which mix with the Rio Yarapa during high flood stage.

Yacumama Vegetation

Yacumama is located in the western Amazon basin and is part of the Amazon basin mixed-water flooded forest and riparian vegetation ecological system as defined by Josse et al. (2007) (Figure 6). More commonly, the forests at Yacumama are described and classified as tropical lowland floodplain rainforest. The floodplain forests of this region alternate between terrestrial and aquatic phases, impacted by floodwaters from 1-6 months per year based on topography. Nebel et al. (2001b) provides thorough treatment of the tree species composition on the floodplain forests of the Peruvian Amazon. The nutrient availability of the soils of floodplain forests are heavily influenced by the type of stream or river that seasonally floods the forest (Kvist and Nebel 2001). The relatively nutrient rich white-water rivers supply more sediment to forests than clear-water or black-water rivers. The Rio Yarapa is generally classified as a black-water river but during flood stage the Rio Yarapa carries a significant amount of sediment and resembles a white-water river thus increasing the amount of sediments and nutrients delivered to the forests of Yacumama thereby maintaining soil fertility.

Within the floodplain forests, two different habitat types have been described primarily based on the duration of inundation, restinga and tahuampa. Restinga is a riverine mixed forest habitat that occurs on the highest portions of the flood plain forest and is only inundated for 1-3 months a year (Kvist and Nebel 2001). Tahuampa is also a riverine mixed forest habitat, occurs on lower terrain than restinga, and is typically inundated from 3-6 months a year. Soils of both restinga and tahuampa are usually well-drained, and the tree species are resilient against long periods of inundation. Factors such as amplitude, frequency, and duration of flooding play a role in determining species composition, due to the fact that different species have varying tolerances to flooding (Kvist and Nebel 2001). There are no clear cut transitions between habitat types, and intermediate zones will have a mix of species from both restinga and tahuampa (Kvist and Nebel 2001). Nebel et al. (2001b) examined in detail the floristic composition of both restinga and tahuampa habitat types. In addition, Nebel et al. (2001b) found the highest species richness in the low restinga, and tahuampa, suggesting that plant diversity is related to inundation period. The proximity of habitat types to a river system is often an indicator of the age of the forest because of the constantly changing course of the river. The meandering nature of rivers in the floodplain contributes to the diversity of the region, creating a mosaic of different aged forests as it migrates (Salo et al. 1986). The project location (i.e. Western Amazon basin) is widely considered one of the most biodiverse regions on the planet with a high diversity of plants, insects, mammals, amphibians, and birds (Finer et al. 2008, Schulman et al. 2007). The floodplain ecosystems of the Peruvian Amazon basin have the highest species richness compared to all other floodplain forests worldwide (Wittman et al. 2011, Finer et al. 2008).

Yacumama Land Use Land Cover (LULC) Benchmark Map

Landsat sensors were used in geospatial analysis and to create LULC benchmark map for the project. The medium resolution imagery provided by landsat sensors is commonly used to map deforestation and estimate area change and widely recognized as a cost effective and accurate image source for mid-resolution data analysis (GOFC-GOLD 2014). The 2012 land use/land cover (LULC) map (figure 6) was derived from a cloud free Landsat 5, 2011 (Julian Day 219) image as downloaded from the United States Geographic Survey's (USGS) Global Visualization Viewer (GloVis) (http://glovis.usgs.gov). Geo-rectification was performed in ArcGIS 10.1 with the 'Geo-referencing' toolbar using the first order polynomial transformation to resample using cubic convolution with the benchmark August 2011 image having an RMS Forward of .32365. Rectification followed all relevant industry standards described in the GEO GOFI Guidance (2014). As the classification was a single-image photo-interpretive process no additional preprocessing was deemed necessary, outside of stacking the individual bands in ESRI's ArcGIS 10.1 (http://www.esri.com/).

CMI performed a full visual delineation of the project area using Landsat. All digitization was performed at an approximate scale of 1:15,000 by an experienced photo-interpreter (PI) familiar with satellite imagery applications, photo-interpretation and possessing *a priori* knowledge of land use/land cover in the area. We used the band combination of 5,4,2 (short-wave infrared, near infrared, green). We reviewed other combinations (e.g., Normalized Difference Vegetation Index (NDVI), bands 4,3,2) but found no additional benefit to the PI and were therefore not included. Subject matter experts possessing significant field experience on the Yacumama property also provided input and assistance during the mapping process.

Image classification consisted of 6 LULC types***: Forest, Cropland, Grassland, Settlements, Water***, and ***Non-forest*** based upon the descriptions in GOFC-GOLD (2014) with a minimum mapping unit of 1 hectare. Image classification was ultimately restricted to one of 4 types, forest[5] , non-forest, settlement or water, as no additional LULC types were distinguishable on the property. Because the project area was relatively small, and mapping was accomplished through visual interpretation, a wall-to-wall mapping strategy was employed as it was practical and the most suitable method for the project. To account for the area of water in the Yarapa and the common oxbow lakes, each were identified in a GIS using heads up digitizing and confirmed via ground visits in 2013 and their area calculated. In addition, a 50m buffer from stream center was placed on the Rio Yarapa and an unnamed tributary for a total of **133 ha** of "permanent" of water in rivers and oxbow lakes. Analysts also detected **4 ha** of non-forested land with the project area. The area of water and non-forested area was subtracted from the total of the two parcels to result in a total forested area of **2863ha.** Upon completion of the initial map, final review and quality control was performed by senior staff per CMI organizational standard operating procedures before the validation and accuracy assessment step.

Accuracy Assessment

Rapideye imagery was used to assess the accuracy of the 2012 landcover map (Figure 4) and is considered an appropriate tool for '"ground-truthing" the interpretation of satellite imagery and for assessing the accuracy (GOFC-GOLD 2014) . The Rapideye 5-band image (August, 2010) with five meter resolution, was used to assess accuracy. The image was obtained directly from the vendor. VTCMI conducted an accuracy assessment on all project area land cover maps following industry standards and applicable practices as described in Congalton (1991) and GFOI (2013). Using the specific land cover

[5] We used the following CDM definition of "Forest" … a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ.

layer, random points were created for Forest, Water and Non forest cover classes. Accuracy assessment points were created and allocated using the *Create Random Points* tool in ArcGIS 10.1 with the following parameters: a Minimum of 250 meters between points and points within 15 meters of a boundary were removed to eliminate confusion during the accuracy assessment. For the Non forest class 5 points were manually placed because of the small overall area of the class. A subject matter expert (based on education, experience, and on-the-ground familiarity with the project area) classified all points using Rapid Eye high resolution imagery from the respective mapping year, after which the points were intersected with the land cover layer to calculate accuracy. Using this approach the total accuracy of the 2012 benchmark LULC map (figure 4) was calculated to be 97.26%

Table 3: Summary of the Accuracy Assessment (by LULC class) for the 2012 benchmark LULC map.

		Forest	**Non-Forest**	**Water**	**Grand Total**	**User Accuracy**
Observer	Forest	50	2		52	96.15%
	Non-Forest		3		3	100.00%
	Water			18	18	100.00%
	Grand Total	**50**	**5**	**18**	**73**	
	LC Accuracy	100.00%	60.00%	100.00%	Total accuracy	**97.26%**

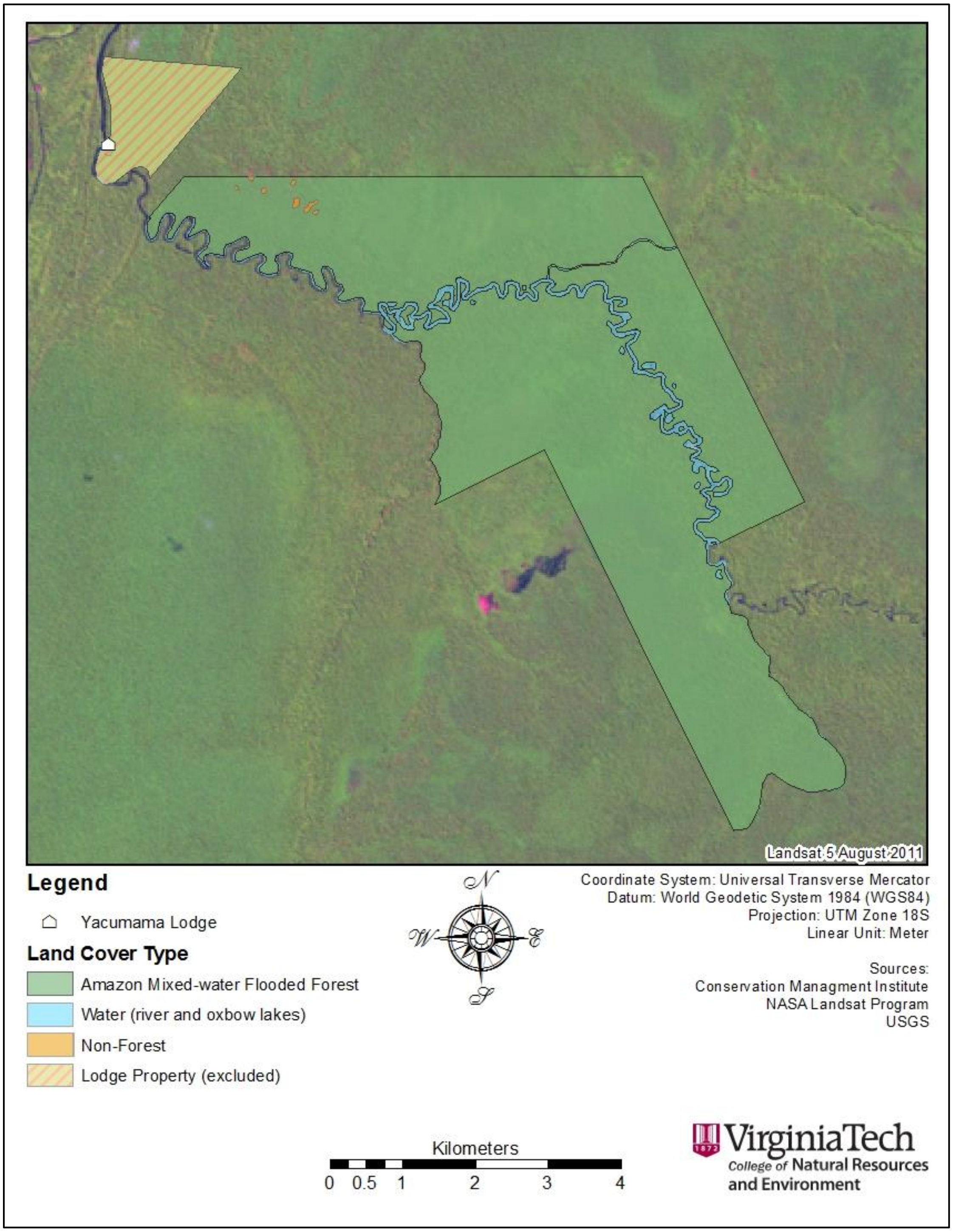

Figure 4: Forest cover benchmark map (2012) for the Project.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Ley Forestal y de Fauna Silvestre and its Reglamento: Ley Nº 27308 y Decreto Supremo Nº N° 014-2001-AG. These also are relevant since they establish specific means for use of timber and non-timber forest resources, and for the establishment of timber and non-timber concessions in appropriate regions.

Legal and other requirements relating to biodiversity:

- Red List of endangered species and other threats category - IUCN Red List
- Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES
- Peruvian law (Supreme Decree No. 034-2004-AG).

Legal and other requirements relating to workers' rights:

Yacumama will strictly follow all relevant laws including applicable labor laws, legal rulings, and other requirements relating to workers' rights. Yacumama is required under Peruvian law to follow appropriate safe labor practices to prevent workplace injury and will comply with all applicable local, district, and national workplace standards. Peru has the following relevant labor laws:

- Current Constitution (Art.25) Workshop, resting right, regulating compensation.
- D.S. N ° 003-97-TR, Competitiveness Act and Labor Productivity.
    - Promoting job training and education of workers;
    - Provide transfer of persons engaged in urban and rural areas of low productivity and income to other more productive activities;
    - Ensure the incomes of workers and protection against arbitrary dismissal;
    - Unify works procurement rules and strengthen existing social benefits.
- D.S. N ° 007-2002-TR Amended Text of Legislative Decree. Act No. 854 Workshop, Modification by Law No. 27,671.

- D. Leg. No. 910, General Law on Labour Inspection and Labor Defense

Worker legal rights will be posted at a prominent location at Yacumama. If an individual is employed who cannot read, Yacumama management will verbally communicate workers' rights. Yacumama staff are paid at a legal minimum rate and in a timely manner according to Peruvian labor laws.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The Project proponent owns the land on which the Project is located fee simple and evidence of the ownership has been provided to the audit team.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable.

1.12.3 Other Forms of Environmental Credit

All of the Project's emission reductions will be registered and held by an independent third-party registry, Markit Environmental Registry, to guarantee avoidance of double-counting.

1.12.4 Participation under Other GHG Programs

The Project is not registered nor is seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The Project has not been previously rejected by other GHG programs

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not applicable

Leakage Management

The parcel controlled by the Project proponent (Yacumama) that is not included in the project area will be monitored to insure no deforestation or greenhouse gas emissions (biomass burning and N_2O) will occur. No income generated by the project will be used for activities that will result in GHG emissions from deforestation.

Commercially Sensitive Information

No Commercially sensitive information has been excluded from the public version of the project description

Sustainable Development

Not applicable

Further Information

Not applicable

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

This Project is designed for validation and verification under the Verified Carbon Standard Version 3.5, AFOLU Requirements Version 3.0 and utilizing methodology and modules:

- VM0007 REDD Methodology Module, REDD Methodology Framework (REDD-MF), Version 1.5
- M-MON VMD0015 Methods for monitoring of greenhouse gas emissions and removals, Version 2.1.
- X-UNC VMD0017 Estimation of uncertainty for REDD project activities, Version 2.1.
- X -STR VMD0016 Methods for stratification of the project area, Version 1.1.
- CP-AB VMD0001 Estimation of carbon stocks in the above- and below-ground biomass in live tree and non-tree pools, Version 1.1.
- LK-ASP VMD0009 Estimation of emissions from activity shifting for avoided planned, Version1.2

- BL-PL VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation and planned degradation, Version 1.2.
- T-ADD VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, Version 3.0
- LK-ME VMD0011 Estimation of emissions from market effects, Version 1.1.
- T-SIG Tool for testing significance of GHG emissions, Version 01
- CP-W Estimation of Carbon Stocks in the Long-Term Wood Products Pool, Version 1.1
- E–BPB Estimation of greenhouse gas emissions from biomass and peat burning Version *1.1*

2.2 Applicability of Methodology

Based on the methodology and the reference for the methodology, VCS "Tool for AFOLU Methodological Issues", this Project qualifies because of a reduction in emissions of carbon dioxide from planned deforestation in the with-Project scenario. This methodology is applicable because:

- Land in the Project Area qualified as forest at least 10 years before the Project start date based on definition of forest land in FAO Forest Resource Assessment of 2000 and remote sensing analysis.
- No peat soils are present on the Project site.
- Project proponent can show ownership of the Project site and ownership of the carbon rights for the Project Area.
- Baseline deforestation in the Project Area falls within the category of planned deforestation (VCS category avoided planned deforestation).
- Baselines will be renewed every 10 years after the start of the Project except where triggers lead to a more frequent renewal.
- No areas registered under the Clean Development Mechanism or any other carbon trading scheme are included within the Project site; validation under the Climate, Community, and Biodiversity Alliance for co-benefits has been disclosed.

- The baseline condition is conversion of the property to a permanent deforested state of agriculture.
- No reforestation is proposed for the Project; and leakage avoidance activities do not include either agriculture lands flooded to increase production, or intensifying livestock production.

The Project is considered under the VCS category Avoided Planned Deforestation. This Project qualifies because:

- Conversion of forestlands to a deforested condition is legally permitted.
- Documentation is available to clearly demonstrate with credible evidence that the land would have been converted to non-forest use if not for the Project.
- Post deforestation land use does not include reforestation.

2.3 Project Boundary

The Project area encompasses the entire Yacumama property with the exception of a small parcel on which the former lodge buildings and other infrastructure is situated (Figure 5). The Project area is comprised of the parcels, Yacurana I and Santuario Privado which are solely owned and held and registered with COFOPRI, the Peruvian Government entity responsible for titling lands (http://www.cofopri.gob.pe/index.aspx?flag=trans). Examination of the COFOPRI map indicated some discrepancies from the original survey maps. Therefore the Project identified and updated the boundaries of the three parcels using the original survey maps produced in the early 1990's and imagery from that time period. The area of individual parcels did not precisely match the COFOPRI map document (Yacurana 1 1425 ha, Santuario Privado 1575), though the total area of **3000 ha** was consistent with that registered with COFOPRI (see Figure 3).

Total forest area within the project area was determined by subtracting the area of "water" and "non-forested" area from the total project area[6]. To account for the area of water in the Yarapa and the

[6] Detailed remote sensing methods including map figures and accuracy assessment are provided in section 1.10, *"*Yacumama Land Use Land Cover (LULC) Benchmark Map*".*

common oxbow lakes, each were identified in a GIS using heads up digitizing and confirmed via ground visits in 2013 and their area calculated. In addition, a 50m buffer from stream center was placed on the Rio Yarapa and an unnamed tributary for a total of **133 ha** of “permanent” of water in rivers and oxbow lakes. Analysts also detected **4 ha** of non-forested land with the project area. The area of water and non-forested area was subtracted from the total of the two parcels to result in a total forested area of **2863ha.**

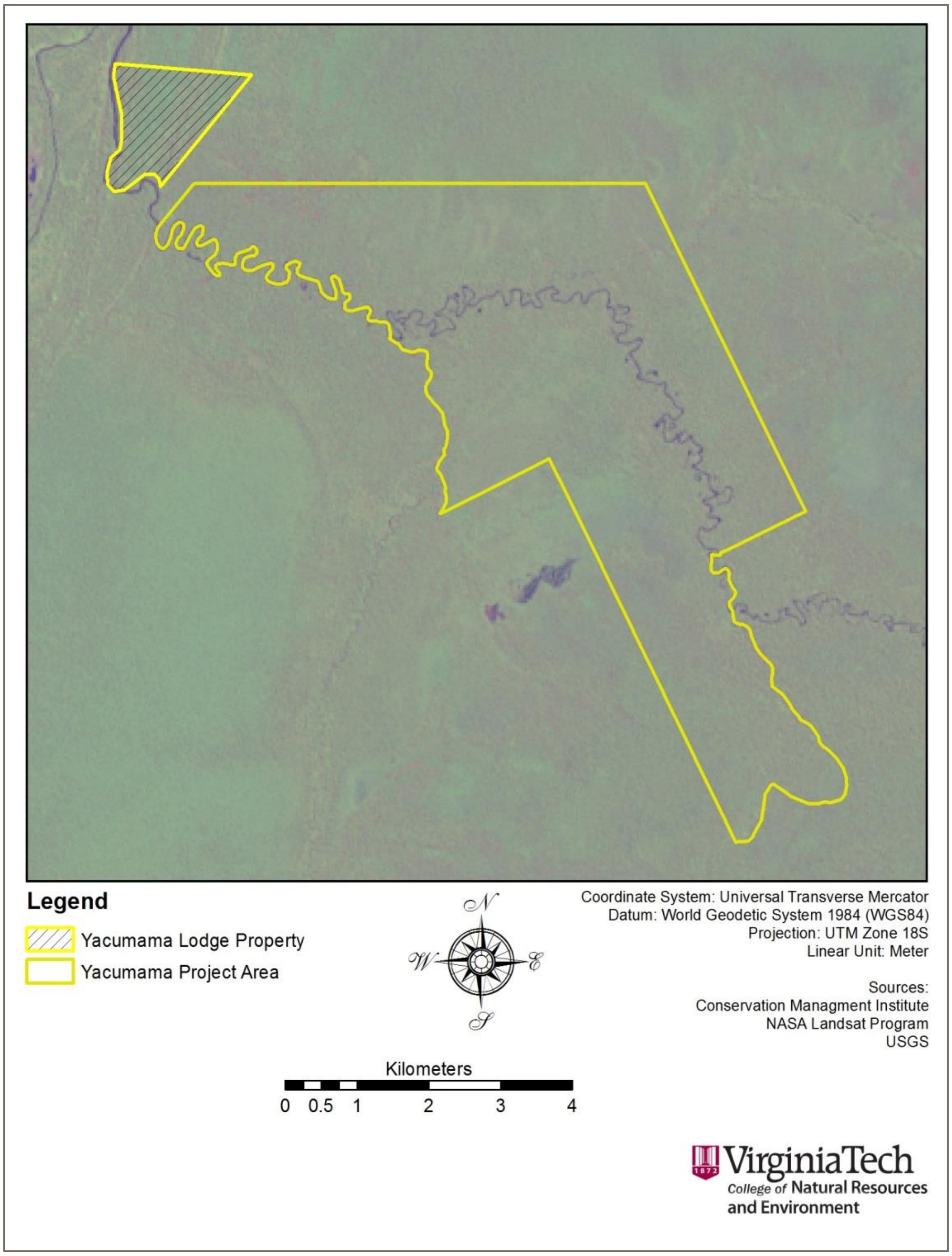

Figure 5: Project area boundary for Yacumama Forest Carbon Project.

The sources of GHG emissions for both the baseline and Project scenario are presented in Table 4.

Table 4: Carbon pools used to calculate GHG emissions for both the baseline and Project scenario.

Source		Gas	Included?	Justification / Explanation
Baseline	Above-ground Tree Biomass	CO_2	Yes	Required pool.
		CH_4	No	
		N_2O	No	
		Other	No	
	Below-ground Tree Root Biomass	CO_2	Yes	Pool calculated based upon above-ground biomass.
		CH_4	No	
		N_2O	No	
		Other	No	
	Soil Carbon	CO_2	No	Conservatively excluded.
		CH_4	No	
		N_2O	No	
		Other	No	
	Dead Wood	CO_2	No	Conservatively excluded.
		CH_4	No	
		N_2O	No	
		Other	No	
	Harvested Wood Products	CO_2	Yes	In Peru the standard practice for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. CP-W used to estimate long lived wood products. However analysis using T-SIG demonstrated this pool to be de-minimis.[7]
		CH_4	No	
		N_2O	No	
		Other	No	
	Litter	CO_2	No	Conservatively excluded.
		CH_4	No	
		N_2O	No	
		Other	No	
	Fuel Wood Collection	CO_2	No	Does not occur and not allowed by the property owners. There are no residents within the project area to collect fuelwood.
		CH_4	No	
		N_2O	No	
		Other	No	
	Biomass	CO_2	No	Conservatively omitted from baseline.

[7] See accompanying spreadsheet "Yacumama_Carbon_Stock_Calculations_2016" T-SIG workbook.

Source		Gas	Included?	Justification / Explanation
	Burning	CH_4	No	
		N_2O	No	
		Other	No	
	Combustion of Fossil Fuels	CO_2	No	Conservatively omitted from baseline.
		CH_4	No	
		N_2O	No	
		Other	No	
Project	Above-ground Tree Biomass	CO_2	Yes	Required pool.
		CH_4	No	
		N_2O	No	
		Other	No	
	Below-ground Tree Biomass	CO_2	Yes	Pool calculated based upon above-ground biomass.
		CH_4	No	
		N_2O	No	
		Other	No	
	Project Leakage	CO_2	Yes	Leakage estimated using LK-ASP and LK-ME. However analysis using T-SIG demonstrated both LK-ASP pool to be de-minimis.
		CH_4	No	
		N_2O	No	
		Other	No	
	Biomass burning	CO_2	No	CO_2 emissions are already considered in carbon stock changes.
		CH_4	Yes	CH_4 and N_2O emissions are included in the with-project case where fires occur.
		N_2O	Yes	
	Combustion of Fossil Fuels	CO_2	No	Conservatively omitted from baseline therefore excluded from project scenario
		CH_4	No	Potential emissions are negligibly small.
		N_2O	No	Potential emissions are negligibly small.
	Use of Fertilizers	CO_2	No	No fertilizer use will occur under the project scenario.
		CH_4	No	
		N_2O	No	

2.4 Baseline Scenario

The estimation of carbon stocks in the with-Project scenario requires the identification of a reasonable and credible alternative land use scenario (i.e. baseline scenario). The analysis conducted by CMI (using BL-PL) of potential alternative land use scenarios identified conversion to agriculture as the most likely land use alternative for the baseline scenario. There are a variety of crops that can be grown in the region both on a commercial and individual scale. Commonly grown crops of the region include rice, corn, beans, and peanuts particularly in riparian areas, and manioc, plantains and bananas on upland soils (McClain and Cossio 2003). All of these crops are grown within the Project zone and regionally. In addition, oil palm plantations are increasing at a relatively rapid rate in the Peruvian Amazon Basin (Gutierrez-Velez et al. 2011). In addition large new cacao plantations near the project area are clearing vast areas of forests at relatively rapid rates (http://earthobservatory.nasa.gov/IOTD/view.php?id=82076).

The land within the entire Project area is ideal for conversion to agriculture since the annual inundation of floodwaters results in deposition of nutrient rich sediments carried by rivers, resulting in some of the most fertile soils of the Amazon Basin (Kvist and Nebel 2001, McClain and Cossio 2003). These areas are widely acknowledged for their agricultural productivity, and in 1997 Peruvian Amazon Research Institute (IIAP) called for intensified agricultural development in the floodplains of the Loreto Department due to the more favorable edaphic conditions when compared to terra firma (Kvist and Nebel 2001). Furthermore, the suitability of floodplains in the Amazon basin for agriculture, in both a historical and prehistorical context, is widely recognized (Fraser et al. 2012). Specifically the two parcels, Fundo Yacurana I and Satuario-Privado, comprise the Project area and are both suitable to agriculture. The entire area Fundo Yacurana I was assessed to be suitable for "agricultural exploitation" by the Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) and identified 61% of the property as suitable for cultivo permanente (permanent cultivation) and 39% pastoreo (Pasture) (Appendix B, Pages 5 & 6). Santuario-Privado is immediately adjacent to Fundo Yacurana I (see Figure 3), has the same soils, climate, and hydrologic regime and is thus is also suitable for "agricultural exploitation". In addition, the ownership and tax documents on page

23 of the 2009 harvest plan classify the property ‘type’ as *S. Productiva* (productive) the same as Yacurana I.

2.5 Additionality

Because of the loss of substantial capital investment in the Yacumama lodge due to multiple economic downturns and a fire, which destroyed significant infrastructure, Yacumama owners do not have the financial means to reinvest the necessary capital in the lodge to rebuild the ecotourism business. Currently there are substantial costs just to maintain the property which is a significant drain on the financial resources of the owners of Yacumama. Because no income is currently being generated, the owners by economic necessity will be forced to harvest the valuable timber and pursue agricultural development and thus are the agents of deforestation. The Project proponent and property owner has clear title to Project property and legal permission and an approved plan to harvest in the project area from the Government of Peru (see Appendix B). As result there is a high likelihood of harvest of the valuable trees and clear the land of remaining woody vegetation without carbon financing. This action would create open land with fertile soils that would be suitable for extensive commercial agriculture which is actively encouraged by the Peruvian government. Furthermore, the the Yacumama Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) identified 61% of the Yacurana I parcel as suitable for cultivo permanente (permanent cultivation) and 39% pastoreo (Pasture) (Appendix B, Page 6). Santuario-Privado is immediately adjacent to Fundo Yacurana I (see Figure 3), has the same soils, climate, and hydrologic regime and is thus is also suitable for “agricultural exploitation”. In addition, the ownership and tax documents on page 23 of the 2009 harvest plan classify the property ‘type’ as *S. Productiva* (productive) the same as Yacurana I. Conversion of the forest includes harvesting merchantable trees, bulldozing, piling, and burning the remaining vegetation. No part of the Project area is currently restricted from development due to government regulation or other legal requirement.

Additionality Analysis

The following analysis was conducted to determine alternative baseline scenarios according to the procedure presented in "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0)." This tool is applicable because a) the proposed Project activities will not violate any Peruvian law, and b) the use of this tool results in identification of the most plausible baseline scenario of the several possible baseline scenarios identified below.

Step 1: Identification of alternative land use scenarios to the AFOLU Project activity.

The following is a "ranking" of the most likely alternative land uses.

Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity.

A. Harvest of Forest and Conversion to Agriculture

Harvest of forest and conversion to agriculture is the most probable land use under the baseline scenario. Large-scale cultivation, cattle ranching with expansion of areas under pasture, production of annual crops using slash and burn agriculture, and large-scale cultivation of oil palm are all primary agricultural drivers of deforestation in the Peruvian Amazon Basin (Verlarde et al. 2010). In addition, deforestation to support the planting of cacao in the vicinity of Yacumama has substantially increased amounting to 2,126 ha between May 2013 and August 2014 (Monitoring of the Andean Amazon Project http://maaproject.org/en/ 2015). The underlying driver of deforestation and conversion to agriculture in the Peruvian Amazon Basin is population increase. Population has grown from 1,772,000 inhabitants in 1981 to 4,115,000 in 2007 according to the Peruvian National Institute of Statistics and Informatics *(*Verlarde et al. 2010). Concurrent with the increase in population is an increase in rural poverty in the Peruvian Amazon Basin, increasing from 68%, in 1985, to 69% in 2000 thus further creating pressure to generate income from forest resources (Verlarde et al. 2010). By 2010, 5% of the original forest cover in the Peruvian Amazon Basin had been lost and Soares-Filho et al. (2006) estimate in just the next 20 years that figure will at least double.

The available land at Yacumama is suitable for land conversion to agriculture since the annual inundation of floodwaters results in deposition of nutrient rich sediments carried by nearby rivers, resulting in some of the most fertile soils of the Amazon Basin (Kvist and Nebel 2001, McClain and Cossio 2003). These areas are widely recognized for their productivity, and in 1997 IIAP called for intensified agricultural development in the floodplains of the Loreto Department due to the more favorable edaphic conditions when compared to terra firma (Kvist and Nebel 2001). In addition the Yacumama Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) *identified 61% of the Yacurana parcel as suitable for* cultivo permanente *(permanent cultivation) and 39%* pastoreo *(Pasture) (Appendix B, Page 6).* The Santuario-Privado parcel is immediately adjacent to Fundo Yacurana I (see Figure 3), has the same soils, climate, and hydrologic regime and is thus is also suitable for “agricultural exploitation”. In addition, the ownership and tax documents on page 23 of the 2009 harvest plan classify the property ‘type’ as *S. Productiva* (productive) the same as Yacurana I.

B. Purchase of the Land by another Entity to Re-open Lodge for Ecotourism

An alternative land use involves the selling of the land and lodge to another entity to refurbish and re-open the lodge. There are several ecotourism lodges in the region which are currently operating and this is a potential alternative land use. However, most of the value associated with the property is in the timber. The lodge infrastructure is located on a separate small parcel from the project area and not included in the Project calculations. Presuming a buyer can be found that would refurbish and operate the lodge the financial burden in taxes and protection costs would not be eliminated for the Project area.

C. Purchase Property as a Private Protected/Conservation Area

Privately owned conservation areas exist in Peru. However, there is no tangible income to offset the purchase price, maintenance, protection, and tax burden that accompanies owning a private conservation area. In addition, Yacumama while conserving considerable biodiversity is not unique within Peru. Therefore, the purchase/financial support by an NGO is considered unlikely.

D. Continuation of Pre-Project Land Use

The Project area has always been forested. Current income from the Project area is zero. Property taxes, maintenance and patrolling are still required expenses; therefore continuation of the pre-Project land use is unsustainable.

E. Project activity on the land within the Project boundary performed without being registered as the VCS AFOLU project

This alternative land use is essentially continuation of the pre-Project land use. Income from the Project Area is zero, while expenses for this scenario include property taxes, maintenance, patrolling, and monitoring. Therefore conducting the Project without registration as a VCS AFOLU Project is unsustainable.

Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory laws and regulations.

Because Yacumama is private property all alternatives presented in **1a** are legal under Peruvian law.

"Alternative A", harvest of forest and conversion to agriculture is legal under Peruvian law.

The Forests and Wildlife Law which was approved by the Peruvian Congress and published in July 2011 (Law 29763, "Ley Forestal y del Fauna Silvestre"). This bill governs the harvesting of forests and provides the legal basis for the "Alternative A" scenario. Law 29763 states that those who have title to authorization certificates (títulos habilitantes) of forest concessions must abide by the corresponding management plan that is approved by the regional forestry and wildlife authority. Yacumama has an approved plan to conduct harvest operations within the project area (Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 {Annual operating plan for permission to timber private property 2009} **Appendix B**) thereby providing the legal basis for the baseline scenario.

"Alternative B", Purchase of lodge infrastructure and property. Because the Project proponent owns the land and infrastructure the sale would be legal under the Peruvian constitution. The Constitution of Peru

(1993) guarantees all persons the right to own and inherit property. Legislative Decree No. 653 (1991) ended the period of agrarian reform in Peru by removing restrictions on the transfer of land. The decree permits the subdivision of land, and land sale, transfer, rental, mortgage, and inheritance (USAID 2010).

"Alternative C", Purchase of the entire property as a private protected area is legal under the Natural Protected Areas Act *(*Law 26834, 1997); incorporates into the Natural Protected Areas System wildlife sanctuaries, and scenic reserves; redefines all categories (Solano 2009).

"Alternatives D and E" require no change in ownership and essentially no change in current land management thus these alternatives would be legal under Peruvian Law.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Because the Project generates no financial or economic benefits other than VCS related income, simple cost analysis is selected. The lodge property adjacent to the project area will be run as a not-for profit business in the future with all student groups and researchers only charged the costs of providing lodging, meals, and maintenance. Any funds generated through the selling of VCUs are completely separate from lodge related activities.

Sub-step 2b. Option 1. Apply simple cost analysis.

Costs have been documented for the Project and audited to demonstrate no financial benefits other than VCU related income.[8]

Step 4. Common Practice Analysis

Similar activities to the proposed project occurring in Peru over the previous 10 years from project initiation were analyzed for common practice. There are multiple private properties officially recognized as private protected areas and numerous privately held preserves within national protected areas in Peru

[8] See accompanying "*Project Expense accounting_Yacumama 1.1*" spreadsheet.

(Solano 2009). The owners of private protected areas voluntarily accept terms and conditions of use to conserve biological diversity and other environmental services. When private protected areas are designated the central Peruvian government does not compensate owners for land use restrictions. In order to qualify as a "recognized" private protected area each area is required to develop a master plan with no financial assistance form the government. It is mandatory for national-level, regional, and private conservation areas (Solano 2009). **The key distinction between the Project and other lands managed as private protected areas is that other areas are able to support the annual costs of management through outside means such as non-governmental organization (NGO) supported and endorsed ecotourism (e.g. the American Bird Conservancy), direct support by NGO's, or private funds.**

For example the *Asociacion Ecosistemas Andinos* (ECOAN) manages two private nature reserves. ECOAN manages the Abra Patricia - Alto Nieva Private Conservation Area (or Abra Patiricia Reserve) and the Huembo reserve. ECOAN policy is that "All the benefits of tourism are reinvested in conservation activities, including the operations and improvement of our reserves. When you visit our reserves, you directly support our conservation efforts." On the ECOAN website (http://www.ecoanperu.org/espa%C3%B1ol/inicio.html) seventeen NGO's, private companies and governmental agencies are listed as financial supporters ranging from the American Bird Conservancy and Conservation International to Conoco-Phillips and the United States Fish and Wildlife Service.
In December 2010 a consortium of conservation organizations purchased privately owned lands that totaled 1,196 acres within a national protected area and subsequently donated them to the national government. Known as the Allpahuayo Mishana National Reserve the donated lands are home to the Iquitos Gnatcatcher, a Critically Endangered bird. The Allpahuayo Mishana National Reserve is located only 15 miles from the city of Iquitos in northern Peru, protecting rare white-sand forests that are home to rare and unique plants and animals. Support from ABC, ConocoPhillips, the National Fish and Wildlife Foundation (NFWF), and the Robert W. Wilson Charitable Trust, allowed ProNaturaleza (a leading Peruvian conservation organization) to purchase the land from willing sellers in the eastern portion of the Reserve. ProNaturaleza assists in the management and protection of the privately purchased portion of the Allpahuayo Mishana National Reserve.

The previous two examples of privately purchasing, protecting, and managing conservation lands are distinctly different from Yacumama in two key areas. The first is that while Yacumama has considerable biodiversity is not unique regionally within Peru. Many hectares surrounding the Project area are very similar ecologically and the nearby Pacaya-Samira national park protects large areas of similar habitats. Conversely the previous examples of privately protecting lands have unique and endemic habitats and biota. Secondly because of the relative ecological uniqueness of the previous two examples, they have attracted funding and support from at least 20 NGO's, private companies, charitable organizations, and governmental agencies. Because Yacumama does not have unique habitat or endemic species and represents a relatively small proportion of the overall floodplain ecosystem in Peru, conservation organizations would be highly unlikely to put limited resources into the purchase and management of Yacumama. Therefore, financial support from these sources is not available to Yacumama landowners and thus the Project activity is additional.

2.6 Methodology Deviations

Not Applicable

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

In order to estimate GHG loss und the baseline scenario the following variables are required:

- Area of forest available for conversion.
- Baseline carbon stocks.
- Deforestation / conversion rates.
- Carbon stocks in agro-ecosystems.
- Fate of commercial timber and long-lived wood products.
- Losses of biomass attributable to fuel-wood collection.
- Avoided emissions from fertilizer use.
- Avoided emissions from biomass burning.
- Avoided emissions from transportation fuel use.

1. Area of forest available for conversion

Yacumama SRL (Project proponent) contracted the Peruvian Ministry of Agriculture in 2009 to prepare a "*Plan Operativo Anual Para Permiso Forestal De Propiedad Privada*. Land clearing (i.e. deforestation) for the purposes of agriculture is a common practice in the Peruvian amazon basin, particularly if the land has been classified as suitable for agricultural exploitation under the Peruvian Ministry of Agriculture's *Best Land Use Capacity (BLUC)* methodology (http://dgaaa.minag.gob.pe/index.php/tierras-tem/capacidad-de-uso-mayor).The definition of BLUC is "….the natural capacity of the land to be productive in a permanent fashion…"(EIA 2015). There are five categories under the BLUC: *intensive cultivation, permanent cultivation, pastures, forestry, and protection* which are defined by soil characteristics and climactic conditions.

The 2009 harvest plan listed the *'Acquisition Object'* of the Yacurana I parcel as *'Agricultural Exploitation'* (page 5). In addition the '*Land Use Capacity Description'* (Page 6) classifies the entire area of Yacurana I as suitable for either '*Pasture*' or '*Standing Crop'* agriculture. The second parcel that comprises the project area, Santuario Privado, (Private Sanctuary) was not included in the 2009 harvest plan because the polygon being harvested was entirely in the Yacurana I parcel. However, the ownership and tax documents on page 23 of the 2009 harvest plan classify the property 'type' as *S. Productiva* (productive) the same as Yacurana I. Furthermore, the soils, climate, and topography of Santuario Privado are the same as Yacurana I, thus, it can be reasonably assumed to have the same BLUC classification and be available for agriculture. Based upon this evidence the entire project area (less permanent water bodies and stream buffer) of 2863 ha is suitable for agriculture and thus does not exceed legal mandates under for deforestation under Peruvian law and common practice[9].

2. Biomass Baseline Carbon Stocks[10]

Baseline biomass carbon stocks were the above ground tree > 5 cm DBH and below-ground biomass. Above-ground non-tree biomass (lianas and palms), down or standing dead wood, and leaf litter were not measured, which resulted in a conservative estimation of carbon stocks in the project area. The mean

[9] See analysis of common practice item section 4 below.
[10] See Appendix A for detailed field methods, QAQC, and allometric equation validation

total carbon pool in 2013 was based on field data collected in 2013 and independently verified[11]. Above-ground biomass (kg) was calculated using the tropical wet forest equation from Pearson et al. (2005). The above-ground biomass for each tree was converted from kilograms to tons (divided by 1000), followed by a conversion of total above-ground biomass to above-ground carbon stock by multiplying the mass by the carbon fraction of biomass (0.47). Below-ground biomass for each tree was estimated using the appropriate root to shoot ratio from CP-AB. Above-ground and below-ground biomass attributed to non-tree biomass (palms and lianas) and soil carbon was conservatively excluded. Table 5 summarizes the above-ground, below-ground and total tree biomass within the project area at Yacumama. Using the total area subject to deforestation (2863 ha) the total above ground tree biomass is 216,242 mt and total below ground biomass 43,832 mt.

Table 5: Summary of above-ground, below ground and total tree biomass with the project area at Yacumama

	ABG Tree Biomass	BG Tree Biomass	Total Tree Biomass
mt ha^{-1}	**75.53**	**15.31**	**90.84**
t CO_2 eq ha^{-1}	**276.95**	**56.14**	**333.09**
Standard Deviation	**65.64**	**15.70**	**81.11**
Confidence (95%)	**27.10**	**6.48**	**33.48**
Confidence % of mean	**9.78%**	**11.54%**	**10.05%**

3. Uncertainty Analysis

Uncertainty was calculated using the equation and approach in the module X-UNC.

[11] See accompanying spreadsheet "*Yacumama_Carbon_Stock_Calculations_2016_final*" *ABG Biomass Calculations and BG Biomass Calculations* worksheet

Part 1-Uncertainty in Baseline Estimates

Step 1: Assess uncertainty in projection of baseline rate of deforestation or degradation.

Because the deforestation rate was determined through a common practice analysis and in concert with the Yacumama deforestation/harvest plan (Appendix B) there is no uncertainty in deforestation rate thus Uncertainty $_{BSL,RATE}$ = 0.

Step 2: Assess uncertainty of emissions and removals in project area in Baseline Scenario *(Equation 4).*

$$U_{REDD\_BSL,SS,i} = \sqrt{\Sigma^n{}_1(U_{REDD\_BSL,i,pool\ \#} * E_{REDD\_BSL,i,pool\ \#})^2} / \Sigma^n{}_1 E_{REDD\_BSL,i,pool\ \#}$$

$$U_{REDD\_BSL,SS,i} = \sqrt{\Sigma^n{}_1[(0.0978 * 276.95)^2 + (0.1154 * 56.14)^2]} / 333.09$$

$$U_{REDD\_BSL,SS,i} = \sqrt{\Sigma^n{}_1 (733.64 + 41.97)} / 333.09$$

$$U_{REDD\_BSL,SS,i} = 8.36\%$$

Where:

$U_{REDD\_BSL,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline case in stratum *i* (%)
$U_{REDD\_BSL,SS,i,pool\#}$	Percentage uncertainty for carbon stocks and greenhouse gas sources in the REDD baseline case in stratum *i* (%)
$E_{REDD\_BSL,SS,i,pool\#}$	Carbon stock or GHG sources in the REDD baseline case (t CO2e)
i	1, 2, 3 …*M* strata (unitless)

Uncertainty across combined Strata (Equation 5)

$$Uncertainty_{REDD\_BSL,SS,} = \sqrt{\Sigma^n{}_1(U_{BSL,\ SS,i} * E_{BSL,SS,\ i,})^2} / \Sigma^n{}_1 E_{BSL,SS\ i}$$

$$Uncertainty_{REDD\_BSL,SS,} = \sqrt{\Sigma^n{}_1(0.0836 * 953{,}636)^2} / 953{,}636$$

$$Uncertainty_{BSL,SS,} = 8.36\%$$

Where:

Uncertainty $_{REDD\_BSL,SS}$	Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline case (%)
$U_{REDD\_BSL,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum i in the REDD baseline case (%)

$E_{REDD\_BSL,SS,t,i}$	Sum of combined carbon stocks and GHG sources in the REDD baseline case (t CO2-e)
i	1, 2, 3 …M strata (unitless)

Step 3: Estimate Total Uncertainty in REDD Baseline Scenario

Note: Because the deforestation rate was derived directly from a common practice analysis there is no variance in the baseline rate of deforestation, therefore equation 6 from X-UNC was not required.

Part 2- Uncertainty in WRC baseline estimates

Not Applicable

Part 3- Uncertainty in the *Ex-Post* REDD project scenario

Any deforestation that occurs during the project will be monitored and tracked directly using remote sensing techniques described below in section **4.3 Monitoring**.

The two pools in the with-project scenario (above-ground tree biomass and below-ground tree biomass) are the same as in the baseline scenario. Therefore using equation 10 (X-UNC):

$$U_{REDD\_WPS,SS,i} = \sqrt{\Sigma^{n}_{1}}(*U_{REDD\_WPS,SS,i,pool\#} * E_{REDD\_WPS,SS,i,pool\#}\ )^{2} / E_{REDD\_WPS,SS,i,pool\#}$$

$$U_{REDD\_WPS,SS,i} = \sqrt{\Sigma^{n}_{1}}\ [\ (0.0978 * 276.95)^{2} + (0.1154 * 56.14)^{2}] / 333.09$$

$$U_{REDD\_WPS,SS,i} = \sqrt{\Sigma^{n}_{1}}\ (733.64 + 41.97) / 333.09$$

$$U_{REDD\_WPS,SS,i} = 8.36\%$$

Where:

$U_{REDD\_WPS,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD project scenario in stratum *I* (%)
$U_{REDD\_WPS,SS,i,pool\#}$	Percentage uncertainty for carbon stocks and greenhouse gas sources in the REDD project scenario in stratum *i* (%)
$E_{REDD\_WPS,SS,i,pool\#}$	Carbon stock or GHG sources in stratum *i* in the REDD project scenario (t CO2)
i	1, 2, 3 …*M* strata (unitless)

Since there was only one stratum Equation 11 from X-UNC was not required and $Uncertainty_p$ = 7.8%

Part -4 Uncertainty in WRC Project scenario estimates

Not Applicable

Part 5-Total Error in REDD Project Activity

Total project uncertainty is equal to the combined uncertainty in the baseline and with-project estimates using equation 15 in X-UNC.

$NER_{REDD+\_ERROR,} = \sqrt{Uncertainty_{REDD\ BSL,t}^{2} + Uncertainty_{REDDwps}^{2}}$

$NER_{REDD+\_ERROR,} = \sqrt{0.0836^2 + 0.0836^2}$

NER_{REDD+_ERROR} = 11.78%

Where:

NER_{REDD+_ERROR}	Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year t* (%)
$Uncertainty_{REDD\_BSL,t}$	Cumulative uncertainty in REDD baseline scenario up to year t (%)
$Uncertainty_{REDD\_WPS}$	Total uncertainty in the REDD project scenario (%)

However where no re-measurements of C pools or GHG sources have been made, as in this case, cumulative project uncertainty through time is equal to com uncertainty in the baseline estimates Thus:

$C_{REDD\_ERROR,t}$ = 11.78%

Because total error is less than 15% no deductions are made in project accounting.

4. Rate of Deforestation and Agricultural Conversion

Background

The baseline scenario, in the absence of carbon financing, is the harvest and export of the valuable hardwood species (see Appendices B and C) and the implementation of agricultural in the fertile soils of the project area. Yacumama SRL (Project proponent) contracted the Peruvian Ministry of Agriculture in 2009 to prepare a "*Plan Operativo Anual Para Permiso Forestal De Propiedad Privada* (Annual Operating

Plan Forest Permit on Private Property[12]).” The plan was explicitly a 12 month harvest plan for 63.76 ha designed for implementation by Yacumama SRL management and staff (see page 31 for activities schedule). Yacumama management, after undertaking initial small scale work based upon the harvest plan, recognized that they could not undertake this effort with current personnel and would have to increase personnel and/or contract a professional logging company to accomplish the task. However, before continuing to pursue the baseline scenario Yacumama began investigating carbon financing as an alternative option.

Determination of Deforestation Rate

VCS module *VMD0006 Estimation of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Planned Deforestation and Degradation (BL-PL)* explicitly states “*Where a valid verifiable plan exists for a rate at which deforestation is projected to occur, this rate shall be used (Page 7 BL-PL Section 1.3)”*. The 2009 harvest plan identified a total of 63.76 ha to be harvested. Using this figure, as required by BL-PL, equates to 2.12 ha cleared/year or an annual rate of 0.07% over the 30 year life of the project. The Project asserts that the total hectares and deforestation rate are economically unrealistic as a baseline scenario and both the rate and total area are well below what has and as occurring in the vicinity of the project. Thus to investigate this assertion the Project conducted an analysis of common practice to determine a realistic baseline scenario.

Common Practice Analysis: Peruvian Amazon

Agricultural Classification

Land clearing (i.e. deforestation) for the purposes of agriculture is a common practice in the Peruvian amazon basin, particularly if the land has been classified as suitable for agricultural exploitation under the Peruvian Ministry of Agriculture’s *Best Land Use Capacity (BLUC)* methodology (http://dgaaa.minag.gob.pe/index.php/tierras-tem/capacidad-de-uso-mayor).The definition of BLUC is “….the natural capacity of the land to be productive in a permanent fashion…”(EIA 2015). There are five

[12] English translation provided in Appendix B.

categories under the BLUC: *intensive cultivation, permanent cultivation, pastures, forestry, and protection* which are defined by soil characteristics and climactic conditions.

The 2009 harvest plan listed the *'Acquisition Object'* of the Yacurana I parcel as *'Agricultural Exploitation'* (page 5). In addition the '*Land Use Capacity Description'* (Page 6) classifies the entire area of Yacurana I as suitable for either '*Pasture*' or '*Standing Crop'* agriculture. The second parcel that comprises the project area, Santuario Privado, (Private Sanctuary) was not included in the 2009 harvest plan because the polygon being harvested was entirely in the Yacurana I parcel. However, the ownership and tax documents on page 23 of the 2009 harvest plan classify the property 'type' as *S. Productiva* (productive) the same as Yacurana I. Furthermore, the soils, climate, and topography of Santuario Privado are the same as Yacurana I, thus, it can be reasonably assumed to have the same BLUC classification and be available for agriculture.

Deforestation for Agriculture

Landowners whose BLUC classification is neither 'forestry' nor 'protection' by common practice have been permitted to harvest their entire property[13]. The following are two examples in the immediate region of the Project.

1. Tamshiyacu - Cocoa and Oil Palm Plantation

Approximately 75 km north of the Project is *Cacao del Peru Norte Plantation* near Tamshiyacu, Loreto district Peru (Figure 6). Deforestation to support the planting of cacao and oil palm plantations amounted to 2,126 ha between May 2013 and August 2014 (*Monitoring of the Andean Amazon Project* http://maaproject.org/en/ 2015). Though the clearing did not occur consistently over this 13 month period the project calculated an average rate of clearance **163.5 ha month^{-1}** or **1962.4 ha year^{-1}** (2126 ha /13 months = 163.5 ha month^{-1} or 1962.4 ha year^{-1}).

[13] This practice was recently upheld by a by a regional court in Loreto province on April 9, 2015.

2. Nueva Requena – Oil Palm plantations onsortium of companies has cleared primary and secondary forest for oil palm plantations south of the Project near Nueva Requena, Ucayali district, Peru (Figure 7). The deforestation amounted to 12,188 ha from late 2011 through April 2015 *(Monitoring of the Andean Amazon Project* http://maaproject.org/en/ 2015). Though deforestation didn't happen consistently over the entire time period, the project calculated an average rate of deforestation using the entire year of 2011 through April 2015. The average monthly deforestation was **234.4 ha month^{-1}** or **2812.6 ha year^{-1}** (12,188 ha /52 months = 234.4 ha month^{-1} or 2812.6 ha year^{-1}).

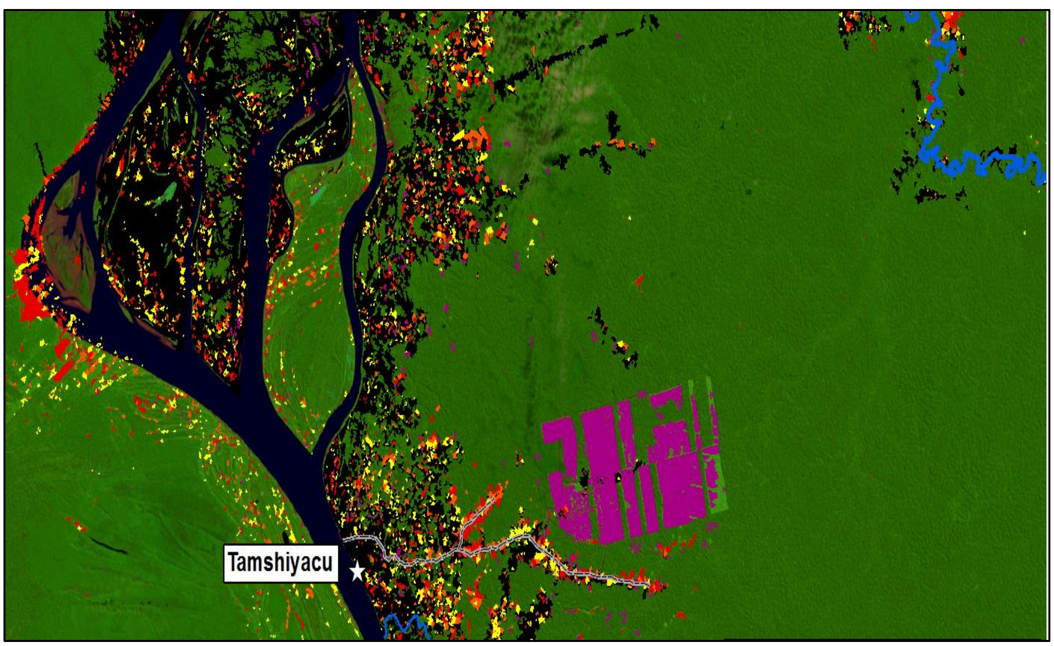

Figure 6: Recent deforestation for a new cacao project outside of the town of Tamshiyacu in the northern Peruvian Amazon (Department of Loreto). Over 2,100 hectares (ha) were cleared between May2013 and August 2014 in an area known as Fundo Tamshiyacu (*Monitoring of the Andean Amazon Project* http://maaproject.org 2015).

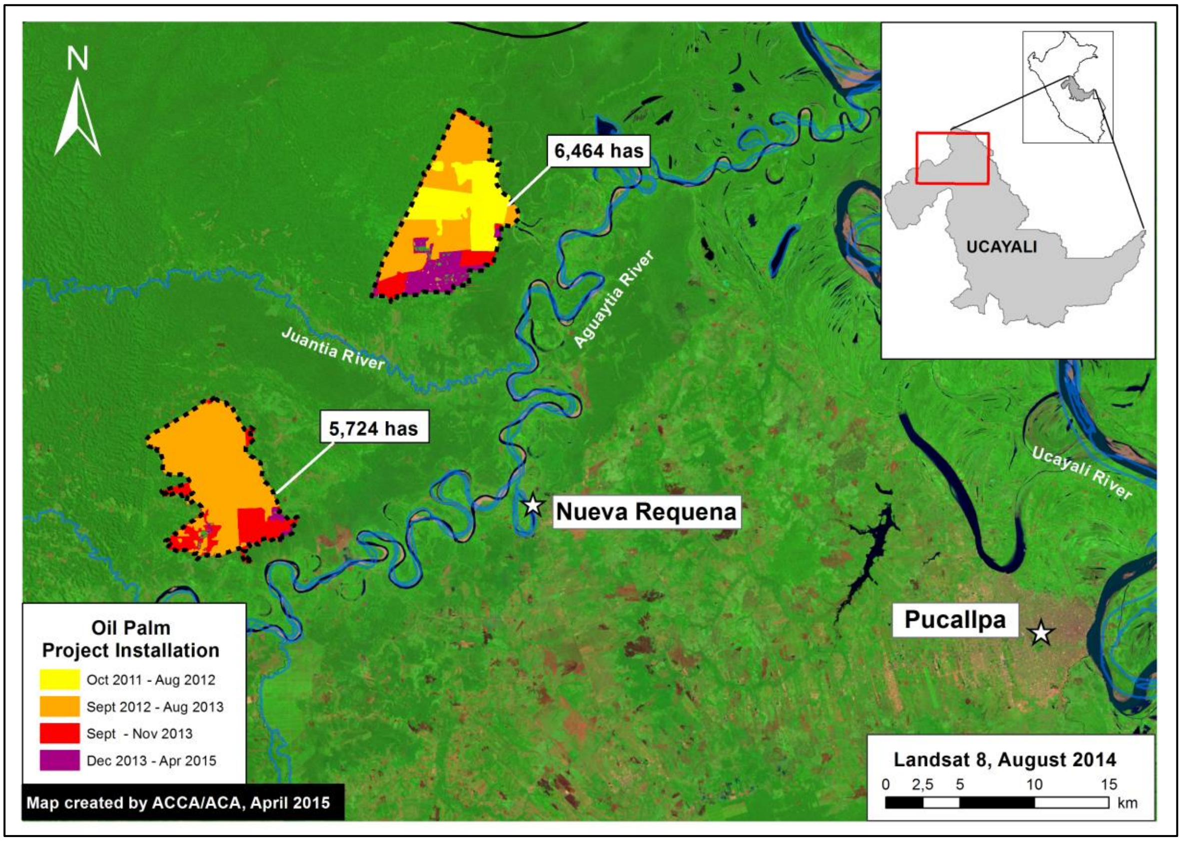

Figure 7: Recent deforestation for a new oil palm project outside of the town of Nueva Requena in the southern Peruvian Amazon (Department of Ucayali). Over 12,188 hectares were cleared between 2011 and April 2015 in an area known as Fundo Tamshiyacu (*Monitoring of the Andean Amazon Project* http://maaproject.org 2015).

Applicability to the project

The average area deforested, using the two examples of common practice in the region, is **2387.5 ha year^{-1}** (1962.4 + 2812.6 / 2 = 2387.5) which is substantially greater than area proscribed by the 12 month Yacumama harvest plan if extended over the 30 year length of the project. Yacumama management assumed that to attract a forestry company and make it economically feasible to conduct the harvest of in the project area, the total area harvested each year would need to increase over the one time harvest area of 63.76 ha. However, before preparing to bid the harvest project, Yacumama pursued the carbon financing option[14].

From the common practice analysis it is clear that properties suitable for agriculture are deforested at a very high rate in the Peruvian Amazon. Multiple lines of evidence indicate that the entire project area is suitable for agricultural uses and thus legally and by common practice can be harvested. The average area deforested, using the two examples of common practice in the region, is 2387.5 ha year^{-1} (1962.4 + 2812.6 / 2 = 2387.5) which is 97.3% higher than the 63.76 ha year^{-1} rate in the 2009 Yacumama harvest plan. Under an economically feasible and realistic baseline scenario, the total area harvested each year would, by common practice, be greater than the one time harvest area of 63.76 ha.

From the previous analysis of common practice, the project proposes that it would be indisputably conservative to assume that the entire area of the project, 3000 ha, would be deforested within 10 years (i.e. 300 ha/year) by the baseline agent of deforestation.

Using this figure $D\%_{planned,i,t} = 300 \text{ ha}/3000\text{ha}$[15]

$$\mathbf{D\%_{planned,i,t} = 10\%}$$

Thus the project is using an indisputably conservative rate of 10% as the deforestation rate for the entire project area. Using equation 3 in BL-PL the annual area of deforestation is:

$$AA_{planned,i,t} = (A_{planned,i} * D\%_{planned,i,t}) * L\text{-}D_i$$

$$AA_{planned,i,t} = (2863 * 0.10) * 1$$

$$AA_{planned,i,t} = \mathbf{286.3\ ha}$$

Where:

$AA_{planned,i,t}$	Annual area of baseline deforestation for stratum *i* at time *t;* ha
$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in stratum *i* during year *t.*
$A_{planned,I}$	Total area of planned deforestation over the baseline period for stratum *I*; ha

[14] As described previously the Yacumama Management is composed of the owner, Lawrence Bishop and the site manager Norman Walters and as such management decisions were made through verbal discussions in person and via telephone thus no meeting “minutes” are compiled.
[15] The total area of the project area before subtractions for non-forested acres.

$L\text{-}D_{,i}$ Likelihood of deforestation for stratum *i*

5. Carbon stocks in agro-ecosystems

Conversion to agriculture after harvest of forest products is the most probable land use under the baseline scenario. While it is likely that large areas of the Project would be subject to conversion to monocultures of rice or other intensive cropping system, under the baseline scenario we identified a 'multi-crop / short-term fallow' as our baseline agriculture system. The 'multi-crop / short-term fallow' agriculture system is the most widespread in the Loreto province followed by intensive cropping systems (Henman et al. 2008). In addition the '*Land Use Capacity Description'* (Yacumama Harvest Plan) classifies the entire area of Yacurana I as suitable for either '*Pasture*' or '*Standing Crop'* agriculture. For the "Private sanctuary" parcel, ownership and tax documents on page 23 of the 2009 harvest plan classify the property 'type' as *S. Productiva* (productive) the same as Yacurana I and thus can be reasonably assumed to be suitable for the same type of agriculture.

Therefore, in order to establish post-deforestation tree stocks (above and below ground) the project determined that a "silvo-pasture" agro-ecosystem would be represent the most accurate and conservative post deforestation agro-ecosystem C stocks. Markewitz et al. (2004) calculated an above ground biomass of 7.8 +/- 5.2[16] mt ha^{-1} for 'degraded pasture with tree islands' (i.e. (silvo-pasture) 19 years after deforestation in the Brazilian Amazon. This silvo-pasture system closely resembles the agro-ecosystem described above under the baseline scenario and has likely reached equilibrium with respect to C fluxes due to the time elapsed since deforestation. Below ground biomass was not directly measured by Markewitz et al. (2004) thus the project calculated $C_{BB\ tree\ post,i}$ in the same manner as in the project scenario using the above ground biomass estimates.

[16] The mean value + 1 standard deviation (i.e. 13.0 mt ha^{-1}) will be used as $C_{AB\ tree\ post,i}$ in the calculations below and in the accompanying MSExcel spreadsheet: "Yacumama_Carbon_Stock_Calculations_2016_Final".

6. Fate of Forest Resources Lost to Agricultural Conversion (Long-lived Wood Products)[17]

The standard practice in Peru for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. Long Lived wood products were accounted for using CP-W option 1.

Option 1: Direct Volume Extraction Estimation

Step 1: Identify the wood product class(es) that are the anticipated end use of the extracted carbon calculated in Step 2. **Sawnwood**

The definition of sawnwood according to the UNFCC (2003) "**Sawnwood** is roundwood that is sawed lengthways or by profile chipping, to produce planks, beams, joists, sleepers and lumber…."

On page 30 of the Yacumama annual harvest plan under the heading: Activities: Primary Processing *…" The primary processing at the site…will be made using a portable sawmill…by which pieces of wood are obtained…."* Thus the anticipated that the wood product class for the trees cut on the property would be sawnwood.

Step 2: Calculate the biomass carbon of the volume extracted by wood product type *ty* from within the project boundary:

$$C_{XB,ty,I} = 1/A_i * \sum_{j=1}^{S} (V_{ex,ty,j,I} * D_j * CF_j *44/12)$$

$$C_{XB,ty,I} = 1/2863 * (245.99 * 0.55 *0.47 * 44/12)$$

$$C_{XB,ty,I} = 1/2863 * 233.36$$

$$C_{XB,ty,I} = 0.082 \text{ t } CO_2\text{–e ha}^{-1}$$

Where:

$C_{XB,ty,i}$	Mean stock of extracted biomass carbon by class of wood product *ty* from stratum *i*; t CO_2-e ha^{-1}
A_i	Total area of stratum *i*; ha

[17] Long-lived wood products were calculated and then assessed for significance using T-SIG.

$V_{ex,ty,j}$	Volume of timber extracted from within stratum *i* (does not include slash left onsite) by species *j* and wood product class *ty*; m^3
D_j	Mean wood density of species *j*; t d.m.m^{-3}
CF_j	Carbon fraction of biomass for tree species *j*; t C t^{-1} d.m.
j	*1, 2, 3, … S* tree species
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)

Note: Because not all of the 7 commercial "species" listed in the harvest plan (Appendix B) were actually identified to species, the project choose to use the total overall volume for $V_{ex,ty,j}$. Furthermore, since these 7 commercial "species" were not identified to species, we calculated a mean D_j. Densities were obtained from Baker et al. (2004) appendix A from data collected in Peru. If multiple values were provided among studies in Peru, a mean value was calculated. If the species was not listed, the mean value for all species in the genus was calculated to determine the mean for that genus. In the instance of *Hymenolobium* sp, the genus was not listed thus we calculated the family (i.e. Fabaceae) level mean. The mean of the 7 species densities resulted in a tree density of 0.55.

Step 3: Calculate the biomass carbon extracted that enters the wood products pool at the time of deforestation.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1-WW_{ty})$$

$$C_{WP,i} = 0.082 * (1- 0.24)$$

$$C_{WP,i} = 0.062 \text{ t CO2-e ha}^{-1}$$

Where:

$CWP_{,i}$	Carbon stock entering the wood products pool from stratum i; t CO2-e ha-1
$CXB_{,ty,i}$	Mean stock of extracted biomass carbon by class of wood product ty from stratum i; t CO2-e ha-1

WW_{ty}	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product ty; dimensionless
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	1, 2, 3, … Mstrata

***Step 4*:** Calculate the amount of wood products entering the pool at the time of deforestation (*CWP,i*, calculated in C-WP) that is expected to be emitted over a 100-year timeframe [18]

$$C_{WP100,i} = C_{wp,i} - C_{wp,i} * (1\text{-}SLF_p) * (1\text{-}Of_p)$$

$$C_{WP100,i} = 0.062 – 0.062 * (1\text{-} 0.2) * (1\text{-} 0.84)$$

$$C_{WP100,I} = 0.062 – (0.062 * 0.8 * 0.16)$$

$$C_{WP100,i} = 0.062 – 0.008$$

$$C_{WP100,i} = 0.054 \text{ tCO}_2\text{-e ha}^{-1}$$

Where,

$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*; t CO2-e ha-1
$C_{WP,i}$	Carbon stock entering wood products pool at time of deforestation from stratum *i*; t CO2-e ha-1
SLF_{ty}	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*; dimensionless
OF_{ty}	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*; dimensionless
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	*1, 2, 3, … M*strata

[18] Source data: Winjum, J.K., Brown, S. and Schlamadinger, B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284.

7. Loss of biomass attributable to fuel-wood collection

Since the property is privately owned no harvest of standing tree biomass for fuel-wood has occurred, historically been allowed or will be allowed in the Project area under the project scenario.

8. Avoided emissions from fertilizer use

Emissions from fertilizer use was conservatively excluded from the baseline scenario.

9. Avoided emissions from biomass burning

In the baseline scenario, land clearing would include piling and burning of all remaining above-ground woody biomass on the site after the valuable timber species are removed. Emissions of CH_4 and N_2O from biomass burning were conservatively excluded.

10. Avoided emissions from transportation fuel use

Emissions from transportation fuel use are conservatively omitted in both the baseline and project scenarios.

3.2 Project Emissions

The net greenhouse gas emissions under the project scenario will be calculated using the following equation 1 from VCS module M-Mon.

$$\Delta C_P = \sum_{t-1}^{t} \sum_{i=1}^{m} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,I,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t})$$

Where:

ΔC_P Net greenhouse gas emissions within the project area under the project scenario; t CO2-e

$\Delta C_{P,DefPA,i,t}$ Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* at time *t*; t CO2-e

$\Delta C_{P,Deg,I,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* at time *t*; t CO_2-e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* at time *t*; t CO2-e
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO2-e
$\Delta C_{P,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum *i* at time *t*; t CO2-e
i	1, 2, 3 …*M* strata
t	1, 2, 3, … *t** years elapsed since the start of the REDD project activity

Under the project scenario there are no planned/predicted activities that will cause or changes to carbon stocks and /or greenhouse gas emissions.

Specifically :

1. No deforestation or harvest of any type is allowed or will be conducted under with-project scenario. Thus $\Delta C_{P,DefPA,i,t} = 0$ and $\Delta C_{P,SeLog,i,t} = 0$

2. No collection of fuel wood for direct biomass burning and/or charcoal production will be allowed under the project scenario. In addition the project is specifically designed to prevent timber poaching and thus any degradation from timber poaching. Thus $\Delta C_{P,Deg,I,t} = 0$

3. No major disturbances (i.e. wildfire, geologic events, pest and disease outbreaks, extreme weather) are anticipated during the course of the project. Yacumama is located in the upper Peruvian Amazon Basin, defined as the region above the confluence of the Rio Ucayali and Rio Marañon (Figure 2), and is affected by yearly flooding events that temporarily inundate large tracts of tropical forest. The annual flooding is a natural part of the system and a key component of local ecosystem processes (Kvist and Nebel 2001). Flood waters originating in the Andes Mountains carry large sediment loads that deposit essential plant nutrients as the flood waters recede. Thus $\Delta C_{P,DistPA,i,t} = 0$

4. Because no forestry activities are planned and active project activities include restricting those fuel wood and timber poaching GHG emissions involved in these activities are not anticipated. Thus $GHG_{P\text{-}E,i,t} = 0$.

5. There are no carbon stock enhancements planned under the project scenario. Forest is currently in a steady- state thus no significant increase biomass is anticipated. Thus $\Delta C_{P,Enh,i,t} = 0$

Table 6: Ex-Ante net carbon stock changes in all pools per hectare.

Year	Total $C_{BSL,i}$ (t CO2 –e ha-1)	Total $C_{P\ post,i}$ (t CO2 –e ha-1)	$\Delta C_{Pools,Def,i,t}$ (t CO2 –e ha-1)
2012	333	57	276
2013	333	57	276
2014	333	57	276
2015	333	57	276
2016	333	57	276
2017	333	57	276
2018	333	57	276
2019	333	57	276
2020	333	57	276
2021	333	57	276

3.3 Leakage

Activity Shifting Leakage (L-KASP)

Activity shifting leakage was assessed using module "Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP)". The deforestation agent was determined to be the current landowner based upon the approved *Operativo Anual Para Permiso Forestal De Propiedad Privada 2009* (Annual operating plan for permission to timber private property 2009)(Appendix B) .The project proponent controls 1 additional property within Peru (Figure 3 and Table 6)[19] where the lodge structures are located. There is no history of deforestation or greenhouse gas emissions within the previous 5 years of the project start date and no verifiable plans for deforestation for controlled and future controlled lands exist.

Using equation 1 from LK-ASP GHG emissions from activity shifting leakage are calculated as:

$$\Delta C_{LK\text{-}AS,\ planned} = \sum_{t-1}^{t} \sum_{i=1}^{m} \{(LKA_{planned,i,t} \times \Delta C_{BSL,i}) + GHG_{LK,E,i,t} + LK_{peat}\}$$

Where:

$\Delta C_{LK\text{-}AS,\ planned}$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation; t CO2-e
$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum *i* at time *t*; ha
$\Delta C_{BSL,I}$	Net carbon stock changes in all pools in baseline stratum *i*;
$GHG_{LK,E,i,t}$	Greenhouse gas emissions as a result of leakage of avoided deforestation activities in stratum *i* in year *t*; t CO2-e
LK_{peat}	Net greenhouse gas emissions due to leakage to peatlands as a result of implementation of a planned deforestation project at time *t*; t CO2-e
i	1, 2, 3 …*M* strata
t	1, 2, 3, … *t** years elapsed since the start of the REDD project activity

Step1: Determination of the Baseline Rate of Forest Clearance by the Deforestation Agent

[19] The parcel identified as "Yacumama" is not part of the project area and is the parcel that the remaining lodge facilities occupy.

Option 1.3b: Estimations of forest clearance are calculated using equation 4 from LK-ASP as:

$NewR_{i,t} = (D\%_{planned,i,t,OP} \times A_{planned,i,OP})$

Where:

$NewR_{i,t}$	New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)
$D\%_{planned,i,t,OP}$	Projected annual proportion of land that will be deforested outside the project boundary in stratum *i* in year *t (*percent)
$A_{planned,i,OP}$	Total area of planned deforestation outside the project boundary over the baseline period for stratum *i* (ha)
i	1, 2, 3 …*M* strata
t	1, 2, 3, … *t** years elapsed since the start of the project activity

Step 2: Estimate new projection of forest clearance by the baseline agent of deforestation (using equation 5 in LK-ASP) with project implementation if no leakage occurring.

$NewR_{i,t} = WoPR_{i,t} - (D\%_{planned,i,t} * A_{planned,i})$

$NewR_{i,t} = 286.3 – (1 *286.3)$

$NewR_{i,t} = 0$

Where:

$NewR_{i,t}$	New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)
$WoPR_{i,t}$	Deforestation by the baseline agent of the planned deforestation in stratum i in year t in the absence of the project (ha)
$D\%_{planned,i,t,OP}$	Projected annual proportion of land that will be deforested outside the project boundary in stratum *i* in year *t (*percent)
$A_{planned,i,OP}$	Total area of planned deforestation outside the project boundary over the baseline period for stratum *I* (ha)

i 1, 2, 3 …*M* strata

t 1, 2, 3, … *t** years elapsed since the start of the project activity

Step 3: Monitor all areas deforested by baseline agent of deforestation through the years in which planned deforestation was forecast to occur.

All areas owned by the landowner in Peru will be monitored for deforestation using remote sensing data.

Calculate using equation 6 in LK-ASP:

$LKA_{planned,i,t} = A_{defLK,i,t} - NewR_{i,t}$

Where:

$LKA_{planned,i,t}$ The area of activity shifting leakage in stratum *i* at time *t*; ha

$A_{defLK,i,t}$ The total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t*

$NewR_{i,t}$ New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)

i 1, 2, 3 …*M* strata

t 1, 2, 3, … *t** years elapsed since the start of the project activity

Step 4: Monitor greenhouse gas emissions (i.e. biomass burning and nitrous oxide emissions) outside the project area boundary by baseline agent of deforestation.

Calculate using equation 7 in LK-ASP:

$GHG_{LK,E,i,t} = E_{biomassburn,i,t} \times N_2O_{direct\text{-}N,i,t}$

Where:

$GHG_{LK,E,i,t}$ Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum *i* in year *t* (t CO_2e).

$E_{biomassburn,i,t}$ Non-CO2 emissions due to biomass burning in stratum *i* in year *t* (t CO2e)

$N_2O_{direct\text{-}N,i,t}$ Direct N_2O emission as a result of nitrogen application on the alternative land use in stratum *i* in year *t* (t CO2e)

i 1, 2, 3 …*M* strata

t 1, 2, 3, … *t** years elapsed since the start of the REDD project activity

Market-Effects Leakage through Decreased Timber Harvest

Market Effects leakage (ΔC_{LK-ME}) was assessed using module "Estimation of Emissions from Market Effects (LK-ME).

The volume of timber projected to be extracted for commercial markets yearly for each stratum ($V_{BSL,EX,i,t}$) under the baseline scenario was calculated by multiplying the volume (3.86 m^3) of merchantable trees per hectare (obtained from the approved Yacumama harvest plan appendix B, page 29, Volume Table summarization) by WoPR (i.e.286.3 ha).

$V_{BSL,EX,i,t} = 3.86*286.3$

$V_{BSL,EX,i,t} = 1{,}105.12\ m^3$

The 7 commercial tree species listed in the approved Yacumama harvest plan (Appendix B) were used to determine the "mean wood density of commercially harvested species" in the project area (Table 6). Densities were obtained from Baker et al. (2004) appendix A. If multiple values were provided among studies in Peru, a mean value was calculated. If the species was not listed, the mean value for all species in the genus was calculated to determine the mean for that genus. In the instance of *Hymenolobium* sp, the genus was not listed thus we calculated the family (i.e. Fabaceae) level mean. The mean of the 7 species densities resulted in a tree density of 0.55 (i.e. D_{MN}).

Table 7: Seven commercial species listed in the approved Yacumama deforestation plan and their wood densities. Wood densities were obtained from Baker et al. (2004) appendix A.

Common Name	Scientific Name	Density (t dry mass m^{-3} green volume)	Notes
Moena	*Aniba sp.*	0.54	Used figures for *Aniba amazonica*
Lagarto caspi	*Calophyllum brasiliense*	0.53	
Andiroba	*Carapa guianensis*	0.52	
Almendro	*Caryocar macrocarpon*	0.65	*C. glabrum* is synonymous.
Shiringa	*Hevea guianensis*	0.53	Used figure for *Hevea indet* a closely related species. Some authorities do not recognize as a separate species.

Mari-mari	*Hymenolobium sp.*	0.58	Fabaceae level mean
Quillosisa	*Vochysia sp.*	0.49	Quillosisa is recognized *Vochysia lanceoloata* by ITTO (http://www.tropicaltimber.info/)
	Mean Density	**0.55**	

Yearly carbon emission due to displaced timber harvests in the baseline scenario was calculated using the equation 5 from LK-ME in the following manner:

$$C_{BSL,XBT,I,t} = ((V_{BSL,XE,it} * D_{MN} * CF) + (V_{BSL,XE,it} * LDF) + (V_{BSL,XE,it} * LIF)) * 44/12$$

$$C_{BSL,XBT,I,t} = ((1{,}105.12*0.55*0.47) + (1{,}105.12*0.53) + (1{,}105.12*0.29) * 44/12$$

$$C_{BSL,XBT,I,t} = (285.67+585.71+320.48) * 44/12$$

$$C_{BSL,XBT,I,t} = 4{,}374.13 \text{ t CO2-e}$$

Where:

$C_{BSL,XBT,i,t}$	Carbon emission due to timber harvests in the baseline scenario in stratum *i* at time *t*; t CO2-e
$V_{BSL,EX,i,t}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* at time *t*; m3
D_{mn}	Mean wood density of commercially harvested species; t d.m.m-3. The value must be the same as that used in the module CP-W if this pool is included in the baseline.
CF	Carbon fraction of biomass for commercially harvested species *j*; t C t d.m.-1 . The value must be the same as that used in the module CP-W if this pool is included in the baseline.
LDF	Logging damage factor; t C m-3 (default 0.53 t C m-3 for broadleaf)
LIF	Logging infrastructure factor; t C m-3 (default 0.29 t C m-3)
i	1, 2, 3, … *M* strata
t	1, 2, 3, … *t** years elapsed since the projected start of the REDD project activity

PMPi is defined as the merchantable biomass as a proportion of the total aboveground tree biomass in stratum *i* at time *t* in the project area. PML_{FT} is defined as the proportion of total biomass that is merchantable for each forest type in the project area. Because there is a single strata and forest type in the project area (i.e. they are exactly the same) PMPi = PML_{FT}. Thus, PML_{FT} is equal (± 15%) to PMP_i; therefore LF_{ME} = 0.4.

Since there was only one strata, the summed carbon emission due to yearly timber harvests in the baseline case potentially displaced through implementation is $AL_{T,i}$ =4,374.13. Thus annual market effects leakage (equation 5 LK-ME) was calculated using equation 4 LK-ME in the following manner:

$LK_{MarketEffects,timber} = \sum (LF_{ME} * AL_{T,i})$

$LK_{MarketEffects,timber} = 0.4 * 4,374.13$

$LK_{MarketEffects,timber}$ = 1,749.65 t CO_2-e

3.4 Net GHG Emission Reductions and Removals

Table 7 summarized the carbon pools measured and/or calculated in the project and baseline scenarios. These pools were above ground tree biomass, below ground tree biomass, long lived wood products, market leakage and activity shifting leakage[20]. Prior to final summary each of the GHG emissions and carbon pools were tested for significance using T-SIG. Thus, based upon T-SIG, long lived wood products can be treated as de-minimis is excluded from further analyses.

Table 8. Summary of the relative contribution of carbon pools and GHG emission sources calculated using T-SIG.

Carbon Pool/GHG emission source	Annual GHG emissions CO_2 t eq ha^{-1}	Total GHG Emissions CO_2 t eq	Relative Contribution
Above-ground Tree Biomass	276.95	792,907.00	81.64%
Below-ground Tree Biomass	53.98	160,728.00	16.55%
Market Effects Leakage	6.11	17,492.93	1.80%
Long Lived Wood Products	0.054	154.60	0.02%
		971,282.53	100.00%

Module BL-PL was used to calculate baseline C-Stock changes in the Project scenario using equations 4 and 6 which correspond to the C pools used for both the baseline and project (see table 7).

[20] Analysis identified no activity shifting leakage and thus was not included in the significance analysis.

Total carbon stock changes in above ground tree biomass were calculated using equation 4 BL-PL.

$\Delta C_{AB\ tree,i} = C_{AB\ tree\ bsl,i} - C_{AB\ tree\ post,i}$ (equation 4)

$\Delta C_{AB\ tree,i} = 276.95\ t\ CO_2 –e\ ha^{-1} – 47.67\ t\ CO_2 –e\ ha^{-1}$

$\Delta C_{AB\ tree,I} = 229.28\ t\ CO_2 –e\ ha^{-1}$

Total carbon stock changes in below ground tree biomass were calculated using equation 6 BL-PL.

$\Delta C_{BB\ tree,i} = C_{BB\ tree\ bsl,i} – C_{BB\ tree\ post,i}$ (equation 6)

$\Delta C_{BB\ tree,i} = 56.14\ t\ CO_2 –e\ ha^{-1} – 9.53\ t\ CO_2 –e\ ha^{-1}$

$\Delta C_{BB\ tree,i} = 46.61\ t\ CO_2 –e\ ha^{-1}$

The sum of the baseline carbon stock changes in all pools at time t was calculated using equation 11 BL-PL

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * (\Delta C_{AB\ tree,i} + \Delta C_{AB\ non\text{-}tree,i} + \Delta C_{LI,i})$$

$$+ \sum_{t-10}^{t} \{AA_{planned,i,t} * (\Delta C_{BB\ tree,i} + \Delta C_{BB\ non\text{-}tree,i} + \Delta C_{DW,i}) * 1/10\}$$

$$+ \sum_{t-20}^{t} \{AA_{planned,i,t} * (\Delta C_{WP100,i} + \Delta C_{soc,i}) * 1/20\}$$

Therefore the baseline net GHG emissions for planned deforestation in the with-project scenario, before reductions for a risk buffer, are conservatively estimated at 729,827 mt CO_2 e (table 9) or the year life of the project.

Table 9: Ex ante GHG Emissions for the baseline, project, and removals before deductions for the risk buffer.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Risk Buffer	Estimated net VCUs (tCO_2e)
2012	66,978	0	1,750	22,103	43,126
2013	68,313	0	1,750	22,543	44,020
2014	69,647	0	1,750	22,983	44,914
2015	70,981	0	1,750	23,424	45,808
2016	72,316	0	1,750	23,864	46,702
2017	73,650	0	1,750	24,304	47,596
2018	74,984	0	1,750	24,745	48,490
2019	76,319	0	1,750	25,185	49,384
2020	77,653	0	1,750	25,625	50,278
2021	78,987	0	1,750	26,066	51,172
Total	729,827			240,843	471,488

The overall project risk buffer from planned deforestation was calculated using equation 4 in VM007 with the risk buffer percentage obtained from the analysis performed using, "AFOLU Non-permanence Risk Tool.[21]"

[21] There were no reductions for Buffer $_{UNPLANNED}$ or Buffer $_{DEGRAD\text{-}FW/C}$.

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	Project Forest Cover Benchmark Map
Data unit:	Ha
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Equations	Used in equation 3,8 in VCS module M-MON
Source of data:	The 2012 land use/land cover (LULC) map (figure 6) was derived from a cloud free Landsat 5, 2011 (Julian Day 219) image as downloaded from the United States Geographic Survey's (USGS) Global Visualization Viewer (GloVis) (http://glovis.usgs.gov).
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology. The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery.
Any comment:	Rapideye imagery was used to assess the accuracy of the 2012 landcover map (Figure 6) and is considered an appropriate tool for '"ground-truthing" the interpretation of satellite imagery and for assessing the accuracy (GOFC-GOLD 2014) . The Rapideye 5-band image (August, 2010) with five meter resolution, was used to assess accuracy.

Data Unit / Parameter:	R
Data unit:	t root d.m. t^{-1} shoot d.m.
Description:	Root to shoot ratio appropriate to biome applied as belowground biomass per unit area.
Equations:	5
Source of data:	$C_{AB\_tree,I}$ multiplied by a root to shoot ratio available in the IPCC GL AFLOU. Global ecoregion specific from IPCC GPG-LULCF.
Value applied	0.20 for ABG < 125 t. ha^{-1}, 0.24 for ABG > 125 t. ha^{-1}
Justification	Tropical ratio provided in IPCC GPG-LULCF
Any Comment	Used in the calculation in Below-ground biomass.

Data Unit / Parameter:	CF_j
Data unit:	t C t-1 d.m.$^{-1}$
Used in Equations:	Used in to estimate above ground biomass of individual trees (equation 4 CP-AB).
Description:	Carbon fraction of dry matter in t C t^{-1-1} d.m. for species *j*
Source of data:	Default value from CP-AB.
Value applied	0.47 C t^{-1-1} d.m.
Justification of choice of data or description of measurement methods and procedures applied:	Using default value from module.
Any Comment	

Data Unit / Parameter:	*fj(X,Y)*
Data unit:	t d.m. tree^{-1}
Description:	Allometric equation for species j linking measured tree variable(s) to aboveground biomass of living trees, expressed as t d.m. tree-1
Equations:	Used in to estimate above ground biomass of individual trees.
Source of data:	Pearson, T., Walker, S. and Brown, S. 2005. Sourcebook for Land Use, Land-Use Change and Forestry Projects. Winrock International and the World Bank Biocarbon Fund. 57pp
Value applied	Tree (AGB) Tropical Wet Forest >4000 (Pearson et al. 2005) AGB= 21.297 – 6.953 * (D) + 0.740 * (D2)
Justification of choice of data or description of measurement methods and procedures applied:	The equation was selected based upon the total inputs of moisture received via rainfall and yearly flood events.
Any Comment	Allometric equation was validated using the limited measurements approach.

Data Unit / Parameter:	$A_{planned,i}$
Data unit:	Ha
Used in equation	Equation 3, VCS module BL-PL.
Description:	The total area under the baseline scenario planned for deforestation.
Source of data:	1. Plan Operativo Anual Para Permiso Forestal De Propiedad Privada. (Annual operating plan for forest permit on private property) 2. Common practice analysis using date from *Monitoring of the Andean Amazon Project*

	http://maaproject.org/en/ 2015).
Value applied:	2863ha
Justification of choice of data or description of measurement methods and procedures applied:	The Yacumama harvest Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) provides legal basis for harvest and conversion. Both parcels comprising the project area are suitable for agriculture and are type classified as “productive”. Yacurana I was additionally classified for agricultural exploitation with the types identified. Identified through common practice analysis.
Any comment:	

Data Unit / Parameter:	$D\,\%_{planned,i,t}$
Data unit:	% $year^{-1}$
Used in equation	Equations 2,3 VCS module BL-PL.
Description:	Projected annual proportion of project deforested.
Source of data:	1. Plan Operativo Anual Para Permiso Forestal De Propiedad Privada. (Annual operating plan for forest permit on private property) 2. Common practice analysis using date from *Monitoring of the Andean Amazon Project* http://maaproject.org/en/ 2015).
Value applied:	10%
Justification of choice of data or description of measurement methods and procedures applied:	Identified through common practice analysis and id the most conservative figure that will result in the project being deforested within 10 years of the start date.
Any comment:	

Data Unit / Parameter:	$AA_{planned,i,t}$
Data unit:	Ha $year^{-1}$
Used in equation	Equation 3, VCS module BL-PL.
Description:	Annual area of baseline planned deforestation for stratum *i* at time t;
Source of data:	1. Plan Operativo Anual Para Permiso Forestal De Propiedad Privada. (Annual operating plan for forest permit on private property). 2. Common practice analysis using data from “Monitoring of the Andean Amazon Project http://maaproject.org/en/ 2015).
Value applied:	286.3 ha $year^{-1}$

Justification of choice of data or description of measurement methods and procedures applied:	This figure represents the most conservative figure that will result in the project being deforested within 10 years of the start date. Based upon a common practice analysis.
Any comment:	

Data Unit / Parameter:	$L\text{-}D_{,i}$
Data unit:	%
Description:	% Likelihood of deforestation in stratum *i.*
Source of data:	Operativo Anual Para Permiso Forestal De Propiedad Privada (Annual operating plan for forest permit on private property)
Value applied:	100%
Justification of choice of data or description of measurement methods and procedures applied:	From BL-PL “For all other planned deforestation areas (i.e. areas not both under government control and zoned for deforestation), $L\text{-}D_i$ shall be equal to 100%”
Any comment:	

Data Unit / Parameter:	D_{mn}
Data unit:	t d.m.m^{-3}
Used in equations:	4,7
Description:	Mean wood density of commercially harvested species.
Source of data:	Species specific values from the literature (Baker et al 2004). Appendix A summarizes values from local publications in Peru.
Value Applied	0.55 t dry mass m^{-3} green volume
Justification of choice of data or description of measurement methods and procedures applied:	The 7 commercial tree species listed in the approved Yacumama harvest plan (Appendix B) were used to determine the “mean wood density of commercially harvested species” in the project area (Table 16). Densities were obtained from Baker et al. (2004) appendix A. If multiple values were provided among studies in Peru, a mean value was calculated. If the species was not listed, the mean value for all species in the genus was calculated to determine the mean for that genus. In the instance of *Hymenolobium* sp, the genus was not listed thus we calculated the family (i.e. Fabaceae) level mean. The mean of the 7 species densities resulted in a tree density of 0.55.
Any comment:	

Data Unit / Parameter:	Project Area
Data unit:	Ha
Description:	Area in which the project occurs
Source of data:	Remote sensing data, COFOPRI maps, and original survey maps.
Value applied:	2863 ha
Justification of choice of data or description of measurement methods and procedures applied:	Use remote sensing data to eliminate water bodies from the project area. Original survey maps and remote sensing were used to confirm project area boundaries.
Any comment:	

Data Unit / Parameter:	Forest harvest plan
Data unit:	Legal record
Description:	Peruvian ministry of agriculture prepared a 12 month plan for the harvesting of trees on the Yacurana parcel of the Yacumama project.
Source of data:	Operativo Anual Para Permiso Forestal De Propiedad Privada (Annual operating plan for forest permit on private property)
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	The plan was prepared specifically for Yacumama and is the basis for the baseline scenario. The plan classified the entire Yacurana I property as “productive” and suitable for agriculture. The plan also classified Santuario Privado, the other parcel comprising the project area, as “productive” lands
Any comment:	Plan has been translated to English. The plan is a specific 12 month plan.

Data Unit / Parameter:	PML_{FT}
Data unit:	%
Used in Equations	Market effects leakage
Description:	Mean merchantable biomass as a proportion of total above ground tree biomass for each forest type.
Source of data:	Field data from Yacumama harvest plan.
Value Applied	+/- 15%
Justification of choice of data or description of measurement methods and procedures applied:	Use field data collected in support of Yacumama harvest plan.
Purpose of data	Calculation of leakage emissions
Any comment:	

Data Unit / Parameter:	$PMP_{,i}$
Data unit:	%
Used in Equations	Market effects leakage
Description:	Proportion of total biomass in commercial species that is merchantable.
Source of data:	Field data from Yacumama harvest plan.
Value Applied	+/- 15%
Justification of choice of data or description of measurement methods and procedures applied:	Use field data collected in support of Yacumama harvest plan.
Purpose of data	Calculation of leakage emissions
Any comment:	

Data Unit / Parameter:	*LDF*
Data unit:	t C m^{-3}
Description:	Factor for calculating the biomass of dead wood created during logging operations m^{-3} extracted.
Equations	5 from VCS LK-ME
Source of data:	Default value provided in VCS LK-ME
Value applied:	0.53 t C m^{-3}
Justification of choice of data or description of measurement methods and procedures applied:	Used default value reported in VCS LK-ME
Purpose of data	Calculation of leakage emissions
Any comment:	

Data Unit / Parameter:	*LIF*
Data unit:	t C m^{-3}
Used in equations:	5 from VCS LK-ME
Description:	Factor for calculating emissions arising from the creation of logging infrastructure during logging operations m^{-3} extracted.
Source of data:	Default value provided in VCD LK-ME
Value applied	Used default value of 0.29 t C m^{-3}
Justification of choice of data or description of measurement methods and procedures applied:	Used conservative default value.
Any comment:	

Data Unit / Parameter:	$V_{BSL,EX,i,t}$
Data unit:	m^3
Description:	Volume of timber projected to be extracted from the within the project boundary during baseline in stratum i at time t
Equations	5
Source of data:	Estimates derived from field measurements
Value applied	1,105.12 m^3
Justification of choice of data or description of measurement methods and procedures applied:	Used estimates derived from field measurements conducted in support of the development of the Yacumama forest harvest plan.
Any comment:	

Data Unit / Parameter:	$E_{REDD\ BSLSS,\ i,\ pool\ \#}$
Data unit:	T CO_2 eq
Description:	Carbon stock or GHG sources (e.g. trees, dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the baseline case (EBSL SS,i, pool#)
Equation	4, in VCS module X-UNC 2.1
Source of data:	The terms denoting significant carbon stocks, GHG sources or leakage emissions from baseline modules used to calculate net emission reductions.
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied	The terms denoting significant carbon stocks , GHG sources, or leakage emissions from models used to calculate net emission reductions.
Purpose of data	Calculation of uncertainty
Any comment:	

Data Unit / Parameter:	$U_{REDD\ BSLSS,\ i,\ pool\ \#}$
Data unit:	%
Description:	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case (1,2…n represent different carbon pools and/or GHG sources) (UBSL,SS,i,pool#)
Equation	4, in VCS module X-UNC 2.1
Source of data:	Calculations from Field Measurements

Value applied:	
Justification of choice of data or description of measurement methods and procedures applied	Uncertainty in pools derived from field measurements.
Any comment:	

Data Unit / Parameter:	SLF_{ty}
Data unit:	Dimensionless
Used in Equations	Equation 1 CP-W
Description:	Fraction of wood products that will be emitted to the atmosphere within 5 years by class of wood product.
Source of data:	Published data provided
Value applied	0.2
Justification of choice of data or description of measurement methods and procedures applied:	
Any comment:	

4.2 Data and Parameters Monitored

Data Unit / Parameter:	Project Forest Cover Monitoring Map
Data unit:	Ha
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data:	Remote sensing in combination with GPS data collected during ground truthing
Value applied:	100%
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology. The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy. Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Any comment:	If stratification is required in the future due to ex-post monitoring , then new strata will be identified using module X-STR.

Data Unit / Parameter:	Degradation PRA results
Data unit:	
Description:	
Source of data:	Participatory rural appraisal
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Consists of semi structured interviews that assess whether the following activities are occurring in the project area: -Harvesting of fuel wood -Harvesting of wood for charcoal production -Timber harvest If 10% of those interviewed believe that degradation or any of the above may be occurring a limited on the ground survey is triggered.
Monitoring Frequency	Every 2 years.
Any comment:	An estimation will be made in the with-project case. In the current project the parameter is set to "0" since there is an infrastructure, hiring, and policies in place to prevent deforestation

Data Unit / Parameter:	$A_{DefPA,i,u,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the project area in stratum *i* converted to land use *u* at time *t* (if any occurs)
Source of data:	Remote sensing imagery
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology. Head's up delineation using GIS and landsat imagery (or higher resolution) using multiple images to get a cloud free image. Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Any comment:	This is presumed to be zero ex ante. The project has in place a clear management strategy, infrastructure, and personnel in place to restrict access to the Project area for the purposes of harvesting trees.

Data Unit / Parameter:	$PMP_{,i}$
Data unit:	%

Description:	Merchantable biomass as a proportion of total above ground tree biomass for stratum *i*
Equations	Used in calculating leakage
Source of data:	Onsite measurements
Description of measurement methods and procedures to be applied:	Merchantable biomass is equal to merchantable volume multiplied by wood density determined from Yacumama forest harvest plan.
Frequency of Monitoring	Monitored every 5 years prior to verification event.
Purpose of data	Calculation of leakage emissions
Any comment:	Ex-ante a time zero measurement shall be made of this factor.

Data / Parameter:	A_i
Data unit:	ha
Description:	Total Area of project stratum *i*
Equations	1, 6, 8, 12 or 7
Source of data:	Own assessment
Justification of choice of data or description of measurement methods and procedures applied	GIS coverages, ground survey data and/or remote imagery (satellite or aerial photographs), as outlined in Chapter 5.
Purpose of data:	Calculation of project emissions
Monitoring Frequency	Reset at baseline
Calculation method:	N/A
Comments:	N/A

Data Unit / Parameter:	A_{sp}
Data unit:	ha
Description:	Area of sample plots in ha.
Equation:	2,6,14 VCS module CP-AB
Source of data:	Nested plot design published in Pearson et al (2005).
Description of measurement methods and procedures to be applied:	*See field method section.*
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	

Tree Class	Plot Radius	Plot Area	Proportion of Hectare
≥5.0cm	4.0m	50m^2	0.005
≥20.0cm	14.0m	616m^2	0.062
≥50.0cm	20.0m	1256m^2	0.125

Monitoring equipment:	*30m fiberglass tape, Dbh tape*
QA/QC procedures to be applied:	*Not applicable.*
Calculation method:	Not applicable.
Any comment:	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known *ex-ante*. Where part of project monitoring, *ex-ante* the number and area of sample plots shall be estimated based on projected sample effort relative to projections of growth and emissions.

Data Unit / Parameter:	DBH
Data unit:	cm
Description:	Diameter at breast height (1.3m) of a tree in cm
Equations	1,3 VCS module CP-AB
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	Measured at 1.3m above-ground, unless tree has buttresses or irregular growth. Minimum diameter is 5cm. See field methods section for detailed procedures. Must be monitored at least every 5 years or if verification < 5 years, or a major event occurs monitoring must take place more frequently.
Frequency Of Monitoring	Monitoring will occur at minimum every 10 years or more frequently if events dictate a reset of the baseline.
Value applied:	See database for tree measurements.
Monitoring equipment:	Diameter tape incremented in centimeters, 1.3m staff, 30m fiberglass tape, GPS to navigate to permanent plots
QA/QC procedures to be applied:	See field methods section
Calculation method:	Direct observation
Any comment:	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data Unit / Parameter:	N
Data unit:	Dimensionless
Description:	Number of sample points
Equations:	4, 8 VCS module CP-AB
Source of data:	Published forest biomass and standard deviation from Nebel et al (2001a).

Description of measurement methods and procedures to be applied:	Information from Nebel et al (2001a) was entered into Winrock Sampling Calculator to determine total number of plots needed. Must be monitored at least every 5 years or if verification < 5 years, or a major event occurs monitoring must take place more frequently.
Frequency of Monitoring/Recording	Minimum of every 10 years for baseline renewal.
Value applied:	25 forest plots
Monitoring equipment:	Not applicable
QA/QC procedures to be applied:	Not applicable
Calculation method:	Winrock Sampling Calculator
Any comment:	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known ex-ante. Where part of project monitoring, ex-ante the number of sample plots shall be estimated based on projected sample effort relative to projections of growth and emissions.

Data Unit / Parameter:	$\Delta A_{P,DistPA,q,i,t}$
Data unit:	Ha
Description:	Area impacted by natural disturbance in project stratum *I*, converted to natural disturbance stratum *q* at time *t*; ha
Source of data:	Remote sensing imagery combined with ground verification points and/or GPS coordinates.
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Any comment:	No major ecological disturbance is predicted within the project area under the with-project scenario.

Data Unit / Parameter:	$\Delta C_{P,Def,i,t}$
Data unit:	t CO2-e
Description:	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t; t CO2-e
Source of data:	calculated
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5

	years examination must occur prior to any verification event.
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).
Calculation method:	
Any comment:	No deforestation is planned or allowed within the project area under the with-project scenario.

Data Unit / Parameter:	$\Delta C_{P,DistPA,i,t}$
Data unit:	t CO2-e
Description:	Net carbon stock change as a result of disturbance in the project area in the project case in stratum i at time t; t CO2-e
Source of data:	calculated
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the

	entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

Data Unit / Parameter:	$\Delta C_{P,Deg,I,t}$
Data unit:	t CO2-e
Description:	Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t; t CO2-e
Source of data:	calculated
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).
Any comment:	No major ecological disturbance is predicted within the project area under the with-project scenario.

Data Unit / Parameter:	$GHG_{P-E,i,t}$
Data unit:	t CO2-e
Description:	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO2-e
Source of data:	calculated
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Required by methodology.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Frequency of Monitoring	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	N/A
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).
Any comment:	No major ecological disturbance is predicted within the project area under the with-project scenario.

Data Unit / Parameter:	$C_{AB\_tree,i}$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in above-ground biomass in trees in the baseline stratum, i
Source of data:	Field measurements applied with allometric equation published in Pearson et. al. (2005)
Description of measurement methods and procedures to be applied:	See field methods section.

Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	In 2013, 276.95 t CO_2-e ha^{-1}.
Monitoring equipment:	Computer and spreadsheet software.
QA/QC procedures to be applied:	Independent 3rd party audit of field measurements utilizing re-measurement of a sample of plots.
Calculation method:	Calculation method follows Pearson et. al. 2005.
Any comment:	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data Unit / Parameter:	$C_{BB\_tree,i}$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in below-ground biomass in trees in the baseline stratum, i
Source of data:	$C_{AB\_tree,I}$ multiplied by a root to shoot ratio available in the IPCC GL AFLOU
Description of measurement methods and procedures to be applied:	See methods section.
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied:	In 2013, 56.14 t *CO_2-e ha^{-1}.*
Monitoring equipment:	Computer and spreadsheet software.
QA/QC procedures to be applied:	Independent 3rd party audit of field measurements utilizing re-measurement of a sample of plots.
Calculation method:	Calculation method follows CP-AB
Any comment:	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data Unit / Parameter:	Leakage (Activity Shifting) $\Delta C_{LK\text{-}AS,planned}$
Data unit:	T CO_2 eq ha^{-1}
Description:	Activity shifting leakage resulting from Project implementation and will include an assessment of acreage harvested and greenhouse gas emissions (Biomass burning and N_2O)
Source of data:	Remote sensing and ground surveys
Value applied:	0

Justification of choice of data or description of measurement methods and procedures applied:	Remote sensing will be used to monitor property controlled by project proponent to insure no harvest of forest resources occurs or emissions of greenhouse gases (biomass burning and N_2O).
Any comment:	The likelihood of activity shifting leakage is considered very low since the Project proponent plans to maintain the Yacumama as a base for project related operations and thus undisturbed from its' current state.

Data Unit / Parameter:	Leakage (Market) $\Delta C_{LK\text{-}ME}$
Data unit:	T CO_2 eq ha^{-1}
Description:	Market leakage resulting from Project implementation
Source of data:	Market analysis of commercial species timber value
Measurement procedures	
Monitoring Frequency	Data from field assessments and Yacumama harvest plan are used to determine commercial species.
Any comment:	Because there is a single strata and forest type in the project area (i.e. they are exactly the same) PMPi = PMLFT .

Data Unit / Parameter:	$A_{defLK,i,t}$
Data unit:	ha
Description:	The total area of deforestation by the baseline agent or class of agent of the planned deforestation in stratum *i* in year *t*
Equations	6 in LK-ASP
Source of data:	Data sources or own measurements
Measurement procedures	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.
Monitoring Frequency	Will be reexamined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Purpose of data	Calculation of leakage emissions
Any comment:	

Data Unit / Parameter:	PMP_i
Data unit:	%
Description:	Merchantable biomass as a proportion of total above ground tree biomass for stratum *i*
Source of data:	Merchantable biomass is equal to merchantable volume multiplied by wood density.
Measurement procedures	
Monitoring Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Any comment:	Ex-ante a time zero measurement shall be made of this factor.

Data unit/ Parameter:	$A_{WPS,i}$ or A_i
Data unit:	ha
Description:	Area of project stratum *i*
Equations	1, 6, 8, 12 or 7
Source of data:	Own assessment
Description of measurement methods and procedures to be applied:	GIS coverages, ground survey data and/or remote imagery (satellite or aerial photographs), as outlined in Chapter 5.
Frequency of monitoring/recording:	At each monitoring event
QA/QC procedures to be applied:	See Section 9.3 of *REDD-MF* or other VCS methodology that uses this module.
Purpose of data:	Calculation of project emissions
Calculation method:	N/A
Comments:	N/A

Data Unit / Parameter:	*WWty*
Data unit:	Dimensionless
Used in equations:	2, 4
Description:	WW = Fraction of extracted biomass effectively emitted to the atmosphere during production by class of wood product *ty* *WW* is therefore equal to *CXB,ty* multiplied by 0.24 for developing countries
Source of data:	The source of data is the published paper of Winjum *et al*. 19982
Justification of choice of data or description of measurement methods and procedures applied:	-
Any comment:	Parameter values to be updated if new empirically-based peer-reviewed findings become available.

4.3 Monitoring Plan

The Yacumama Monitoring Plan was developed to assess compliance with the overall goals of the project and insure proper project implementation to VCS standards.

Specifically monitoring is designed to insure that the following project goals and objectives are achieved:

- Avoidance of 1,084,648mtCO_2e emissions from land clearing and conversion to agriculture.

In order to accomplish the overall goals and objectives the monitoring plan will implement the following tasks:

Revision of the Baseline

a. Technical description of the monitoring task

This monitoring task is designed to update and revise the estimation of baseline carbon stock changes and GHG emissions form planned deforestation at Yacumama. Baseline will be renewed no later than January 1, 2022 unless unforeseen events trigger an earlier renewal.

b. Data to be collected

The following data will be collected and updated in support of the revision of the baseline.

-Total area planned deforestation

-Carbon stock in ABG biomass in trees

-Carbon stock in BGB in trees

-Carbon stock in wood products

c. Overview of data collection procedures

The data collection procedures will follow those outlined in VCS module BL-PL to revise the baseline and will be the same ones used in the initial assessment.

d. Quality control and quality assurance procedures

Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

<u>Specifically, QC activities will include:</u>

-accuracy checks on data acquisition and calculations,

-the use of approved standardized procedures for emission calculations, measurements, and estimating uncertainties, and

-archiving information and reporting.

<u>Specifically, QA activities will include:</u>

-A planned system of review procedures conducted by “in house” personnel not directly involved in the inventory compilation/development process.

-Reviews, by independent third parties, should be performed upon a finalized inventory following the implementation of QC procedures.

e. Data archiving

All data collected and documents created as part of the monitoring program will be archived electronically at the Virginia Tech Conservation Management Institute on secure servers that have been approved by the Virginia Tech Office of Export and Secure Research Compliance (OESRC) for maintenance of “not for public release” secure data. Final tabular data will be compiled in MS-excel compatible spreadsheets and final documents will be maintained in MS-word. Geo-spatial data will be compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents will be kept at least for two years after the end of the project. A mirror copy of the databases on secure portable hard-drives will also be housed with Yacumama management.

f. organization and responsibilities of parties involved in the above

Baseline will be renewed no later than January 1, 2022 unless unforeseen events trigger an earlier renewal. The Project proponent (Yacumama Management/Lawrence Bishop) will be responsible for contracting qualified organization to perform the monitoring tasks. In concert with Yacumama management, the selected organization will collect, summarize, analyze, and archive all of data required to perform the monitoring tasks. Yacumama management will secure a third party auditor to verify that the monitoring is in compliance with all VCS requirements.

Monitoring of actual net carbon stock changes and greenhouse gas emissions

a. Technical description of the monitoring task

This monitoring task is designed to asses changes in forest cover (if any) in the project area. These changes will be measured prior to each verification as part of the overall monitoring program. Methods will follow and must be consistent with VCS M-Mon.

b. Data to be collected

Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the changes in forested area (if any) areas at each monitoring event.

c. Overview of data collection procedures

Remote sensing will be used in concert with ground data to produce a forest / non-forest map and geodatabase. Methods will be consistent with VCS module M-Mon. The geodatabase will be produced for each independent verification audit and a report of the results produced for each independent verification audit. Landsat sensors will be used in geospatial analysis and to create LULC maps in order to detect changes in forested areas. The medium resolution imagery provided by Landsat sensors is commonly used to map deforestation and estimate area change and widely recognized as a cost effective and accurate image source for mid-resolution data analysis (GOFC-GOLD 2014). However, in the future

Landsat datasets may not be available and/or new and higher resolution source becomes available, ex-post deforestation detection will be determined using these newer higher resolution datasets.

Preprocessing of imagery will include the following three steps: geometric corrections, cloud removal, and radiometric corrections. Since a visual interpretation method was employed for the original benchmark map, radiometric corrections provided little additional benefit and thus may be omitted in future monitoring if the if using similar datasets. In addition, given that '*For simple scene by scene analysis (e.g. visual interpretation), the radiometric effects of topography and atmosphere should be considered in the interpretation process but do not need to be digitally normalized'* (GOFC-GOLD 2014). Thus, foregoing this step would have no impact on the map products or resulting geospatial analysis. Employing visual interpretation techniques also will allow for cloud coverage to be effectively handled as part of the interpretation process (GOFC-GOLD 2014). If cloud free images are difficult to obtain, multiple images can be used if within the appropriate time period. If cloud free images are not available the use of automated methods that follow industry standards should be employed.

d. Quality control and quality assurance procedure

Upon completion of the initial map, final review and quality will be performed by senior staff according organizational standard operating procedures before the validation and accuracy assessment step. Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

<u>Specifically, QC activities will include:</u>

-accuracy checks on data acquisition and calculations,

-the use of approved standardized procedures for emission calculations, measurements, and estimating uncertainties, and

-archiving information and reporting.

Specifically, QA activities will include:

-A planned system of review procedures conducted by "in house" personnel not directly involved in the inventory compilation/development process.

-Reviews, by independent third parties, should be performed upon a finalized inventory following the implementation of QC procedures.

e. Data archiving

All data collected and documents created as part of the monitoring program will be archived electronically at the Virginia Tech Conservation Management Institute on secure servers that have been approved by the Virginia Tech Office of Export and Secure Research Compliance (OESRC) for maintenance of "not for public release" secure data. Final tabular data will be compiled in MS-excel compatible spreadsheets and final documents will be maintained in MS-word. Geo-spatial data will be compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents will be kept at least for two years after the end of the project. A mirror copy of the databases on secure portable hard-drives will also be housed with Yacumama management.

f. organization and responsibilities of parties involved in the above

Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event. The Project proponent (Yacumama Management/Lawrence Bishop) will be responsible for contracting qualified organization (VTCMI) to perform the monitoring tasks. In concert with Yacumama management, the selected organization will collect, summarize, analyze, and archive all of data required to perform the monitoring tasks. Yacumama management will secure a third party auditor to verify that the monitoring is in compliance with all VCS requirements.

Monitoring of leakage, Carbon Stock changes and Greenhouse gas emissions

a. Technical description of the monitoring task

All significant sources of leakage identified in the PD will be monitored[22]. In the case of Yacumama Forest Carbon PD, ex ante "Activity Shifting Leakage" and "Market Effects Leakage" were not considered significant.

b. Data to be collected

GHG gas emissions from carbon stock changes due to activity and/or market leakage will be reported.

c. Overview of data collection procedures

Because the project proponents are the agents of deforestation the portion of the Yacumama property that is not included in the project area will be monitored to insure no deforestation will occur through field visits and remote sensing. Market effects leakage will be recalculated when new field data are collected to assess whether the effect of leakage is significant. Data collection procedures will follow those described in VCS modules LK-ASP and LK-ME.

d. Quality control and quality assurance procedure

Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

<u>Specifically, QC activities will include:</u>

-accuracy checks on data acquisition and calculations,

[22] In the case of Yacumama Forest Carbon PD, ex ante "Activity Shifting Leakage" and "Market Effects Leakage" were not considered significant.

-the use of approved standardized procedures for emission calculations, measurements, and estimating uncertainties, and

-archiving information and reporting.

<u>Specifically, QA activities will include:</u>

-A planned system of review procedures conducted by “in house” personnel not directly involved in the inventory compilation/development process.

-Reviews, by independent third parties, should be performed upon a finalized inventory following the implementation of QC procedures.

e. Data archiving

All data collected and documents created as part of the monitoring program will be archived electronically at the Virginia Tech Conservation Management Institute on secure servers that have been approved by the Virginia Tech Office of Export and Secure Research Compliance (OESRC) for maintenance of “not for public release” secure data. Final tabular data will be compiled in MS-excel compatible spreadsheets and final documents will be maintained in MS-word. Geo-spatial data will be compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents will be kept at least for two years after the end of the project. A mirror copy of the databases on secure portable hard-drives will also be housed with Yacumama management.

f. organization and responsibilities of parties involved in the above

The Project proponent (Yacumama Management/Lawrence Bishop) will be responsible for contracting qualified organization to perform the monitoring tasks. In concert with Yacumama management, the selected organization will collect, summarize, analyze, and archive all of data required to perform the monitoring tasks. Yacumama management will secure a third party auditor to verify that the monitoring is in compliance with all VCS requirements.

Estimation of ex-post net carbon stock changes and greenhouse gas emissions.

a. Technical description of the monitoring task

The ex post greenhouse gas emissions due to carbon stock changes (if any) will be, monitored, assessed, calculated, and reported. Specifically the objective for this task is to monitor the following parameters using equation 1 from VCS module M-MON:

$$\Delta C_P = \sum_{t-1}^{t} \sum_{i=1}^{m} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,I,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t}) \quad (1)$$

Where:

ΔC_P	Net greenhouse gas emissions within the project area under the project scenario; t CO2-e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* at time *t*; t CO2-e
$\Delta C_{P,Deg,I,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* at time *t*; t CO2-e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* at time *t*; t CO2-e
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO2-e
$\Delta C_{P,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum *i* at time *t*; t CO2-e
i	1, 2, 3 …*M* strata
t	1, 2, 3, … *t** years elapsed since the start of the REDD project activity

Degradation will be calculated using equations 7 and 8 in VCS module M-mon.

$$\Delta C_{P,Deg,i,t} = \Delta C_{P,Deg,i,t} + \Delta C_{P,SelLog,i,t} \quad (7)$$

Where:

$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* at time *t*; t CO2-e

$\Delta C_{P,DegW,i,t}$	Net carbon stock change as a result of degradation through extraction of trees for illegal timber or fuelwood and charcoal in the project area in the project case in stratum *i* at time *t*; t CO2-e
$\Delta C_{P,SelLog,i,t}$	Net carbon stock change as a result of degradation through selective logging of FSC certified forest management areas in the project area in the project case in stratum *i* at time *t*; t CO2-e
i 1, 2, 3 …	*M* strata
t 1, 2, 3, …	*t** years elapsed since the start of the REDD project activity

$$\Delta C_{P,DegW,i,t} = A_{DegW,I} * C_{DegW,i,t} / AP_i \qquad (8)$$

Where:

$\Delta C_{P,DegW,i,t}$	Net carbon stock changes as a result of degradation in stratum *i* in the project area at time *t*; t CO2-e
$A_{DegW,i}$	Area potentially impacted by degradation processes in stratum *i*; ha
$C_{DegW,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* at time *t*; t CO2-e
AP_i	Total area of degradation sample plots in stratum *i*; ha
i 1, 2, 3 …	*M* strata
t 1, 2, 3, …	*t** years elapsed since the start of the REDD project activity

b. Data to be collected

The primary monitoring objective is to calculate carbon stock changes due to reductions in forest cover that may result in GHG emissions during the monitoring period.

c. Overview of data collection procedures

Data collection procedures will follow and be consistent with those described in VCS module M-mon. This monitoring task will use will use data collected as part of the "**Monitoring of actual net carbon**

stock changes and greenhouse gas emissions" in the calculation of ex post carbon stock changes. Ancillary data, such as official news reports, on the ground reports from Yacumama employees, and immediately available satellite and other imagery will also be used to monitor the potential for impacts from natural disturbances. If there are indications of a major natural disturbance, on the ground visits to collect ground control GPS points and satellite imagery will be used to determine if the project area was affected. Natural disturbance area must be > than 1 ha. Where natural disturbances occur in the project area, such as tectonic activity (earthquake, landslide, volcano), extreme weather (hurricane), pest, drought, or fire that result in a degradation forest stocks the area disturbed will be delineated and the resulting emissions estimated. A participatory rural appraisal (PRA) will be used to assess whether there is potential for forest degradation from fuelwood collection and/or illegal logging. If the results of the PRA suggest that there is a potential for degradation activities, then limited field sampling will be undertaken based upon the methods described in M-mon. In the event that deforestation related to harvesting of trees were to occur, GHG emissions involved with the harvest operations would be calculated based upon the methods described in M-Mon

d. Quality control and quality assurance procedure

Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

<u>Specifically, QC activities will include:</u>

-accuracy checks on data acquisition and calculations,

-the use of approved standardized procedures for emission calculations, measurements, and estimating uncertainties, and

-archiving information and reporting.

<u>Specifically, QA activities will include:</u>

-A planned system of review procedures conducted by “in house” personnel not directly involved in the inventory compilation/development process.

-Reviews, by independent third parties, should be performed upon a finalized inventory following the implementation of QC procedures.

e. Data archiving

All data collected and documents created as part of the monitoring program will be archived electronically at the Virginia Tech Conservation Management Institute on secure servers that have been approved by the Virginia Tech Office of Export and Secure Research Compliance (OESRC) for maintenance of “not for public release” secure data. Final tabular data will be compiled in MS-excel compatible spreadsheets and final documents will be maintained in MS-word. Geo-spatial data will be compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents will be kept at least for two years after the end of the project. A mirror copy of the databases on secure portable hard-drives will also be housed with Yacumama management.

f. organization and responsibilities of parties involved in the above

Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event. The Project proponent (Yacumama Management/Lawrence Bishop) will be responsible for contracting qualified organization to perform the monitoring tasks. In concert with Yacumama management, the selected organization will collect, summarize, analyze, and archive all of data required to perform the monitoring tasks. Yacumama management will secure a third party auditor to verify that the monitoring is in compliance with all VCS requirements.

Monitoring Project Emissions-Biomass Burning

a. Technical description of the monitoring task

Non-CO_2 gas greenhouse emissions occurring within the project boundary due to biomass burning will be monitored.Non-CO_2 gas greenhouse emissions will be calculated using equation 30 from VCS module M-mon.

$$GHG_{P,E,i,t} = E_{F,C,i,t} + E_{biomassburn,i,t} + N_2O_{direct\text{-}N,i,t} \qquad (30)$$

Where:

$GHG_{P,E,i,t}$	Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum *i* in year *t*; t $CO_{2\text{-}e}$
$E_{FC,i,t}$	Emission from fossil fuel combustion in stratum *i* within the project area in year *t*; t $CO_{2\text{-}e}$
$E_{BiomassBurn,i,t}$	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*; t $CO_{2\text{-}e}$
$N_2O_{direct\text{-}N,i,t}$	Direct N_2O emission as a result of nitrogen application on the alternative land use in stratum *i* within the project area in year *t*; t $CO_{2\text{-}e}$
i 1, 2, 3 …	*M* strata
t 1, 2, 3 …	*t** years elapsed since the start of the REDD VCS project activity

In order to calculate equation 30 from M-mon, equations 1 and 2 VCS module E-BPB will be calculated.

$$E_{biomassburn,i,t,} \sum_{g=1}^{G} (((A_{burn,i,t} \times B_{i,t} \times COMF_i \times G_{g,i}) \times 10^{-3}) \times GWP_g) \qquad (1)$$

Where:

$E_{biomassburn,i,t}$ Greenhouse gas emissions due to biomass burning as part of deforestation activities in stratum *i* in year *t* of each GHG (CO_2, CH_4, N_2O) (t CO_2e)

$A_{burn,i,t}$	Area burnt for stratum *i* in year *t* (ha)
$B_{i,t}$	Average aboveground biomass stock before burning stratum *i*, year (t d.m. ha^{-1})
$COMF_i$	Combustion factor for stratum *i* (unitless)
$G_{g,i}$	Emission factor for stratum *i* for gas *g* (kg t^{-1} d.m. burnt)
GWP_g	Global warming potential for gas *g* (t CO_2/t gas g)
g 1, 2, 3 ...	*G* greenhouse gases including carbon dioxide[1], methane and nitrous oxide (unitless)
i 1, 2, 3 …	*M* strata (unitless)

t 1, 2, 3, … t^* time elapsed since the start of the project activity (years)

$$B_{i,t} = (C_{AB\_tree,i,t} + C_{DWi,t} + C_{LI,i,t}) \times 12/44 \times (1/CF) \qquad (2)$$

Where:

$B_{i,t}$	Average aboveground biomass stock before burning for stratum *i*, year *t* (tonnes d.m. ha^{-1})
$C_{AB\_tree,i,t}$	Mean aboveground biomass carbon stock in stratum *i* at time *t* (t CO_2e ha^{-1})
$C_{DWi,t}$	Carbon stock in dead wood for stratum *i,* in year *t* (t CO_2e ha^{-1})
$C_{LI,i,t}$	Mean carbon stock in litter for stratum *i,* in year *t* (t CO_2e ha^{-1})
12/44	*Inverse* ratio of molecular weight of CO_2 to carbon (t CO_2e t C^{-1})
CF	Carbon fraction of biomass (t C t^{-1} d.m.)
i 1, 2, 3 …	*M* strata (unitless)
t 1, 2, 3, …	t^* time elapsed since the start of the project activity (years)

b. Data to be collected

The primary monitoring objective is to calculate Non-CO_2 gas greenhouse emissions changes due to biomass burning during the monitoring period.

c. Overview of data collection procedures

Data collection procedures will follow and be consistent with those described in VCS module M-. This monitoring task will use will use data collected as part of the Monitoring Project Emissions described in M-Mon

d. Quality control and quality assurance procedure

Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).

Specifically, QC activities will include:

-accuracy checks on data acquisition and calculations,

-the use of approved standardized procedures for emission calculations, measurements, and estimating uncertainties, and

-archiving information and reporting.

Specifically, QA activities will include:

-A planned system of review procedures conducted by “in house” personnel not directly involved in the inventory compilation/development process.

-Reviews, by independent third parties, should be performed upon a finalized inventory following

the implementation of QC procedures.

e. Data archiving

All data collected and documents created as part of the monitoring program will be archived electronically at the Virginia Tech Conservation Management Institute on secure servers that have been approved by the Virginia Tech Office of Export and Secure Research Compliance (OESRC) for maintenance of “not for public release” secure data. Final tabular data will be compiled in MS-excel compatible spreadsheets and final documents will be maintained in MS-word. Geo-spatial data will be compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents will be kept at least for two years after the end of the project. A mirror copy of the databases on secure portable hard-drives will also be housed with Yacumama management.

f. organization and responsibilities of parties involved in the above

Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event. The Project proponent (Yacumama Management/Lawrence Bishop) will be responsible for contracting qualified organization to perform the monitoring tasks. In concert with Yacumama management, the selected organization will collect, summarize, analyze, and archive all of data required to perform the monitoring tasks. Yacumama management will secure a third party auditor to verify that the monitoring is in compliance with all VCS requirements.

5 SAFEGUARDS

5.1 No Net Harm

No potential negative environmental and socio-economic impacts associated with the project were identified or anticipated in the future.

5.2 Environmental Impact

No environmental impact assessments for the project were required.

5.3 Local Stakeholder Consultation

Stakeholders were identified using the procedural steps found in the "Community Development Toolkit" methodology.[23] Yacumama management has actively sought to inform and engage local stakeholders of the Project and encourage comments on Project. The primary and most involved local stakeholders are the employees of the lodge. Several of the local lodge staff were actively involved in the collection of forest biomass data and will play a key role in patrolling the property and biodiversity monitoring. Other stakeholder involvement has been solicited formally and informally over a period of time to inform stakeholders of the Project and solicit feedback. Because local stakeholders in Puerto Miguel and Yacumama lodge do not have access to digital information, except through cell phones, a considerable effort was expended by Yacumama management and VTCMI to explain in detail the overall Project in person. In addition, both Spanish and English language flyers describing the Project were posted and circulated both among lodge employees and in the village of Puerto Miguel. Furthermore a Spanish translation of the final English PDD will be placed at the lodge and the village. A yearly update on the status of the Project will be provided to all identified stakeholders both digitally and through community meetings.

Project Zone stakeholder groups are:

[23] http://www.icmm.com/page/629/community-development-toolkit-c

- Yacumama management and staff
- The village of Puerto Miguel Loreto Province, Peru
- Amazon Promise
- Dolphin Corners Ecolodge
- Renaco Lodge
- Jungle Walk Lodge
- Peruvian Forestry Department

Stakeholder meetings were held at the Yacumama Lodge on Tuesday June 25, 2013 with 6 employees of Yacumama. A second Community Meeting was held on Wednesday June 26, 2013 4:00pm at the Artisans Committee Pavilion, Puerto Miguel, Loreto Province, Peru. Approximately 70 men, women and children were in attendance form the village. Three village officials oversaw the meeting and notes were taken and entered in the official community ledger (Figures 6- 8). In addition to the formal meetings a number of informal meetings and visits were held in Puerto Miguel with small groups and individuals where the project was discussed at a local tienda, at the Artisans village committee pavilion during local women's craft sales, and during sporting events.

Stakeholder Communications Plan

Throughout the life of the project, pending final approval, the proponents will provide yearly updates to all of the identified stakeholders to solicit input and provide information on the progress of project activities. Because of the varied stakeholders and differences in access to forms of communication, project proponents will provide these updates through a variety of methods. For the local community of Puerto Miguel a yearly meeting will be held with Yacumama employees and at the Artisans Committee Pavilion that will provide a verbal assessment of the project activities to date and solicit any input form the local community. In concert with the local meetings a yearly update will be written that mirrors the information provided in the meetings. This document will be circulated via e-mail to the managers/owners of the local lodges and sent to the Peruvian Forestry Department, Amazon Promise and any other interested parties that may request a copy. In addition various forms of social media will be used to disseminate the information as appropriate. The yearly update document will be both in English and Spanish and will be available at the time of the yearly local meetings. Any major inputs received that merit a change in plans etc. will be communicated via meetings and written updates as appropriate. Additional stakeholders will also be identified as merited.

5.4 Public Comments

Yacumama Forest Carbon Project Community Meetings Summary

<u>Notes from Formal Community/Stakeholder Meeting #1:</u>

Tuesday June 25, 2013 7:00pm

Yacumama Lodge, Loreto Province, Peru

Meeting was held at Yacumama lodge with 6 long term and short term current employees of Yacumama. Eleven individuals were in attendance: VTCMI staff (Verl Emrick, Eric Wolf, Mike St. Germain, Aaron Teets) and Yacumama management (Norman Walters) and staff (Alfredo, Chino, Hugo, Percy, Magno, and Juan). Norman Walters explained the basic concepts of the project from prepared notes for approximately 15 minutes. Verl Emrick, through Norman Walters as translator, asked the employees about the potential for illegal harvesting of trees for fuel or other purposes. Both Norman and the VTCMI teams then addressed questions and discussed in detail specific aspects of the project for approximately 1.5 hours. There were two primary questions and concerns from the lodge staff. The first and most important was how the project would affect future employment and if it would increase, decrease, or stay relatively constant. The second concern was how the project would affect collection of non-timber forest products particularly palm leaf for roof maintenance.

Formal Meeting adjourned 8:15pm

<u>Notes from Formal Community/Stakeholder Meeting #2</u>

Wednesday June 26, 2013 4:00pm

Artisans Committee Pavilion, Puerto Miguel, Loreto Province, Peru

There were 65-70 men, women and children from the village of Puerto Miguel in attendance, VTCMI staff (Verl Emrick, Eric Wolf, Mike St. Germain, Aaron Teets), and Yacumama management (Norman Walters). Norman Walters was seated at a table with three village officials, there was also a gentleman taking official notes in bound black book. Meeting opened by official seated to Norman's right. Norman spoke and read from notes for approximately 15 minutes, then plaid shirt official opened floor for questions and discussion. Eight individuals from the village spoke, asked questions, and engaged in discussion with Norman about the project for approximately 2 hours. There were three main concerns that the villagers expressed with regard to the project. The first was continued access to the Yarapa River for the purposes of fishing. The second was the opportunities for continued economic interaction with the lodge either through short-term or long-term employment, purchasing of goods from the village (fish, vegetables etc.) and/or bringing visitors to purchase local crafts. Finally there was near unanimous support for Yacumama supporting the private clinic as part of the project. At the conclusion of the meeting the plaid shirt official called for voice vote on whether the Village would support the project and the response was unanimous "si", and the gentleman recording official notes brought the 'official book of record' of the village up to the table to be signed.

Formal Meeting adjourned 5:15pm.

Figure 6: Stakeholder meeting held on Wednesday June 26, 2013 4:00pm at the Artisans Committee Pavilion, Puerto Miguel, Loreto

Figure 7: Yacumama management (Norman Walters) discussing project with local stakeholders in Puerto Miguel.

Figure 8: Receiving input from local stakeholders in Puerto Miguel at the meeting conducted on June 26, 2013.

Incorporation of Public/Stakeholder Input in the Project Design and Implementation

The Yacumama lodge employee stakeholder group has the greatest stake in the project and thus significant effort was expended in discussing the project, considering the implications of project design, and involving them in the implementation of the initial stages of the project. Input received from the employee group led to an alteration in the aboveground carbon stock assessment. The employee group was concerned that the collection of palm fronds for roofing would be limited by the project. Thus the project decided not to include palms as part of the carbon stock assessment[24]. The employee stakeholder group was also critical to the implementation of the project. All members participated in and were trained in the forest inventory assessment of above ground biomass. Three of the employees (Hugo, Percy, Juan) were involved in all field work as guides, boat operators, and provided local knowledge of the flora and fauna assisting VTCMI field ecologists with identification. In addition all employees have responsibility in the upkeep of the remaining lodge facilities and participate in patrolling the project area.

[24] Subsequent field work revealed that overstory palms were a very minor component of the forest and the fronds typically are collected from understory palms.

The village stakeholder group has a less of a day to day stake in the project but still will experience positive community benefits. The two community benefits the project team envisioned at the beginning of the project (i.e. maintaining employment levels and supporting the local health clinic in Puerto Miguel) were confirmed by the village stakeholder meetings. The project proponents confirmed to the village community group that employment opportunities would be advertised to Puerto Miguel villagers when available and that all individuals regardless of gender, race or ethnicity will be encouraged to apply. In addition when the lodge was hosting both project related activities and/or educational activities Yacumama would source provisions, laundry service etc. from the village. The project will also fund the re-establishment of the health clinic as planned. Two additional issues that were of interest to the village community group were: access to the Yarapa River for fishing and the collection palm thatch for roofing. Each will be specifically allowed under the project scenario.

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APPENDIX A: FIELD MONITORING AND ASSESSMENT METHODS

YACUMAMA FOREST CARBON PROJECT

. **A.1.0 Forest Carbon**

A.1.1 Plot Allocation

The estimated number of forest plots needed for the project area at Yacumama was calculated using published forest biomass data (Nebel et al 2001a) and the Winrock International Sampling Calculator.[25] Nebel et al. (2001a) reported mean above-ground biomass with 95% confidence limits from a 4 year study near Jenaro Herrera, Peru, a town approximately 50 km southwest of the Project area. The mean biomass for all plots was used since both restinga and tahuampa occur on within the Project area. Based on 1 ha forest plots, Nebel et al (2001a) reported 39,682 ± 2894 g/m^2, which converted to 198.41 carbon tonnes/ha with a 22.15 standard deviation. Using the total area of the Yacumama property, the *Winrock International Sampling Calculator* estimated 19 forest plots were needed to achieve a 95% confidence. We randomly allocated 25 forest plots within the Project area to ensure the full range of variability was captured (Figure A-1).

Due to the remote location of the project area, all plots are accessed via boats along the Rio Yarapa. From the Rio Yarapa, field crews navigated to plot XY coordinates using a GPS unit and a compass (Table A-1). Once field crews arrived at the field point (GPS reading 0 m) a permanent center marker (3/4’’ rebar marked with orange flagging) was firmly implanted into the ground. A new GPS point was collected with a Garmin GPS map 78 unit in WGS 84 datum, averaging the point for several minutes while the plot was measured. Trees adjacent to center point were marked with orange flagging to make the plot more conspicuous for future field crews. Final GPS coordinates were recorded on data sheets, as well as date, crew members, and any supplemental or useful information at each plot.

[25] http://www.winrock.org/Ecosystems/tools.asp

Table A-1: Coordinates to Forest biomass assessment and monitoring plot locations.

Forest Plot ID	WGS84 UTM Zone 18S			
	UTM X-Coordinate	UTM Y-Coordinate	Decimal Degrees Northing	Decimal Degrees Easting
01A	678296	9492323	-4.5912	-73.3928
02A	679668	9489778	-4.61419	-73.3804
03A	679865	9488339	-4.6272	-73.3786
04A	674361	9494048	-4.57568	-73.4283
05A	676446	9493250	-4.58285	-73.4095
06A	676402	9491522	-4.59849	-73.4098
07A	677100	9491132	-4.602	-73.4035
08A	679729	9491673	-4.59705	-73.3799
09A	674011	9493810	-4.57784	-73.4314
10A	676679	9492205	-4.5923	-73.4074
11A	677986	9493358	-4.58185	-73.3956
12A	677285	9494071	-4.57542	-73.4019
13A	678663	9493754	-4.57825	-73.3895
14A	678924	9491201	-4.60133	-73.3871
15A	677341	9492767	-4.58721	-73.4014
16A	678894	9491726	-4.59659	-73.3874
17A	678788	9490656	-4.60627	-73.3883
18A	679331	9493059	-4.58453	-73.3835
19A	677191	9493208	-4.58322	-73.4028
20A	680381	9491426	-4.59928	-73.374
21A	680075	9492068	-4.59347	-73.3768
22A	673004	9494255	-4.57384	-73.4405
23A	679384	9489362	-4.61796	-73.3829
24A	674830	9493661	-4.57917	-73.424
25A	676182	9492019	-4.594	-73.4118

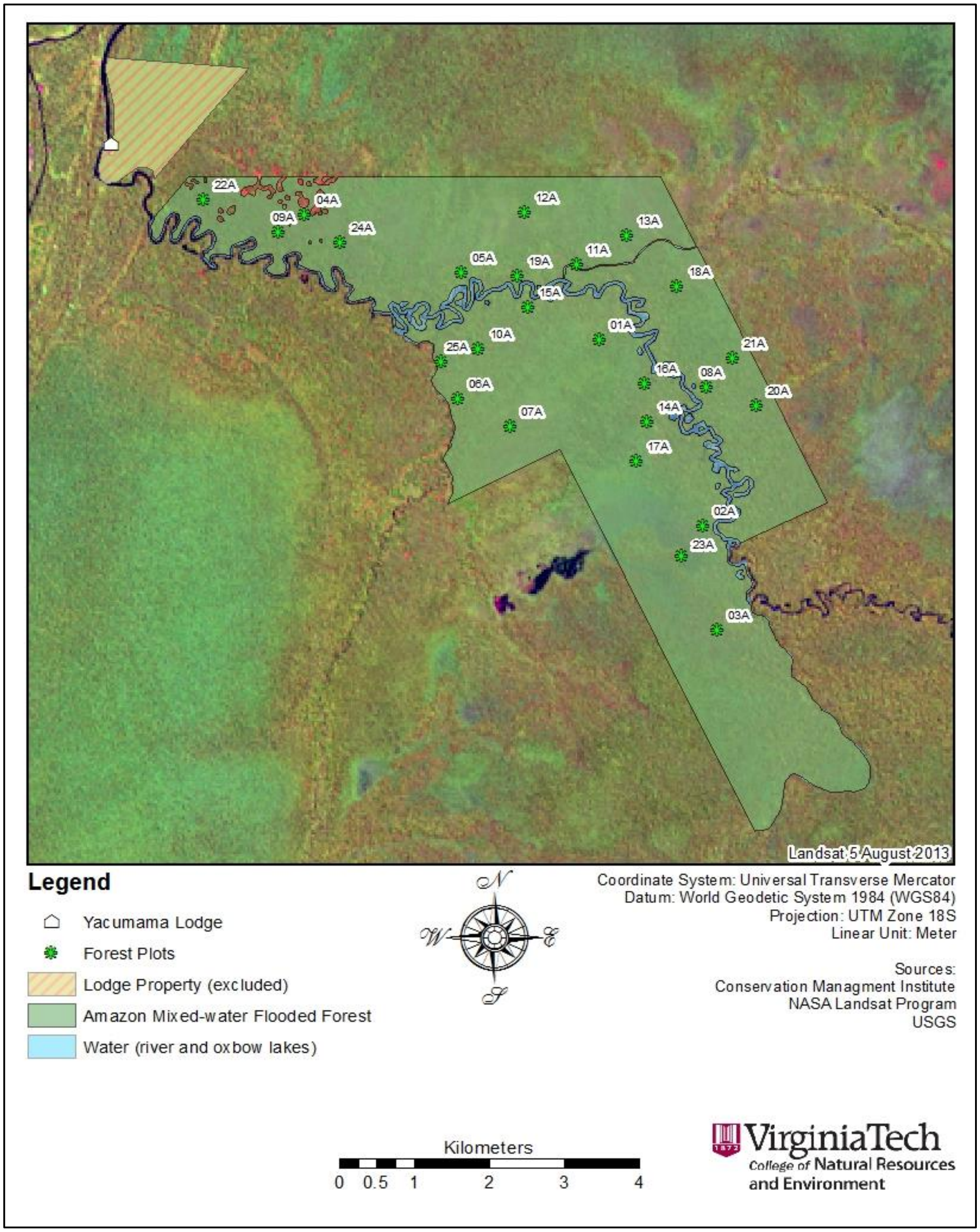

Figure A-1: Yacumama Project area and forest plot allocation.

A.1.2 Field Measurements

Forest biomass data collection was based on the nested circular plot design described in Pearson et al (2005). All living trees within 4m of the plot center with a minimum diameter of 5.0 cm at breast height (1.3 m) were measured using a diameter at breast height (DBH) tape. Each tree was examined to make sure it was alive, and identified by local guides whenever possible. Trees greater than or equal to 5.0 cm were labeled with a unique numbered tag, and the DBH, local name, and tag ID were recorded. Once all of the trees within the 4.0 m radius were measured, trees greater than or equal to 20.0 cm were measured and recorded within 14.0 m radius of the plot center. Once all of the 20.0 cm trees were measured within 14.0 m of the plot center, any trees within 20.0 m of the plot center greater than or equal to 50.0 cm were measured. When measuring distance from the center point, the tape was held on 1.3m poles, making sure the tape was completely level and straight (bends in the tape will skew measurements). A tree was only considered "in" if greater than 50% of the trunk was in at DBH (1.3m). Whether the tree was rooted in or out does not dictate whether the tree was measured, only where the trunk is at 1.3m.

When measuring DBH, a 1.3m staff or pole was used to consistently measure at the correct height, holding it directly upwards, not with the slope of the tree. DBH was measured to the nearest millimeter, and if the tree was between millimeter increments, the diameter was always rounded down. If the tree forked below DBH, it was treated as multiple trees. Additional rules used for measuring trees were as follows:

i. If the tree is on a slope, always measure 1.3m from the uphill side.
ii. Measure tree diameter with tape aligned with the tree's natural angle (not always parallel to the ground).
iii. If the tree is growing irregularly, or fallen down, measure the tree where it reaches 1.3 m. If a fallen tree never reaches 1.3 m it was excluded.
iv. If the tree has buttresses, measure above the buttresses and record height taken. If the buttresses extend out of reach, take diameter measurements using the Criterion RD 1000 – Electronic Dendrometer. Record the height that the diameter was measured.

v. If a tree has fallen and side branches are large enough to be measured, measure 1.3m from the ground, not standing on the tree.

vi. If a tree has vines or lianas, pull them away from the trunk and run the DBH tape underneath. If they cannot be pulled away, use the back of the tape to estimate the diameter.

vii. Measure above other abnormal growths, termite nests, etc. If the tree is too small above the irregularity, the tree is "out".

Palms falling inside of the forest plot were held to the same size class specifications for each nested plot. To measure a palm DBH accurately, the palm must not have remnant leaf sheaths running along its main stem which would inflate stem diameter. Only palms with a true trunk were measured to determine whether it was in the each size class. If the palm was considered in, the height and DBH were recorded. A clinometer was used to measure the height of the palms. Although the DBH and height were recorded for all palms inside forest plots, the palm biomass was being conservatively excluded from total biomass calculations. Liana biomass was similarly excluded from biomass estimates.

During data collection, trees within 0.2cm from diameter cut offs (5.0, 20.0, and 50.0cm) were re-measured by another field worker for QA/QC purposes. Additionally, random trees were selected throughout the measuring process to be re-measured for QA/QC. Tree measurements which fell within 1-2mm of the size class cut-offs (5cm, 20cm, and 50cm) were re-measured by other members of the field crew for quality assurance. Table A-2 represents trees which were checked for QAQC purposes during the field measurement phase of the project. Only the correct or corrected values were recorded to prevent any confusion during the data entry phase.

Table A-2. Trees which were re-measured for QA/QC purposes during the field measurement phase of the project.

Plot ID	Tag #	2013 DBH	Explanation
01A	105	5.1	Re-measured by field crew member, previous measurement is identical or unavailable
01A	108	5.1	Re-measured by field crew member, previous measurement is identical or unavailable
01A	110	5.2	Re-measured by field crew member, previous measurement is identical or unavailable
02A	248	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
02A	253	20.0	Re-measured by field crew member, previous measurement is identical or unavailable
02A	256	20.1	Re-measured by field crew member, previous measurement is identical or unavailable
02A	N/A*	19.8	11m from plot center at 20°, not tagged or included
04A	160	20.2	Re-measured by field crew member, previous measurement is identical or unavailable
04A	N/A*	19.5-19.9	Measured by two members of field crew, <20cm for both measurements, not included
04A	N/A*	19.5-19.9	Measured by two members of field crew, <20cm for both measurements, not included
05A	799	20.1	Re-measured by field crew member, previous measurement is identical or unavailable
05A	796	50.5	Re-measured by field crew member, previous measurement is identical or unavailable
06A	720	20.9	Re-measured by field crew member, previous measurement is identical or unavailable
06A	N/A*	19.9	Adjacent to tree tagged #724, not tagged or included
07A	738	5.2	Re-measured by field crew member, previous measurement is identical or unavailable
08A	198	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
09A	133	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
09A	128	5.1	Re-measured by field crew member, previous measurement is identical or unavailable
09A	146	20.1	Re-measured by field crew member, previous measurement is identical or unavailable
10A	N/A*	17.3	6m from plot center, >20 at DBH, but 17.3 above irregular growth, not tagged or included
10A	N/A*	<50	19.5m from plot center at 225°, less than 50cm above buttress, not included
11A	58	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
12A	775	20.2	Re-measured by field crew member, previous measurement is identical or unavailable
12A	779	23.2	Distance from center, and DBH Re-measured due to proximity to edge of 14m plot
12A	769	20.3	Distance from center, and DBH Re-measured due to proximity to edge of 14m plot

13A	369	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
13A	380	20.1	Re-measured by field crew member, previous measurement is identical or unavailable
14A	285	5.1	Re-measured by field crew member, previous measurement is identical or unavailable
14A	N/A*	<20	7m from plot center at 320°, <20cm above irregularity, not tagged or included
15A	91	20.2	Re-measured by field crew member, previous measurement is identical or unavailable
15A	500	53.5	Changed from 52.8 to 53.5cm, difference due to location measured above irregularity, not tagged or included
16A	309	20.0	Re-measured by field crew member, previous measurement is identical or unavailable
16A	307	20.1	Re-measured by field crew member, previous measurement is identical or unavailable
19A	N/A*	<50	15m from plot center at 150°, less than 50cm above irregularity, not tagged or included
20A	407	5.0	Re-measured by field crew member, previous measurement is identical or unavailable
20A	N/A*	~30.0	Distance from center Re-measured, 14.1m from plot center, not tagged or included
20A	N/A*	48.0	16m from plot center at 284°, less than 50cm above buttress, not tagged or included
20A	N/A*	45.0	>14m from plot center at 210°, less than 50cm above buttress, not tagged or included
21A	N/A*	<20	7m from plot center at 240°, less than 20cm above irregularity, not tagged or included
25A	334	20.0	Re-measured by field crew member, previous measurement is identical or unavailable
25A	332	50.3	Re-measured by field crew member, previous measurement is identical or unavailable

*Re-measured, but did not reach minimum criteria for inclusion. Tree not included in calculations.

A.1.3 Allometric Equation Selection and Validation

An allometric equation is selected based on its applicability to test trees within the project area. For an allometric equation to be validated, the estimated biomass for at least 30 trees representative of the project area must fit the predicted curve of the allometric equation (points must fall above and below the predicted curve, and no more than 75% of the samples can fall under the curve). The biomass of individual trees was estimated using the DBH and height (to 10cm diameter) for 43 individual trees collected throughout the Project area. The DBH and height of 1-2 trees in close proximity to each forest plot was measured to test the allometric equation. Care was given to ensure the trees species, and distribution of size class was representative of the project area. Since the trees were selected near randomly allocated forest plots, the selected trees were well distributed through the project area and reflected the tree species composition of the surrounding forest type. There are more than 320 species of tree documented in the region (Nebel et al 2001b), and using any 30 trees is a poor representation of the actual species distribution. An additional 12 trees (40% more) were included to improve the species, and size class representation. In addition, trees in smaller classes (20-30cm) are more abundant in the surrounding area (Nebel et al 2001b). As a result, the sizes of test trees were selected to have a higher incidence of smaller trees (20-30, 30-40cm) than larger trees (50-60, 60-70cm) to reflect the natural size distribution.

To determine the biomass of individual trees, the volume was calculated by multiplying the basal area by the height, and then by a correction factor of 0.42 to account for the tapering of the trunk (Magnussen and Reed 2004). The biomass of each bole was then estimated by multiplying the volume by the average tropical wood density (0.60g/cm^3)[26] and the appropriate biomass expansion factor (Reyes et al 1992)[27]. Once converted to tons, the weight of the bole was compared to weights calculated using the allometric equation. The estimated biomass for each tree was graphed alongside several accepted, and applicable allometric equations. The three equations tested were taken from two of the most widely accepted publications for non-specific tropical allometric equations (Chave et al. 2005; Pearson et al. 2005) (Table A-2).

Table A-2. Potential Allometric Equations for Yacumama Forest Carbon calculations.

Type	Rainfall (mm/yr)	Source	Equation
Tree (AGB) Moist Tropical	1500-4000	Pearson et al. 2005	AGB = exp(-2.289 + 2.649 * ln(D) - 0.021 * ln(D^2))
Tree (AGB) Wet Tropical	>4000	Pearson et al. 2005	AGB= 21.297 – 6.953 * (D) + 0.740 * (D^2)
Tree (AGB) Moist Tropical	1500-3000	Chave et al. 2005	AGB = ρ * exp(-1.499 + 2.148 ln(D) + 0.207 (ln(D))^2 - 0.0281 (ln(D))^3)

AGB = aboveground biomass
D = diameter at breast height

[26] Average Tropical America wood density. Species specific wood density was used where species were identified.
[27] See accompanying spreadsheet Yacumama_Allometric_Equation_Validation.

ρ = wood density (0.55 from Reyes et al 1992)

The biomasses of the 43 trees measured were graphed alongside the three potential allometric equations to determine applicability (Figure A-2). One of the trees was removed from the analysis since it exceeded the maximum DBH of the wet tropical forest equation (Pearson et al 2005).

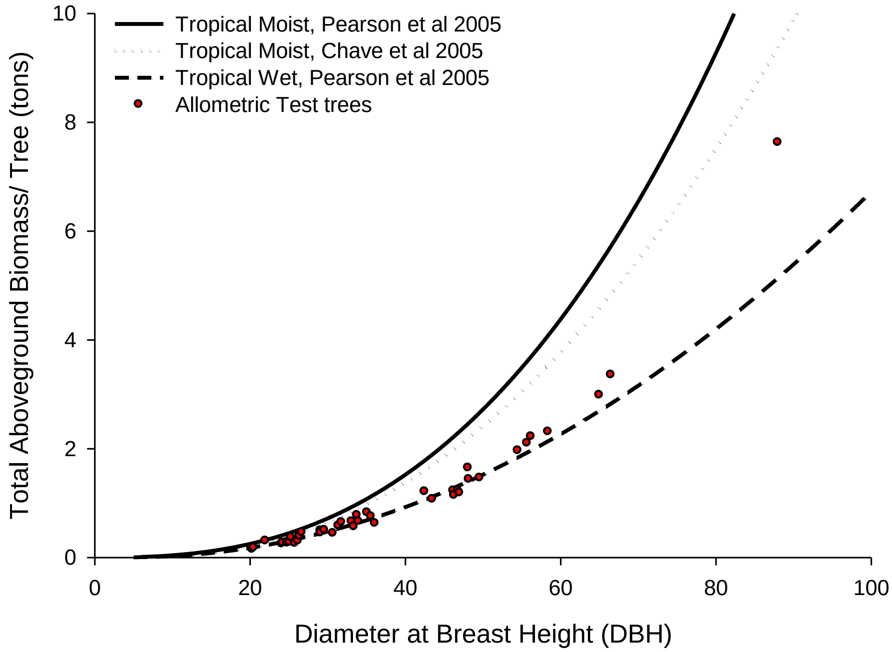

Figure A-2. Applicability of three allometric equations chosen for the Yacumama Forest Carbon Offset Project.

Based on the distribution of the tree biomass data collected, the Tropical Wet equation from Pearson et al. (2005) is the most applicable, and the most conservative of the three equations. The tropical biomass equations in Pearson et al (2005) were originally published by Brown (1997), and the rainfall regimes (tropical dry, moist, and wet) were based on their relation to potential evapotranspiration. The tropical wet rainfall regime (>4000mm/year) assumes the “rainfall is in excess of the potential evapotranspiration,” also mentioning the rainfall regimes are “just guides” (Brown 1997). Although the equation was generated for tropical forests receiving 4000mm of rain per year (annual rainfall of Yacumama = 2715mm), the annual flooding greatly exceeds the potential evapotranspiration of the vegetation on Yacumama, and by these criteria can be classified as “tropical wet” forest. Aside from the discrepancy in rainfall per year, it is not unreasonable to classify a flooded tropical forest as a wet tropical forest. For all of these reasons, we concluded that the tropical wet forest equation from Pearson et al. (2005) was the best suited for Yacumama.

A.1.4 Data Analysis

Data collected were entered into Excel spreadsheets following field data collection. Unaltered field data underwent QA/QC analysis by another CMI employee, double checking all diameter values, and tree tag numbers. For each tagged tree, aboveground biomass (kg) was estimated using the tropical wet forest equation from Pearson et al (2005). The aboveground biomass for each tree was converted from kilograms to tons (divided by 1000), followed by a conversion of total aboveground biomass to aboveground carbon stock by multiplying the mass by the carbon fraction of biomass (0.47). Next the aboveground biomass for each of the nested circles was summed (4m, 14m, and 20m). Biomass stocks were transformed to t C ha^{-1} by multiplying the sum in each nested circle by their ratio to a hectare. The sum of the three nested circles gives an estimate of the aboveground tree biomass for each forest plot.
Table A-3: Nested forest plot design, area and criteria for each tree class.

Tree Class	Plot Radius	Plot Area	Proportion of Hectare
$\geq$5.0cm	4.0m	50m^2	0.005
$\geq$20.0cm	14.0m	616m^2	0.062
$\geq$50.0cm	20.0m	1256m^2	0.125

Belowground biomass for each tree was multiplied by a root to shoot ratio available in the IPCC GL AFLOU. The belowground biomass for each of the nested circles was summed (4m, 14m, and 20m). These carbon stocks were transformed to t C ha^{-1} by multiplying the sum in each nested circle by their ratio to a hectare. The sum of the three nested circles gives an estimate of the belowground tree biomass for each forest plot.

The above- and belowground biomass figures were summed to estimate the total tree biomass in each forest plot. These values were multiplied by the ratio of molecular weight of CO_2 to carbon (44/12). The final above- and belowground carbon stocks, as well as the total CO_2 equivalents for each of the 26 forest plots are presented in Table A-4.

Table A-4. Above and belowground, total carbon stocks, and CO_2 equivalents for Yacumama forest plots in July 2013.

Plot ID	Above-ground tree biomass tons ha^{-1}	Above-ground Tree Biomass t CO_2 eq ha^{-1}	Below - ground Tree Biomass tons ha^{-1}	Below-ground Tree Biomass t CO_2 eq ha^{-1}	Total (AG +BG) tons ha^{-1}	t CO_2 eq ha^{-1}
01A	84.25	308.92	16.85	61.78	101.10	370.71
02A	73.78	270.53	14.76	54.11	88.54	324.64
03A	56.06	205.55	11.21	41.11	67.27	246.66
04A	65.13	238.83	13.03	47.77	78.16	286.59
05A	100.79	369.57	20.16	73.91	120.95	443.48
06A	81.97	300.56	16.39	60.11	98.36	360.67
07A	79.71	292.28	15.94	58.46	95.65	350.73
08A	75.42	276.52	15.08	55.30	90.50	331.83
09A	86.28	316.35	17.26	63.27	103.53	379.61
10A	59.16	216.93	11.83	43.39	71.00	260.32
11A	79.33	290.89	15.87	58.18	95.20	349.06
12A	68.28	250.36	13.66	50.07	81.94	300.43
13A	78.96	289.51	15.79	57.90	94.75	347.41
14A	55.86	204.83	11.17	40.97	67.03	245.79
15A	71.35	261.63	14.27	52.33	85.62	313.96
16A	76.10	279.02	15.22	55.80	91.31	334.82
17A	50.42	184.88	10.08	36.98	60.51	221.86
18A	127.92	469.03	30.70	112.57	158.62	581.60
19A	109.56	401.73	21.91	80.35	131.48	482.08
20A	70.04	256.81	14.01	51.36	84.05	308.17
21A	54.37	199.36	10.87	39.87	65.25	239.23
22A	60.10	220.36	12.02	44.07	72.12	264.43
23A	61.05	223.85	12.21	44.77	73.26	268.63
24A	85.59	313.83	17.12	62.77	102.71	376.59
25A	76.81	281.64	15.36	56.33	92.17	337.97
totals	**75.53**	**276.95**	**15.31**	**56.14**	**90.84**	**333.09**

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APPENDIX B: PLAN OPERATIVO ANUAL PARA PERMISO FORESTAL DE PROPIEDAD PRIVADA

(ANNUAL OPERATING PLAN FOR PERMISSION TO TIMBER PRIVATE PROPERTY)

PAGE 1
ANNUAL OPERATING PLAN FOR FOREST PERMIT ON PRIVATE PROPERTY
Year of the social economic consolidation of Peru
Regarding letter N 102 - 2010 - AG - GRL - PRMRFSS - DER SDPM
Subject: Observations Document
Iquitos. March 14, 2010
Ing. Armando Caceres Concha
Provincial Director of Maynas sub-PRMRFFS
By this mean, I address you, with due respect and salute while wishing you the successful public administration and at the same time take the opportunity to deliver you the report with the relevant observations concerning this Permit.
Without further, I subscribe to you
Att.
Mario Enrique Chang Villacorta
Forestry Consulting Engineer

PAGE 2
ANNUAL OPERATING PLAN (POA)
FOREST PERMIT FOR PRIVATE PROPERTY
OWNER
BISHOP ALLEN LAWRENCE
“FUNDO YACURUNA I”
PCA: 63.76 has
REGION: LORETO
PROVINCE: MAYNAS
DISTRICT: FERNANDO LORES
BASIN: RIO YARAPA
IQUITOS - PERU
2009

PAGE 3
ANNUAL OPERATING PLAN FOR FOREST PERMIT ON PRIVATE PROPERTY
DOCUMENTS LIST
1.POA Request Presentation
2.Front Page
3.Contents
4.Processing fee payment receipt copy
5.Legalized Deed copy
6.Property Registration Copy in the Public Records
7.Special Power Copy Listed in the Public Records
8. Special Power Registration in the Public Records
9.Owner Identification Copy
10.RUC Copy
11. Forestry Rights Duty Payment Agreement
12.Forest Engineer Certificate Registration in the INRENA Consultant Register Copy from the Engineer who drafted the POA
13.Forest Engineer Professional Certificate Copy from the Engineer who drafted the POA
II. GENERAL MANAGEMENT FORESTRY PLAN (GFMP)
1.General Information
2.Basic Information
3.Harvesting Plan
4.Silvicultural Plan
5.Activity Chronogram
6.Annex
FUNDO "YACURUNA I"

PAGE 4
PROCESSING FEE PAYMENT RECEIPT COPY
PAGE 5
MINISTRY OF AGRICULTURE
LAND DIVISION UNIT XXII - Loreto
Directorate of Natural Resources and Rural Development

Docket No. 19450	Year 1993	
Registered Folio 1096	Book 19	
Interested Party Name	Lawrence Allen Bishop	
Property Name	Yacuruna I	
Acquisition Form	Title Onerous Adjudication	
Acquisition Object	Agricultural Exploitation	
Area	1,499 has	
Observations	Purchase – Sale Agreement	
Department	LORETO	
Province	MAYNAS	
District	FERNANDO LORES	
Area or Region	LORETO	
Property Title	00178	
Resolution	Directorate No. 025-93	Date 14-04-93
Registrant Folio	Book	

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"YEAR OF THE MODERNIZATION OF EDUCATION"
DESCRIPTIVE MEMORY OF RUSTIC PROPERTY MAP
YACURUNA I

1.- Name of Contractor: ALLEN LAWRENCE BISHOP
2.-Location:
-Sector: Co. Puerto Miguel - Rio Yarapa
-District: Iquitos
-Province: Maynas
-Dpto: Loreto
-Region: Loreto

3.-AREA: One thousand four ninety-nine hectares

4.Land use capacity description
A. Clean Area:
C. Standing Crop: 909 has 9,500m^2
P. Pasture: 509 has 0,500m^2
F. Area with Forestry Potential:
X. Protected Area:

5.-Perimeter: It has a perimeter of Twenty FourThousand Nine Hundred Sixty linear meters (24,960 lm)

6.-Topography: Presents long slopes with micro-waves space

7.-Borders:
NORTH.-Open Area
SOUTHUR.-Protected area, Yarapa River, right bank
EAST.- Open Area
WEST.- Open Area

8. DATA POINTS

MILESTONES	Azimut	DISTANCE (M. L.)
PP-2	40°	750
2-3	90°	6,300
3-4	153° 30'	5,000
4-5	244° 30'	1,240
5-PP	Rio Yarapa Natural Watershed Bank	11,670

Iquitos, November 1,992

PAGE 7.

REPUBLIC OF PERU
MINISTRY OF AGRICULTURE
REGIONAL GOVERNMENT Loreto
PURCHASE AND SALE AGREEMENT No. 00178

PAGE 8
PURCHASE CONTRACT SALE No. 00178
ASSESSED PLOT CODE No. 30178

This document certifies the SALE PURCHASE AGREEMENT entered into by the Regional Director of Agriculture, duly represented by Eng. CARLOS GARCIA MERE identified with Electoral Notepad No. 05283380, Military Book No .-------, Tax Book No .------, which acts on behalf of the Regional Government of Loreto, here-in-after "regional government" should be named, located on Pevas No. 350 and the other party identified as LAWRENCE BISHOP ALLEN - Single – USA, with voter registration No. PS 120010792, Military Book No.------, Tax Book No. ------, which here-in-after will denominate "THE AWARDED" listing as his address the property requested in the following terms:

FIRST: In accordance with the provisions of the sixth additional provision of Law No. 24794 "Organic Law of the Region of Loreto", the grounds of the property tax not included in the award process and certification for Native Communities, or purposes of urban expansion, are awarded by the Regional Government, subject legislation on the subject

SECOND: In accordance with the provisions of Decree Law No. 22936, Supreme Decree No. 072-80-AA and Article No. 79 of the "Regulations of the Law on Investment Promotion in the Agricultural Sector", approved by Supreme Decree No. 0048-91-AG-0GA-0ADUT stating "the Land adjudication in Regions and Ceja de Selva and Ceja de Selva, were done for a consideration, regardless of the form it takes, with Buy-Sell Agreement retains title until full settlement of the agreed value. The Contract may be executed by private document notarized signatures and title will be sufficient for registration

THIRD: The Regional Directorate of Agriculture in exercise of the powers conferred by the sixth additional provision of Law No. 24794 and applying the rules contained in Legislative Decree No. 653 "Law for Promotion of Investments in the Agricultural Sector" and Regulations approved by Supreme Decree No. 0048-91-AG-0gr 0AD-UT-by Directorial Resolution No. 025-93-GRL-SRAFE / DRA, dated April 14, 1993 has approved the allotment project called Yacuruna and accordingly arranged the award by way of consideration for Mr. LAWRENCE ALLEN BISHOP, the rustic property called Yacuruna I cadastral code No. 30178 with an area of 1,499 m^2 has., located in Sector Co. Pto. Miguel, Fernando Lores District, Maynas province, Loreto Region, whose boundaries and perimeter measures are detailed in the descriptive and topographic map memory in the files of the Regional Directorate of Agriculture which the awarded declares have knowledge

PAGE 9

FOURTH: In accordance with the provisions of Article No. 86 of Supreme Decree No. 0048-91-AG-0GA-0ADUT for Departmental Resolution No. 037-93-GRL-SRAPE-DRA-DUAT-SDAAT has qualified 01 (one) Awarded in the project area awarded called YACURUNA, among whom is qualified "THE AWARDED"

FIFTH: In this Agreement, the Regional Directorate of Agriculture on behalf of the Regional Government of Loreto, awards for sale with express reservation of ownership until the redemption value agreed for the rustic property called YACURUNA cadastral code No. I -.-.- in favor of Mr Lawrence Allen Bishop in this sale taking into account inputs and outputs, practices, customs, easements and everything fledged could correspond

SIXTH: The value of this award is:
Value of Land S/. 7,553.64
Contract Expenses S/. 28.00
Other S/. 8.00
Total S/. 7589.54

They are: Seven Thousand Five Hundred Eighty-nine and 64/100 Nuevos Soles to be split into (five) equal annuities $ 1,517.93 each, whom the AWARDED agrees to pay when due in the Office of Administration Regional Government during the month of April each year to pay the total price, may make such cancellation in less time

SEVENTH: Constitutes grounds for total termination and / or part of the Contract Awarded, as applicable, when THE AWARDED incurs in the grounds provided by Article No. 113 of Legislative Decree No 611 and Article No. 22 of the Legislative Decree No. 653 in the following cases:

a) Abandonment of the property for 2 consecutive years
b) Use the land for non-agricultural purposes
c) Failure to pay when due, the annual payments for the purchase of the property

EIGHTH: The AWARDED is also required for maintaining regular and legal easements established, the following obligations:

a) To ensure free passage through bridges, oroyas and existing roads, as well as those that are built in the future

PAGE 10

b) Get the free passage of oil and gas pipelines, facilities for mining and oil drilling, facilities for public telecommunications services, power transmission lines, roads of all kinds, other than irrigation and drainage established or are required as well as those required for its operation and maintenance.
The establishment of such easements shall be used by the competent organ of the Regional Government.

NINTH: The breach of duty to the clauses referred above, shall constitute sufficient grounds for determining the termination of this Agreement

TENTH: The AWARDED declares that the plot acquired and received from the Regional Government of Loreto is his satisfaction. Both parties express their agreement as to the conditions are set out in this Agreement

ELEVENTH: According to the provisions of Article No. 9 of the Political Constitution Peru, intervene in this Contract as awarded wife Dona __________ with Notepad Electoral No ._________, or as a permanent companion of Dona adjudicatory with Electoral Book No.

Probate costs signatures are a responsibility of the "THE AWARDED"

Granted in Iquitos on______ day of April, one thousand ninety-three

The Awarded by the Regional Government of Loreto

NORMAN WALTER EARL
ATTORNEY FOR LAWRENCE
BISHOP ALLEN, WITH POWER
ENROLLED IN VOLUME 59, FS. 313
PDA. CLV AND REGISTER AS 1
MANDATE Loreto

Ing. CARLOS GARCIA MERE
Regional Director of Agriculture
PROBATE ATTORNEY
CERTIFY THE AUTHENTICITY OF FIRMS
THE SRS. NORMAN EARL WALTERS,
MERE AND CARLOS GARCIA, ATTEST
Iquitos, APRIL 19, 1993

PAGE 11
SECTION ADDITIONAL CLARIFICATION

That, the rural property called "BOLIVAR" running for state registered in Volume 26 Folio 224 with an extension of - - - - - - you - - - - - m2, by this contract is transferred to Mr. (a) Lawrence Allen Bishop an area of 1,499m^2, the same which will became independent of the volume and page number indicated above and to form a new independent rural property whose name is " YACURUNA I"

Once the area indicated made independent, the surface of rural farm called "BOLIVAR" has shrunk to 2,874 has, 817 m^2, because of an earlier independendization for Mrs. Roxanne Kremer

Iquitos, 27 Apr 1994

Regional Agricultural Directorate
Loreto Region

Ing. Great Zagaceta Guevara
regional director

Registered The Sale
Volume 262 Folio 425
Xxxxx Seat 1

PAGE 12
VERBATIM COPYING
Rustic Land called "Yacuruna I" located in the Sector Caserio Puerto Miguel, Fernando Lores District, Maynas Province, Loreto Region

Privatization

-1-
Lawrence Allen Bishop, American, of age, single owns the rustic farm named "Yacuruna I" located in sector Caserio Puerto Miguel, Fernando Lores distric, Maynas province, Loreto region, which was part of the xxxxxx folio two hundred xxxxxx took twenty of the Land Registry, property Loreto, where a surface area of xxx thousand four hundred ninety-nine hectares becomes independent, enclosed within the

boundaries and following permitrales measures, north, east and west Brownfields, south to fiscal belt, Yarapa right bank of the river. Said Bishop Lawrence Allen, has acquired control of this land by virtue of having purchased from its previous owner, General Directorate of Land Reform, for the price of seven thousand five hundred point ochentinueve sesenticuatro soles, fully paid - Sale Contract Number percent seventy-eight date April 14 last year and legalized by the Notary Public signature, Jose Hernandez Lopez - the title for that purpose at thirteen and forty-two in the afternoon of the day may 2 this year is presented under the five thousand seven cuarentitres number of volume xxxxxx xxxxxx daily forty-six point twenty soles. Receipt number sixty-two veinticuatro 1900, Iquitos, May 11 of 1900 noventicuatro

-2-

Lawrence Allen Bishop, constituted legal mortgage on her property, registered under this heading for the General Directorate of Agrarian Reform and Rural Settlement, Ministry of Agriculture, for the sum of seven thousand five hundred point ochentinueve sesenticuatro soles for guarantee payment of the sale price of this land - consisting So - sale Contract Number seventy-eight percent dated April 14 last year and legalized by the Notary Public firms Jose Hernandez Lopez, issued by the Regional Directorate of Agriculture. The title at thirteen and forty-two miuntos the day May 2 presents

PAGE 13

VERBATIM COPYING

This year, under the number five thousand cuarentitres setesientos daily volume of xxxxtidos rights xxxx point twenty twenty soles veinticuatro receipt number sixty-two in 1900, Iquitos, Once May 1900 noventicuatro

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CONSULATE GENERAL OF PERU IN CHICAGO

FIRST TESTIMONY
PUBLIC WRITING: SPECIAL POWER
GIVEN BY: LAWRENCE BISHOP ALLEN
IN FAVOR: NORMAN EARL WALTERS

THE CONSUL GENERAL OF PERU ASSIGNED IN CHICAGO, ILLINOIS, A SEVEN DAY OF JULY TWO THOUSAND NINE, TESTIMONY IN THIS ISSUE FIVE SHEETS RUBRICATION USEFUL AND SEALED IN EACH OF THEIR SHEETS, A REQUEST FOR INTERESTED PARTY AND AGREE THE LAW, THE WRITING IS REGISTERED IN THE NUMBER hander CINETOCUATRO TO BOOK NUMBER SEVEN PERCENT LIV DEED OF RECORD THIS CONSULATE GENERAL PUBLIC THAT THE LETTER SAYS:

"Forty-four PUBLIC DEED NUMBER PERCENT OF THE SPECIAL GIFT THAT GIVES (NA) BISHOP ALLEN LAWRENCE FOR DON (NA) WALTERS IN NORMAN EALR chichago, ILLINOIS, UNITED STATES OF AMERICA, BEING THE HOURS A DAY SEVEN 11:40 JULY TWO THOUSAND NINE, BEFORE ME CANDY GLORIA CHAVEZ GONZALES, CONSUL GENERAL APPEAR ASSIGNED: DON (nA) BISHOP ALLEN LAWRENCE OF AMERICAN NATIONALITY OF LEGAL AGE OF OCUPACON EMPLOYEE iDENTIFIED (A) WITH US PASSPORT NUMBER FOUR ZERO FOUR SIX SIX ONE ZERO ZERO SIX OF MARITAL STATUS mARRIED WITH ADDRESS IN 5579 STATE RD 45, NASHVILLE, INDIANA 47448, UNITED STATES OF AMERICA, NOT ABOUT THE INTELLIGENT CASTILIAN LANGUAGE TRANSLATOR MAKING USE OF MANUEL EDUARDO ARELLANO Garibotto iDENTIFIED WITH NATIONAL IDENTITY DOCUMENT 06480208; The appearing COMES IN ITS OWN RIGHT, WITH CAPACITY, AND FREEDOM TO ENTER INTO CONTRACTS WITH FULL KNOWLEDGE OF LEGAL ACT GRANTING OF ATTEST THAT LEAVING CERTIFICATE

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CONSULATE GENERAL OF PERU IN CHICAGO

ACCORDING TO ARTICLE 58 PARAGRAPH A OF THIS LAW NOTARY PUBLIC INSTRUMENT NO MINUTES, the appearing THROUGH TRANSLATOR EXTENDS ITS DECLARE THAT:
"LORD OF PERU CONSUL IN CHICAGO, PLEASE EXTEND THE LOG OF PUBLIC DEED WITH YOU, ONE OF THE SPECIAL YOU GIVE ME, DON (NA) BISHOP ALLEN LAWRENCE OF AMERICAN NATIONALITY OF LEGAL AGE OF OCUPACON EMPLOYEE IDENTIFIED (A) WITH US PASSPORT NUMBER FOUR FOUR ZERO ZERO ONE ZERO SIX SIX SIX OF MARITAL STATUS mARRIED WITH ADDRESS IN 5579 STATE RD 45, NASHVILLE, INDIANA 47448, UNITED STATES OF AMERICA, WHO IN THE FRONT IS sIMPLY CALLED (LA) PODERANTE FOR DON (NA) NORMAN EARL WALTERS, WHO will identify with AMERICAN PASSPORT NUMBER ONE ZERO SEVEN SEVEN ZERO NINE FOUR CINCONUEVE WITH ADDRESS IN PERU, WHO IS CALLED THE hEREAFTER (LA) REPRESENTATIVE (A) IN THE FOLLOWING TERMS:
SECTION ONE: IN ORDER FOR THE ATTORNEY REPRESENTING THE ONMBRE And PODERANTE appear before FORESTRY AND WILDLIFE MANAGEMENT SILVESTER THE MINISTRY OF AGRICULTURE, SUNAT - National Tax ANY OTHER ADMINISTRATION AND CIVIL AUTHORITIES, MILITARY, ADMINISTRATIVE, POLICY, JUDICIAL, MUNICIPAL REGIONAL, STATE AND PRIVATE BANKS, PERFORM ANY LEGAL PROCESS REQUIRING AS THE COMMERCIAL LAW AND LEGAL FRAMEWORK IN PERU. DOCUMENT ARE FOR PRIVATE OR PUBLIC AND ESPECIALLY IN WRITING THE EXECUTION OF DOCUMENTS IN ORDER TO GET PERMISSION TO FORESTRY FORESTRY AND WILDLIFE DIRECION MINISTRY OF AGRICULTURE OF PREMISES DENONIMADO "FUNDO YACARUNA 1" REQUESTED TO AWARD BY LAWRENCE B .BISHOP LOCATED IN THE DISTRICT FDO. LORDS, PROVINCE MAYNAS, Loreto REGION, WITH AN AREA OF 1,499 ACRES AND AN 0.000M2

PAGE 16
CONSULATE GENERAL OF PERU IN CHICAGO

PERIMETER 24,960 LINEAR FEET AND REGISTERED IN 1992 IN THE ELECTRONIC GAME OF REGIONAL GOVERNMENT 04,018,664 Loreto. REGIONAL PRODUCTION SECRETARY EXTRACTIVE AFFAIRS DIRECTORATE OF AGRICULTURE, address N USE AND LAND ALLOCATION OF SUB-ADDRESS FILE AND RURAL RUSTIC FOREST AND ESTATE CALLED "PRIVATE SANCTUARY-RIO YARAPA" REQUESTED IN AWARDING A ROXANNE KREMER LOCATED IN THE DISTRICT DE FDO. LORDS, PROVINCE MAYNAS, Loreto REGION WITH AN AREA OF 1.5000 ACRES AND A PERIMETER 0,000M2 24,750 LINEAR FEET AND REGISTERED IN THE ELECTRONIC GAME 04,000,170 OF THE REGIONAL GOVERNMENT OF Loreto. REGIONAL PRODUCTION SECRETARY EXTRACTIVE AFFAIRS DIRECTORATE OF AGRICULTURE, address N USE AND LAND ALLOCATION OF SUB-ADDRESS FILE AND RURAL RUSTIC FOREST AND ESTATE NAMED "Yacumama" REQUESTED BY THE COMPANY IN AWARDING Yacumama SRLTDA LOCATED IN THE DISTRICT FDO LORES, PROVINCE MAYNAS, Loreto Region, WITH AN AREA OF 202 AND HAS A pERIMETER 9,886M2 6585.00 ML AND REGISTERED IN THE ELECTRONIC GAME 04,018,667 MINISTRY OF AGRICULTURE, LAND-Loreto REGIONAL STEERING, STEERING OF LAND USE AND AWARD, SUB-DIRECTORATE OF RURAL LAND REGISTRY AND FORESTRY
CONSUL ADD YOU LORD THAT APPLY AND MAINTAIN MOVE TO THE OFFICE PARTIES REGISTRATION DUE COMPETENT FOR REGISTRATION. CHICAGO ILLINOIS 07 JULY 2009 (SIGNED): LAWRENCE BISHOP ALLEN "

CONCLUSION: EXPRESSION UNDER THE WILL OF THE FOREGOING, WHICH IS A PUBLIC HIGH WRITING, THE (LA) PODERANTE GIVES THE POWER CONNECTION AND I, GLORIA CHAVEZ GONZALES CANDY, CONSUL GENERAL ASSIGNED, ATTEST THAT HE MET WITH THE REQUIREMENTS LAW OF THE REPUBLIC OF NOTARIES AND CONSULAR REGULATIONS OF PERU TO HAVE READ THIS INSTRUMENT TO THE (LA) was ratified in PODERANTE WHO THE

CONTENT AND PURPOSE WITHOUT ANY mODIFICATION, PROCEEDING TO SIGN AND PRINT YOUR FINGERPRINT

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CONSULATE GENERAL OF PERU IN CHICAGO

DECLARING ALSO TO BE SURE THAT THE ENTERED DATA THAT ARE: NAME, LAST NAME, MARITAL STATUS, OCCUPATION, ADDRESS, IDENTIFICATION IS CORRECT: AND THAT HAS BEEN INFORMED OF ANY CHANGES OR CORRECTION REQUESTED THE GRANTING OF A NEW PUBLIC DEED PURSUANT TO ARTICLE 48 THE LAW OF NOTARIES AND ARTICLE 433 OF THESE RULES AND CONSULATE OF PERU
IS NECESSARY TO transcribe, INSERTS AS WRITING THIS PUBLICATION AS FOLLOWS:
CIVIL.ARTICULO PROCEDURE CODE 74 - JUDICIAL POWERS GENERAL- REPRESENTATION REPRESENTATIVE GIVES GENERAL DUTIES AND POWERS THAT APPLY TO PICTURED, EXCEPT THOSE FOR WHICH THE LAW REQUIRES EXPRESS POWERS. REPRESENTATION IS GIVEN TO UNDERSTAND THE WHOLE PROCESS, EVEN FOR THE EXECUTION OF SENTENCE AND THE RECOVERY OF COSTS AND COST. Legitimizing REPRESENTATIVE FOR INTERVENTION IN THE PROCESS AND REALIZATION OF ALL ACTS OF THE SAME, EXCEPT THOSE REQUIRING PERSONAL STATEMENT AND PROXY DIRECT
ARTICLE 75.-ESPECIALES.- POWERS IS THE GRANTING OF SPECIAL POWERS REQUIRED TO MAKE ALL RIGHTS ACTS OF DISPOSITION OF SUBSTANTIVE AND SUE AND CLAIM. THE CLAIM acquiesce, conciliate, settle, SUBMIT TO ARBITRATION CLAIMS CONTROVERSIAL IN THE PROCESS, REPLACED OR DELEGATE REPRESENTATION AND EXPRESSING THE OTHER ACTS OF LAW. GRANT OF SPECIAL POWERS IS GOVERNED BY THE PRINCIPLE OF literalness. NOT THE EXISTENCE OF SPECIAL POWERS PRESUMED NOT EXPRESSLY CONFERRED
WRITING THIS PUBLICATION IS REGISTERED IN THE SHEETS TO FOUR HUNDRED SEVEN PERCENT INSTRUMENT LIV BOOK THIS CONSULATE GENERAL PUBLIC. CONCLUDES THE EXECUTION OF SIGNATURES. WHAT ATTEST, GLORIA CHAVEZ TO MY CANDY

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CONSULATE GENERAL OF PERU IN CHICAGO

GONZALEZ, CONSUL GENERAL ASSIGNED. SEVEN DAY OF JULY TWO THOUSAND NUENVE. SIGNS PARTY LAWRENCE BISHOP ALLEN, SIGNED MANUEL EDUARDO ARELLANO Garibotto TRANSLATOR; CANDY SIGNS GLORIA CHAVEZ GONZALES, CONSUL GENERAL ASSIGNED, OFFICIAL SEAL, REVO POST SIGNS OF CONSULAR OFFICER. 4134 ORDER NUMBER, NUMBER OF ACTION 111 13 A RATE RECEIVED IN SOLES CONSULAR RIGHTS Forty-five USD 45.00. CONSULAR STAMPS USED TWO TWENTY FIVE SUNS SUNS AND ONE OF CONSULAR

PAGE 19
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REGISTRY OFFICE AREA No.IV Iquitos
REGISTRY OFFICE Iquitos
ITEM No. 11031111

REGISTRATION TERMS AND POWERS
REGISTRATION TERMS AND POWERS
AWARD CATEGORY
A00001

ATTORNEY: US NORMAN EARL WALTERS, identified with Ps. No.
PODERDANTE: LAWRENCE BISHOP ALLEN American, identified with Ps. No.

INSTRUMENT: On 07/07/2009 PUBLIC DEED in the city of CHICAGO, Illinois, United States of America, awarded to CANDY GLORIA CHAVEZ GONZALEZ, Consul General of Peru Assigned in that city

POWERS: That the attorney on behalf of the poderdante appear before the Forestry and Wildlife Directorate of the Ministry of Agriculture, SUNAT - Superintendency of Tax Administration and to other, military, administrative, political, judicial, municipal, regional civil authorities , state and private banks, perform any required legal processed according to the commercial legislation and Peruvian legal framework. They are for private contract or public deed, **especially in the signing of documents in order to obtain permission before logging** Direcion Forestry and Wildlife, Ministry of Agriculture of the property denonimado "**Fundo Yacaruna I"** requested adjudication by Lawrence B . Bishop, located in the district Signed. Lords Maynas Province, Loreto Region, with an area of **1,499 hectares and a perimeter** of 0.000m2 with 24,960 linear and enrolled in 1992 at 04,018,664 electronic game of the Regional Government of Loreto meters. Regional Secretary of Extractive Productive Affairs, Directorate of Agriculture, Directorate of Land Use and Adjudication Sub-Directorate of Cadastre and Rural Forestry and rustic property called "**Sanctuary Private-Rio Yarapa**" requested adjudication to ROXANNE KREMER located in the district of Signed. Lords Maynas Province, Loreto Region with an area of **1,5000 hectares** and a perimeter of 0,000m2 24,750 linear and entered in the electronic heading 04000170 of the Regional Government of Loreto meters. Regional Secretary of Extractive Productive Affairs, Directorate of Agriculture, Directorate of Land Use and Adjudication Sub-Directorate of Cadastre and Rural Forestry and rustic farm called **"Yacumama"** ***requested by the company Yacumama*** adjudication SRLTDA located in the district of signed Lords Maynas province, Loreto Region, with an area of 9,886m2 and 202 has a perimeter of 6585.00 ml and registered in the electronic heading 04018667 of the Ministry of Agriculture, Land-Loreto Regional Directorate, Directorate of Land Use and Adjudication, sub-Directorate of Forestry and Rural Cadastre.
The title was submitted on 13/07/2009 at 08:45 AM hours as No. 2009-00013561 Tomo Collected Rights Journal 0085 S /. 18.00 soles with Receipt (s) Number (s) 00010022-01 - MAYNAS, July 17, 2009

Nestor Luis Sifuentes Rios
lawyer Certifier
Registered Office No. IV Iquitos

PAGE 20
ANNUAL OPERATING PLAN FOR FOREST PERMIT PRIVATE PROPERTY
IDENTITY COPY

FOUNDED "Yacuruna I"

PAGE 21
ANNUAL OPERATING PLAN FOR FOREST PERMIT PRIVATE PROPERTY
IDENTITY COPY

FOUNDED "Yacuruna I"

PAGE 22
SUNAT

FILE RUC: 2014502698
Yacumama S.R.L.
Transaction Number: 40225994
CIR - Evidence of Recorded Information

General Information Contributor

Full name or Company Name: Yacumama SRL
Type of Taxpayer: 28 SOC.CON RESPONS.LTDA
Deadline: 16/07/2008
Activity Start Date: 16/07/2008
Taxpayer Status: ACTIVE
SUNAT Unit: 0123 - I.R.LORETO.XXXXX
Fiscal Condition Address: THERE

Taxpayer Data

Business Name:
Type of Representation:
Main Economic Activity: 555104 - HOTELS AND OTHER CAMPS
Secondary Economic Activity 1: 63040 - TRAVEL AGENCIES AND TOUR GUIDES
Secondary Economic Activity 2:
Voucher Issuance Systems: MANUAL
Accounting System: MANUAL
Code of Profession / Occupation:
Foreign Trade Activity: IMPORTER / EXPORTER
Fax Number:
Telephone line 1: 65-24397
Telephone line 2:
Mobile Phone 1:
Mobile Phone 2:
Email Address 1:
Email 2:

Fiscal domicile

Department: Loreto
Province: MAYNAS
District: Iquitos

Area Type and Name
Type and Name Via: CAL SERGEANT LOPES
Number: 149
Km:
Mz:
Lot:
Dept:
Inside:
Other References:
Condition of Property declared domain:
Prosecutor:

Company Data

Date of Registration RR. PP: 15/06/91
Starting Registration Number: 00020693
Volume / details:

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Folio:
Seat:
Origin of Capital: NATIONAL
Country of Origin of Capital:

Registration Tax Exemption Affections
Tribute from Mark of Affection Exemption From To
IGV.OPER. INT. - 16/07/2009 OWN CTA
RENT - AMOZANIA - 16/07/2009 OWN CTA

Legal Representatives
Type and Number Date of Issue Date. Order
Document Name and Surname Position Representation From Birth
NORMAN EARL WALTERS 23/10/1948 15/06/1993 GENERAL MANAGER
Passport Address Phone Email UBIGEO
7100959742 URB. AQUARIUS Mz. B Lot 4 Loreto MAYNAS
Iquitos

establishments Annexes
Type Designation Code UBIGEO Address Other Cond. legal
REFERENCES
0001
S. PRODUCTION
I Yacuruna
Loreto CASERIO ASSIGNMENT IN USE
MAYNAS FND. **I Yacuruna SN RIO PUERTO YARAPA**
MIGUEL FERNANDO
LORES

002
S. PRODUCTION
SANT. PRIVATE
Loreto
MAYNAS FND**. PRIVATE SANCTUARY SN RIO PUERTO YARAPA**
ASSIGNMENT IN USE
MIGUEL FERNANDO

LORES

important
Document issued by SOL - SUNAT Online Operations, which is valid for procedures Administrative, Judicial and further

UNIT SUNAT
Date: 04/09/2009
Time: 13:54

PAGE 24
COMMITMENT TO PAY THE PRICE OF WOOD NATURAL STATE

This document certifies commitment to accept and faithfully fulfill the payment for the price of roundwood to the natural state and Reforestation canon established by the Technical Forestry and Wildlife Management, agreeing on the price set by the institution.

NORMAN WALTER EARL
Legal Representative
"Yacuruna I"

PAGE 25
MINISTRY OF AGRICULTURE
NATIONAL INSTITUTE OF NATURAL RESOURCES
GENERAL FOREST MANAGEMENT AND FAUNA
WILD

CERTIFICATE OF REGISTRATION

REGISTRATION CONSULTANTS AND INDIVIDUALS
PROVIDING LEGAL SERVICES FOREST: PROCESSING
MANAGEMENT PLANS AND EVALUATION, MONITORING
FOREST AND CONTROL

Certifies hereby that (the):

ING. MARIO ENRIQUE CHANG VILLACORTA

He has qualified to furnish Forest Service in developing management plans and assessment, monitoring and forest control and is registered in the Register No. 190, for two years in accordance with the provisions of the Single Text of Administrative Procedures-TUPAs, approved by Supreme Decree No. 014-2004-AG

lime,

Ing. RAFAEL RAMIREZ ARROYO
Mayor Forestry and Wildlife

PAGE 26
COLLEGE OF ENGINEERING OF PERU
DIVISIONAL COUNCIL
Loreto
CERTIFICATE OF PROFESSIONAL SKILL
ENGINEER IDENTIFICATION OF COLLEGIATE RECORD CIP 76889
LAST NAMES AND MARIO ENRIQUE CHANG VILLACORTA

FOREST CHAPTER
SPECIALTY FOREST ENGINEER
ADDRESS YAVARI No. 1784
COD. POSTAL
Phone 797 404
COMMENTS
GENERAL INFORMATION PROJECT / WORK
PROJECT NAME / SITE / DOCUMENT
NAME OF OWNER
LOCATION OF PROJECT / WORK
DEPARTMENT DISTRICT PROVINCE COD. POSTAL
ZONE TYPE AVENUE, JR, STREET OR PASSENGER No. MZ
BUILT AREA m2 CONTRACT AMOUNT USED LOT OF STORY BUILDING No.
ISSUE DATE: 10.07.09
VALID UNTIL: 30.08.09

PAGE 27
Annual Work Plan (AWP) for Forestry Permit No. 01 for timber

Permit No. Contract
Department: Loreto
Province: MAYNAS

1.General Information

Name of Owner: LAWRENCE BISHOP ALLEN

Name of Legal Representative: NORMAN EARL WALTERS

Number of Identity Document
Legal Representative: Passport No. 710095974

No. RUC: 20141502698

Address URB. AQUARIUS Mz. Lot B-4 Iquitos

Eng. Forest have drafted the POA MARIO ENRIQUE CHANG VILLACORTA

Enabling Certificate Ing. For .: 0010408

No registration consultants INRENA: 190

Date of preparation of POA: August 2009

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2. BASIC INFORMATION
2.1 Accreditation of private property
Document Type: PURCHASE CONTRACT
Number 00178
Area (ha) 1499

2.1 geographical and political location

a. Area private plot to intervene
Department Loreto
Province Maynas Maynas
District Sector Fernando Fernando Lores Lores

b. Surface area has to intervene 63.76

c. UTM coordinates (Zone: 18. Datum: WGS 84)

PAGE 29
3. USE PLAN
3.1 Determination of the volume of annual cut
Annual cut volume according to the following table shall be established
No. Species No. of trees Volume (m3)
N. N. Common Scientific Dmc (cm)

PAGE 30
3.2 Yield System
Must specify the information in accordance with the following table

-Activities: Cut

- System to Use Description : To cut trees reduced impact techniques will be applied, taking into account the direction of fall, trunk/stem form, natural inclination, land slope, and surrounding vegetation, in order to reduce impact on future natural regeneration
During the cutting, the Chain-Sawer separates the Tree Crown from the Tree Trunk
The cutting process is to divide the trunks/shaft into smaller logs

-Machinery, equipment and supplies used: 2 Chainsaws, 2 Axes, 2 machetes, Fuel, Lubricants

-Personnel required: 1 Chain-Sawer 1, Assistant, 2 Workers
-Observations:

-Activities: Dragging

- System to Use Description : The manual pull or wallowed is to move the pieces of wood to the stockyard by manually rolled on joists or sleepers

-Machinery, equipment and supplies to be used: 100 m steel cable 1 Winch 1 patesca, 1000 concamos

-Personnel required: 1 Head of Operation, 8 workers
-Observations :

-Activities: Primary Processing (in place of logging)

-Description of the System Use: The primary processing at the site of the grave will be made using portable sawmill, ts, disco 16 "D by which pieces of wood are obtained asserrada

-Machinery, equipment and supplies used: 1 portatl sawmill, fuel, winch

-Personnel required: 1 operator, 2 assistants, 5 workers
-Observations: The portable sawmill to use is the thousand marks LUCAS series: 409.82

-Activities: Transportation

-Description of the System Use: The transfer of lumber will be made using trails, hacie the main river where the collection will be held and then transported via river (in boats) to the final destination

-Machinery, equipment and supplies used: waistband, 1 small 9hp engine

-Required Staff: 5 Workers, 1 biker, 2 Assistants
-Observations

PAGE 31
4. SILVICULTURAL PLAN

Describing the silvicultural practices to be implemented in the area to intervene, which must be primarily aimed at the identification and protection of Mother trees (for seeds)

Silvicultural Practice: Select trees to cut vines

Description: To cut and remove vines that are affecting the tree trunks/shafts of selected trees and can hinder harvesting activities

Silvicultural Practice: Seed trees tagging and protection

Description: Selection and marking of the Mother trees (for seeds) of at least a number equal to a minimum of 10% by species under exploitation
Selected trees should show good genotype and phenotype quality

5. Activities Schedule
A schedule of activities for the implementation of the Annual Working Plan will be indicated on a monthly basis

ACTIVITY	Year 01 ANNUAL PLAN (Months of the year)
Commercial Census	1
Formulation of POA (Annual Working Plan)	1
Silviculture	1, 2, 3, 4
Use	2, 3, 5, 6, 8, 9, 11, 12
Cutting (Trees)	4, 7, 10, 11, 12
(Minor) Transport	4, 5, 7, 8, 11, 12
Harvesting Rights	5, 9, 12

6. ANNEX
6.1 Maps
1) Map 01: Location Map for private plot "Fundo Yacuruna I" and the area to intervene
2) Map 02: Map of species dispersal

PAGE 32
MAP

PAGE 33
MAP

PAGE 34

6.1 Field data inventory

No.
Tree Cod.
Tree Species Common N.
DBH (cm)
Commercial Height (m)
Volume (m3)
Coordinates East North
PURPOSE: Mother Tree (for Seeds) or TO HARVEST

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PAGE 36

APPENDIX C: OFFICIAL DOCUMENTS RELATED TO YACUMAMA

ING. GERSON PACHECO MENDOZA

Chief of Loreto Zone Office

Subject: Request for update of the base map

From my special consideration:

It pleases me to write you to most cordially send my greetings while also applying for THE UPDATE OF THE BASE MAP of the assigned property in the district of Fernando Loores, Maynas Province, Loreto Region, whose owner is the Yacumama Enterprise S.R. Ltd, known as YACUMAMA, written in the Public Resources with Party CXIV, Volume 262 – pages 473; which ask you to accept the information update.

Without further ado/Without any other particular details, [I subscribe myself from you? Or I leave you be now] gracious for the assistance granted at the present.

Sincerely,

Gloria J. Tello Torres de Rojas

Yacumama Enterprise Representative

Attached:

- Copy of the actual territory
- Purchase and Sale contract
- Geographic assignment plan
- Georeferenced plan

"Year of the National Union Front at the External Crisis"

Iquitos, July 21 2009

Sir:

Eng Reden Suarez Gonzales, Technical Administrator of Wildlife – Iquitos

Subject: Presentation of the Annual Operative Plan for Forest Permission of Private Property

From my consideration:

Norman Earl Walters of North America, identified with passport N 710095974, legal representative of the private land known as "YACURUNA I", with Title of Ownership, located in Fernando Lores District, Maynas Province, Loreto Region, Caserio Puerto Miguel-Yarapa river sector, with an area of 1,499 hectares; I present myself before you with all respect and to explain:

That, in compliance with the Wild Flora and Fauna Forest Law, and the Regulations of the Wild Flora and Fauna Forest Law passed by DSN 014-2001AG, in which it stipulates that all Timber Forest Resource Use comply with an annual operative plan for the area to be authorized.

With regards to these requirements we make arrival to your worthy office the studies of the area titled rustic land "YACURUNA I" for your respective evaluation with the final count with the permission of Extraction of Forest Resources to be able to use these resources with the ultimate result of raising our quality of life and provide benefits to the people of the zone.

Without further ado, best wishes to you,

Norman Earl Walters

"RUC" Receipt: 20141502698

YACUMAMA S.R.L.

Proof of Registered Information

General Taxpayer Information

Name: Yacumama S.R.L

Date of Registration: 6/15/1993
Party Registry Number: 00020693
Group Origin: National

Fee Registry

Tax/Fee	Effective Since
IGV-International operation – CTA. Owned	7/16/2009
Rent, Amazon, CTA Owned	7/16/2009

Legal Representatives

Document Type and Name	Names	Manager	Date of Birth	Active since	Order of representation
Passport - 7100959742	Walters Norman Earl	General Manager	10/23/1948	6/15/1993	
	Address	**Location**	**Phone**	**Email**	
	URB. Acuario MZ B lot 4	Loreto Maynas Iquitos	--	--	

Added Establishments

Code	Type	Name	Location	Address	Other References	Legal Status
001	Productive	Yacaruna1	Loreto Maynas Fernando Lores	FND. YACURUNA I—RIO YARAPA SN	Village of Puerto Miguel	Leased
0002	Productive	Private Sanctuary	Loreto Maynas Fernando Lores	FND. PRIVATE SANCTUARY—YARAPA RIVER SN	Village of Puerto Miguel	Lease

Important
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Primary taxpayer, request you usercode and access key at the SUNAT Operations Line system, with those you can conduct transactions from the comfort of your home, work, or anywhere else with Internet access.

Technical Report N 166-2010-PLRD

To: Engineer GERSON MANUEL PACHECO MENDOZA, Zone Chief of Loreto

From: Bach, Pedro Leonarda Rojas Davila, Cartographic Analyst

Subject: Proposal for the Update of the Base Map

File/Record: 2010046868

Date: Iquitos, May 20 2010

I have the pleasure of writing to inform you with regards to the proposal N 2010046868 via the Sra Gloria J Tello Torres de Rojas as representative of the Yacumama Enterprise with D.N.I 05351451 requesting an update of the Base Map of COFOPRI – Loreto with respect to the rustic properties "**Private Sanctuary"** and "**Yacuruna I**" which you find in the Yarapa river area, Fernando Lores District, Maynas Province, Loreto Region.

The presented documentation has been examined and the Base Map of COFOPRI, which determines the following:

- That, the rustic land "PRIVATE SANCTUARY" is found written in Vol. 262, page 229, P.E. N 04000170 of the Public Registry of Loreto, and currently it is in favor of the marriage formed by BISHOP LAWRENCE ALLEN y ADRIANA G. BISHOP.
- That, the rustic land "YACURUNA" is found written in Vol. 262, page 425, P.E. N 04018664 of the Public Registry of Loreto, and currently is found in favor of LAWRENCE ALLEN BISHOP.
- That, the rustic lands mentioned above were freed from the rustic land referenced as "Bolivar" that is found written in Vol. 26, page 223, P.E. N 04015639 of the Public Registry of Loreto, and currently finds good favor of the STATE – General Management of Agricultural Reform and Rural Settlements.
- That, the polygons of the lands have been recreated in the study agreed upon by the coordinators that monitor the attached plans.
- That, the recreated polygons were added to the Base Map of COFOPRI – Loreto definitive at end of preserving the rights of the owner.
- That, a sketch of the study land polygon is attached.

Without other matters, this is all that I have to inform you, for your knowledge/awareness and ends the case requires.

Bach. Pedro L. Rojas Davila, Cartographic Analyst