VARIETY WOODS AND GREENHEART LIMITED

SFEP 2/2012

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

Northwestern slope of Makari Mountains, Upper Demerara

JANUARY 2017

EXECUTIVE SUMMARY

Context

Forest conservation and its linkages with a green economy and climate change is a major concern for local policy makers. Many experts in the global environmental community believe that well managed forest concessions support and complement the general (biodiversity) conservation goals embodied in a system of protected areas. There is also the shared view that when reduced impact logging practices form part of an enterprise's concession management system, the functional aspects of the original ecosystems are retained in the logged over forests. The developer, VWL, has been a forest concessionaire since 1985, the company has embraced RIL since 2003, undertaken independent biodiversity conservation practices and has given serious consideration to FSC certification. At the local level, and especially since the early 1990s, there has been steady progress in the development of a robust environmental framework to manage the development of natural resources generally and forest resources in particular. Key developments include the establishment of the EPA, the developments of Codes of Practices as well as guidelines covering forest inventory and the preparation of forest management plans, and the development of the overarching policies and plans including the LCDS and strategic plans on land use, protected areas and the conservation of biodiversity. The Tropenbos-Guyana Programme, Conservation International Guyana, WWF-Guyana and Iwokrama International Centre have all partnered with the Government of Guyana in the thrust for a feasible environmental framework. The lead agency in the forestry sector, the GFC, has also partnered with international agencies such as ACTO, DFID, FAO and ITTO to achieve major forestry developments. The current Green Agenda pursued by the Government of Guyana has a firm foundation on which to achieve its developmental outputs.

On the basis of the foregoing, the award of the forest concession to VWL is **consistent** with the developmental goals of the national green agenda.

VWL –the company.

VWL management team has been engaged in large scale logging activity since 1985 and has conducted exemplary logging operations via TSA 08/85 (1985-2005) and currently WCL 1/2007. The company's embrace of RIL, its responsible environmental behaviour illustrated by its proactive approach to conserving fauna (such as the Harpy eagle and the Giant Otter), its voluntary decision to conserve the natural environment in the vicinity of Canister Fall, and the company's early willingness to subject the company to third party forest management certification are all evidence of a company that has the *will* and the *passion* for responsible management of local forest resources.

VWL has also been outstanding in the social arena. Since scoping meetings in 2004 mainly at Bamboo Landing, when VWL produced its first ESIA study (Denise Fraser et al, 2004) in respect of a wood processing pilot certification project, VWL has attached as much importance to its social obligations as its technical operations.

VWL brings to bear its experience, its knowledge of local conditions, its commitment to responsible stewardship of the forest resources and its passion for forest conservation to this project –the development of logging project within the SFEP area. Its experience with managing its current environmental permit, in managing processes linked to third party certification via FSC and Rainforest

Alliance respectively and in supporting research on feline populations will serve the company well as it assumes its new responsibility.

The ESIA

VWL recruited a team of consultants to take forward an ESIA required for a logging project of the magnitude contemplated.

The core team comprised the following:

a) Godfrey Marshall-Forester, Team Leader;
b) Environmental Engineering Solutions (EES) - Environmental Consultants; and
c) Eustace Alexander-Social scientist and biodiversity Specialist.

In the developing the ESIA report, and in line with the Terms of Reference approved for the study, the consultants engaged in a variety of activities as follows:

a) Desktop studies, including a review of the legislative framework
b) Interviews with stakeholders
c) Aerial inspection of the concession area
d) Physical visits to the area targeted for a concession as well as surrounding areas
e) Sampling and analysis of water, soil and air (to record the current state of the environment
f) Sampling and analysis of the biological environment
g) Considered the anticipated environmental and socio-economic impacts of the logging project and identified mitigation measures

The Logging project

VWL's concession has an area of 132,863.21 ha and will be managed on a 40 year cycle that allows a cutting intensity of 13.33m^3/ha. Annual production is projected at 30,905.49m^3. VWL will develop the concession in a systematic manner and once blocks are closed, they will remain so (for at least another 40 years).

VWL aims to conduct a logging operation based on the principles of reduced impact logging (RIL) and in line with the GFC's Code of Practice and ancillary forest management prescriptions and guidelines. The use of RIL implies that all interventions are planned, that staffs are trained, that all machines are in a proper functional state and that there is due attention to occupational safety and health practices. VWL's forest management plans and annual plans of operations respectively provide ample detail of the scope of the company's operations. VWL intends to harvest logs (and piles) from the concession area and transport the logs by road with the use of 6x 4 Kenworth trucks via Charabaru to Bamboo Landing for further processing.

For the next five years at least most employees will live at Charabaru. Within the concession area small camps will be set up to cater for inventory teams, road construction crews and logging teams.

For the logging operation itself, the core practices are as follows:

a) All staffs are trained for the job they have to do and are equipped with safety gear

b) Forest management plans and annual plans of operations are duly prepared for approval by the GFC; these plans set out the scheduling of the main interventions such as road layout,

road construction and road maintenance works and forest inventory activities, both at the management or reconnaissance level and for 100% enumeration.

c) The stock map based on 100% pre-harvest enumeration of 100ha blocks is the basis for logging operations, specifically:
    a. Setting out buffer or protected zones
    b. Scheduling road construction and road maintenance works
    c. Selection of the merchantable harvesting stock
    d. The planning and construction of log markets and skid trails
    e. The scheduling of tree felling operations
    f. The scheduling of forest monitoring and post-harvest operations respectively.

d) Tree marking operations will be used to determine the final harvesting crop

e) Directional felling of trees will be the norm

f) Skid trail layout will be based on the terrain and the stocking of merchantable trees and will be planned in detail; log market layout will be influenced by the skid trail layout as well as the layout of access roads.

g) For the next five years, all timber will be transferred by road to Charabaru, within WCL 1/2007.

VWL has standard operating procedures (SOPs) for its logging operations. The most critical aspect of those SOPs allow the company to monitor every aspect of its operations, including log tracking.

Legislative framework

VWL's operations will be subject *primarily* to the provisions of the Forest Regulations and ancillary prescriptions published by the GFC as well as the provisions of the EPA Permit.

(VWL is prepared to continue to seek third party certification for its forest management systems and also to subject itself to emerging prescriptions linked to the national FLEGT initiatives).

Assessment of Logging Impacts

Road works represent the primary interventions within the concession area. Road works necessitates the removal of trees and earthworks linked to borrow pits, the construction of side ditches, bridges and culverts, and the laying down of corduroy works. Since logging roads are capped with earths it is necessary to carry out maintenance works, which leads to new 'disruptions' throughout the active life cycle of the road. Apart from the loss of vegetation, road works generate dust, modifies under-storey regimes of moisture, light, temperature and wind, and facilitates soil erosion, especially on slopes.

Logging impacts on forest structure. According Schmidt et al (20011) in Werger (2011) logging creates forest gaps, alters the diameter class distribution, reduces basal area and standing volume (phytomass);logging also leads to soil compaction which affects infiltration rates for surface water.

Logging is a noisy affair and scares away animals, disrupting their foraging habits while rapid changes in understory conditions could jeopardize the lives of slower moving animas such as tortoises and destroy nests, clutches of eggs or burrows.

Logging results in the export of logs from the forest which represents a loss of nutrient capital (though fortunately in Guyana, only straight sections of the **bole** of the tree is removed from the forest floor).

Mitigation of Impacts

Dust and modification of the under-storey conditions

VWL will be using RIL practices. Experiences with Celos System in Suriname indicate that even though any logging damages the ecosystem, well planned logging does not create any major disruption beyond normal natural mortality, especially when VWL will be removing 13.33m^3over a 40 year period. Roads will be designed and maintained properly to minimize accelerated erosion. Truck speeds will be kept below 60kmh.

Modification of water quality

Storm water draining off roads will be led via side drains through a mass of rock or vegetation to trap sediment so that this sediment does not enter waterways.

Fauna

Bicknell et al, 2015 suggests that on the basis of his studies at Iwokrama, that RIL has a 'benign effect on birds, bats and large mammals while De Dijn (2011) in Werger (2011) recommends that hunting and collection prohibitions should be enforced in order to conserve fauna'. VWL will both implement RIL practices and discourage commercial scale hunting and fishing.

Waste

VWL's standard practice is to bury waste. No burning is ever carried on its concession. Waste oil is sold to chainsaw operators. Sites where waste is buried is normally put at least 150m from any waterway.

Camp Hygiene

Field teams will use pit latrines and these will be positioned at least 200m from any water way. They will be put on elevated ground or otherwise constructed so that surface water does not flow into the toilet pits.

Effluent from kitchens and bathrooms will be led into 'dead' sumps, special pits where the water will be allowed to infiltrate into the soil. These pits will be put some 150m away from any waterway.

Corporate social responsibility

VWL has a robust business relationship with the logging associations in the Kwakwani-Hururu-Ituni Triangle worth in excess of US$ 50,000.00 per year. VWL rents its skidding assets to the loggers and also buy a great deal (about 1/3) of their annual output; VWL also rents logging trucks owned by the loggers. Also the associations buy lumber from VWL. This relationship has been in place since 2007.

VWL has responded to requests from the management of Kwakwani Hospital for small donations; a request on hand is for benches for the outpatients waiting area which VWL will contribute. VWL

currently contributes hampers on a quarterly basis for elderly people in Linden. VWL has sponsored several medical outreaches to communities in the Rupununi and will continue to do so or to otherwise offer material support to the communities.

VWL will partner with IIC to monitor the Essequibo River Corridor between the two concessions.

Management of Conflicts

VWL anticipates issues with other developers and will always seek positive ways to resolve these issues. For potential issues with Fairview and Iwokrama, VWL is already in talks with Iwokrama regarding joint monitoring of the Essequibo Corridor. VWL has also taken the position that much the northwestern area of the concession and much the right bank Essequibo River to a depth of 500m will be free from logging.

Forest management Plan, Annual Plans of Operations, Environmental Plan

All activities by VWL will be set out in the company's forest management plan, its annual plans of operations and reports linked to its environmental management plan which will be available for scrutiny at all times.

Recommendation

We believe that the EPA and the GFC have the tools at hand to ensure that logging companies adhere to the legislative framework for forest management.

We believe that the mitigation measures put forward to address negative impacts are adequate and appropriate. It is also our view that VWL has the corporate discipline, the experience and the passion to conduct a sustainable logging operations in line with the legal framework for such projects and also requirements of other stakeholders.

We also think that wider principles and goals of environmental conservation, regional development and national development will be addressed.

We unreservedly recommend that the company be issued an Environmental permit.

Godfrey Marshall
Team Leader

REFERENCES:

Tables:

Figures

Annexes:

I. Terms of Reference for ESIA Study
II. Minutes of Scoping Meeting
III. (A): Organizational Chart (A)-VWL
(B): Organizational Chart for Field Operations
IV. Description of the Concession Area
V. Water Quality Standards
VI. US EPA Standards and World Health Organisation Guidelines
VII. Illustration of VWL's Quest for 3rd Party Validation of Its Forest Management Systems
VIII. Master List of Equipment Used for VWL's Operations/Sawmill and Logging
IX. Copy of Rental Agreement
X. Proposal for managing the Essequibo River Corridor
XI. Map of Concession Area Showing Buffer Zone on Right Bank Essequibo River
XII. Map of Sample Points
XIII. List of merchantable species recorded to date within VWL's concession
XIV. Extracts of VWL's Standard Operating Procedures
XV. Fauna recorded within the concession and adjacent areas
XVI. Questionnaire used for social surveys
XVII. CV of Consultants

ACRONYMS

APO	Annual Plan of Operations
ACTO	Amazon Cooperation Treaty Organization
CI	Conservation International (Guyana) Inc.
COP	Code of Practice for Timber Sales Agreements and Wood Cutting Leases 3rd Ed.
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agricultural organization of the United Nations
FLEGT	Forest Law Enforcement, Governance & Trade
FMP	Forest management plan
FTCI	Forestry Training Centre Incorporated
GGB	Guyana Gold Board
GFC	Guyana Forestry Commission
GGMC	Guyana Geology & Mine
GNBS	Guyana National Bureau of Standards
GWMA	Guyana Wildlife Management Authority
IIC	Iwokrama International Center for Rain Forest Conservation and Development
ITTO	International Tropical Timber Organization
LCDS	Low Carbon Development Strategy
MNR	Ministry of Natural Resources
NEAP	National Environmental Action Plan
NRDDB	North Rupununi District Development Board
OCC	Office of Climate Change
PAC	Protected Areas Commission
REDD	Reduced Emissions from Deforestation and Forest Degradation
RIL	Reduced Impact Logging
SFEP	State Forest Exploratory Permit
TBI	Tropenbos-International
TSA	Timber Sales Agreement
VWL	Variety Woods & Greenheart Limited
WCL	Wood Cutting lease
WHO	World Health Organization
WWF	World Wildlife Fund

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1.0 INTRODUCTION: THE CONTEXT FOR THE PROJECT

1.1 Overview of the forestry sector

The green economy

The concept of a green economy is taking hold at the global level driven primarily by concerns about the adverse effects of climate change and emerging research capabilities for quantifying some critical benefits of forest resources; for example, the quantity of carbon generated annually by a specific mass of forest or the economic benefits of pollination services by bees. While traditional forest conservation measures have targeted biodiversity, issues of climate change mitigation are now treated with similar importance.

At the local policy level, building on the LCDS and related initiatives, there is a concerted move by the Government and civil society to promote a green economy. Issues of forest management, the conservation of biodiversity via protected areas and the development and adoption of suitable green energy technologies benefit from partnerships among a large number of agencies (see Figure 1). There are also concerted efforts by the Government and civil society to develop and implement educational initiatives that emphasize forest conservation and a green economy.

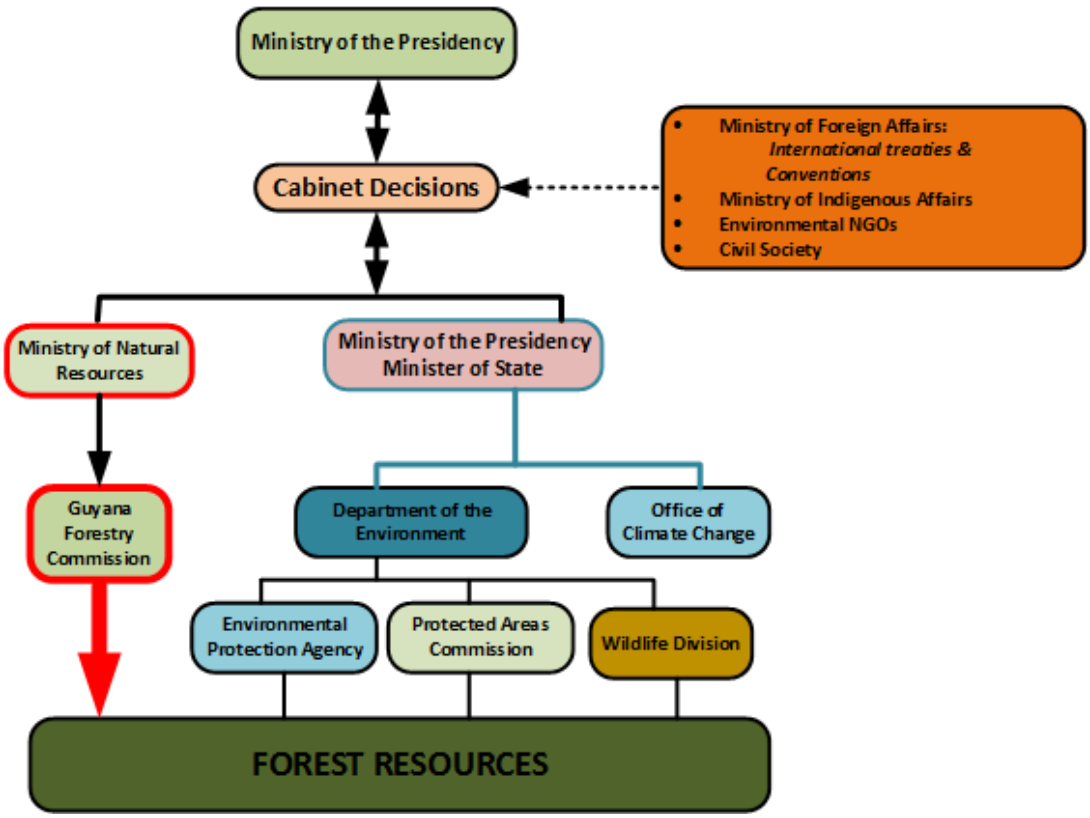

Figure 1: Core agencies involved in the management of forest resources

Closely allied to forest conservation initiatives are the development of a land use plan (GLSC, 2013) and a biodiversity action plan (GOG, 2015) that seek to promote coherence, consistency and order in the way forest resources in particular are liberated for conservation purposes. Traditional multiple forest use models such as that exemplified by the IIC have garnered and are attracting new importance. Community based eco-tourism is emerging as the preferred economic initiative for communities that have considerable forest resources and unique landscapes at their disposal.

Forest management

The increasing attention to the global value of (local) forests has encouraged the GFC to develop robust forest management measures, including Codes of Practice, and also forest monitoring practices. The GFC, which has more than sixty-two(62) graduates on its staff-including twelve(12) persons with MSc Degrees, nine(9) with MBAs, and two (2) with post-graduate diplomas has developed and prescribed forest management prescriptions via Codes of Practices, and guidelines for *forest management plans* and *annual plans of operations* respectively. Table 1 presents some of GFC's requirements for timber concessions and the way these measures help to conserve forests.

Table 1: Current forest practices fostering forest conservation

#	Criteria	Activity	Implications
	A. **Selection of merchantable stock**		
1	Identification of merchantable trees	Pre-harvest forest inventory	More or less four mature trees are harvested per hectare
2	Tree marking	Tree marking	Considers potential crop trees near to the tree targeted for felling
3	Diameter limits	Pre-harvest inventory	Protects the growing stock, ensures residual stands of mature trees
4	Tree form	Pre-harvest inventory	Conserves forest environment because trees of poor form are not felled
5	Tree vigour	Pre-harvest inventory/tree marking	Conserves forest environment because trees with defects are not felled
	B. Site requirements		
6	Buffer zones	Tree marking	Conserves forest environment, prevents erosion
7	Proximity trees (8m rule)	Tree marking	Conserves the under-storey environment
8	Site requirements (Steep slopes, etc.)	Tree marking	Conserves forest environment, prevents erosion, contamination of creeks
	C. Logging practices		
9	Road construction and road maintenance	Drainage parameters for roads and borrow pits	Prevents water logged conditions that degrade forests and displace fauna
10	Directional felling	Felling	Protects potential crop trees in the vicinity of target trees
11	Planning of skid trails and log markets	Skid trail & log market planning and alignment	Conserves forest environment by prescribing specific routes for extracting logs
12	Skidding with a winch, use of choker straps	Skidding practices	Restricts forest impacts (such as soil disturbance & erosion) to specific areas
	D. Other practices		
13	Restrictions on hunting	Forest monitoring	Conserves pollination and seed dispersal and seed regeneration processes.
14	Restrictions on littering/pollution	Forest monitoring	Conserves seedling growth, prevents injury to fauna
15	Biodiversity reserves	Forest protection	Conserves species of trees, fauna
16	Support for research	Forest management/research	Various

Recently the GFC invited bids for a review of its forest policy statement; no doubt, the intention is to align the policy to a wider array of forest based values and the national green agenda.

At the level of forest concessionaires, there is a more energized response to policy measures and forest management prescriptions.

Timber marketing

The local timber market has become quite competitive due to the fact that home builders are opting for concrete houses as well as steel beams, PVC panels and metal doors and window frames. The export market has other challenges: other tropical timber exporting countries have been much more aggressive in their marketing efforts, and requirements for tropical timber imports in consumer countries such as USA, European Union and Japan are steadily becoming more demanding. These factors appear to have combined to reduce the volume of timber marketed over the last few years.

1.2 Specific context for the project

The developer will launch the logging project within the upper Essequibo-Corentyne Watershed which incorporates portions of Regions 6, 8, and 10. During reconnaissance work that included flights over the concession area, trips along the Essequibo River and Berbice Rivers respectfully, and trips overland, no evidence was discerned regarding the presence of any community or any other developer **within** the area. There are a few aged signboards (see Figure 2) indicative of an interest in areas on left bank Berbice River.

Figure 2: Signboards within the SFEP area, left bank Berbice River.

Residents of Fairview, Apoteri, and Rewa villages respectively, related that, for many years now, they have been fishing, hunting and gathering NTFPs along the right bank Essequibo River, including areas within the forest concession area. Indeed, the consulting team did see residents of Fairview Village (see Figure 3) and of Apoteri Village (Figure 4) fishing along the Essequibo River (see Figures 3, 4). In addition, the team noted remnants of seines, old camp sites, hunters' perches (*Wabini*) and numerous signs of fishing expedition on right bank Essequibo River.

Areas on right bank Maam Creek and in fact all areas north of Maam Creek, right bank Essequibo River are already under forest concessions (TSA 2/91 and TSA 3/91) held by Demerara Timbers Limited, but there have been no specific complaints reported by residents of Fairview Village.

Figure 3: Photo showing residents of Fairview Village on a fishing trip

Figure 4: Photo showing residents of Apoteri Village encamped for a fishing trip.

While traversing the right bank Essequibo River, several metallic objects were encountered at a site-IIC's forest rangers said that that was the site for a water gauge, but appearing more like a Pall(see Figure 5, Map 1, testify to extensive activity by the *Ministry of Public Infrastructure*[1] in the past.

Figure 5: Metallic paal (?) observed at the site of a water gauge

There is an Eco-Lodge, Paraiba (Lau Lau) Eco-Lodge, situate on an **island** in the Essequibo River (see Figure 6, Map 1). The property is neither part of IIC nor the SFEP. According to the enterprises website, www.adventureguianas.com , the enterprise offers experiences in activities including fishing, wildlife, birding tours, trekking, canoeing and swimming

[1] During colonial days when water gauges were set up all across Guyana by the *Public Works Department*, which did the same activities as the current Ministry of Public Infrastructure.

Figure 6: Photograph of the Paraiba Eco-Lodge

IIC's Rangers routinely patrol the Essequibo River between Kurupukari and the southern boundary of Iwokrama Forest; they make a record of who is doing what, the number of people per activity and the kind of equipment or tools being used. They also collect data in support IIC's ongoing research on wildlife.

It is also apparent from information garnered from loggers in the Upper Berbice River that various people hunt and fish along the Berbice River as far south as the mouth of Duck River, left bank Berbice River, during the dry season. Also, balata bleeders, based at Apoteri, operated within the SFEP area up to the late 1970s. The consultants were able to verify that the GGMC has issued mining concessions throughout the entire SFEP area but none of these have been developed to date.

1.3 Challenges

For the development of the concession area, there are three *overarching* factors of operational significance, at hand. Firstly, the Essequibo River and the Berbice River respectively and their respective tributaries cannot be used to transfer heavy logging equipment and other goods to the concession area due to the prevalence of sandbars and rock outcrops (see Figure 7). A network of roads is the only way to develop the concession for logging purposes (and for other land uses as well).

Figure 7: Photograph showing a mass of rock outcrop in Essequibo River

Secondly, during the rainy season there is a significant rise in water levels within the various water courses during the rainy season, leading to extensive *overland water flow* (see Figure 8). These flooding events create extensive *inoperable areas*, especially along the banks of the Berbice and Essequibo Rivers to depths of up to 500m (overland) and also imply that major work is required in the design of roads, bridges and culverts if they are to remain functional during or immediately after the

peak rainy season. On the other hand, many creeks dry out completely during the dry season and this affects the deployment of field operatives.

Figure 8: A tributary of The Berbice River during the rainy season: the water course is not apparent

Thirdly, in undertaking this project, and in the face of known mining interests in the area, VWL will bear the financial burden of pioneering the development of a road network at its own costs. Also, the development of forest concessions to the south of the one held by VWL **will consider VWL's road network.** In fact, it seems certain that the road infrastructure for all the current forestry concessions within the Upper Essequibo-Upper Corentyne Watershed will be integrated at some stage. While **it is** desirable **that c**ollaboration between developers for shared road use will reduce the overall road density within the Essequibo –Corentyne district, the Company anticipates a similar shared, multi-stakeholder approach to road maintenance costs and public security.

2.0 THE DEVELOPER

2.1 Profile of the Developer

2.1.1 Corporate affairs

Variety Woods & Greenheart Limited, Company # 2066 owned and operated by Guyanese, was incorporated on May 14, 1986 in Georgetown, Guyana under the Companies Act, Cap. 89:01. The Company's TIN Number is 010085721.

The primary business of the Guyanese company is the production of value added timber products primarily for the export markets. However the company will also bring to bear on this project, its passion for orderly and responsible environmental practices and its proven track record on worker welfare.

The company currently boasts one of the most experienced management team for forest concessions in Guyana, as follows:

(a) Mr. Shiek Niamatali MS, the managing director, who has been active in the local forestry sector for more than 56 years and who pioneered forestry concession development in the upper Berbice District (at a time when bauxite mining was still the dominant economic activity in the area);

(b) Rommel Niamatali, the Operations Director, who has been working with the company for more than 20 years, and who has been instrumental in implementing emerging forest management standards and prescriptions;

(c) Mr. Dhannyram Bissessar, the Operations Manager, who has been working with the company for more than 25 years with a passion for sawmilling and occupational safety and health;

(d) Mr. Bryan Barretto, Coordinator, who has been with the company for eight years, and who has familiarized himself with emerging developments in the forestry sector.

The stability of the senior management is testimony to the leadership and management skills of Mr. Shiek Niamatali, who has a sound knowledge of local forest conditions and the passion and courage for creating value from local forest resources. The organizational charts for the company and for its forest operations respectively are set out in Annexes III (a) III (b). The company currently employs 102 persons on a fulltime basis; however this figure can rise to 170 on receipt of the TSA for the area held under the SFEP.

VWL will invest US$20million over the next five years; US$10 million will be spent by October 2016 mostly in the acquisition of heavy-duty equipment, fuel costs and road and bridge construction for compartment Maam.

VWL will be able to bring to the new concession its corporate discipline and its and proven capabilities for forest concession management generally and voluntary forest conservation practices in particular. The company will build on the market niche it has carved for itself in the international lumber market. The company will also maintain its philosophy of only engaging in log exports where the logs targeted are of the lesser used species and the total annual volume of log exports does not exceed 5% of its annual production.

2.1.2 Organization of operations

The company's operations are spread over three sites:

a) Head Office, the registered office of the company, situate at 99 Laluni Street, Queenstown, Georgetown;

b) Bamboo Landing, left bank Berbice River, situate 240km south of New Amsterdam and 12.8km north of Kwakwani; and

c) Charabaru, right bank Demerara River, the primary forest operations centre situate 190 km by road from Bamboo Landing.

Communication by radio transceivers is available 24 hours per day between the three operational centers; in addition there is cell phone communication between Bamboo Landing and Georgetown.

No major forward camp is anticipated within the first five years of the issue of the forest concession. (Field teams will operate from Charabaru, with temporary, tarpaulin covered camps supporting field teams engaged in forest inventory, road construction and road maintenance respectively, and felling teams).

2.1.3 Forest resources management capability and experience

The Company has been managing WCL 1/2007 over an area of 21268.35 ha since 2005; and prior to that the same management team was engaged with TSA 08/85-Mondeen Industries Limited[2] with an area of 164,568ha for period 1985 through 2005. During the past 30 years, and in particular during the last ten years, the management of VWL subscribed fully to the principles and practices of reduced impact logging, including a fully established log tracking system. The company is a model of full compliance with all legal requirements of the Guyana Forestry Commission and the Environmental Protection Agency; its WCL 1/2007 is covered by an APO, a FMP and an EMP.

The company is sufficiently robust in its forest management systems that it has allowed third party certification of its forest management systems via *Rain Forest Alliance*, and the random scrutiny of a large number of experts from the GFC, an array of overseas customers and international agencies including FAO, WWF and TBI. Since 2013, the company has been hosting an EPA approved ongoing research arrangement with Panthera (Corporation) for the study of big cats (mainly *Puma concolor*, *Panthera onca,* and *Leopardus pardalis* on its concession). On its own initiatives, the company has implemented *specific* measures to protect the harpy eagle (*Harpia harpyja*) and the giant otter (*Pteronura brasiliensis*) living on the concession area (WCL 1/2007). Further the company enforces a no-hunting policy to ensure that critical forest functions such as seed dispersal are conserved throughout the concession.

2.1.4 Social practices

VWL's management philosophy is based on frequent *briefing* sessions with its operatives, using a flat management style that allows frequent interaction between clerical staffs, technicians, mechanics and field operatives on the one hand and management staffs on the other hand, staff training, and the deliberate attention to the welfare of *each* employee. VWL maintains very exemplary social practices that starts with employment practices and accommodation for its workers. All workers at the main operations centre, Bamboo Landing, enjoy 24 hour supply of potable water and electricity.

[2] It should be noted that TSA 08/85 which was voluntarily reverted to the State, with a fully functional, integrated road network, have been supporting many small loggers' associations since 2005.

There is a medical facility at Bamboo Landing and a first aid kit at Charabaru. Schooling is available at Bamboo Landing. All workers have safety gear and an active safety committee is in place. At Bamboo Landing the company maintains a well-stocked ration store while for Charabaru and the temporary forward camps used by road construction and forest inventory crews, there are *weekly* trips for supplying rations and medical supplies. The company maintains a farm that allows it to provide all field operatives with fresh vegetables on a weekly basis. The company has partnered with several religious bodies over the years to provide free medical services for targeted rural communities in Region 9 from which its field operatives are recruited. Over the years the company provided scholarships for teachers and donated generators to rural communities.

2.1.5 Community relations

VWL is very active in supporting road maintenance works on the UNAMCO Road and the Ituni-Kwakwani Road. The company has allowed its sawmill at Bamboo Landing and its forest concession respectively to be used for training courses on timber grading for forest operatives from Ituni-Aroaima-Hururu-Kwakwani 'triangle' in Region 10.

2.1.6 Wood processing and timber marketing

The company has the installed capacity to produce 200,000 board feet of Grade 'A' sawn lumber per annum. It has garnered markets in every continent, selling timber to demanding markets in New Zealand, Japan, and the Netherlands.

2.1.7 Strategic Plan

The acquisition of the SFEP area is the basis for VWL's strategic plan. The company believes in a multiple use approach to the management of the natural resources of Guyana. The company's model will see a blend of reduced impact logging practices, the preservation of unique landscapes and ecosystems for the conservation of biodiversity, and *partnerships* with agencies such as IIC and Panthera.org. VWL undertakes to bring its experience to bear on the management of the new concession by maintaining its record of robust corporate discipline, allowing full third party oversight of its field operations. It has garnered experience through the Rain Forest Alliance 'certification scheme' for its current WCL and the company will aim for FSC Certification on the attainment of the TSA for the current SFEP area. The company will continue to value the conservation of indigenous assets and the provision of material support to indigenous peoples.

2.2 Objectives of the Developer

The Objectives of the Developer may be summarized as follows:

a) To conduct a viable logging operation consistent with the best practices developed and applied for local forests;
b) To develop partnerships with other agencies and groups to foster a shared approach and shared responsibility for a multiple use approach to forest development; special attention will be paid to partnerships with IIC and Panthera.org.

c) To support national forest based conservation goals.

SECTION 3.0: POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK

3.1 Introduction

Article 36 of Guyana's Constitution of 1980 is the basis for the environmental initiatives across the entire natural resources sector by prescribing the following: *'In the interests of the present and future generations, the State will protect and make rational use of its land, mineral and water resources, as well as its fauna and flora, and will take all appropriate measures to conserve and improve the environment'.* In 1996 the Environmental Protection Act (hereinafter referred to as the Act) was enacted to give effect to the provisions of the Constitution.

Guyana is endowed with a considerable diversity of natural resources and this diversity is also reflected in a diversity of policies, legislation, and standards across the sector. Issues of climate change and conservation of biodiversity, for example, are applicable right across the natural resources sector and are addressed as overarching issues before the more specific policy and legislative framework is addressed.

3.2 Overarching frameworks

3.2.1 National Environmental Action Plan (NEAP) 1994

The major objective of the NEAP is to 'identify and the major environmental problems (today) and to formulate appropriate policies to address the cause and effect of these problems. A major focal point of the NEAP is sustainably managing the economic potential and conservation of the hinterland forests in the face of massive investments in forest and mineral resources respectively (since the advent of the Economic Recovery Programme which deliberately sought (foreign) investment in these resources to promote economic development.

This ESIA study is consistent with the aims of the NEAP, set out as follows:

a) Assure all people living in the country the fundamental right to an environment adequate for their health and well-being;

b) Achieve a balance between the use and conservation of the nation's resources to meet the needs of economic development and improved standards of living e Institute punitive measures to deter possible violations of environmental norms;

c) Ensure that, where environmental damage occurs, remedial action will be taken with the cost being covered by those responsible for causing the damage;

d) Conserve and use the environment and natural resources of Guyana for the benefit of both present and future generations, based on the principle of the exercise of sovereignty;

e) Maintain ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and to observe the principle of optimum sustainable yield in the use of renewable natural resources and ecosystems, both on land and the sea;

f) Rehabilitate damaged ecosystems where possible and reverse any degradation of the environment Ensure prior environmental assessments of proposed activities which may significantly affect the environment;

g) Ensure that conservation is treated as an integral part of the planning and implementation of development activities;

h) Promote the pursuance of international co-operation on environmental issues;

i) Raise consciousness of the population on the environmental implications of economic and social activities through comprehensive education and public awareness programmes;
j) Involve the population, including indigenous peoples, women and youth, in the management of the environment and natural resources;

3.2.2 The National Biodiversity Strategy and Action Plan, 2012-2020

The NBSAP, 2012-2014 was developed by the Ministry of Natural resources (an Environment) and the EPA in partnership with several international partners and NGOs and aligns Guyana to global and regional initiatives on the conservation of biodiversity.

In the context of this ESIA report, priority areas for action set out in the Plan include:

a) Expansion of protected areas to meet the goal of 17% of terrestrial area in-situ conservation in legal protection by 2020. To ensure that these areas would also be effectively managed, capacity would be built for planning, establishment and management of protected areas. A National Protected Areas Trust Fund would be established which is expected to contribute significantly to the financial sustainability of these protected areas

b) Reviews of existing legislation and outcomes of Environmental Impact Assessments (EIAs) and their roles in protecting biodiversity.

c) Compilation and consolidation of biodiversity data from local, international and web-based sources including traditional knowledge and development of a database system for biodiversity which makes data freely available to users.

3.2.3 The National Land Use Plan, 2013

The National Land Use Plan (NLUP) provides 'a strategic framework to guide land development in Guyana' and is distilled from a number of national policies and strategies that have a direct relevance for land use and land management.

Key operational measures of the NALP include:

a) effective management of competing land use claims
b) The need for linkage between regional development plans and national development

Mining activities on forest concessions is a major concern of loggers. In the context of this ESIA, the NALP attempts to *'provide for the co-existence of multiple land uses and also provide clear, implementable guidelines for making decisions on multiple land uses and mutually exclusive, competing land uses'.*

The NALP is administered principally by the Guyana Lands & Surveys Commission (see Section 3.5.6).

3.2.4 The LCDS, 2013

The Government of Guyana launched a *Low Carbon Development Strategy* on June 8, 2009. The strategy elaborates Guyana's vision for promoting economic development while at the same time combatting climate change. The context for the LCDS lie in two main areas: that Guyana's coastland

is vulnerable to flooding from rising sea levels generated by global warming; and that Guyana has abundant resources that could be used to combat climate change; and that with its current development goals, Guyana cannot simply keep all of its forest resources intact. The core underlying idea of the strategy is that Guyana is willing to put measures in place to keep its forests intact providing that it can realize alternative options for meeting development needs. As a policy instrument, the LCDS will provide the framework in which all interventions in local forest resources occur.

In November 2009, the Governments of Guyana and of Norway signed an MOU that would witness Norway providing the Government of Guyana with a sum of US$ 250 million provided that the avoided deforestation rate can be kept within prescribed values.

After a series of consultations, revised versions of the document were published on May 24, 2010 and March 2013.

3.2.5 National Development Strategy, 2001-2010

The National Development Strategy, 2001-2010 attempted to identify the entire array of political and socio-economic factors issues that stymy the development of Guyana, collated basic statistics on each sector and presented detailed and objective policy measures achieve national economic development.

The core thematic areas addressed in the NDS, 2001-2010 are a macro-economic strategy, the social sectors, the productive sectors, the infrastructure sectors and an investment programme and legislative requirements. Within the thematic area '*the productive sectors'*, Chapter 30 deals with Forest Management

The Ministry of Finance has responsibility for the NDS. Many of the ideas articulated in the NDS has been the basis for other developments such as the NLUP 2013 and the NEAP, 1994.

3.2.6 Environmental Protection Act, 1996

(Cap. 20:05), The Environmental Protection Act, 11 of 1996 revised by Act 17 of 2005 prescribes the basic institutional and regulatory framework within which all activities that impact on the natural, social, and cultural environments are assessed. The Environmental Protection Agency (EPA) is mandated under the Act to make assessments and to issue environmental permits prescribing conditions for developmental activity. The EPA has established guidelines for conducting and reviewing environmental impact assessments; the guidelines explain provisions of the Act in relation to the environmental impact assessment procedure and outline the level of detail required in the environmental baseline study, impact assessment and the environmental impact statement.

3.3 Environmental Protection Regulations

In 2000, under the EPA Act, regulations on Water Quality, Air Quality and Noise Management (among others) were established. These pollution management regulations were developed to prescribe standards for developmental projects during construction and operation.

3.3.1 Environmental Protection (Water Quality) Regulations 2000

These regulations require, among other matters the registration and environmental authorization by any person whose construction, installation, operation, modification or extension of any facility cause the discharge of effluents. Guidelines on the discharge of effluents and disposal of waste are detailed in these regulations. A Standard for water quality has been developed by the Guyana National Bureau

of Standards[3]. VWL has taken measures to determine actual water quality at three points where it will operate. (Please see section 4.1.3, Annex VIII).

3.3.2 Environmental Protection (Air Quality) Regulations 2000.

The requirements for registration and environmental authorization by persons with facilities that emit air pollutants from any process into the atmosphere are outlined in these regulations. Elements related to parameter limits on air contaminants and emission samplings are also stated in the regulations. *The EPA and the GNBS are currently developing air quality standards.*

3.3.3 Environmental Protection (Noise Management) Regulations 2000.

The EPA is responsible for the establishment of standards for permissible noise levels in industry, construction and other areas. The categories for which permissible noise levels are to be fixed by the EPA were identified as follows: Residential, Institutional, Educational, Industrial, Commercial, Construction, Transportation and Recreational

The GNBS, in collaboration with the EPA, has published interim guidelines as follows:

Table 2: Noise Guidelines (Source GNBS: GYS263:2005)

Categories	Daytime (06:00-18:00hrs) Limits (Decibels)	Night Time Limits (Decibels)
Residential	55*	45
Institutional	50	40
Educational	50	40
Industrial	75*	70
Commercial	65*	55
Construction	86*	75
Transportation	110*	70
Recreational	110	85
*Relevant to the project		

3.3.4 Environmental Protection (Authorization) Regulations 2000, 2005

These regulations cover the legal basis and modalities for the application and receipt of an Environmental Authorization, the management of the conditions under which the Authorization is granted, and the conditions under which the Authorization may be renewed.

This ESIA Report is a direct consequence of Section 3 'Environmental Impact assessment' of the Environmental Protection (Authorization) Regulations 2000, 2005.

3.3.5 Environmental Protection (Hazardous Waste Management) Regulations, 2005

These regulations cover in essence the management of substances that may modify the environment in a negative way. For example, in logging operations there may be spillage of oil, or accelerated erosion leading to pollution of waterways.

[3] See GNBS GYS 262: 2004: Specification for drinking water

3.4 Forestry Policy & Forestry Legislation

3.4.1 Forest Policy

3.4.1.1 The National Forest Policy Statement (2011)

A National Forest Policy Statement 2011, which reviewed and replaced those published in 1953 and 1997 respectively was approved by the Government in 2011. The new policy responds to the changes in Guyana's economic, social and political environment over the last fifty years and reflects the country's national and global responsibility for the sustainable management of local forests. The GFC is currently reviewing the forest policy to reflect *'developments in the forestry sector, changes in legislation, and new and additional policy decisions'.*

The *National Forest Plan 2011* which sets out the manner in which core policy statements will be implemented is also under review.

3.4.1.2 Forestry Management Plan Guidelines, 1999

The Forestry Management Plan Guidelines, 1999 elaborates the basis for strategic and operational planning. Guidelines for annual operational plans (AOP) have also been published.

3.4.1.3 Code of Practice for Forest Operations 3rd Ed, 2013 for Timber Sales Agreements and Woodcutting License Holders.

The original Code of Practice for Timber Harvesting, 2nd Ed. based on FAO's Model Code of Forest Harvesting Practice, 1996 provides guidance on applicable standards for local forest conditions. It is designed essentially to balance commercial considerations with the conservation of the natural environment and issues of occupational safety and health.

Over the years the Code has been reviewed and developed to target specific operators at the various concession levels.

3.4.1.4 Environmental Impact Assessment Guidelines: Volume 5 – Forestry, 2000

These guidelines produced by the EPA and the EAB and in consultation with the GFC, provide a framework for conducting and reviewing EIAs for forestry projects in Guyana.

3.4.2 Forestry Legislation

3.4.2.1 Forests Act 2009

This Forests Act 2009 authorizes the GFC to, among other things:

(a) Grant forest concession agreements to individuals and companies to harvest timber or non-timber products or to undertake research or to carry out approved community based activities or to generate approved forest services (including ecotourism) from defined tracts of State forests;

(b) Regulate the conveyance of timber along public roads, and timber exports;

(c) Regulate the rights and privileges of Amerindians in relation to State Forests

The Act also outlines the ownership of forest produce, offences and legal proceeding under the Act, and penalties that may arise as a result.

3.4.2.2 Guyana Forestry Commission Act, 2007

The Guyana Forestry Commission Act No. 20 of 2007 provides specifically for the establishment, organization, mandate and functions and responsibilities of the Guyana Forestry Commission.

The object of the Commission is to encourage the development and growth of forestry in Guyana on a sustainable basis.

The primary functions of the Commission include:

a) Develop, advise the Minister and carry out Forestry Policy
b) Research, collate, analyze and prepare and disseminate data, statistics, and other information about forests and all aspects of forestry and forestry related jobs; and
c) To administer the Forests Act, 2009

3.4.3 Other Relevant Laws

3.4.3.1The Protected Areas Act of 2011

The Protected Areas Act of 2011 provides for (a) the protection and conservation of Guyana's natural heritage and natural capital, (b) the creation, management and financing of a national system of protected areas; (c) the maintenance of ecosystem services of national and global importance including climate regulation; (d) the establishment of a protected areas commission; (e) the establishment and management of a protected areas trust fund; (f) the fulfilment of Guyana's international environmental responsibilities; (g) participation in protected areas and conservation; and (h) related purposes.

The Act aims to provide for the conservation of biological diversity, natural landscapes, seascapes and wetlands and to safeguard ecosystem services. VWL's conservation practices will have to be aligned with the objectives of this Act.

3.4.3.2 The Environmental Protection (Wildlife Management and Conservation) Regulations 2009

The Environmental Protection (Wildlife Management and Conservation) Regulations 2009 provides generally for the conservation of wildlife. More importantly, the Regulations define the term 'wildlife' as including any *'non-cultivated or non-domestic organism in the kingdoms of animals and plants, Protista, prokaryota and fungi or any parts or derivatives thereof*'.

The Regulations also defines the following:

a. *biodiversity*- the variability among living things including inter alia terrestrial, marine and other aquatic systems and ecological complexes of which they are a part, and including diversity within species, between species and of ecosystems.
b. *endangered species*- species facing extremely high risk of extinction in the wild
c. *hun*t - includes pursue, worry, stalk, mutilate, call, follow after, kill or capture any animal or attempt to do so.

3.5 Regulatory Agencies/Departments

3.5.1 Ministry of the Presidency

3.5.1.1 Office of Climate Change

The Office of Climate Change has direct responsibility for managing consultations and other liaison responsibilities for the LCDS. The OCC manages GoG's engagements with the Forest Carbon Partnership Facility (FCPF), the Forestry Investment Programme, UN-REDD.

3.5.1.2 Department for the Environment

The Department for The Environment has oversight and policy coordination functions over the Environmental Protection Agency, the Protected Areas Commission and the Wildlife Commission.

3.5.2 Ministry of Natural Resources (MNR)

The Ministry manages the overarching initiatives to coordinate policy development for the following agencies in the natural resources sector: the GFC, the GGMC, the GGB, the EPA, the PAC and the GWMA. The MNR is expected to oversee the multiple use approach to natural resources generally and the resolution of emerging conflicts in particular.

3.5.3 Environmental Protection Agency

The Environmental Protection Act provides for the establishment of the (Guyana) Environmental Protection Agency (EPA) as the principal authority for environmental management in Guyana. In Sec. 4 (1) (a), the EPA is given the mandate to "take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resources" In addition the Agency is given the overall responsibility to "coordinate the environmental activities of all persons, organizations and agencies" [Sec. 4(1) (c)]; and is mandated "to play a coordinating role in the preparation and implementation of cross sectored programmes of environmental contents" [Sec. 4(1) (1)]. The mandate to serve as the highest authority for granting Environmental Authorizations, where they are required, is supported by Sec. 5 which states that "any person or authority under any other written law, vested with power in relation to the environment shall defer to the authority of the Agency and shall request an environmental authorization from the agency before approving or determining

Within the EPA there is the GWMA *Wildlife Management Authority* that is responsible for the administrative aspects of wildlife trade regulation.

3.5.4 Guyana Forestry Commission

Of the 214,970 km2 of which nearly seventy-five percent is covered with natural vegetation, approximately four fifths is classified as State Forests under the jurisdiction of the GFC. The GFC is responsible for advising the subject Minister on issues relating to forest policy, forestry laws and regulations and forestry practices. The Commission is also responsible for the administration and management of all State forests. The work of the Commission is guided by a Draft National Forest Plan that has been developed to implement the forest policy. The Commission develops and monitors standards for forest sector operations, develops and implements forest protection and conservation strategies, oversees forest research and provides support and guidance for forest education and training. The functions and responsibilities of the GFC are assigned under the Guyana Forestry Commission Act. The GFC is the institution responsible for prescribing conditions for the use of forest resources and implementing forest monitoring programmes.

The GFC has recently published its Service Charter that makes it relatively easy to understand the overall thrust of its mandate and the scope of its field operations.

3.5.5 Guyana Geology & Mines Commission

The Guyana Geology and Mines Commission (GGMC) was created in 1979 from the Department of Geological Surveys and Mines which itself was the successor to the Geological Survey of British Guiana.

The functions of the Commission include:

a) Promotion of mineral development; b) Mineral exploration; research in exploration, mining, and utilization of minerals and mineral products; and c) Enforcement of the conditions of Mining Licenses, Mining Permits, Mining Concessions, Prospecting Licenses (for Large Scale Operations), Prospecting Permits (for Medium and Small Scale operations) and Quarry Licenses;

(Note that under certain conditions, miners may fell trees. Large scale mining of gold, bauxite and white sand requires the removal of forest cover).

(The mining community has expressed strong interest in the same area in which VWL intends to conduct its logging operations).

3.5.6 Guyana Lands and Surveys Commission

The core function of the Guyana Lands and Surveys Commission is to survey and map the land and water resources of Guyana, to be custodians of all public lands, to administer these effectively in the national interest, and to provide land-based information to a broad range of public and private sector entities and interests.

The GFC consults with the Guyana Lands and Surveys Commission before issuing forest concession agreements.

3.5.7 The Protected Areas Commission

This Commission enforces the Protected Areas Act, 2011.

3.6 Treaties & Conventions

Guyana has signed on to a number of international and regional treaties and conventions (see Table 3) to ensure that forest based developments in Guyana are consistent with global and regional approaches to such development.

Table 3: Conventions/International Agreements to which Guyana is a party

No.	Conventions	Ratification/Accession
A.	**Biodiversity**	
1	United Nations Convention on Biological Diversity • Cartagena Protocol on Biosafety • Nagoya protocol on Access to genetic Resources and the fair and equitable sharing of benefits arising from their utilization.	Signatory in 1992, ratified in 1994 Acceded to in 2008 Acceded to in 2014
2	Convention on International Trade in endangered species of wild fauna and flora (1973)	Ratified in 1977
3	Cartagena Convention or the Protection and development of the Marine environment of the wider Caribbean region (1983). • Specially protected Areas and Wildlife (SPAW) Protocol (1990)	Ratified in 2010 Ratified in 2010
4	International plant protection convention (1952)	Acceded to 1970
5	Convention on the Protection of the World Cultural and the Natural.	Acceded to in 1977
6	Ramsar Convention on Wetlands (1971)	Party
7	Convention on the Protection of the World Cultural and Natural Heritage (1972)	Signatory 1977
8	International Tropical Timber Agreement 1994, 2006	Signatory 2006
B.	**Environmental conventions to which Guyana is a party**	
9	United Nations Framework Convention on Climate Change • Montreal Protocol • Kyoto Protocol • Paris Agreement	Signatory in 1992, ratified in 1994 Acceded to in 1993 Acceded to in 2003 Acceded to in 2016
10	Vienna Convention on the protection of the Ozone Layer	Acceded to in 1993
11	United Nations Convention to Combat Desertification	Signatory in 1996, ratified in 1997
12	International Convention for the Prevention of pollution (MARPOL 73/78)	Acceded to 1997
13	Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and their Disposal	Acceded to in 2001
14	Stockholm Convention on Persistent Organic Pollutants	Acceded to in 2007
15	Rotterdam Convention on Prior Informed Consent for Certain Chemicals and pesticides in International Trade	Accede to in 2007
	International Plant protection Convention (IPPC), 1951	Adherence 1970
16	Minamata Convention on Mercury	Signatory in 2013
C.	**Other relevant items**	
17	Caribbean Planning for the Adaptation to Climate Change CPACC (and its sequel Mainstreaming Adaptation for Climate Change in the Caribbean (ACCC)	Signatory 1997
18	Caribbean Regional Environmental Programme (CREP)	Signatory 2001
19	Caribbean Environmental Programme and its Specially Protected Areas and Wildlife (SPAW Protocol)	Signatory 1990
20	Treaty for Amazonian Cooperation	Signatory 1978
21	Guiana Shield Initiative (and Guiana Shield Facility)	Signatory 1993

4.0 THE NATURE AND SCOPE OF THE PROJECT

4.1 Access options

VWL contemplates a primary access road on right bank Essequibo River linked to the primary logging road in WCL 1/2007 via Canister Falls and TSA 3/91 Phase II (see Map 1). Exploratory options are still under review to determine to what extent the company may use the UNAMCO Road or roads constructed by other loggers.

Current access options target the Maam Compartment in the north western part of the concession area and allows the company to maintain roads of a high standard.

More details of access options will be set out in the company's Forest Management Plan (see also section 4.2.3)

4.2 Planning

4.2.1 Reconnaissance work

Two phases of reconnaissance work have been conducted. The first entailed concession flyovers by aircraft and several general ground surveys to determine primary land use within the area, to determine access options and to elaborate options for the primary road network. On the basis of the first phase, the Company was able to plan an access road from Canister Fall to a point within Maam Compartment. The second phase entailed the collection of baseline data on water quality, soil parameters, merchantable timber, noise parameters, relative humidity and fauna over the entire concession area, and pre-harvest forest inventory within Maam Compartment.

4.2.2 Planning and concession organization

The SFEP area comprises some 132,863.21ha and the first order of business is to organize the concession into compartments and blocks, so that the concession area can be developed in an orderly manner. To date, five compartments have been identified (see Table 4, Map 2):

The entire concession area is also divided into 100ha blocks, each with a distinct *alpha-numerical* code. These units are the basis for pre-harvest inventories and the planning of logging operations; the blocks are also the basis on which the GFC will issue tags and monitor the performance of the Company.

4.2.3 Access and internal road network

A total road density of 1km/115ha is projected: some 400 km of primary road and 750 km of secondary roads have been planned for construction over the next 25 years; primary roads will be built at a rate of 20km per year while secondary roads will be built at a rate of 30km per year. All road construction practices will follow best practices prescribed by the Guyana Forestry Commission and road construction works elsewhere.

Currently, VWL will access the concession by extending its main logging road (WCL 1/2007) through TSA 3/91 thence over Maam creek, the northern boundary of the concession.

Table 4: List of compartments, SFEP

#	Compartment Name	Estimated Area (ha)	General Location
1	Maam	13,118.55	Left bank Maam river, right bank Essequibo River; between UTM coordinates 21N Eastings 320000 & 33800; Northings 500000 & 516000.
2	Essequibo	24,960.24	Right bank Essequibo River, immediately south of Makari Mt., between UTM Coordinates 21N, Eastings 332000 & 355000; Northings 487000 and 504000.
3	Berbice	21,843.06	Right bank Essequibo River, left bank Berbice river, south of Essequibo Compartment; delimited by UTM coordinates: 21N between Eastings 337000 & 362000; Northings 478000 and 495000
4	Rappu	31,046.83	Right bank Essequibo River, left bank Rattlesnake River South-western area of concession, south of Compartment Berbice: delimited by UTM coordinates 21N, between Eastings 335000 & 357000; Northings 461000 & 481000
5	Corentyne	36,443.84	Right Bank Berbice River, delimited by UTM coordinates 21N, Eastings 355000 & 377000; Northings 461000 & 495000.
6	Biodiversity Reserve	5,448.53	Between right bank Rattlesnake River and left bank Berbice River
TOTAL (Estimated)		**132,861.05**	

Other potential access points are:

a) the extended UNAMCO Road: this road was extended southwards to the extent that it approximates the north-eastern boundary of the concession, on left bank Berbice River; this road could allow for the exploration of areas covered by compartments Essequibo, Berbice and Rappu, respectively.

b) Compartment Corentyne, right bank Berbice River, may be accessed via road networks established by other concessionaires in the area, Baishanlin (Area C) and Rong-An Inc.; if VWL decides to use them, the use of these roads will be the basis for negotiations between VWL on the one hand and Rong-An Inc. and Baishanlin on the other hand.

Of course, the Berbice River itself allows access to the concession but not for operational purposes, no logs can be transported by river. A couple of options for bridges across the Berbice River are under consideration even though extended waterlogging along the banks of the Berbice River will make bridge construction very challenging.

Under local forest conditions, primary road location is more a function of terrain and hydrology rather than stocking. This implies that it is possible to **plan** the primary road alignment well before any data is available from ML Inventories or Pre-harvest Inventories. To date, VWL has been able to align the primary road network for Compartment Maam, SFEP 1/2012.

4.2.4 Forest Inventory

The Company determined that the first part of the concession to be harvested is the Maam Compartment. Consequently, pre-harvest inventories were initiated for four blocks within Compartment Maam. All forest inventory is carried out according to the procedures recommended by the GFC and all field work is subject to validation by the GFC. The company's experience is that the protocols prescribed by the GFC serves its needs.

4.2.5 Stock map preparation

The data collected from forest inventory will be used to prepare stock maps. These stock maps will show the following:

a) The location of merchantable trees relative to the terrain
b) Tree diameter classes
c) Spacing between adjacent trees
d) Site conditions: slope%, altitude, stream pattern
e) Buffer zones; and
f) Access roads.

Tree location maps will be used for planning the harvest of merchantable trees targeted for felling and for planning access/secondary roads, skid trails and log markets respectively. Stock maps also facilitate tree marking. A study of a set of adjacent tree location or stock maps will determine the location of forward camps, access roads, and log markets.

The preparation of stock maps will be a standard practice for every block inventoried.

4.2.6 Skid trails

Skid trail alignment and skid trail density will be based partly on the terrain and partly on the stocking. Skid trail density is projected at 4.5km/100ha.

4.2.7 Logging Assets

The assets available to the Company available for *immediate deployment* within the SFEP area are set out in Annex VI. All of the current assets will be replaced by 2025. New assets are required to address the road works in particular as the operations extend towards the southern and southeastern areas of the concession area.

4.2.8 Forward Camps

VWL will establish a forward camp within Block 10J, Maam Compartment (see Map). This camp will house logging crews, crews engaged in forest inventory and clerical staffs. A maximum of 20 persons will be accommodated at the location.

All vehicle maintenance and servicing will be carried out at Charabaru thereby reducing the environmental impacts within the concession itself. VWL will consider other base camps in due course. Generally, the number of forward camps will depend on the scale of the logging activity, that is for example, whether VWL wants to operate more than three logging crews; the number of forward camps will also depend on the intensity of forest monitoring necessary, for example, if there are other developers on the concession area, VWL will need to set up more forward camps.

4.2.9 Employee recruitment and training

There will be deliberate efforts to recruit and train residents of Fairview and Apoteri, *providing they are prepared to work under the conditions set down for all field operatives.* VWL will ensure that the company brings to bear the same level of corporate discipline that currently prevails on its current concession, to the new concession. This discipline not only relates to logging practices but also to other environmentally related issues such as camp hygiene, cleaning of machines and hunting and fishing. (Note that VWL will not prevent any of the indigenous peoples on its staff from engaging in any traditional hunting or fishing activity or the collection of any forest product for domestic use).

4.3 Operations

4.3.1 Road construction

VWL has the capability and experience for the construction of roads, bridges and culverts under local forest conditions. Road construction works will follow the well tested practices for the various soil conditions prevalent within the concession area and in line with the practices prescribed in GFC's Code of Practice for Timber Harvesting 3rd Edition (see Figure 9).

Figure 9: An example of VWL's primary road

4.3.2 Log market construction

Log market *location* will be influenced by the location of secondary roads. Log markets will be adequate enough to ensure that the loading of trucks occur *off* the main carriageway. Log markets will as far as practicable be put into areas with poor forest-such as Muri scrub- and well drained, firm sites.

4.3.3 Skid trail construction

VWL will use a network of skid trails to extract logs from the stump to log markets. The skid trail density will depend on the stocking and the spatial distribution of merchantable tree selected for harvesting, but will not exceed 4.5km/100ha.

4.3.4 Tree marking

Tree marking will be carried out before felling to achieve the following:

a) Recheck the quality of trees selected for felling. (These trees would have had a preliminary assessment during the forest inventory exercise).
b) Recheck the status of proximity trees, site conditions (slope %) and proximity to buffer zones
c) Establish whether there are any other factors that mitigates against the tree being harvested, for example nesting eagles.
d) Liberate the trees targeted from any lianas that may bind them to other standing trees by cutting the lianas
e) Determine the felling direction for merchantable trees relative to the position of the skid trail

4.3.5 Felling

Tree felling practices are guided by stock maps which sets out the nature of the terrain including the stream patters therefore concerns about buffer zones (see Section 4.2.5).

Directional felling of trees will be practiced: it's a safer practice because the feller has more control over the tree felling activities and the practice also prevents damage to the falling tree, thereby ensuring a log of good quality.

All the current fellers in the company have been trained several times to carry out directional felling. The Company has at hand the model of chainsaws, the sledge hammers and wedges necessary for carrying out directional felling.

4.3.6 Short haul to Charabaru

During period 2015 -2020, VWL will be working within the Maam Compartment. Logs will be conveyed with 6 x 6 militant trucks from log markets in the Maam Compartment to Bamboo Landing. After 2020, when the company envisages it will shift operations to Essequibo Compartment, the company will consider (partial) use of the UNAMCO Road. Logs may be hauled from log markets in Essequibo Compartment to Charabaru or direct to Bamboo Landing depending on the species and quality of logs being hauled. The same will apply to logs harvested in the Berbice and Rappu Compartments respectively.

For the Corentyne Compartment, the company will consider partnering with other concessionaires if this would lead to reduced trucking costs, reduced environmental impacts through reduced road density in the general area, and if road standards and road maintenance cost-sharing mechanisms are agreeable to VWL.

4.3.7 Log breakdown to cants and flitches

Logs hauled to Charabaru may be reduced to cants or flitches to improve the value of material trucked to Bamboo Landing for further processing. VWL is still thinking about this option.

4.3.8 Long haul to Bamboo Landing

The Long Haul to Bamboo Landing will (at least for the next five years) be carried out by Kenworth model Logging trucks with pole trailers capable of carrying 30-35m^3 of logs or cants; alternatively a flatbed trailer will be used if there is a large volume of flitches to be conveyed to Bamboo Landing.

(For Corentyne Compartment, VWL will determine whether it would be feasible to set up a portable sawmill for partial log processing sometime in 2025).

4.3.9 Forest Road maintenance

VWL will bring to bear the same meticulous approach to road maintenance as prevails in WCL 1/2007 (see Figure 9). The company follows the old adage, *'a stitch in time, saves nine'*. More importantly, the company will deliberately budget for planned road maintenance. The conservation of natural water courses, bridge and culvert construction, and roadside ditches will receive special attention with aim to prevent pollution of water courses.

The company's road construction equipment includes a motor grader and an excavator that allows for due attention to every conceivable kind of road works.

4.3.10 Forest monitoring

VWL has certain standards which it enforces whenever it has the opportunity to do so. The company's monitoring standards are based on its forest conservation values as well as obligations to the GFC and other parties. VWL must safeguard its production assets, its boundaries, protected zones and water courses.

The effectiveness of the company's monitoring efforts depend to a major extent to the control it has over the concession area. If there are other developers, such as miners, the monitoring effort will be more onerous.

VWL will review its monitoring efforts from time to time to better manage any emerging conflicts with other developers.

4.3.11 Stakeholder consultations

VWL's primary stakeholders are its own employees. To date VWL has been able to enjoy cordial but productive relationships with all of its staffs to the extent that it has never had any significant industrial problems. VWL believes in frequent briefing sessions with employees, to share information and to garner feedback.

VWL, in consultation with the GFC, will set up a mechanism to deal specifically with other developers (miners) on the concession area. For VWL, it is vital that all developers **share responsibility** for the conservation of the environment, including the management of waterways, the draining of water from ponds and depressions created during mining, road maintenance to prevent excess silt from entering waterways and the management of solid waste, including litter on the forest floor. The same mechanism will also review comments by stakeholders during consultations on the Project.

VWL will maintain a special relationship, via a MOU (see draft in Annex VIII) with IIC regarding the monitoring of the Essequibo River corridor between the concession, on right bank Essequibo River and the Iwokrama Forests on left bank Essequibo River. The MOU will allow for the voluntary retention of a buffer zone on right bank Essequibo River and the setting up and use of a monitoring outpost on right bank Essequibo River.

Generally, hunting and fishing activities that will be critical points for discussion between VWL and stakeholders. Although VWL is committed to a multiple-use approach to natural resources, the company *would not be happy* with *any* level of ***commercial*** hunting and fishing within the forest concession.

4.3.12 Conservation of Biodiversity

VWL values the conservation of biodiversity, unique landscapes and indigenous assets. VWL has been proactive in the voluntary protection of sites where nesting birds (*Harpia harpyja*) and giant otters (*Pteronura brasiliensis*) have been observed on WCL 1/2007. VWL also supported *Panthera.org* in a study of feline species on the same concession. VWL promotes a 'no commercial hunting and fishing' on WCL 1/2007 and the company will maintain the same approach for the new concession.

Biodiversity Reserve

VWL has already set aside an area of 5,448 ha for a biodiversity reserve (see Map 2). There are several reasons for this decision:

a) The area is remote, pristine and only accessible in the wet season. In addition, it will be least another 10 years before the Company approximates the area. Therefore the area will be conserved in a pristine state for a considerable time.

b) During the consultant's visit to the area (*during the rainy season*), a large number black caimans, toucans of several species, and howler monkeys were observed.

c) The forest types comprise a good balance of Mora forests and mixed forests on hilly to undulating terrain and will have species representative of the entire region.

(No roads are contemplated for the area. For now, all monitoring work will occur on left bank Berbice River; monitoring work will be intensified after a road network for Compartment Rappu is developed. VWL will approach the GFC to discuss measures to make sure that the area stays in a pristine condition.

Other biodiversity reserves

VWL will also not carry out any logging on ridges in the following area because of their landscape attributes:

a) Block 9J, Compartment Maam
b) Block 20 AE, Compartment Essequibo
c) Block 23AD, Compartment Essequibo.

Buffer zones

VWL will establish such buffer zones within operational areas relative to the stream network in the area, in line with GFC's COP. In addition, VWL is serious considering a buffer zone for a mean depth of 150m depth on right Essequibo River, extending from Maam River to Pakani Landing. (Note that after Pakani Landing, the boundary of IIC's Forests, moves south westerly, away from left bank Essequibo River).

4.4 Project Feasibility & Risk Analysis

4.4.1 Adequacy of timber production

VWL projects a minimum, annual *sustainable* production of 25,000m^3 of high grade timber. On the basis of its experience and the terrain prevalent in the concession area, the company projects that it can haul logs and sawn timber up to 200km and still make a profit. To make a profit, the Company will have to process at least 70% of the timber into value added products and export these products.

VWL has the (traditional) markets for high end, sawn wood products such as decking and hardwood flooring. (VWL's marketing drive has been constrained by the inability to generate sufficient suitable timber volume from the current TSA 1/2007).

There is a strong internal demand for round wood (Greenheart) piles as the building boom continues, including the rehabilitation of large structures such as the Parika Stelling. VWL's marketing practice contemplates log exports only for the *lesser used species* and only where there is *evidence* that there will be an emerging market in the short term for sawn timber of the same lesser used species. (Currently, log exports constitute less than 5% of the volume of timber exported by the company).

4.4.2 Risk and Uncertainty

Resource availability for the life of the concession

VWL has the capability to manage the variables normally associated with logging under local conditions. These variables *include:*

a) species composition and especially the proportion of the more popular merchantable species (for example Greenheart and Locust);
b) the spatial distribution of merchantable trees,
c) the distribution of diameter classes for the merchantable species,
d) road construction works for the various soil types,
e) the density of bridges, culverts, and corduroy works; and
f) the variable terrain types.

In line with standard prescriptions for sustainable forest management, VWL will harvest the forest concession systematically, starting from the North west-the Maam Compartment- then moving to the left bank Berbice and then the right bank Berbice over a period of 40 years. Since a profit may not be possible until Y05 of the logging operation, due to concession development costs, new assets and forest inventory**, it is vital that the timber resources for future harvests *remain intact.*** The fact that the entire concession area has a large number of *dormant* mining concessions is a major risk for the company.

Customer preferences

VWL would have to establish to what extent customers in Europe and North America, who pay premium prices for timber harvested under sustainable forestry management practices, would tolerate any compromises the company may have to make to ***co-manage*** the concession area with the mining community and if necessary, other resource users. (VWL already works very closely with *Rainforest Alliance and is seriously considering FSC certification).*

Management of road corridors

Experiences elsewhere indicate that the development of mining blocks within forest concessions is closely linked to access provided by logging roads. VWL will explore mechanisms for working closely with policy makers and with miners to address any conflicts that may emerge.

While the concept of *private roads* is frowned upon within the context of multiple use of local resources, only private roads can guarantee safe, hazard free operations. For example, on the UNAMCO road, small operators load logs on the margin of the road then depart leaving a mass of wood debris and litter; the wood debris in particular can badly damage truck tires and makes overtaking other vehicles challenging. In addition, VWL's high-tech trucking assets cannot operate on poor roads while persons using ex-military 6 x 6 vehicles and agricultural tractors-popular with small scale loggers-can do so. There is also the onerous issue of apportioning costs for road maintenance.

Management of River Corridors

The management of the Essequibo River Corridor will be done in partnership with Iwokrama. Currently there is no major use of the Berbice River Corridor between the SFEPs held by VWL and Rong-An Inc. (see Map1) and since there are no communities in the upper Berbice District, VWL expects the situation to remain as it is indefinitely.

Local market trends

The local construction boom in commercial buildings in Guyana is characterized by large three to four floor buildings based on steel, concrete, PVC panels, tiles and metal doors. Although to a lesser extent, the same applies to the construction in the residential construction sector, with the added challenge that these also use imported pine lumber. Consequently, with the exception of piles, VWL is not optimistic that it can depend on the local market for timber for its sustenance. VWL notes though that the regional tourism sector (mainly hotel construction, hotel expansion or modification) provides opportunities hardwood flooring, hardwood decking and hardwood doors. (There is a huge market for shingles too, but traditionally, VWL has not gone into the shingle sub-sector).

Socio-economic context

VWL has faith that the socio-economic framework will have a positive impact on the sector. Key socio-political developments that would impact on the proposed project include the following:

a) Rigorous and robust environmental requirements both at the level of the EPA and the GFC;
b) Initiatives to improve port facilities in Georgetown;
c) Emphasis on vocational education and training, including at the level of the forestry sector and also in *rural communities*;
d) Development of FLEGT initiatives to foster timber exports;
e) REDD, Climate change, biodiversity conservation and other initiatives in the
f) Sectored initiatives to promote the use of a larger number of timber species along with emphasis on value adding timber enterprises;
g) New homeowners' preferences in choosing construction materials; and
h) The need to focus on new wood processing technologies (and computer software) that ultimately lead to reduced operational costs, better conversion efficiency and shorter production cycles.

4.5 Alignment with other sectored developments

VWL's preference for the use of RIL practices, complemented by restrictions on commercial hunting and fishing will guarantee that its logging practices support other forest based values, including those linked to wildlife and climate change. VWL will partner with IIC to *inter alia* tap its experience with FSC certification and its extensive sponsored forest research outputs, for example the review of RIL and biodiversity conservation (Bicknell, Struebig & Davies, 2015).

VWL is committed to supporting forest based initiatives that target any of the functionally diverse values and benefits of local forest resources.

5.0 BASELINE INFORMATION

5.1 Basic site information

5.1.1 Geographic location and topography

Baseline information on the concession area was garnered from some 20 field tours, from Apoteri-Essequibo River, by trail from Canister Fall and across the Demerara and Maam Rivers, via the UNAMCO Road, via the Haimorakabra Road originating from Bissaruni Junction and extending southwards on right bank Corentyne River , via the upper Berbice River itself between 110km and the mouth of Rattlesnake River, left bank Berbice River and traverses of the (right bank) Essequibo River between Kurupukari and Pakani Landing. The field tours covered the rainy and the wet season; for wildlife surveys, there were also field trips at night.

The consultants also conducted several low level (5,000ft) fly-overs of the concession area, including one trip sponsored by VWL which lasted for about 45 minutes over the concession area itself.

SFEP 1/2012 is spread over Administrative Regions 6, 8 and 10 (see Map 1) attached. Using the first base camp, Compartment Maam, the nearest communities are Kurupukari Village (Fairview Village, Apoteri Village, Rewa Village, and the Iwokrama Field Station. The nearest town is New Amsterdam, the primary regional administrative Centre for Region 6, about 160km north.

The concession may be accessed in the following ways;

a) By Boat from Kurupukari or Fairview travelling up right bank Essequibo River
b) By boat from Apoteri, travelling down right bank Essequibo River
c) An access road, linking the northwestern part of the concession with the cattle trail at Canister Falls
d) The northern part of concession area *on left bank Berbice River* may be accessed via the southern extremity of the UNAMCO Road.
e) The south eastern part of the concession may be accessed via the extended Haimorakabra Road that originates at Bissaruni Landing then runs southerly on the watershed between the Berbice & Corentyne Rivers.

There are no communities *within* the concession area. There are three large concessions on the perimeter of the concession: DTL 3/91-Phase II (Sirropa & Canister Compartments) to the north, the SFEP held by Rong-An Inc. to the east and a number of SFEPs (formerly) held by Baishanlin to the East and South east and Grand Bright Forestry (Guyana) Inc. to the south. In addition, there are a number of small concessions on the north eastern area of the concession on the (extended) UNAMCO Road, left bank Berbice River.

5.1.2 Topographic attributes

The most dominant feature in the general area is the **Makari Mountains** but these are *not* part of the SFEP. There are two ridges in the northwestern part of the area with elevations of 500 to 550 feet; the remainder of the area is relatively flat to slightly undulating with a mean elevation of about 300 feet. The north-western part of the area is drained by tributaries of the Right Bank Essequibo River, namely the Maam River and several other large unnamed tributaries. The central and eastern segments of the concession are drained by tributaries of the Berbice River, namely the Duck River, the Rattlesnake River and several large unnamed tributaries. In the rainy season, the rivers overflow their banks to the extent that there is water flow overland, outside of the stream bed. None of the rivers or creeks within the concession are suitable for conveying timber by barge or punt.

5.2 Environmental conditions-the Physical environment

5.2.1 Rainfall

Rainfall is the most critical climatic factor affecting logging operations in Guyana. No tree felling takes place during rainfall and erosion from rain storms degrade roads, especially when such roads occur on steep gradients that are not capped with laterite.

To gauge rainfall (and other climatic parameters) within the concession area, rainfall data for New Amsterdam to the North and Apoteri Village to the south east were reviewed (see Figures 10, 11). The distribution of rainfall is also important: we note that the rainfall pattern in Apoteri varies much more than that for New Amsterdam, but this difference is not critical. It is apparent though that logging would be challenging during the periods December-January and May-July.

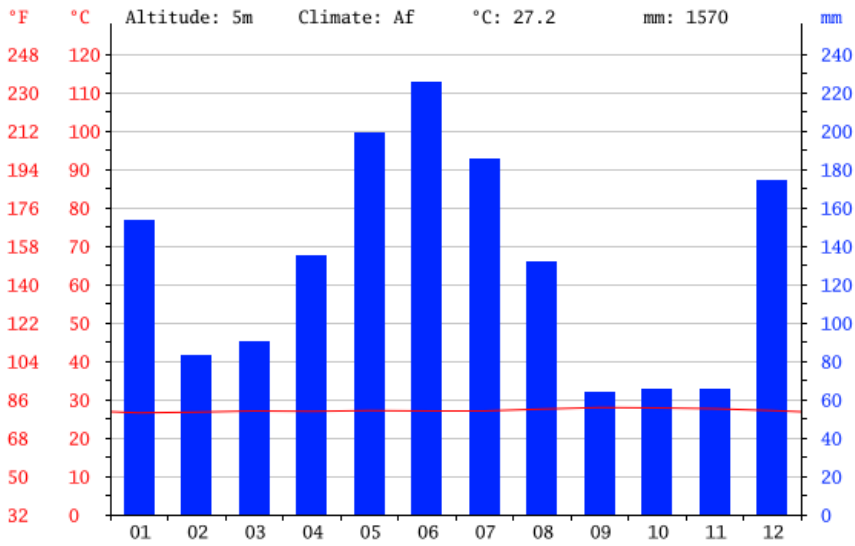

Figure 10: Distribution of rainfall-New Amsterdam

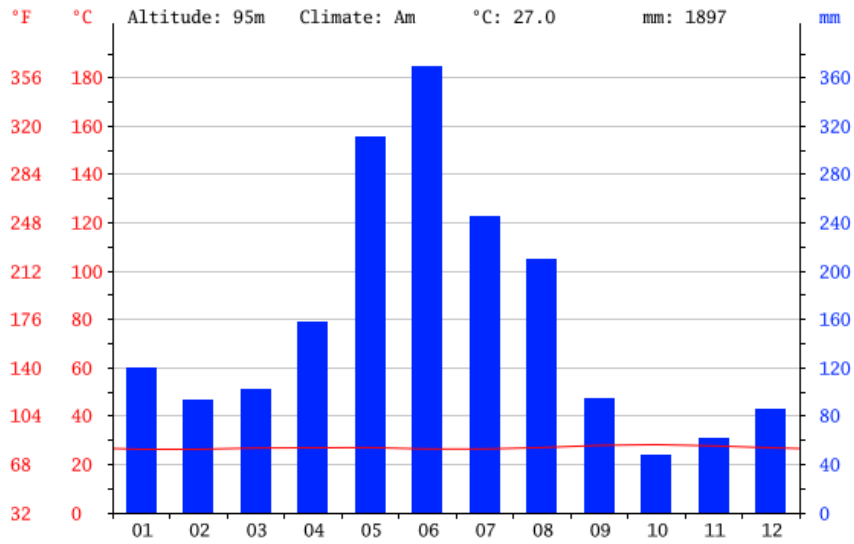

Figure 11: Distribution of rainfall-Apoteri

5.2.2 Soils

Introduction

Soil maps available at the GFC provide details of the major soil types across the concession area (See Table 5). However, the consulting team collected data on the soil features within the concession area. Soil moisture is a very useful parameter to evaluate runoff potential, flood control, soil erosion, slope failure, reservoir management, geotechnical engineering, earthworks for road construction and water quality. Soil moisture is defined as the water that is held in the spaces between soil particles in the upper 10 cm of soil, the information is valuable in any baseline study.

Table 5: Soil types occurring within SFEP 1/2012

#	Code	Type	Description	Area (ha)	%
1	1b	Endoaquepts	Fine textured, poorly drained soils, blackish grey in colour	3,101.53	2.3
2	1c	Quartzpsamments	Freely drained soils with a high content of quartz sands some of which are stained brown	36,032.24	27.1
3	1e	Kanhapludults	Freely draining, shallow, humus poor soils characterized by 1:1 silicate clays in the sub soil that contain oxyhydroxides of clay or aluminium; the lower subsurface has more clay than the lower subsurface.	3,841.65	2.9
4	2b	Endoaquults	Poorly drained grayish alluvial soils that could contain some laterite	14,877.01	11.2
5	2c	Ustochrepts	Shallow, well drained soils characterized by large rock fragments	44,802.83	33.7
6	3c	Kanhaplustults	Light textured, red yellow well drained soils, frequently used for earth fills.	25,603.07	19.3
7	3f	Udorthents	Shallow, well drained soils whitish to cream rock fragments	3,153.26	2.4
8	4c	Kandiudults/ euthrochrepts	Gravelly, well drained soils on flat to gently undulating terrain.	543.49	0.4
9	No data			908.13	0.7
	TOTAL			132,863.21	100

The soil types in the area have been previously classified and recorded in detail in accordance with FAO's soil classification system. To date the study team have encountered sandy loams and red earths on the concession area, with more clayey soils near streams and in marsh/swamp conditions. Such soils (the sandy loam in particular) are suitable for road construction. The soil conditions would be even better for road construction on higher ground. Many of the creeks encountered had clear 'white water'; evidence of clay soils as well as the absence of erosion.

Methodology

During the wet season, thirteen (13) soil samples of approximately 36 inches in depth of soil were taken within the Variety Woods & Greenheart Ltd. Concession during June 18 and 19, 2015, July 09 and 11, 2015, and August 01 and 02, 2015 (Figure 12). During the dry season, five (5) soil samples

were taken within the Variety Woods & Greenheart Ltd. Concession on January 23 and 24, 2016 and December 10, 2016 (Figures 13, 14).

Soil samples were taken based on accessibility to the site and hence, a complete stratification of soil sampling throughout the concession could not be achieved. The pH and moisture content of the soil samples were measured in-situ using a Vernier technology device (LabQuest) (see Figure 15) with a pH and soil moisture probe and the soil type was identified physically.

Results and Discussion

The general soil type of the concession area is predominantly sand, clay and sandy loam; this was noted from the various soil samples collected throughout the project area and the upper 4 inches of the soils were composed of humus. The colour of the soils ranged from light brown, grey, light grey and dark brown, either showing some indication of light weathering or oxidation.

During the wet season the percentage soil moisture content ranged from 10.1 to 32.6 % and soil pH ranged from 3.8 to 6.1, while during the dry season the percentage soil moisture content ranged from 14.5 to 19.5 % and soil pH ranged from 5.3 to 6.0 and this is considered common for sandy and clay soils or soils rich in humus. These parameters indicate a healthy soil for a tropical forest (Table 6).

Figure 12: Soil specimens at project site

Figure 13: Soil sample collection activity, dry season: VWL

Figure 14: Illustration of soil storage practices

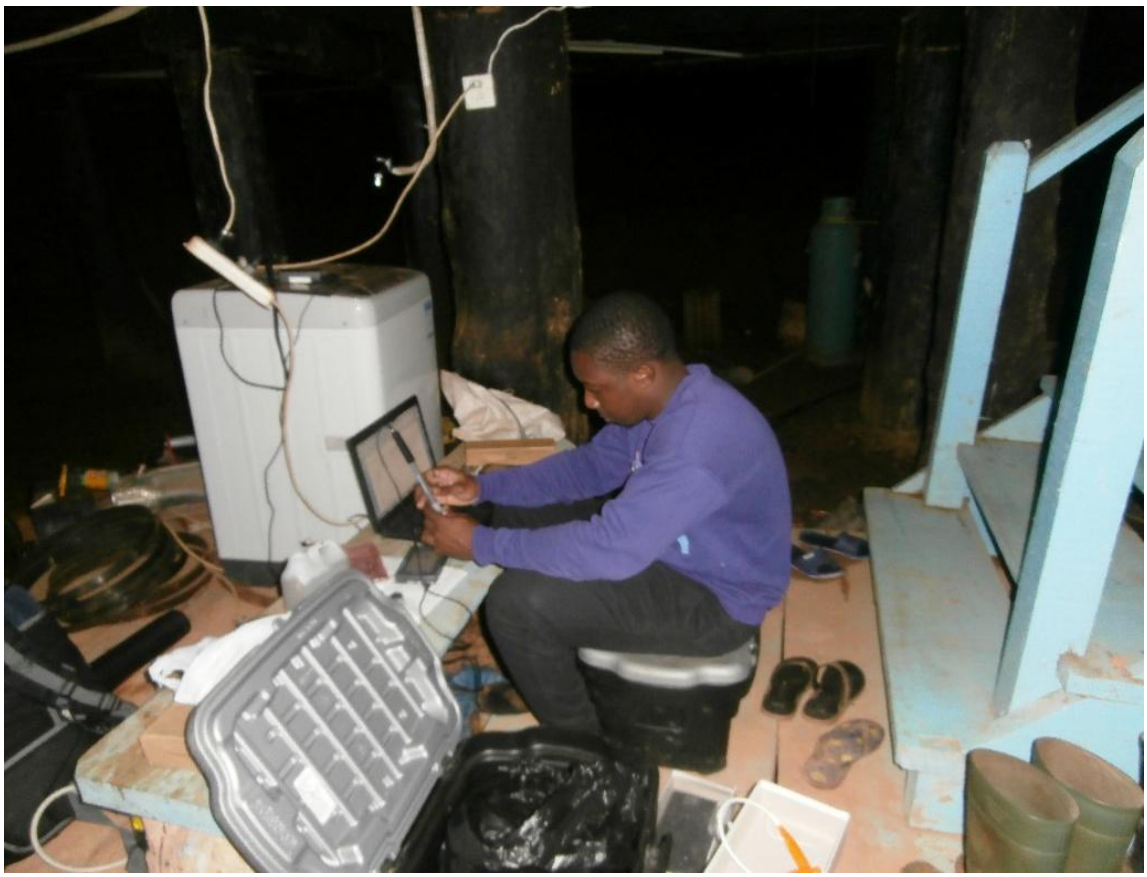

Figure 15: Testing Soil pH and Moisture Content

Table 6: Soil Moisture Content (%) and Soil pH collected from various soil samples at the VWL

Soil Type (Sand, Clay and Sandy Clay)							
Sample ID	Coordinates UTM; 21N	**Soil Depth**		**Data**			
		Top	Sub	Soil Moisture (%)	Soil Type	Soil pH	Colour
Wet Season							
S1	0329000, 0505984	√	----	21.8	Sandy Clay	4.4	Light Brown
S2	0331006, 0504987	√	----	20.1	Clay	3.9	Brown
S3	0330483, 0504999	√	----	15.9	Sandy Loam	4.3	Light Brown
S4	0329025, 0504993	√	----	10.1	Clay	4.3	Brown
S5	0335422, 0512210	√	----	14.4	Sand	3.8	Grey
S6	0357068, 0491990	√	----	21.1	Sandy Loam	4.3	Light Brown
S7	0356652' 0491611	√	----	12.3	Clay	4.1	Brown
S8	0358424 0488056	√	----	27.7	Sand	6.1	Dark Brown
S9	0360280 0490900	√	----	22.8	Clay	5.5	Light Brown
S10	0356086 0479716	√	----	26.7	Clay	5.2	Dark Brown
S11	0356177 0470864	√	----	13.2	Sandy Loam	5.5	Dark Brown
S12	0356324 0471189	√	----	32.6	Clay	4.9	Dark Brown
S13	0356515 0479027	√	----	25.5	Clay	4.8	Light Brown
Dry Season							
S1	0325443 0505940	√	----	19.5	Sandy Clay	5.3	Brown
S2	0326298 0506182	√	----	15.3	Sand	6.0	Dark Brown
S3	0330261 0502355	√	----	14.5	Clay	6.0	Light Brown
S4	0337612 0516277	√	----	15.7	Sand	5.5	White
S5	0335810 0469470	√	----	15.5	Clay	6.0	Light Brown

Of the thirteen (13) soil samples taken the wet season as well as the five (5) soil samples taken within the dry season from the Variety Woods & Greenheart Ltd. Concession, the general soil type was found to be predominantly sand, clay, sandy loam and sandy clay. The pH of the soil at the Project Area is generally acidic and this is considered common for forested soils.

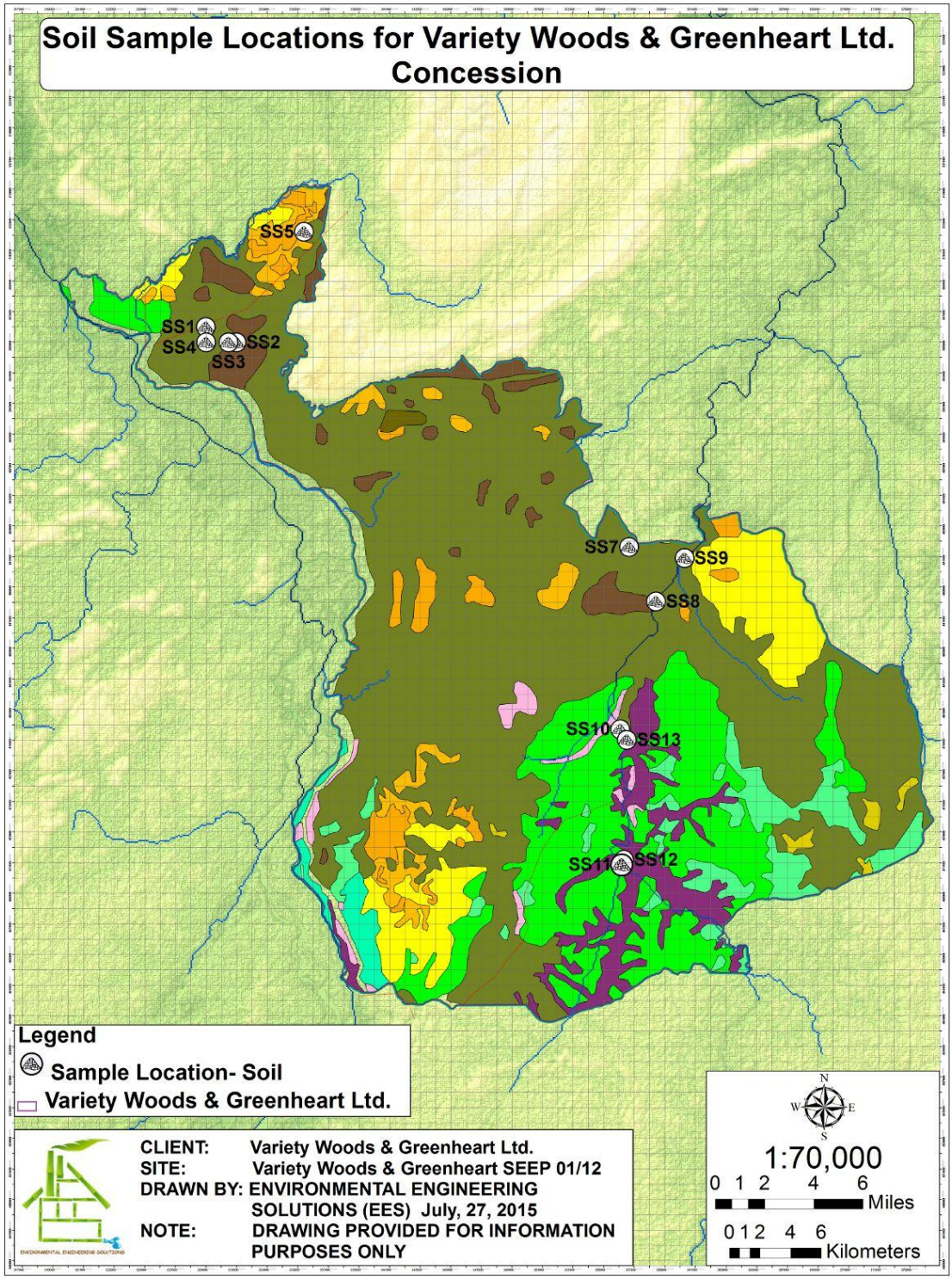

Figure 16: Soil Sample Points of Variety Woods & Greenheart Ltd. Concession during the Wet Season

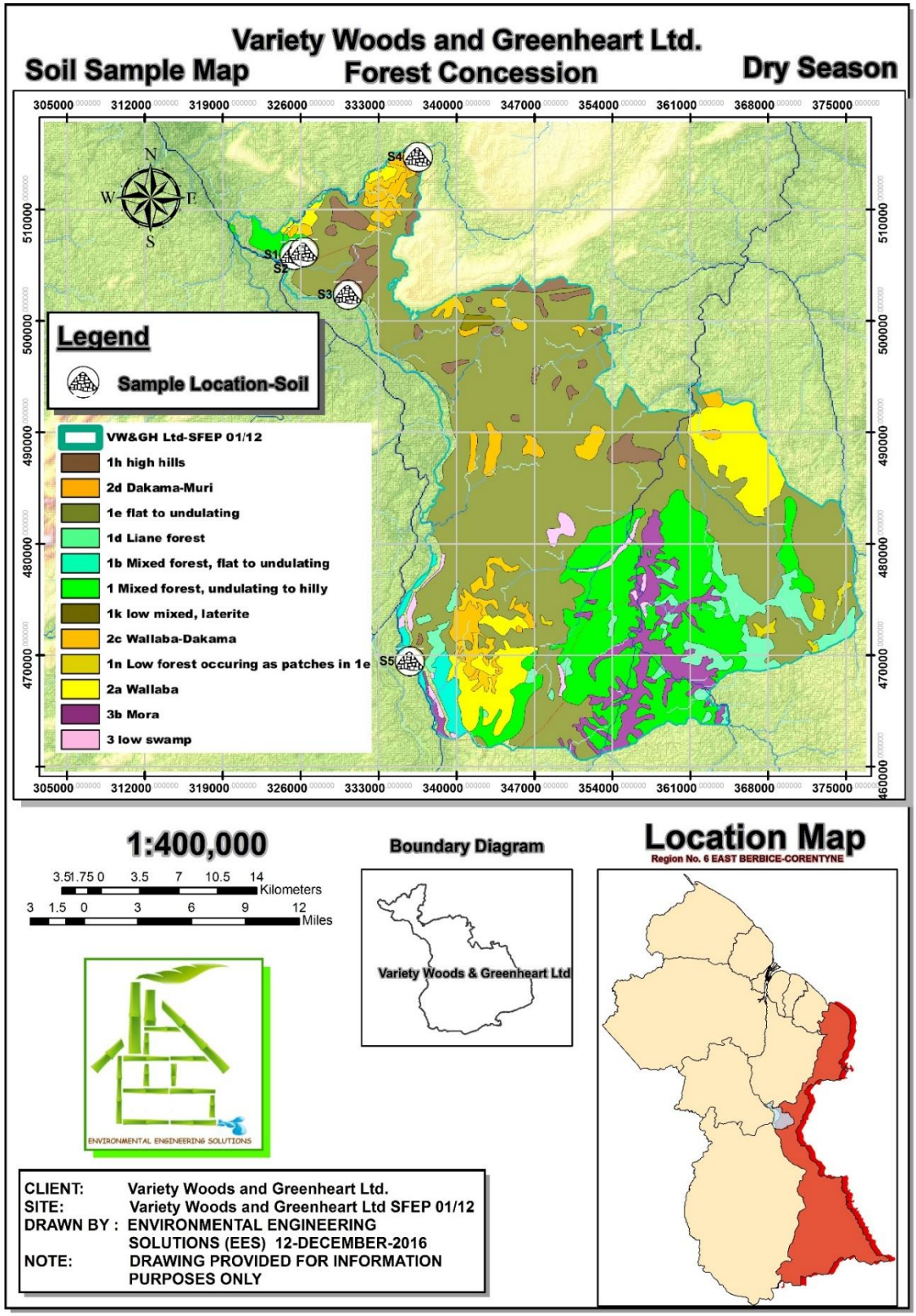

Figure 17: Soil Sample Points of VWL'S Concession during the Dry Season

5.2.3 Noise Conditions

Introduction

Noise pollution also called sound pollution is defined as a form and level of environmental sound that is generally considered likely to annoy, distract or even harm people or animals (BusinessDictionary 2015). Most industrial plants located near a residential area will need to be respectful of others residing within earshot regarding their production of noise pollution (BusinessDictionary 2015). The existing sound environment throughout the Variety Woods & Greenheart Ltd. Concession was characterized almost completely by sounds of nature since the concession area is undeveloped lands with no communities, land use or nearby roads. The areas where noise readings were taken were generally very quiet with rain, winds, rustling of trees and chirping of birds in the background.

Procedure

Noise levels were recorded during the wet season at seventeen (17) points within the Variety Woods & Greenheart Ltd. Concession (Figure 19) on June 18 and 19, 2015, July 09 and 11, 2015, and August 01 and 02, 2015, while in the dry season noise levels were recorded at eight (8) points on January 23 and 24, 2016, and December 10, 2016 (Figure 20) using a Sound Level Meter (ExTech 407730) (Figure 18).

Figure 18: Recording Noise Levels in the Field using a Sound Level Meter (ExTech 407730)

Results and Discussion

Noise levels within the Variety Woods & Greenheart Ltd. Concession ranged from 40 dB to 53.6 dB. The sampled areas never exceeded 54 decibels (dB). During the wet season within Variety Woods & Greenheart Ltd. Concession, the Sample Point N14 (53.6 dB), N4 (45.7 dB), N17 (45 dB), N13 (43 dB), and the sample point N5 (42 dB) showed small increments in noise levels and was as a result of sounds from the rain, high winds and birds chirping in the background, while, during the dry season the Sample Point N3 (49) was the only location that showed an increase in noise level from 40 dB. Table 2 below shows the noise parameters around the Project Area.

Table 7: Noise Levels within Variety Woods & Greenheart Ltd. Concession

Sound Level (dB)							
ID	**Coordinates**	**Time**		**Data**	**Wind**		**Remarks/ Comments**
	UTM, 21N	**Start**	**End**	**Decibel (dB)**	**Direction**	**Speed (m/s)**	
Wet Season							
N1	0328968,0506603	08:35	08:37	40	NW	0.1	The areas where noise readings were taken were generally quiet with winds, rustling of leaves and birds chirping in the background.
N2	0329000,0505984	09:03	09:05	40	NW	0.0	
N3	0329029, 0504959	09:35	09:37	40	NW	0.0	
N4	0330003,0505008	10:15	10:17	45.7	NW	0.0	
N5	0331006,0504987	11:00	11:02	42	NW	0.0	
N6	0335422, 0512210	14:08	14:10	40	NW	0.0	
N7	0357316, 0492297	07:36	07:38	40	NW	0.0	
N8	0357068, 0491990	08:14	08:16	40	NW	0.0	
N9	0356782, 0491741	09:03	09:05	40	NW	0.0	
N10	0356652, 0491611	09:50	09:52	40	NW	0.0	
N11	0358424, 0488056	15:30	15:32	40	NW	0.0	
N12	0360135, 0489435	16:03	16:05	40	NW	0.0	
N13	0360280, 0490900	16:30	16:32	43	NW	0.0	
N14	0356086, 0479716	13:48	13:50	53.6	NW	0.0	Rain in the background
N15	0356177, 0470864	15:22	13:24	40	NW	0.0	
N16	0356324, 0471189	15:35	13:37	40	NW	0.0	
N17	0356515, 0479027	16:37	16:39	45	NW	0.0	
Dry Season							
N1	0325443, 0505940	11:45	11:47	40	NW	0.0	Generally very quiet with winds, rain, rustling of trees and chirping of birds in the background.
N2	0326298, 0506182	14:16	14:18	40	NW	0.7	
N3	0328905, 0506591	15:17	15:19	49	NW	0.0	
N4	0329455, 0502624	13:20	13:22	40	NW	0.0	
N5	0330261, 0502355	12:54	12:56	40	NW	0.6	
N6	0337612, 0516277	15:24	15:26	40	NW	0.0	
N7	0323948, 0505478	08:20	08:23	40	NW	0.0	
N8	0335810, 0469470	12:30	12:33	40	NW	0.0	

Furthermore, the noise measurements of the areas recorded around the Variety Woods & Greenheart Ltd. Concession were all below the 100 dB Daytime (06:00 h -18:00 h) Industrial limits of the Guyana National Bureau of Standards (GNBS) Guidelines for the Measurement and Assessment of Noise in the Environment.

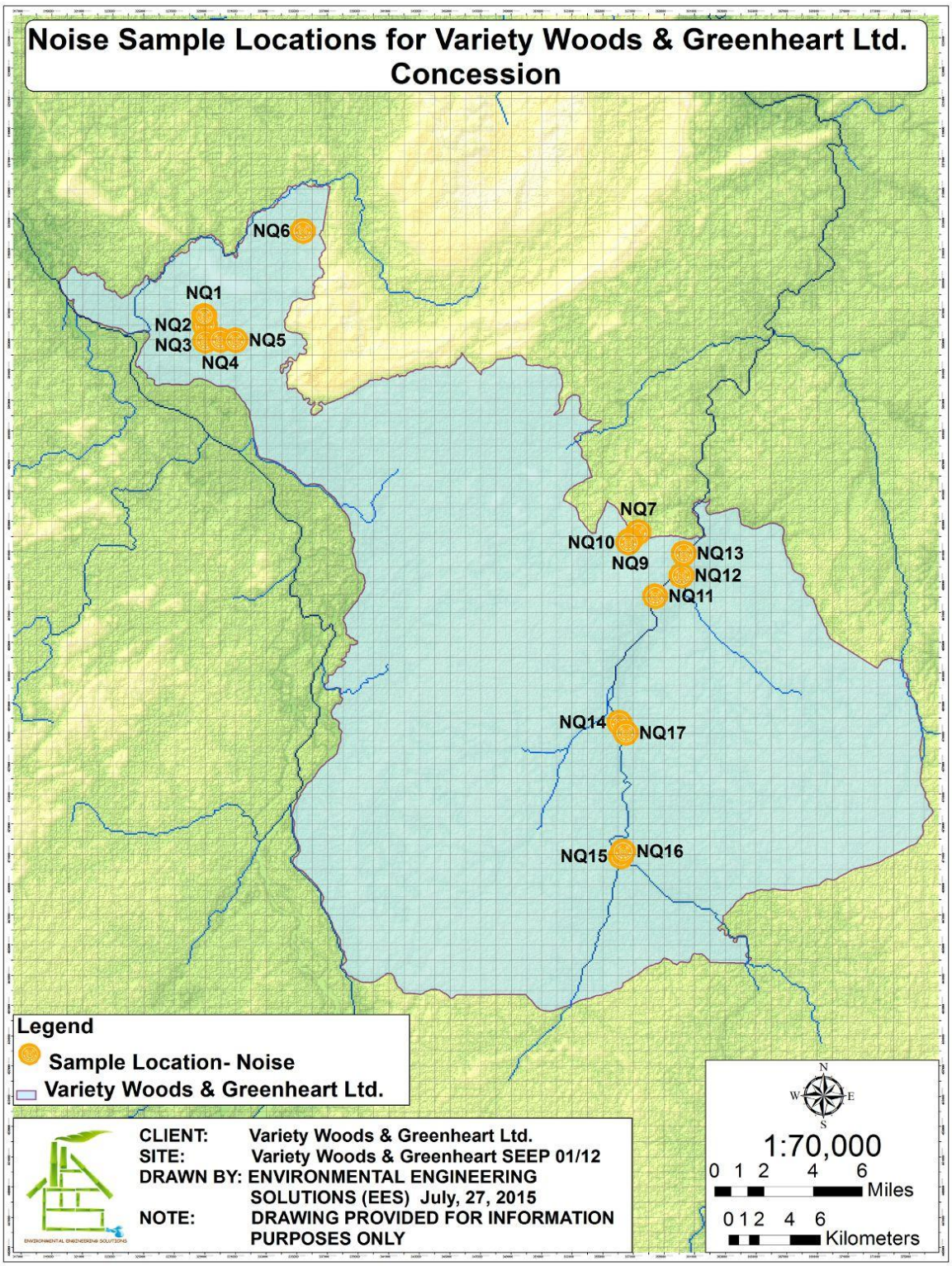

Figure 19: Noise Measurement Points within VWL'S Concession during the Wet Season

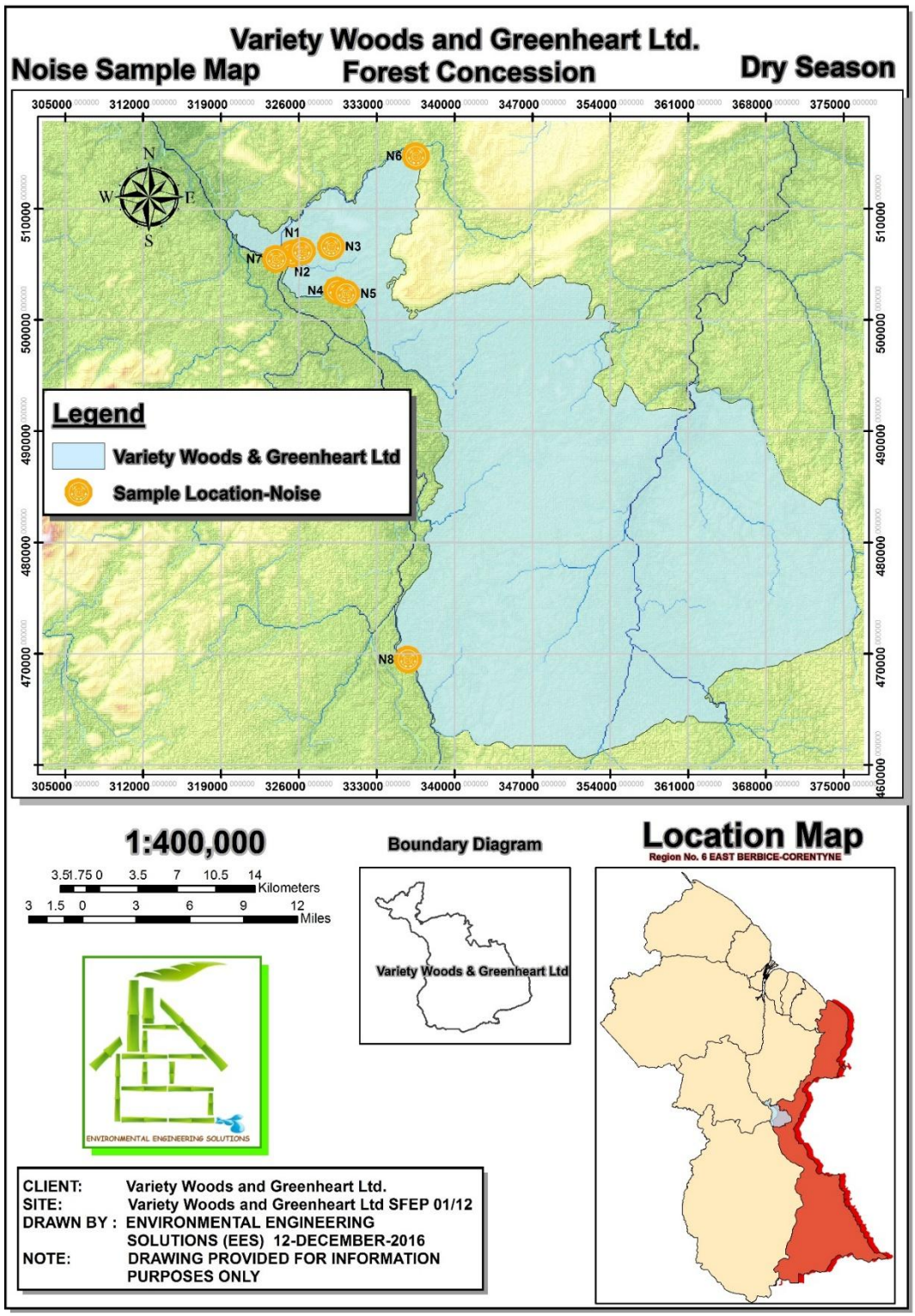

Figure 20: Noise Measurement Points within VWL's Concession during the Dry Season

5.2.4 Air Quality

Introduction

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere (World Health Organization 2012). This is becoming an increasingly significant problem to growth and development

of cities and communities. The air pollutants of major public health concern include: particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulphur dioxide and metals, such as lead (Hedges 2004) (World Health Organization 2012).

Air quality data in Guyana is extremely limited given the constraints relating to the unavailability of equipment and cost associated with this type of data collection. There was no historical air quality data for the Project Area, however, the air quality within the project area can be considered good since major activities to affect air quality was limited. As an indicator of Air Quality within the project area, a preliminary assessment was done of Particulate Matter reflected in the Total Suspended Particles concentration during the wet season (June 18 and 19, 2015, July 09 and 11, 2015, and August 01 and 02, 2015) and dry season (January 23 and 24, 2016, and December 10, 2016) for the Concession area.

Particulate Matter (PM) is the term for a mixture of solid particles (dust, dirt, soot, and smoke) and liquid droplets suspended in the air. These PM emissions originate from a variety of sources, such as vehicles, factories, industrial sites, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood (Hedges 2004, p.58). Particulate Matter comprises both coarse and fine particles. The coarse particles (PM_{10}) have an aerodynamic diameter between 2.5µm and 10µm. They are formed by mechanical disruption (e.g. crushing, grinding, abrasion of surfaces); evaporation of sprays, and suspension of dust. Fine particles have an aerodynamic diameter less than 2.5µm ($PM_{2.5}$). These particles are formed from gas by chemical reactions; and condensation of high-temperature vapours during combustion (Fierro 2000).

Total Suspended Particulates (TSP) refers to all particles in the atmosphere that are less than 100 micrometres. The amount of PM_{10} and $PM_{2.5}$ are related to the amount of total suspended particulates (TSP) in the air (Alias, Hamzah, and Kenn 2007).

Particulate Matter guidelines and standards are instituted (Table 8) due to short term and long term health effects including premature mortality, chronic respiratory disease, acute respiratory systems, decreased lung functions and aggravated asthma, persistent cough, phlegm, wheezing and physical discomfort (Fierro 2000, p.5)(Alias, Hamzah and Kenn 2007, p.258). These health effects are especially associated with PM_{10} and $PM_{2.5}$. The PM_{10} fraction from TSP is able to reach the lower regions of the respiratory tract. On the other hand, $PM_{2.5}$ is able to absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs (Alias, Hamzah and Kenn 2007, p.256). Additionally, there is increased harm to the environment as PM is a major source of haze that reduces visibility, causes changes to nutrient and chemical balance of the soil and aquatic environment, erosions and staining of structures (residential, commercial, or cultural monuments) (Hedges 2004, p.58).

The purpose of the ambient air quality standards are to establish maximum limits on parameters of air quality considered desirable for the preservation and enhancement of the quality of air resources and health (Mecklenburg-County-NC 2012). The WHO Air Quality Guideline (AQGs) are intended for worldwide use but have been developed to support actions to achieve air quality that protects public health. Air quality standards, are set by each country to protect the public health of their citizens and as such are an important component of national risk management and environmental policies. National standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors, which in turn will depend on, among other things, the level of development and national capability in air quality management (World-Health-Organisation 2006).

Table 8: Air Quality Standards and Guidelines

Air Pollutant	Mecklenburg County NC	NAAQS	OSHA	WHO (1999)	WHO (2006)	NHMRC (1996)	Malaysia
PM2.5	15µg/m^{3}annual mean	15µg/m3 annual mean	---	---	10 µg/m3 annual mean	---	---
	65µg/m^3 24-hour average concentration	35µg/m3 24-hour average concentration	---	---	25 µg/m3 24-hour mean	---	---
PM10	50µg/m^{3}annual mean	50µg/m3 annual mean	---	---	20 µg/m3 annual mean	---	---
	150µg/m^3 24-hour average concentration	150µg/m3 24-hour average concentration	---	---	50 µg/m3 24-hour mean	---	150µg/m3 24-hour average concentration
TSP	75µg/m^{3}annual mean	---	Permissible Exposure Limits (PELs, TWA 8-hour exposure)	---	---	90 µg/m3 Annual mean	---
	150µg/m^3 24-hour average concentration	---	15 mg/m^3 (total) 5 mg/m3 (for respirable fraction)	120 µg/m3 24-hour average	---	---	260µg/m3 24-hour average concentration

Source: (World Health Organization 2006, p.10), (Mecklenburg-County-NC 2012), (Environmental-Protection-Authority 2001), (United-States-Environmental-Protection-Agency 2012), (Fierro 2000), (Alias, Hamzah and Kenn 2007, p.255), (Mecklenburg-County-Government 2012), (United-States-Department-of-Labour-OS&H 2012)

Monitoring Procedure

The Total Suspended Particulate (TSP) measurements were taken using the Thermo pDR-1000AN personalDataRAMTM Particulate Monitor (see Figures 21, 22). TSP measurements recorded in mg/m3 (milligram/meter3), were taken at fifteen (15) sample sites during the wet season and eight (8) sample sites during the dry season, after a log interval of 5 minutes (Thermo-Electron-Corportation 2005).

After the 5 minute interval log time, the real time concentration value, the maximum concentration value and the time weighted average (TWA) concentration in milligrams per cubic meter (mg/m3) were recorded from each sample site. The wind direction and temperature at time of monitoring at each site was recorded. Conversions from milligrams per cubic meter (mg/m3) to micrograms per cubic meter (µg/m3) were done by taking the milligrams per cubic meter (mg/m3) measurements x 1000 (Hedges 2004, p.23). Micrograms per cubic meter (µg/m3) results were then compared to the Mecklenburg County North Carolina Air Quality TSP Standard, as a current TSP limit permissible utilised by North Carolina State and OSHA Permissible Exposure Limits related with the 8 hours monitoring. Quality assurance and quality control (QA/QC) was practiced, were routine parts of the air quality monitoring during the calibration, operation and maintenance of the monitoring equipment.

Figure 21: Air quality monitoring using a Thermo pDR-1000AN personalDataRAMTM Particulate Monitor

Figure 22: Air quality monitoring: Temperature, Humidity, and Wind Speed Testing

Results and Discussion

The following table and map show the results of Total Suspended Particulates concentration taken during the wet (seventeen (17)) and dry season (eight (8)) sites around the Variety Woods & Greenheart Ltd. Concession.

Table 9 contains the average concentration, Total Weighted Average (TWA) and maximum concentration of the air quality during the monitoring period.

Table 9: Results of TSP Measurement at VWL'S Concession.

Sample ID	Coordinates UTM, 21N	Time		Data µg/m³			Wind	Humidity (%)	Temp (°C)
		Start	End	TWA	Max. Con	Avg. Con	Speed (m/s)		
Wet Season									
AQ1	0328968,0506603	08:35	08:41	42.7	46.6	42.5	0.1	83	31.6
AQ2	0329000,0505984	09:03	09:08	42.7	46.4	42.9	0.0	69	32.3
AQ3	0329029,0504959	09:35	09:41	43.5	43.8	43.7	0.0	79	29
AQ4	0330003,0505008	10:15	10:21	44.3	44.9	44.8	0.0	80	29
AQ5	0331006,0504987	11:00	11:06	44.7	45.7	44.8	0.0	87	28
AQ6	0335422,0512210	14:08	14:14	49.1	53.7	52.4	0.0	92	30.8
AQ7	0357316,0492297	07:36	07:42	46.1	47.6	45.6	0.0	89	29
AQ8	0357068,0491990	08:14	08:20	45.5	45.8	45.5	0.0	89	29
AQ9	0356782,0491741	09:03	09:09	44.6	46.2	42.7	0.0	91	29
AQ10	0356652,0491611	09:50	09:56	45.4	46.4	45.0	0.0	96	28
AQ11	0358424,0488056	15:30	15:36	42.5	44.7	42.3	0.0	89	26.6
AQ12	0360135,0489435	16:03	16:09	42.2	42.7	42.1	0.0	99	27.3
AQ13	0360280,0490900	16:30	16:36	42.3	43.4	42.1	0.0	92	26.9
AQ14	0356086,0479716	13:48	13:54	45.6	49.0	45.3	0.0	99	28.9
AQ15	0356177,0470864	15:22	15:28	46.8	47.9	47.2	0.0	99	30
AQ16	0356324, 0471189	15:35	15:41	46.8	48.1	46.5	0.0	99	30.9
AQ17	0356515,0479027	16:37	16:43	45.5	47.4	44.9	0.0	97	29.8
Dry Season									
AQ1	0325443,0505940	11:45	11:51	44.9	49.9	45.1	0.0	63	30.5
AQ2	0326298,0506182	14:16	14:21	41.5	47.0	44.3	0.7	64	31.2
AQ3	0328905,0506591	15:17	15:22	42.4	47.1	41.4	0.0	61	30.7
AQ4	0329455,0502624	13:20	13:26	44.3	45.5	44.1	0.0	70	26.6
AQ5	0330261, 0502355	12:54	13:00	44.0	46.1	43.9	0.6	64	31
AQ6	0337612, 0516277	15:24	15:30	45.3	48.4	45.6	0.0	64	29.4
AQ7	0323948, 0505478	08:26	08:32	43.5	46.7	42.9	0.0	83	27.3
AQ8	0335810, 0469470	12:34	12:40	45.1	47.0	44.3	0.0	85	30.2

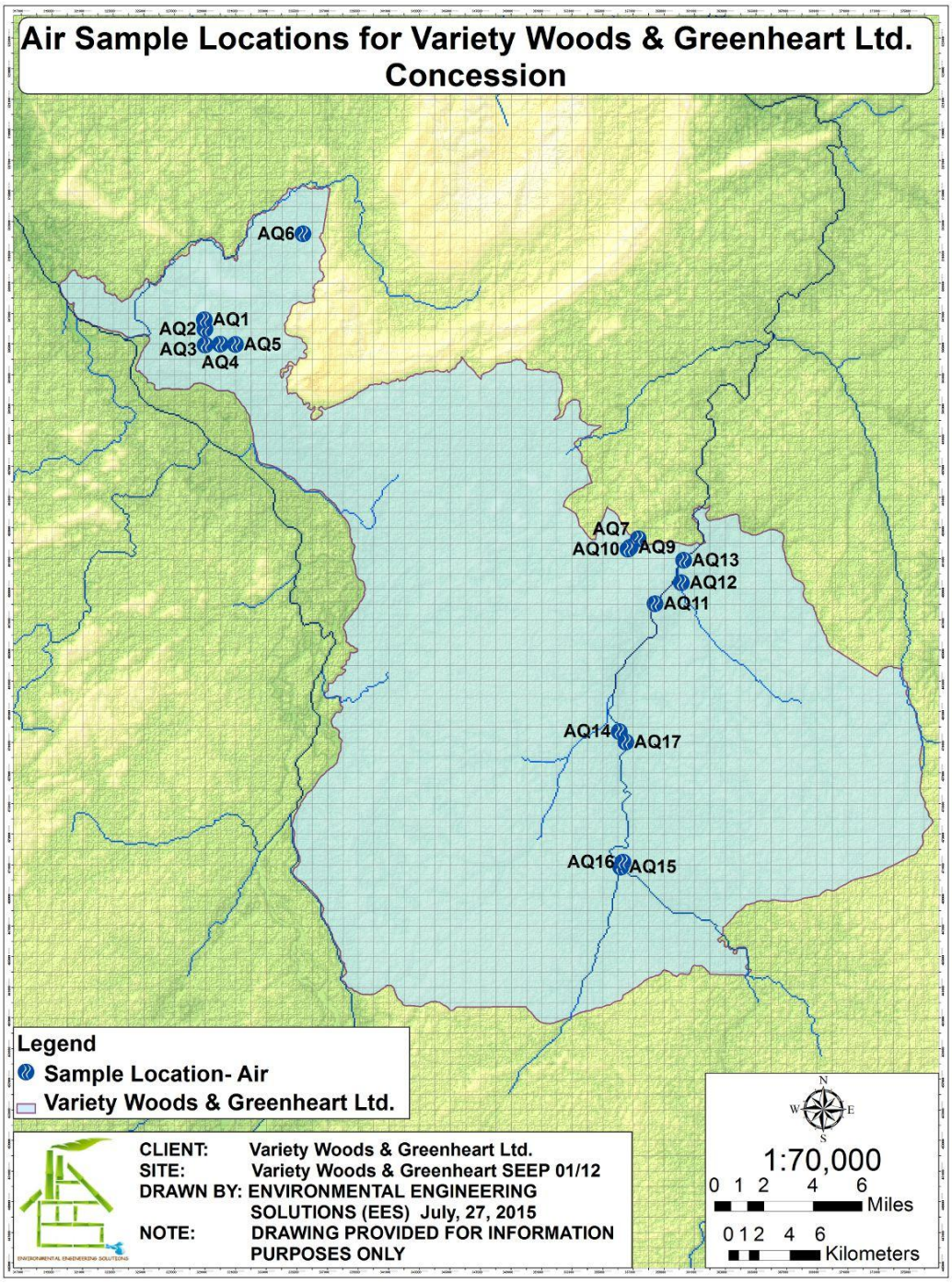

Figure 23: Air quality sample points for VWL's concession during the wet season

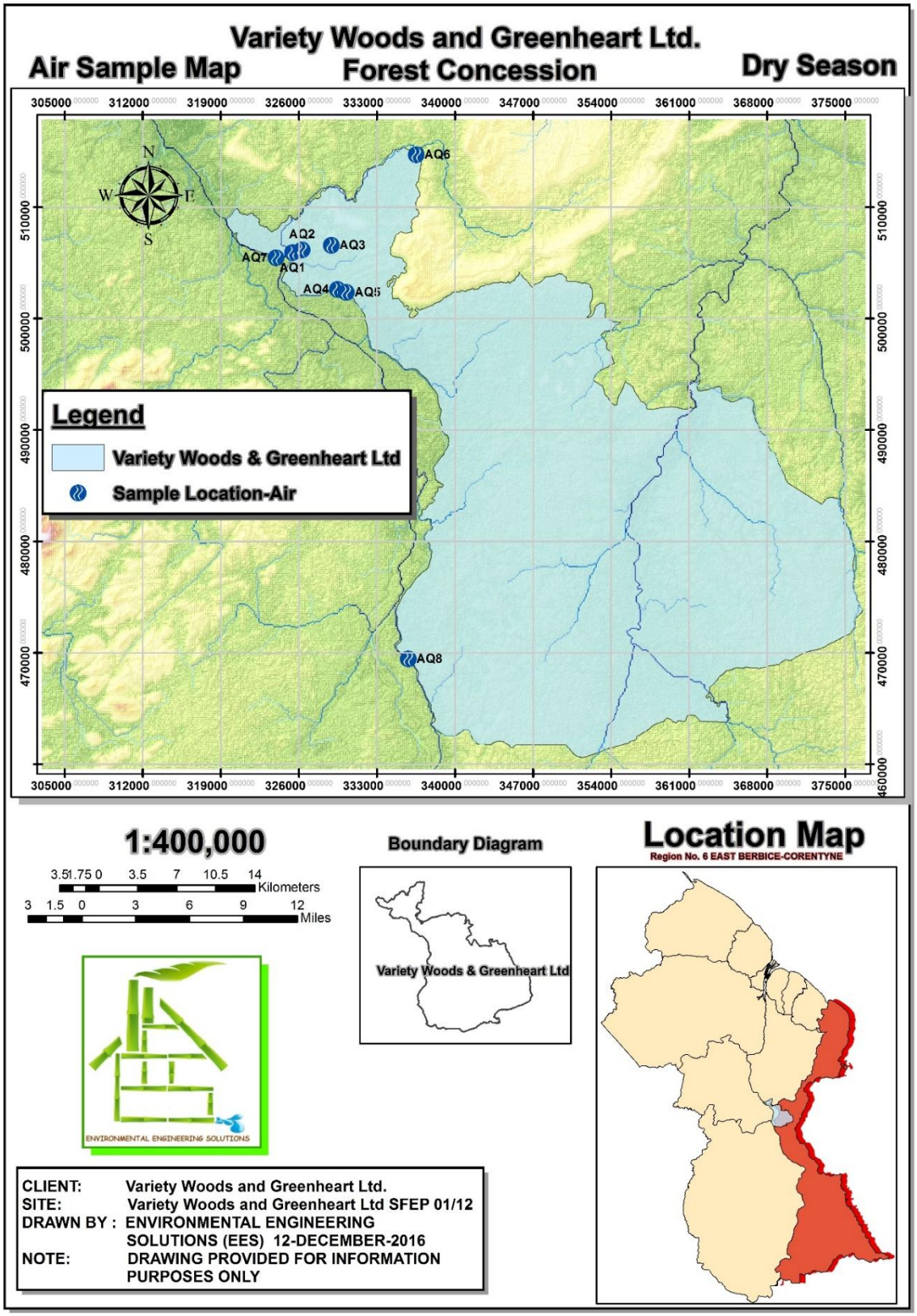

Figure 24: Air Quality Sample Points for VWL'S Concession during the Dry Season

Under clean atmospheric conditions; the TSP level can be as low as 0 – 10 µg/m^3. In a very dusty environment, TSP concentration can be as high as 1500 µg/m^3 (Alias, Hamzah and Kenn 2007, p.258).

Wet season: Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.); the range of 42.2 – 49.1 µg/m^3 and 42.7 – 53.7 µg/m^3 were recorded respectively, during the monitoring period (Table 4). The TWA readings varied among the seventeen (17) sites, with the highest TWA concentration recorded was 49.1 µg/m^3 at site 6. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average, the value recorded at site 6 was under the TSP AQS. TWA levels were also below the limit at all site locations during the monitoring period.

The highest Maximum Concentration was 53.7 µg/m^3 at site 6 followed by sites 14 (49 µg/m^3), and site 16 (48.1 µg/m^3). The Maximum Concentration is the highest value detected by the sensor during the monitoring time (5 minutes); therefore this does not represent the average maximum concentration. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average, measurements showed that all seventeen (17) sites were below the Mecklenburg County TSP AQS as a random reading during the time of monitoring. The average concentration values recorded for Variety Woods & Greenheart Ltd. Concession were generally below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average and the readings were also below the TSP limit for the WHO Guidelines.

The Total Suspended Particles (TSP) concentrations measured varied based on TWA and Maximum Concentrations at the 17 sites monitored around the Variety Woods & Greenheart Ltd. Concession. The TWA, Average and Maximum concentration readings were below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The maximum concentration values recorded was not enough to modify and increase the TWA concentrations in comparison with TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The results reflect TSP values based on the technical capabilities of the equipment *p*DR-1000AN *personal*DataRAM^{TM}.

Dry Season: Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.), a range of 41.5 – 45.3 µg/m^3 (TWA) and 45.5 – 49.9 µg/m^3 (Max. Conc.), were recorded, during the monitoring period (Table 4). The TWA readings varied among the eight (8) sites, with the highest TWA concentration recorded was 45.3 µg/m^3 at site 6. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average, the value recorded at site 6 was under the TSP AQS. TWA levels were also below the limit at all site locations during the monitoring period.

The highest Maximum Concentration was 49.9 µg/m^3 at site 1 followed by site 6 (48.4 µg/m^3), and site 3 (47.1 µg/m^3). The Maximum Concentration is the highest value detected by the sensor during the monitoring time (5 minutes); therefore this does not represent the average maximum concentration. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average, measurements showed that all eight (8) sites were below the Mecklenburg County TSP AQS as a random reading during the time of monitoring. The average concentration values recorded from Variety Woods & Greenheart Ltd. Forest Concession were generally below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average and the readings were also below the TSP limit for the WHO Guidelines.

The Total Suspended Particles (TSP) concentrations measured varied based on TWA and Maximum Concentrations at the 8 sites monitored around the Variety Woods & Greenheart Ltd. Forest Concession. The TWA, Average and Maximum concentration readings were below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The maximum concentration values recorded was not enough to modify and increase the TWA concentrations in comparison with TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The results reflect TSP values based on the technical capabilities of the equipment *p*DR-1000AN *personal*DataRAM^{TM}.

Both wet and dry season: There was no major impact to air quality within the concession and the area can be considered pristine since activities to affect air quality were limited. There were also no industrial type activities in close proximity, as well as activities which generate significant quantities of dust. As a recommendation $PM_{2.5}$ and PM_{10} need to be measured to assure this conclusion. EES is

looking forward to collaborate with Environmental Protection Agency to do further monitoring if necessary.

5.2.5 Water Quality

Introduction

Water quality is highly variable over time due to both natural and human factors. Water temperature, photosynthetic activity, and flows vary with season (Brown and Caldwell 2002). Flows, and therefore suspended sediment, can vary daily with rainfall (Brown and Caldwell 2002). Nutrient loads can vary with season, flow and human management (Brown and Caldwell 2002). A comprehensive characterization of natural water quality therefore requires a large amount of data. Water quality data is expensive and time-consuming to acquire, however, so water quality managers usually deal with a large amount of uncertainty (Brown and Caldwell 2002).

Procedure

Surface water samples were collected and analysed using the LabQuest 2 Water Quality Package (which includes an electronic interface and several sensors and probes which test for various water quality parameters) to determine the quality of surface water within the Variety Woods & Greenheart Ltd. Concession. During the wet season sixteen (16) water samples were collected while during the dry season four (4) water samples were collected and analysed within and around the concession from the Essequibo River, Maam Creek, the Berbice River and a number its smaller tributaries located within the Concession.

Surface water samples were analysed twice to have a representative value of the water quality in the general concession area. During the wet season samples were collected and analysed on June 18 and 19, 2015, July 09 and 11, 2015, and August 01 and 02, 2015, while during the dry season samples were collected and analysed on January 23 and 24, 2016, and December 10, 2016. Additionally, since activities within the concession area were significantly limited due to inaccessibility, it could be assumed that the surface water quality would generally have characteristics of natural watercourses in Guyana.

The sample locations were selected at strategic points based on the accessibility to the concession area to provide an indication of the baseline surface water quality. These locations should also become permanent monitoring sites during project implementation, since, if there are any impacts on water quality by the project during operation, the impacts can be detected by testing these locations. Analyses were conducted in the fields, as shown in Figures 25 and 26 and a detailed description of the surface water sample locations are outlined in Table 10 and 11. The locations where the samples were collected are identified on the maps below (see Figures 25 and 26) as the WQ locations and described in table 10 below.

Table 10: Description of Surface Water Sample Location for VWL'S Concession

No.	ID	Sample Location	Date Sampled	Time Sampled (h)	Weather Conditions	GPS Readings (UTM, 21N
Wet Season						
1	WQ1	Maam R.	June 18, 2015.	07:55	Overcast	0337931,0515902
2	WQ2	Creek	June 18, 2015.	09:15	Overcast	0329010,0505612
3	WQ3	Creek	June 18, 2015.	09:35	Overcast	0329029, 0504959
4	WQ4	Creek	June 18, 2015.	10:45	Overcast	0330311,0505012
5	WQ5	Creek	June 18, 2015	11:00	Overcast	0331006,0504987
6	WQ6	Creek	June 19, 2015	07:15	Overcast	0358601,0493687
7	WQ7	Creek	June 19, 2015	08:19	Overcast	0357316,0492297
8	WQ8	Creek	June 19, 2015	11:46	Overcast	0356782,0491741
9	WQ9	Creek	June 19, 2015	14:35	Overcast	0358259,0493004
10	WQ10	Creek	July 11, 2015	15:25	Overcast	0374930,0484328
11	WQ11	Creek	Aug 01, 2015	16:03	Rainy	0358424,0488056
12	WQ12	Creek	Aug 01, 2015	16:30	Rainy	0360135,0489435
13	WQ13	Creek	Aug 02, 2015	13:48	Overcast	0356086,0479716
14	WQ14	Berbice R	Aug 02, 2015	15:15	Overcast	0356177,0470864
15	WQ15	Berbice R	Aug 02, 2015	15:35	Overcast	0356324,0471189
16	WQ16	Berbice R	Aug 02, 2015	16:37	Overcast	0356515,0479027
Dry Season						
1	WQ1	Creek	Jan 23, 2016	11:45	Sunny	0325443,505940
2	WQ2	Creek	Jan 23, 2016	15:17	Sunny	0328905,0506591
3	WQ3	Creek	Jan 24, 2016	13:20	Sunny	0329455,0502624
4	WQ4	Essequibo R	Dec 10, 2016	14:24	Sunny	0335334, 0475168

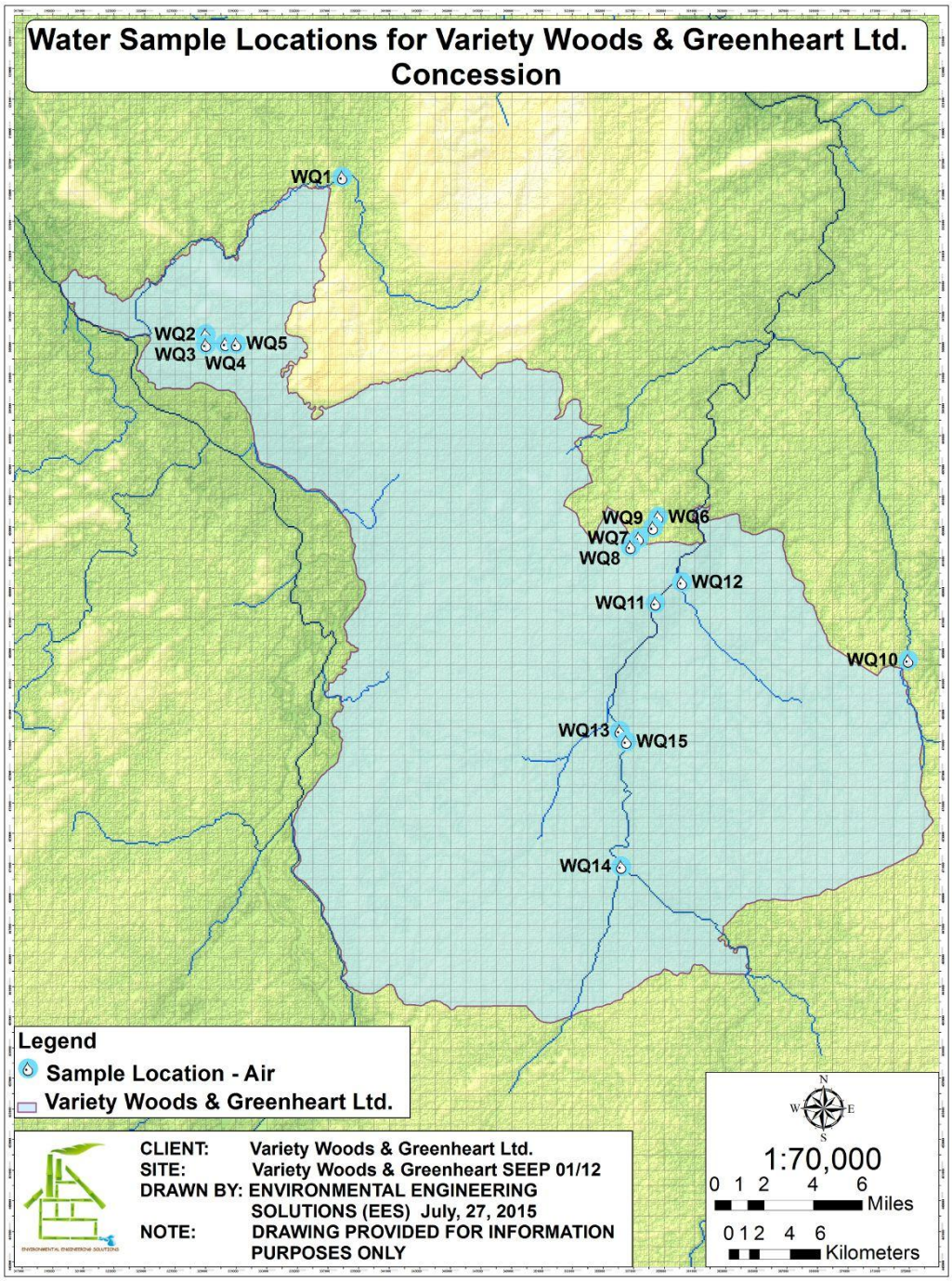

Figure 25: Sample Points of Variety Woods & Greenheart Ltd. Concession during the Wet Season

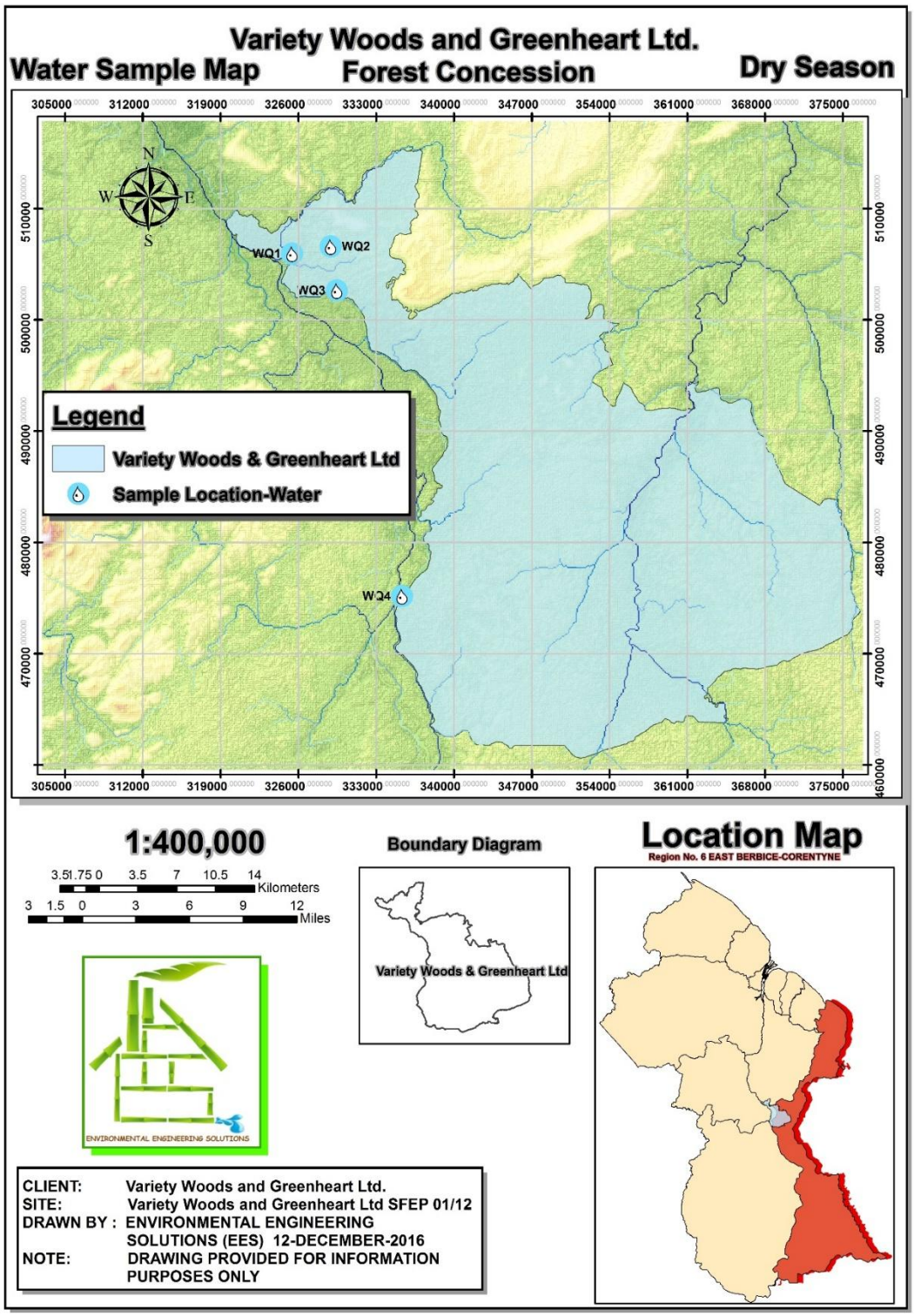

Figure 26: Water Sample Points of VWL'S Concession during the Dry Season

Surface water quality analysis was performed in the field almost immediately after samples were collected (see Figure 28). The samples collected were analysed for several parameters which are important and generally used to determine the quality of water, i.e. measurements of pH, Turbidity, Total Ions, Conductivity and Dissolved Oxygen (DO) were taken to assess the spatial changes of the quality of water.

Figure 27: Illustration of collection of water samples

Figures 28: Conducting Field Analysis of Surface Water Quality

Further, in the absence of a national standard on water quality, comparison was made with the Guyana National Bureau of Standards (GNBS) GYS 262:2004 Specification for Drinking Water as well as internationally acceptable limits from the US-EPA, 1985, the WHO Drinking Water Guidelines, 2011, and the World Bank, 1984. These limits are included in Annexes V, VI.

Table 11: Results of Surface Water Quality Analysis for VWL's Concession

ID	UTM Coordinates 21N	Parameters								
		Temp(°C) < 40	pH 5.0-9.0	Conductivity (µS/cm) *0-1500*	Turbidity (ntu) 10	DO (mg/L) ≤ 5.0	NO_3 (mg/L) 10	Cl (mg/L) 250	NH_4 (mg/L) 0.2	TDS (ppm) 500
Wet Season										
WQ1	0337931, 0515902	32.4	6.60	67	16.2	4.4	0.0	0.9	0.7	30
WQ2	0329010, 0505612	29	6.40	41	19.6	4.9	0.1	0.1	0.6	16
WQ3	0329029, 0504959	28.8	6.41	39	20.5	4.8	0.0	0.3	0.6	15
WQ4	0330311, 0505012	28.5	6.40	43	15.7	4.4	0.0	0.4	0.6	17
WQ5	0331006, 0504987	28.7	5.40	70	14.7	4.7	0.0	0.6	0.6	28
WQ6	0358601, 0493687	26.1	6.43	38	27.3	4.9	0.2	0.5	0.6	15
WQ7	0357316, 0492297	26.2	5.42	68	27.6	4.6	0.2	0.4	0.7	29
WQ8	0356782, 0491741	26.4	6.23	25	27.0	4.7	0.0	0.2	0.2	9
WQ9	0358259, 0493004	26.0	6.20	25	27.2	4.7	0.0	0.2	0.2	9
WQ10	0374930, 0484328	27.4	5.78	35	24.9	4.2	1.9	3.2	7.7	12
WQ11	0358424, 0488056	30.1	7.46	45	32.7	4.5	1.4	1.1	0.6	16
WQ12	0360135, 0489435	29.9	7.82	33	25.7	4.6	1.9	0.6	0.6	11
WQ13	0356086, 0479716	30.5	7.63	41	32.3	3.5	1.5	0.3	0.7	15
WQ14	0356177, 0470864	29.7	7.56	40	35.7	4.3	1.4	0.5	0.2	15
WQ15	**21N** 0356324, 0471189	29.5	7.46	44	34.9	4.1	1.3	0.5	0.2	16

WQ16	0356515, 0479027	30.0	7.42	41	30.3	3.6	1.4	0.4	0.6	16
Dry Season										
WQ1	0325443, 0505940	27.3	5.63	52	29.4	4.5	1.2	2.3	0.0	19
WQ2	0328905, 0506591	28.5	5.53	26	40.2	4.4	2.0	1.6	0.0	9
WQ3	0329455, 0502624	28.9	5.20	27	30.5	4.8	1.2	1.3	0.0	9
WQ4	0335334, 0475168	28.2	5.49	30	34.8	4.7	1.2	1.7	0.0	11

Sample ID	UTM Coordinates 21N	Parameters	
		Oil & Grease (mg/L)<10	**COD (mg/L)<250**
Wet Season			
WQ13	0356086,0479716	46.50	96.80
WQ14	0356177,0470864	48	61.60
Dry Season			
WQ1	0325443, 0505940	0.50	24
WQ2	0328905, 0506591	0.06	48
WQ3	0329455, 0502624	0.013	92
WQ4	0335334, 0475168	Analysis Pending	Analysis Pending

Key

DO - Dissolved Oxygen **NO_3** - Nitrates **Cl** – Chlorides **NH_4** – Ammonium **Ca** – Calcium **ND** – Not Detected

TDS – Total Dissolved Solid **COD** – Chemical Oxygen Demand

Results and Discussion

For the results of the surface water quality analysis conducted for Variety Wood & Greenheart Ltd. Concession, most of the parameters analysed were within the acceptable range. For the parameters that were analysed the results were as follows:

Water temperature is affected by air temperature, storm water runoff, groundwater inflows, turbidity, and exposure to sunlight. The surface water temperature reading ranged from 26.0 to 32.4 ^{0}C during the wet season and 27.3 to 28.9 ^{0}C during the dry season, these were within the GNBS accepted range of < 40 ^{0}C, which is considered healthy for living organisms. It is expected that human activities within the area should not change water temperatures beyond natural seasonal fluctuations.

pH is a measure of a solution's acidity. In water, small numbers of water molecules (H_2O) will break apart or disassociate into hydrogen ions (H^+) and hydroxide ions (OH^-). Other compounds entering the water may react with these, leaving an imbalance in the numbers of hydrogen and hydroxide ions. When more hydrogen ions react, more hydroxide ions are left in the solution and the water is basic; when more hydroxide ions react, more hydrogen ions are left and the water is acidic (Behar 1997a).

The pH analysis of the surface water samples of the Creeks within the Variety Woods & Greenheart Ltd. Concession during the wet season ranged from 5.40 to 7.82 pH, and 5.20 to 5.63 pH during the dry season indicating that water in the area is acidic to neutral. The pH parameters were within the limits (5.0 – 9.0 pH) GNBS Interim Guidelines for Industrial effluent into the Environment.

Conductivity of the water samples within the concession during the wet season ranged from 25 to 70 μS/cm and 26 to 52 μS/cm during the dry season, these were within the WHO standards for drinking water i.e. 0 to 1500 μS/cm. Distilled water has a conductivity ranging from 0.5 to 3 μS/cm, while most streams range between 50 to 1500 μS/cm. Freshwater streams ideally should have a conductivity between 150 to 500 μS/cm to support diverse aquatic life.

Turbidity is a measure of how particles suspended in water affect water clarity. It is an important indicator of suspended sediment and erosion levels (Behar 1997b). During the wet season the turbidity level of the streams ranged from 14.7 to 35.7 ntu, while during the dry season the turbidity level ranged from 29.4 to 40.2 ntu. Therefore, the turbidity levels within the creeks and River were above the accepted 10 ntu GNBS Interim Standards. The levels recorded were higher, probably as a result of the fact that turbidity generally increase with distance closer to the bank of a stream or flowing creek. This is expected since the closer the proximity to land, the higher the turbidity level.

Dissolved oxygen (DO) is oxygen gas molecules (O_2) present in the water. Plants and animals cannot directly use the oxygen that is part of the water molecule (H_2O), instead depending on dissolved oxygen for respiration. Oxygen enters streams from the surrounding air and as a product of photosynthesis from aquatic plants (Cooke 2014). The Dissolved oxygen readings of the Berbice River and creeks were within the accepted standard of ≤ 5.0 mg/L during the exercise. The levels recorded ranged from 3.5 mg/L to 4.9 mg/L, while during the dry season levels recorded ranged from 4.4 mg/L to 4.8 mg/L and did not exceed a total dissolved gas concentration of 110 percent. Total dissolved gas concentrations above 110 percent can be harmful to aquatic life resulting in “gas bubbles disease.” Dissolved oxygen levels of 4 – 7 mg/L is considered good for many aquatic animals (Behar 1997b).

Nitrogen is abundant on earth, making up about 80% of our air as N_2 gas. Most plants cannot use it in this form. However, blue-green algae and legumes have the ability to convert N_2 gas into nitrate (NO_3^-), which can be used by plants. Plants use nitrate to build protein, and animals that eat plants also use organic nitrogen to build protein. Nitrate ion levels of the water samples during the wet season ranged from 0.0 to 1.9 mg/L, and 1.2 to 2.0 mg/L during the dry season which are within the safe levels for marine organisms (20 ppm) (J.Camargo, Alonso, and Salamanca. 2005; Joksimovic 2010) and were below the GNBS Guidelines and the WHO drinking water standard of 10 mg/L. Concentrations over 10

mg/L will have an effect on the freshwater aquatic environment. 10 mg/L is also the maximum concentration allowed in human drinking water by the U.S. Public Health Service.

Chloride is a salt compound resulting from the combination of the gas chlorine and a metal. Chloride, in the form of the Cl^- ion is one of the major inorganic anions (negative ions) in saltwater and freshwater. Almost all natural waters contain chloride ions. Their concentrations vary considerably according to the mineral content of the earth in any given area. The wet season Chloride ion levels ranged from 0.1 mg/L to 3.2 mg/L, while the dry season Chloride ion levels ranged from 1.3 mg/L to 2.3 mg/L, indicating good quality as they were below the US-EPA Secondary Drinking Water Regulations of 250 mg/L.

Ammonia will react with water to form a weak base. The term ammonia refers to two chemical species which are in equilibrium in water (NH_3, un-ionized and NH_4^+, ionized). When dissolved in water, normal ammonia (NH_3) reacts to form an ionized species called ammonium (NH_4^+). Ammonium ion levels of the streams within the concession during the wet season ranged from 0.2 mg/L to 7.7 mg/L; and 0.0 mg/L during the dry season. The majority of the wet season readings were above the WHO Guidelines for Drinking Water Quality level of 0.2 mg/L. The levels of ammonia were high due to the presence of animals located in close proximity to the streams.

Total Dissolved Solids (TDS) is the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water (Yamamura et al.). TDS, which is based on conductivity, is expressed in parts per million (ppm). TDS includes any conductive inorganic elements present other than the pure water molecules (H_2O) and suspended solids (Yamamura et al.). TDS affects everything that consumes, lives in or uses water, from fish and plants to plumbing and laboratories. For people, the lower the TDS level in the water you drink, the more efficiently your body's cells are hydrated. The higher the TDS level in water, the greater the probability of harmful contaminants that can pose health risks or hinder the absorption of water in the body. The TDS levels of the water samples during the wet season ranged from 9 ppm to 30 ppm and 9 ppm to 19 ppm during the dry season, these were all below the U.S. EPA's Maximum Contaminant Level for TDS of 500 ppm.

Oil and Grease (OG): The concentration of dispersed oil and grease (OG) is an important parameter for water quality and safety. OG in water can cause surface films and shoreline deposits leading to environmental degradation, and can induce human health risks when discharged in surface or ground waters (NCDWQ 2006). OG analysis reveals the total concentration of a family of organic compounds including "non-volatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related matter" (NCDWQ 2006).

Oil and grease levels of two (2) water samples taken during the wet season were 46.50 mg/L (WQ13) and 48 mg/L (WQ14) respectively and were all above the limits (<10) GNBS Interim Guidelines for Industrial effluent into the Environment. While three (3) water samples taken during the dry season, the levels were 0.50 mg/L (WQ1), 0.06 mg/L (WQ2), and 0.013 mg/L (WQ3). These results were all below the GNBS Interim Guidelines of (<10).

Monitoring during the wet season indicated that OG is present in the streams of the Concession and the concentrations were above the GNBS accepted limit. The presence of oil and grease in the water samples could have been due to contamination during travel from the concession to the Guyana Sugar Corporation Inc. laboratory.

COD (Chemical Oxygen Demand): analysis is a measurement of the oxygen-depletion capacity of a water sample contaminated with organic waste matter (MANTECH 2015). Specifically, it measures the equivalent amount of oxygen required to chemically oxidize organic compounds in water (MANTECH 2015).

COD levels of two (2) water samples taken during the wet season were 96.80 mg/L (WQ13) and 61.60 mg/L (WQ14), while three (3) water samples were taken during the dry season and the levels were 24 mg/L (WQ1), 48 mg/L (WQ2) and 92 mg/L (WQ3) and these results were within the GNBS accepted

range of <250 mg/L. Chemical oxygen demand (COD) does not differentiate between biologically available and inert organic matter, and it is a measure of the total quantity of oxygen required to oxidize all organic material into carbon dioxide and water.

The results of the analyses of surface water quality of the Variety Woods & Greenheart Ltd. Concession indicated that the existing water quality of the area is a characteristic of the water quality for similar types of areas within Guyana. The results also indicated very low levels of contamination. The water quality standards are attached in Appendix A and the results of the water sample analyses from the Guyana Sugar Corporation Inc. are attached in Appendix B.

5.3 Biological Resources

5.3.1 Forest resources

Ter Steege (2002) has provided the most recent description of the forests for the geographic area extending from right bank Essequibo River to left bank Corentyne River, in which the concession is situated; the expert describes the forest as Central Guyana Wet forests situate the sandy Berbice formation (soils). According to ter Steege, the most widespread and abundant species within the area are set out in Table 12.

Table 12: Abundant species within the general Essequibo-Corentyne Region

#	Species		Presence (% of sampled area in which species occur)	Abundance Av No. of trees/100ha
	Common Name	Botanical name		
1	Baromalli	Catostemma spp.	100	180
2	Wamara	Swartzia leiocalycina	100	337
3	Greenheart	Chlorocardium rodiei	81	256
4	Soft Wallaba	Eperua falcata	81	220
5	Black Kakaralli	Eschweilera sagotiana	100	440
6	Morabukea	Mora gonggrijpii	75	250
7	Mora	Mora excelsa	75	392

Procedure used for assessments

Vegetation maps produced by the GFC indicate that there is a diversity of forest types within the area with mixed forests on flat to undulating terrain constituting more than 50% of the area (see Table 13) Note that Greenheart and Wamara, currently two of Guyana's most important merchantable both occur in at least 70% of the area.

For the assessment of the forest resources three kinds of exercises were conducted:

a) Firstly, the vegetation features were assessed at each point where a soil sample was taken using a radius of 100m from the soil sample point: this assessment considered general characteristics of the forest. General characteristics include forest type, species association, species dominance, and correlation between species association and soil type. *(This exercise was particularly important for setting out the buffer zone on right bank Essequibo River because not all riparian vegetation is the same and some parcels of forest contain extensive stands of Dakama (Dimorphandra conjugate), a species that will not be harvested. Similarly, there is considerable variation in soil properties along the river banks).*

b) Secondly, the merchantable stock for the general geographic area was addressed using data from 100% pre-harvest inventories from four clusters of blocks, one cluster within the Maam Compartment, and three clusters from neighbouring concessions (see Annex XII); a total sample area of 3100 ha was assessed.

c) Finally, 100% inventory data for 35 blocks in the Maam Compartment-where operations will start-were analyzed in some detail.

Table 13: Forest Types prevalent with SFEP 01/12 (GFC July 2015)

#	Forest Type	Area (ha)	%	Common species
1	1a Mixed forest, undulating or hilly terrain	21,517.59	16.20	Greenheart, Wamara, Black Kakaralli
2	1b Mixed forests on flat to undulating forests, generally on clay	1,734.98	1.31	Greenheart, Black Kakaralli
3	1d Liana forest	6,107.62	4.60	Parakusan, Apokuito,
4	1e Mixed forests on flat terrain with regular canopy on brown sands	70,432.34	53.01	Greenheart, Baromalli, Locust, Suya, Wamara, Black Kakaralli, Kauta
5	1h Mixed forest on moderate to steep slopes	4,403.23	3.31	Greenheart, Black Kakaralli, Wamara, Purpleheart
6	1k low mixed forests on lateritic soils	297.51	0.22	Greenheart, Kakaralli, Kauta
	1n Low forest occurring as patches in 1 and 1e	586.89	0.44	Black Kakaralli, Cocorite palm
7	2a Wallaba on flat white sand ridges	9,153.05	6.89	Wallaba, Baromalli, Fukadi, Korokororo
8	2c Low poor Wallaba-Dakama forest on flat white sand	3,953.16	2.98	Futui, Tauroniro, Cocorite palm
9	2d Dakama-Muri scrub and bare white sand	3,308.97	2.49	Dakama, Tauroniro, Duka
10	3 Low swamp	1,472.75	1.11	Mora, Crabwood, Manni, Trysil
11	3b Mora forest on alluvial clay	6,798.95	5.12	White cedar, Morabukea,
12	No data	3,096.16	2.33	
TOTAL		**132,863.21**	**100.0**	

Discussion

The following conclusions are based on observations recorded during the soil (and forest assessment) exercise;

a) The emergent species (with crown height >40m) are Mora (*Mora excelsa*) and Baromalli (*Catostemma spp*). The main canopy was dominated by Wamara (Swartzia spp), Kabukalli (Goupia glabra) and Dakama (*Dimorphandra conjugata*). The dominant species in the understory are palms of the genus *Astrocaryum* and *Maximiliana.*

b) Forest types within the area are not as sharply delineated as in other parts of Guyana.

c) Greenheart, wherever it occurs, does not show the same clumped growth as in other areas, for example Bartica Triangle.

d) The areas on right bank Essequibo River, below Acromakra Falls are fairly flat, though there are low ~2m cliffs near the river bank and it is apparent that the area floods during the rainy season. For areas above Acromakra Falls, the areas on right bank Essequibo River are swampy for the most part, and will be unsuitable for logging.

e) There are a large number of trees of popular commercial species along the banks of Essequibo River and the Berbice River, respectively. However many have poor form, crown damage and defects and soils prone to water logging in the rainy season create inoperable conditions for logging.

f) There is evidence of extensive flooding along the banks of all the rivers during the rainy season: and there are two consequences, the flood plain for the rivers extend to a depth of up to 500m, and there is merging of the waters from different streams during the rainy season.

g) There are several areas where there are a large number of fallen trees on the forest floor: these occur in low lying areas and one suspects that on clayey soils in low lying terrain, the emergent trees cannot withstand waterlogged conditions for extended periods. There are also small patches of fallen trees apparently due to violent localized gusts of strong wind (see Figure 29).

Figure 29: Evidence of strong winds, note broken tops of trees

Where these occur, the palms referred to are abundant and there are a large number of juvenile trees and thick growth of lianas. This also creates a relatively dark understory which appear ideal for wild hogs, deer and pumas because tracks and scat were seen everywhere.

In respect of merchantable trees, based on pre-harvest inventory data the following observations were made:

a) Among merchantable species, more than 50% of the trees are less than 60cm in dbh.

b) The dominant (>76%) merchantable species in the lower diameter 40-59cm class is Wamara

c) The species that are typical for the highest diameter classes (>100cm) are Darina, Locust and Muniridan

d) For a probability level of 95%, the estimated sound *merchantable* volume of timber per hectare is **10.61.80m^3 ±2.05m^3.**

e) Similarly, for a probability level of 95%, the estimated number of merchantable trees per hectare is 3.02±0.45.

Finally, an analysis of pre-harvest data for 35 blocks (3500ha) collected by VWL, which in the opinion of the consultants is similar to types for most of the concession area, show that Wamara is the dominant species in the diameter class 40-59cm (see Figures 30a, 30b).

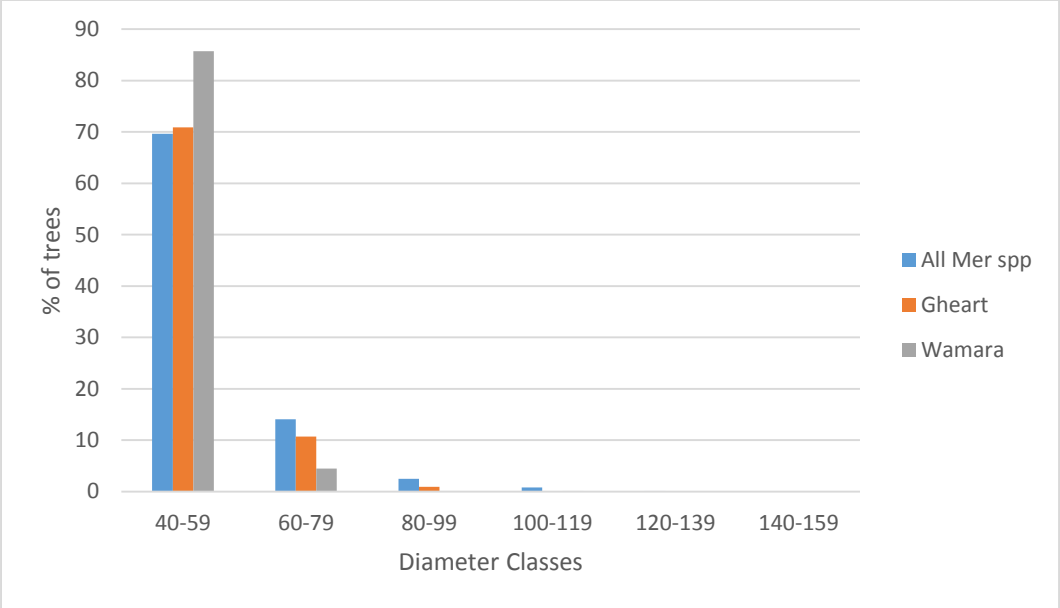

Figure 30 (a) Chart showing distribution of diameter classes

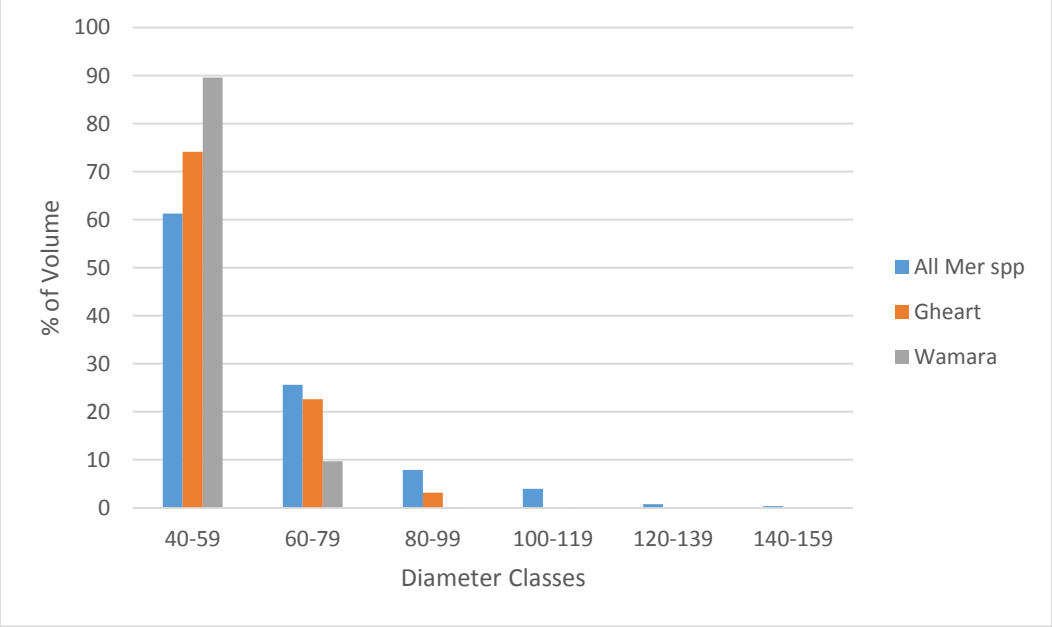

Figure 30 (b) Chart showing distribution of volume by diameter classes

The vegetation along the Berbice River itself is quite interesting (Figures 31, 32) and reflects instability in climatic conditions and therefore ground conditions. During the dry season, many creeks dry out completely and in the rainy season there is extensive flooding

Figure 31: Exquisite vegetation: Left: *Victoria regia*; **Right:** *Astrocaryum spp*.

Figure 32: A diversity of plant forms, upper Berbice River, including Aroids

A list of the commercial species encountered in VWL's concession is listed in Annex XIII.

5.3.2 Fauna

Introduction

In the assessment of the fauna of the district, the consultants relied on two experts, Mr. Mike Tamessar[4] and Mr. Phillip Odwin[5] both of whom have had considerable experience doing wildlife collections in Guyana. Mr. Tamessar in particular worked for several years at the University of Guyana and with the Smithsonian Institute (Washington, DC) and he participated in several faunal surveys linked to ESIAs in Guyana, including that for Case Timbers Limited (Welch, 2003).

The team also reviewed the recent work done WWF's Biodiversity Assessment Teams (BAT) on the Berbice Corentyne watershed (WWF-Guianas, 2014) as well as a recent biodiversity surveys conducted at IIC Field Station (Bicknell, Struebig and Davies, 2015).

The team's main objective during faunal surveys was to collect as many specimens and observations as possible to help Mr. Tamessar to review or validate the information he recorded earlier based his extensive work experience in the area (see Annex XV). Onsite, (in situ) identifications were conducted by Mr. Phillip Odwin.

Methodology

Faunal studies were conducted over several three day periods during the dry season and the wet season, during period December 2014 to February 2016. Patrols were done randomly along roads, following cut lines along the forest floor and by boat along creeks. Night patrols were also carried out between 18:00pm and 22:00pm with special listening exercises between 5:30am and 6:30 am each day.

The team used both active and passive means to record the presence of wildlife. Active methods involved the use of fishing tackle, nets for trapping bats and cages for trapping small animals. Passive methods simply involved traversing the forest floor via cut lines used for forest inventory (during the dry season or drifting exercises along rivers and creeks with a light bateau type craft simply observing fauna which (inadvertently) revealed themselves. The team used a Nikon 3300 camera with telescopic lens, binoculars, fishing tackle, nets, torchlights and traps to capture wildlife (see Figures 33).

The dry season was more productive for assessing faunal populations than the wet season, mainly because of extensive flooding of the forest floor during the rainy season. Early morning and late afternoon walks were more productive in terms of observing animals. In several instances, during encounters with monkeys, large mammals and caimans, one got the impression that these had never seen a human being before. A sample of the fauna recorded is set out in Figures 34 through 39 while the full record is presented in Annex XV.

The traps proved the least successful measure to capture wildlife and the team suspects that the human scent on the cage and on the fruits (-the fruits used were bought in Linden) prevented the animals from approximating the traps.

[4] Mr. Tamessar declined to register as a consultant because of health issues.
[5] Mr. Odwin, a Bartican, is an expert in the identification of birds and fishes.

Figure 33: Illustration of some of the means used for locating and identifying fauna

Figure 34: Examples of fish specimens recorded during faunal surveys.

Figure 35: A few of the mammalian species recorded during faunal surveys

Figure 36: Reptilian species recorded in the concession area

Figure 37: Photo showing a couple of amphibian species recorded during faunal surveys

Figure 38: Photographs of insects recorded for the concession.

Figure 39: Avifaunal species observed within the concession area

Discussion

The concession area is rich in fauna. The 40 year cycle adopted by the developer will witness much localized disturbances to the forest environment. Further, the developer will use RIL practices which prevents unnecessary forest gaps and forest fragmentation. RIL does not induce detectable changes in the relative abundance of medium and large vertebrates between unlogged and logged forests (Lanfer, Michalski & Peres, 2015). The most important thing however is that the company does not encourage hunting and fishing on its concession; this does not apply to subsistence level traditional hunting and fishing by indigenous peoples.

The Berbice River Corridor

To date, no hunter or fisherman seems to traverse the Berbice River above Duck River, due no doubt to physical challenges in using the river. One can only traverse the Berbice River above Duck River at the peak of the rainy season; at the peak of the rainy season when the river overtops its banks, hunting and fishing are not feasible. In the dry season, it's difficult to traverse the river due to rock outcrops.

It is the opinion of the consultants that the river is a natural barrier, protecting fauna in the upper Essequibo-Corentyne Watersheds.

The Essequibo River Corridor

During reconnaissance trips to the right bank Essequibo River, evidence of hunting and fishing were observed over the entire boundary. It was also observed that birds (especially parrots and macaws were flying across the river in both directions and it is reasonable to assume that animals such as deer, tapir and wild hogs traverse the river on a regular basis.

During just one 10 hour reconnaissance trip on December 10, 2016 on a rainy day in the Essequibo River, between Kurupukari and Pakani Landing, the consulting team recorded from simple observation, the presence of 74 birds, five species of fishes, three species of monkeys, a frog, a lizard and several caimans. The team used a bateau type aluminum boat and a 40hp outboard motor; the implication here is that a quieter mode of travel might have led to the revelation of even more fauna.

The consultants reviewed, and the developer is quite interested in work done by IIC in relation to faunal studies. According to a note published by the Community & Tourism Services in relation to the Iwokrama Canopy Walkway, there is substantial faunal resources recorded within the Iwokrama forests: 200 mammals, 500 birds, 420 species of fishes, and 150 species of amphibians and reptiles.

VWL will collaborate with IIC to explore mechanisms for supporting the census of wildlife and the unimpeded movement of fauna across the Essequibo River Corridor.

5.4 The Socio-economic environment

5.4.1 Current Land use

Several aerial surveys over the concession did not reveal any human presence or human habitation **within** the concession area. On the ground though, aged slash marks on Bulletwood (*Manilkara bidentata*) trees can be related to the Balata trade based at Apoteri, left bank Essequibo River (Region 9). Residents also reported that there was a Water Gauge Station on right bank Essequibo River and some old metallic objects (see Figure 5, Map 1) have been noted by the consulting team.

On the right bank Essequibo River, old camp frames, a fisherman's camp (see Figure 4) pieces of seine and a hunter's perch (wabini) are the only evidence of any current human activity ***within*** the concession area. There are no roads in the area, save for those put in by VWL for access purposes generally and forest inventory in particular. A number of trails (for example one linking Pakani Landing with the upper Demerara River), probably used during the balata trade appears on the map of the concession area (see Map 1) but these have not yet been detected on the ground. The area is occupied primarily by dense, intact forests, including some scrub forests.

The residents of Fairview reported that they have been fishing and hunting on the right bank of the Essequibo River, particularly in the vicinity of Maam Creek. (This would be true also for all persons transiting the Essequibo River between Kurupukari and King William Falls via Apoteri, although the tourists will most likely be engaged in sport fishing. Tourists do camp out on right bank Essequibo River from time to time to savour the aesthetics of the Essequibo River basin, especially at sunset.

Areas north of Maam Creek, including areas on the right bank Maam Creek have already been allocated under logging concessions TSA 2/91 and TSA 3/91 held by Guyana Timbers Limited. However, although DTL has been logging those areas, there were no specific complaints from the residents of Fairview.

Some 97% of the concession area has been granted to the mining community primarily for the exploration of gold. To date none of the concessions have been developed and the consultants have been unable to identify any specific area where even reconnaissance work is being done. *(The consultants' experience is that loggers rely on the logging community to build roads, which they then use to access their mining concessions; for example, Buck Hall Road logging road built by Barama Company Limited now witnesses heavy use by the mining community).*

In the northern part of the forest concession, there is evidence of recent forest fires within Dakama Forests

Whatever scenario or decision emerges however, there are three questions that would occupy the minds of the forestry developer and hopefully policy makers:

a) Where there is competing land use, specifically, mining and forestry, is sustainable forest management a realistic proposition. Will residual or post-harvest merchantable timber stocks deliberately be available for the next harvest?

b) How will critical physical parameters such as water quality, air quality and noise levels be monitored and how will the responsibility for keeping those parameters within tolerable limits be assigned?

c) What will be the situation with typical overhead costs for all loggers, including for example road maintenance costs and acreage fees? Given the costs for pre-harvest inventory, what happens when the logger cannot in fact harvest the blocks due to occupancy or the blocks are otherwise rendered inoperable?

For the logger, there are also issues of:

i. security for personnel and production assets spread across the concession area;
ii. the need for unfettered passage for logging trucks and utility trucks respectively;
iii. the preservation of biodiversity reserves;
iv. the physical disruption of signposts, block and strip lines, and skid trails; and
v. restricted access to certain areas of the concession occupied by miners.

Normally, mining activities are manageable, especially where only a single miner is involved with the mining concessions. There is an example at DTL, where miners and logging teams operate side by side. The problems arise when there is a 'shout' then hordes of itinerant miners descend on the target 'shout' area.

It is necessary to point out too that mining activities also attract or are typically associated with other kinds of business, some of which are unsavory in nature.

5.4.2 Communities

5.4.2.1 Upper Berbice Residents

Brief profile of communities

There are no communities **within** the concession area, neither are there any farms or any structure or materials that indicate actual human presence within the area. However, areas north of the concession area, and in particular along the UNAMCO Road are being harvested by people who live mostly at Ituni, Kwakwani, Hururu and Aroaima.

The people who live, work, or transit the UNAMCO Road would be impacted when the logging operations get into full gear. In order to assess these impacts, a social survey (see questionnaire used in Annex XVI) was conducted with persons, most of whom were members the various several loggers' associations that have forest concessions in the upper Region 10 district; also, RDC staffs at Kwakwani and Linden were also interviewed. A total of 59 persons were interviewed as follows: UNAMCO Road (4), Jeep Landing (1), Kwakwani (19), Hururu (7), Ituni (19) and Linden (9).

Stakeholder issues

Although many loggers alluded to issues of forest conservation, in essence, on the basis of more informal conversation, their real concerns were based on their personal livelihoods, and to what extent they can benefit from the development of VWL's project. For example, there is a direct economic link between the quality of logging roads in the upper left bank Berbice River and the viability of 'small loggers' operating there and their interest in VWL is strongly linked to VWL's work on the UNAMCO Road. VWL also rents (skidding) equipment to loggers in the lower UNAMCO road in accordance with terms agreed with the GFC (see Annex IX) and on occasion, purchase logs from them: direct *trade* between VWL and small loggers in the upper Berbice District is about US$50,000 per annum.

For the Kwakwani sub-region administration, economic activity is the key to the development of the region and improvement in social services.

5.4.2.2 Communities in the North Rupununi

All the consultants[6] have interacted with communities in the North Rupununi for many years; in particular, the consultants have been dealing with residents of Apoteri and REWA respectively for a number of years.

The management of VWL engaged with and consulted the Toshaos of Rewa and of Apoteri since 2012 and 2014. The company received their support and representatives of the two communities accompanied the Operations Director and his team to the concession area for reconnaissance works in Pakani area.

The logging project being developed by VWL generates interest in mostly in three communities: Fairview Amerindian Village, Apoteri Amerindian Village and Rewa Amerindian Village. Stakeholders have also asked that Crash Water be considered. All communities in the North Rupununi keep abreast of developments in the general region through meetings of the NRDDB[7] and many developments in that area involve several communities.

Profile of the communities

Fair View Amerindian Village[8] is situated on the left bank or the western bank of the Essequibo River at crossing and is also known historically as Kurupukari. It is located adjacent to the Linden-Lethem Road which was first completed in 1992. Fair View obtained title for its Village Lands in 2006. Its titled lands consist of approximately 21,950.82 hectares. It is the only Amerindian territory located

[6] The team leader has been visiting Apoteri in various capacities since 2010; Mr. Eustace Alexander was engaged directly for many years with the communities of Crash water, Rewa and Apoteri in the management of CI's Conservation Concession; and EES has had consultations with the community in relation to an ESIA (for BAIHSANLIN).

[7] The team leader sought permission to attend a meeting of the NRDDB scheduled for November 2016 but there was no response.

[8] nrddb.org/communities/fairview

within the Iwokrama Forest Programme Site and as such has special rights-holder relations with the Iwokrama International Centre for Rain Forest Conservation and Development. Fairview has a population of about 232 persons spread over 41 households. The people are of the Makushi, Wapishiana and Patamona tribes. The principal occupation of the people there are farming, fishing and hunting. Those with a preference for paid employment have been able to get jobs as rangers, boat captains and tourism workers with IIC.

Apoteri Village[9] occupies an area of 71.88km2 and has a population of about 283 persons spread over 52 households. The people are of the Wapishiana, Macushi and Patamona tribes and their primary occupations are hunting and fishing. Apoteri village is located between the Rupununi and Essequibo rivers. The name Apoteri comes from the Arawak name of a tree. The history and development of Apoteri village is closely tied to the balata industry. In the 1970s Apoteri was formed as a base for the business firm, Booker Brothers, McConnell & Company, popularly known as Bookers. Workers from all over the region came to work there mainly from villages in the south Rupununi like Shea, Sand Creek, Sawariwau and Kraudarnau. Today the village has several tribes including Patamona, Wapishiana and Makushi.

In 1973 the village got its first paid teacher and others villages namely Rewa, also came to attend the school. The community credits retired Headmaster and longtime resident, Naidu (from Anna Regina) with the high standard of education and the progression of several students to secondary school in recent years. In 1987 Guyana Stores started working in the area. The main activities in the community are mainly agricultural such as farming cash crops, planting peanut and fishing which was then bought by Guyana Stores. In 1998 Guyana Stores handed over its activities to the community. The community still relies heavily on subsistence farming and hunting.

Apoteri village has been a member of the North Rupununi District Development Board (NRDDB) since 2002. In 2002, Conservation International Guyana (CIG) created a conservation concession in the upper Essequibo and Apoteri along with Rewa and Crash Water became stakeholder communities. The community now benefits annually from a small grant to support community development under the Voluntary Community Investment Fund (VCIF).

Rewa Village[10] has an area of 184.8km^2 and a population of 271 persons spread over 48 households. Rewa is a small developing community which is situated on the left bank of the Rupununi River. It is a recognized community and in 2008 received its land title. The name “Rewa” comes from the Wapishiana word for a tree called the Iliwa tree. During the years of 1940-1950s the Booker brothers, McConnell and company came to the area and introduced bleeding Balata latex from the bullet wood tree. Two men were involved in this operation George William and Nicolas Edwards. Most of the residence of Rewa originally came from Massara village but because of the population increase during the time of Balata bleeding the village was no longer large enough. Nicolas Edwards and his family moved to the area which is now Rewa in 1975, becoming the first family of the village.

Crash Water Village[11] (derived from the mispronunciation of *Kulashe-Wata*) has an area of km^2 and a population of 226 persons spread over 36 households. The people are from the Makushi and Wapishiana tribes. Crash Water Village, located in the North Rupununi district of Region 9, was originally called by the Makushi name for a bird; this was later distorted by the English language causing it to be known its current name. Prior to the establishment of the Village, the land was used

[9] http://indigenouspeoples.gov.gy/amerindian-villages/apoteri/
[10] http://indigenouspeoples.gov.gy/amerindian-villages/rewa/
[11] http://indigenouspeoples.gov.gy/amerindian-villages/crash%20water/

as farming ground for the people of Yakarinta. However, due to the difficulties experienced by children left in Yakarinta while their parents went farming in Crash Water; the farmers found it more convenient to establish a community in the vicinity of their farms. Hence, Crash Water Village was formed.

Residents of Fairview, Apoteri and REWA traverse the Essequibo River regularly on hunting and fishing expeditions. Residents of REWA and Apoteri were involved in early reconnaissance work on the concession area and offered support to VWL management in its logging enterprise, in so far that there is net material benefit for them. IIC and the villages of Apoteri and Rewa are working to develop co-monitoring mechanisms for the Essequibo River Corridor extending from Apoteri to Kurupukari. No doubt the proposed MOU between IIC and VWL will contribute to safeguarding the critical environment so valued by the communities

For residents of Crash Water, it is not economical to hunt or fish for domestic purposes in the Essequibo River due to the distance that they would need to traverse. They focus more on the creeks nearer to their community. They are however involved in projects that have a regional scope such as the Arapaima Project.

Stakeholder issues

In formal and informal discussions with representatives of the communities in the North Rupununi, three primary concerns of the residents of Fairview, Apoteri and REWA emerge:

a) Firstly they value their lifestyle, especially in terms of their *independence* and their *self-reliance*: the conservation of their fishing and hunting grounds is vital for them to savour their traditional lifestyle; for many residents, fishing in particular is a family affair.

b) Secondly, many of the younger skilled people such as boat captains (potentially) earn significant income from eco-tourism activities such as sport fishing along the Essequibo River. Eco-tourism type activities are well aligned with their lifestyles-work for short periods and still have time for traditional hunting and fishing activities. But ecotourism will only occur if the current geographic and aesthetic attributes of the upper Essequibo River is conserved and fish stocks are maintained at adequate levels. Therefore once logging does not lead to significant modification of their environment, they are not worried.

c) Another major general concern is that they demand respect from anyone traversing or occupying their lands for any reason. The Ministry of Indigenous Affairs has a protocol for anyone visiting an Indigenous Peoples' community: firstly, there is need for approval from the Ministry, then the approval letter should be presented to the Toshao of the village who would make the final determination about access to the village (lands).

It is the opinion of the consultants that the VWL project will have minimal impact on the communities of Fairview, Apoteri and Rewa. On the other hand, the development of the VWL's logging project will have significant positive benefits for the communities in the upper Berbice District (Kwakwani, Hururu, Aroaima and Ituni).

SECTION 6: IMPACTS AND RISKS

6.1 General discussion

The proposed project will have negative and positive direct and indirect impacts on the socio-economic environment, the physical environment and the biological environment. Most of the negative impacts will prevail throughout the operational phases of the project. Positive impacts revolve primarily around the partnerships and employment opportunities respectively created by the project. There will be *cumulative impacts* and in addition, on the basis developments by other developers, there will be synthesizing impacts. The scale and benefits resulting from the project itself will therefore depend to a major extent on the future development strategies adopted by the VWL for the development of the forest concession and associated emerging impacts from activities by other developers, particularly in the mining sector. These impacts are related below.

6.2 The Socio-economic environment

6.2.1 Effects on Labour, Employment

Description

VWL requires a number of skilled and unskilled operatives to take forward its logging operations. VWL has over the years built up teams of workers to undertake logging operations. Recruitment is well planned and there are frequent briefing sessions to lay out the company's rules regarding its field operations and all aspects of corporate discipline, including matters of OSH. Nevertheless, there will is a frequent need to recruit new field operatives. Field operatives are generally deployed in small temporary camps for the purpose of conducting forest inventory, constructing roads or conducting felling and skidding operations.

Impacts

The association of workers from different geographic regions in camps can result in both positive and negative social and economic impacts. Persons encamped share skills and experiences and become more skilled as time passes: skilled persons generally produce a better quality of work and also earn more income. On the other hand, some persons might be forced to compromise on, for example, their dietary or religious preferences due to peer pressure; on their return to their normal residences, there could be conflicts with family values.

The pursuance of logging operations in the area will increase the critical mass of people necessary for public officials to provide social services to designated areas within Regions 6, 8 and 10. Such a critical mass of people will also attract businesses and contribute to fostering local economic activity. On the other hand, more people in the Upper Regions 6 and 8 will lead to an increase in demand for food, fuel and housing materials with consequent impacts on prices for goods elsewhere (for example in Kwakwani) and pressure on forest resources, to provide building materials. However, the extent to which these impacts occur will depend largely upon the number and physical extent of work camps and ancillary facilities.

The expansion of VWL's workforce could draw on skills sets from other enterprises in other geographic areas, which in turn could affect economic activity in those areas, either due to decreased economic activities through the loss of the skills sets or the need to recruit and train other operatives.

Workers from Region 9 prefer self-employment and cannot be relied upon to spend several years with the same enterprise; on the other hand workers from Region 6 (Kwakwani-Aroaima-Hururu-Ituni Districts) appear more inclined to accept long term employment and problems associated with, male-absenteeism-for example inadequate *paternal instilled* discipline for children.

Positive socio-economic impacts can occur whenever loggers make it a policy to employ people who live within or near to the concession area. The additional income energizes the communities, improves their welfare, and provides the youth and sometimes women with employment and a chance to learn a new skill.

Cumulative impacts

Increased employment opportunities and skills development could make it feasible for people already residing in the upper Berbice district to remain there. Once sufficient people remain in the area, there is the opportunity for the Government to improve the level and range of social services that could further enhance the welfare of the residents. This would lead to rural development and reduce the incidences of people migrating to urban centers on the coastland.

6.2.2 Social issues

Description and analysis

VWL needs to set up a small encampments at strategic positions within the concession area to control its field operations. There is the tendency for opportunists with various specialties (for examples vendors of clothes, rations, cigarettes and alcoholic beverages) to engage with people in such encampments in the attempt to themselves earn money.

Impacts

The incidence of vendors at encampments can lead to the demand for cash transactions which could create security issues for the company. Vendors could also breach VWL's SOPs by introducing disagreeable behaviour (for example the drinking of alcoholic beverages or gambling) among field operatives that lead to indiscipline with negative impacts on productivity.

Indirect impacts

Frequent problems among field operatives could affect the viability of the company which in turn could lead to a reduced scale of operations or the retrenchment of workers.

Cumulative impacts

Any undue pressure on VWL, in terms of its inability to meet production targets could lead to reduced income levels at Kwakwani, which in turn could affect the viability of other businesses established at Kwakwani. Retrenchment of workers could lead to temporary disruption of family structures as the retrenched persons seek out new employment.

6.2.3 Road Safety

Description and analysis

VWL will be hauling logs, preferably by day, from the concession area to Bamboo Landing using two 6x6 or 6x4 heavy-duty trucks carrying about 35m^3 of timber These trucks will use VWL's private

logging road via WCL 1/2007 then traverse some 40km of public road, including the northern part of the UNAMCO road for a distance of about 28km.

Several other loggers already transport up to timber using 6x6 heavy duty trucks with pole trailers (see Figure 40) while others carry lumber on 4 x 4 or 6 x 6 ex-military trucks; some loggers also transport logs using containers. There are also 4x4 pickups, cars and motor cycles using the UNAMCO Road on a regular basis.

The UNAMCO road itself has long steep grades, very sharp turns and is very narrow at some points, to the extent that a loaded truck is unlikely to travel at an average speed of about 25 miles per hour (40km/hr.).

At various locations there are camps and workshops near the margin of the road. There are also old vehicles and wood debris on the road margin.

Fig 40: Hazard presented by logging trucks travelling along the UNAMCO Road in the dry season

Impact

Traffic accidents are likely to be highly significant direct impact during the entire logging project. Serious accidents are likely due to a combination of excessive speed, visibility impaired by dust, adverse road surfaces and camber, poor vehicle condition, and driving impaired by drinking or drugs. It is therefore necessary that the VWL adopts a zero tolerance policy with regard to occupational health and safety and ensure that all workers are exposed to basic training for good practices.

Indirect impact.

The use of the road by VWL's vehicles could lead to enterprises concluding that it is worthwhile establishing mechanical/ vulcanizing shops, a parlour or restaurant, which in turn will create employment for people and also security issues. Roads also provide the opportunity for other developers to access the concession to explore economic ventures in hunting and fishing, no-timber forest products, agriculture, mining or ecotourism.

Cumulative impacts

The need to transport lumber to Bamboo Landing, when added to the requirements of other fuel users, would lead to more business for oil companies, fuel bowsers, and retailers. The increase in the volume of fuel transported could result in:

a) employment opportunities for more people;
b) a higher national fuel bill
c) the risk of spillage and its dire consequences.

6.2.4 Regional Development

Project implementation will have direct effects on Government finances. A successful logging operation yielding revenues to the Government may, in the long term, attract a corresponding attention by public (and regional) officials towards road maintenance in particular and regional development in general.

There may be a possibility for the developer to assist with improved forestry and security services respectively in the upper Berbice District. The new operation will attract the presence of a forest station and the security services would have a natural interest in new access points created within the concession area, leading to a strengthened police presence in the Kwakwani-Ituni area, more regular and random patrols along UNAMCO Road or the establishment of a Police Station in the Canister Area[12].

GGMC will also expand its patrol services in the Upper Berbice based on the scale of mining activity.

Expanded activities in the Upper Berbice could lead to expanded economic activity in Kwakwani and consequently, the development of that community's social infrastructure.

Implementation of the project will have major impacts on regional development due primarily to improved incomes and services provided by the proposed project. It will also encourage economic activities, specifically the trade in rations, beverages, clothing and electronic items.

To the extent that persons from the surrounding communities are employed, this project is likely to result in significant increases in *per capita* income for those residents who can capitalize on the economic opportunities that will arise. However, in the absence of complimentary investments and mitigation measures, the project will probably result in significant negative impacts on health (accelerated introduction and transmission of diseases) crime and social problems (principally related to drugs and alcohol, but also concerning abuse and exploitation of women).

[12] VWL has already expressed interest in supporting security initiatives in the Upper Berbice District.

6.2.5 Conflicts

Description and analysis

The establishment of signposts on the perimeter of the concession area and on the perimeter of compartments, the zoning of the forest concession into productive and non-productive areas, the need to conserve biodiversity reserves, and the need to push roads and skid trails along specific routes, may restrict in some measure, the movement of people.

Logging roads provide access to remote sites or allow other parties better or faster routes to *miners,* to hunters and to fishermen. Any restriction is distasteful, and there is no desire to interfere with legitimate resource users. VWL will have a large number of assets, including heavy duty tractors, trucks, generators, water-pumps, lumber and fuel and the company must take measures to protect its assets. The company also needs to safeguard its primary resources-standing trees- from illicit operations.

Impacts

Transport crews, hunters, fishermen and other residents will be restricted from entering or using areas occupied by VWL's workforce. Such restrictions could lead to conflicts with persons who have the need to use such areas, for example miners, or hunters and fishermen supplying businesses in Kwakwani, Linden or Georgetown with meat.

Indirect impacts

Prolonged conflicts could lead to individuals and families migrating away from the Region 10 district to other locations with some changes in life styles. Serious changes in life-style could lead to domestic problems in the case of families.

Cumulative impacts

The extent of cumulative impacts depends on the number of people affected by restrictions, the particular set of activities in which they are involved, and their position in a supply chain. For example, consider a hunter who traditionally hunted within the concession area and sold wild meat to vendors at Kwakwani. The inability to hunt would reduce or even eliminate supplies to the vendor who in turn may raise the price of stocks of meat at hand due to the limited supply; in turn, certain restaurants in the city that sell 'exotic' dishes may be unable to do so for a while and may even lose some of its customers; if the restaurant loses a few customers, it may retrench a few employees. In addition, the hunter would lose income with potentially grave domestic consequences.

The development of concessions to the south and south-east of that held by VWL will witness the need to use the company's roads and avoid a situation where the road density across the entire Essequibo Watershed is reduced to the minimum necessary. Eventually the road network will transform the entire region as mining, logging and other developments occur.

6.3 Impacts on the physical environment

6.3.1 Earthworks

Description and analysis

VWL is expected to construct more than 300 km of primary and secondary roads and skid trails to access timber resources within the concession area over a ten year period. Closely associated with

road construction are the necessary side drains that require scouring the soil for up to ten meters from the road margin, the construction of bridges and culverts, and the layout of borrow pits. Studies have concluded that 90% or more of the non-point source pollution caused by forestry operations can be attributed to the construction of logging roads and log markets (Walbridge, 1997).

VWL will make decisions based on a number of variables during the planning stages of the operations. The design and quality of each road segment will be based on the terrain, the soil type, the volume of timber to be extracted, the duration of road use, and the kind of logging trucks to be deployed (for example 6 x 4 heavy-duty trucks). Road development will follow the sequence of use of the compartments and earthworks for roads will be carried out well in advance of their actual use for hauling timber to allow for the consolidation of the road base. As far as practicable, most road works will be carried out at the peak of the dry season.

In addition to *road works*, VWL will have to address several other activities requiring earthworks. VWL will have to clear a large number of small areas to store logs (at a density of $600m^2/1{,}000{,}000m^2$). *(Naturally the site for log markets is selected with great care and since their constructions incur costs, use will be made of existing clearings as far as possible).*

In the long term, fuel depots, machine servicing areas, and camps and ancillary facilities for employees will have to be constructed.

Impacts

The construction *and the regular maintenance* of logging roads, create direct environmental impacts through activities such as grubbing trees, cut and fill earthworks, side drain construction, and bridge and culvert construction. These activities lead to scarification of the soil surface, exposure of sub-soils, erosion, degradation of soil structure and compaction-with corresponding changes in its capacity to absorb water, sustain micro-fauna or support regeneration of trees in the short term. Oil spills from the use of machinery modifies soil aeration, soil humidity and soil ph. The use of heavy duty machines also produce vibration.

Clearing large sites create drastic changes in the micro-environment because it requires denuding small patches soil of its vegetative cover, with drastic changes in micro-climate. The exposed soil dries out and may easily erode if rain falls afterwards. Some soils, when denuded of trees, are leached severely by rainfall. Additionally, the repeated passage of heavy machines over bare ground results in a compacted soil which, beyond reducing soil permeability, also stymies seed germination. In the case of soils with low permeability, some rutting and ponding of water could also occur.

The impacts from earth works are extensive, irreversible because the road will stay in place and will be maintained by the same activities that produced the road in the first place. These impacts also have a high probability of occurrence because roads, skid trails and clearings are essential to the logging activity. Generally, impacts from road works will be localized.

Indirect impacts occur when loose or eroded soil is washed down into waterways, affecting water temperature, water turbidity, water ph, and oxygen levels. These changes will kill some types of fauna outright while probably favouring other types of fauna. Water ponding promotes the breeding of mosquitoes and certain reptiles such as frogs. Frequent sediment loads lead to the migration of riverine fauna to other areas.

New vegetative growth at the sides of roads and clearings such as *Cecropia spp.* support species such as deer, tapir and agouti which in turn attracts predators such as the jaguar and pumas. For this reason,

there is normally a heavy population of fauna in logged over areas. With all the mining and human populations within WCL 1/2007, just north of the SFEP, jaguars can be observed in the area, clear testimony to the availability of large herbivores.

Evidence from the mining sector and in some cases the forestry sector indicate that poor soil management practices have several cumulative impacts. Malaria is more prevalent in areas where earthworks are not properly managed, and malaria affects the human population over extensive areas. When targeted species migrate further inland, hunters and fishermen must either cover greater distances, then meat and fish become more expensive and lead to a higher cost of living, or a modification of lifestyle (through a departure from traditional food sources).

6.3.2 Air quality

Description and analysis

Air quality is subject to dust arising from earthworks (such as soil excavation from borrow pits and bulldozing of soil) and from the movement of machines for the transportation, unloading and spreading of soil materials. Air quality is also subject to the receipt of vehicular emissions.

During the dry season in particular, dust will be found along road corridors each time a vehicle passes (see Figure 17). The creation of forest gaps after tree fall will lead to changes in air quality (light, temperature and humidity) in the under-storey. The duration of impact depend on prevailing wind speed and direction.

Fumes emitted from engine exhausts under normal tropical forest conditions seemingly dissipates very quickly, and is hardly noticeable (to humans) after a few minutes. VWL's logging operations will occur in stages, at specific locations, and at specific times; and therefore the vehicular emissions and the dust will be localized and also negligible relative to the total concession area.

Impacts

Dust and smoke provoke changes in microclimate at work sites and along road ways, especially in the dry season. However, such impacts are considered negligible, relative to the total mass of air prevailing at the concession. Apart from dust and smoke, there is a drastic change in microclimates (mainly in temperature, light and humidity), every time a tree is felled or a clearing produced. These impacts will occur regularly but their effect will be negligible because of the high relative humidity and low wind speed within forests.

6.3.3 Water resources

Description and analysis

The concession has a high drainage density (0.8km/100 hectares). VWL will take advantage of this water for *domestic* purposes. Likewise people who travel through the concession area and fauna use this water. Waterways near roads are easily contaminated with sediment, easily discoloured after rainfall. VWL will not use any river to transport logs or any other materials.

Once VWL starts to do logging, there could be some incremental increases in sediment loads in waterways, even though VWL will take proper precautions in road alignment and road and skid trail construction. VWL will put in place mechanisms to monitor water quality, using the baseline data already collected.

Impacts

'Timber harvesting leads to the alteration of stream sediment loads, turbidity, and solute chemistry, changes in hydrology and fluvial geomorphology, and shifts in stream incident light and temperature regimes; also the physical and chemical alterations of aquatic systems have ecological consequences, including the loss of in-stream and riparian zone biodiversity, decreases in the abundance of fish and benthic invertebrates that are intolerant of high sedimentation, and the facilitation of invasion by exotic species' (Fimbel, Grajal, & Robinson, 2001)

Surface runoff generally occurs wherever there is a logging operation, leading to larger and rapid surges in rivers after rainfall. On the other hand, increased runoff results in less water infiltrating to the sub-soils and this has an effect on the duration of stream flow. Logging may therefore lead to a more erratic stream flow in the short term. Increased runoff also leads to accelerated erosion which dumps larger volumes of sediments in waterways with effects on water turbidity, ph and oxygen bearing capacity. Where small amounts of petroleum derivatives or detergent enter streams (such as when persons wash vehicles near streams) water quality deteriorates. Water contaminated with oil and debris may cause several gastro-intestinal diseases. Artificial ponding of water could lead to a drastic increase in mosquitoes that cause Dengue fever and Malaria.

The overall impact will be short term and negligible as logging will be concentrated on very small areas for a limited time (due to the systematic method of working).

6.4 Impacts on the ecological/biological environment

6.4.1 Timber harvesting

Description and analysis

Tree felling is unavoidable. Trees will be bulldozed along areas targeted for road and skid trail construction respectively; normally, as far as practicable, areas with light vegetation, for example Muri scrub are targeted.

The **selective** harvesting of mature trees will be the core activity in which VWL will be engaged. As is typical of approved logging operations, only trees of good form that have a diameter at breast height greater than 35 cm will be felled. To a major extent, the magnitude and extent of the impacts of logging depends on the stocking. The higher the stocking, the more intensive will be the logging activity and the heavier the impact.

Impacts

Timber harvesting will have major impacts on the biological environment. There will be the denudation of areas targeted for road, skid trail and log market construction. There will be damage to or destruction of juvenile trees during tree felling activities even though directional felling techniques will be employed. Felling trees also lead to the genetic erosion of some species, because trees of good form will be removed from the populations. ; lead to a decline in soil fertility because in nutrient poor soils, a substantial reservoir of nutrients occurs only in the live vegetation. Timber harvesting leads to reduced biodiversity because many tree species of high commercial value occur at very low densities (number of individuals/square kilometre).

Indirect Impacts

Timber harvesting reduces the number of stems per hectare and will allow for winds of higher speed to pass through the canopy. This could provoke a higher incidence of wind thrown trees or damaged crowns of standing trees and their eventual demise.

Field teams engaged in logging frequently leave a considerable amount of debris (boxes, food containers, old filters, etc. on the forest floor, which spoils the aesthetic values of forests and possibly injure wildlife.

Cumulative Impacts

Forest inventory and tree felling brings field operatives in contact with patches of fertile soil which they could cultivate unless restricted from doing so. Such cultivation represents a conversion of small patches of forest to agricultural lands.

Timber harvesting requires the uses a variety of machines, fuel and lubricants. Machine components such as starters and batteries have high commercial value within mining communities. Similarly, fuel, water pumps, and generators are usually stolen from loggers. This necessitates the employment of security, which adds new operational costs.

Similarly, new roads and skid trails lead to better (easier) access to forest resources, creating several new economic or cultural opportunities. For example, many waterfalls, caves, minerals and wildlife that promote eco-tourism have been discovered as a result of forest inventories and the subsequent layout of skid trails. In addition, new assets of indigenous or archaeological importance are usually discovered in this manner.

6.4.2 Wildlife

Description and analysis

Annexes X indicates that faunal resources are quite diverse. It is apparent from the list of fauna mentioned, that fauna occupy all strata and niches along the vertical tree storeys, from regeneration to emergents. This is to be expected in extensive, prime tropical forests, where the tree canopy is virtually unbroken.

Impacts

All timber harvesting practices impact forest wildlife and their habitat. Logging directly impacts forest dependent wildlife through the destruction or degradation of habitat, disruption of faunal movements, and the interruption of ecological interactions between organisms. Indirectly logging increases accessibility to the forest, which frequently leads to hunting and land conversion activities (Fimbel, Grajal, & Robinson, 2001).

During the typical logging operation, there is the modification of animal habitats by: the removal of trees and consequent changes in micro-climate; the removal of food sources and cover; artificial ponding in previously dry areas; and changes in ecological relationships. Logging and other human activities create noise and vibrations, alteration in air quality and water quality which effectively chases fauna. There is evidence though that for most of the common animals, any such discomfort is very temporary. In logged over areas, most large herbivores and common birds are very common.

Indirect impacts

There is some evidence that wildlife benefits from the human presence. Field operatives tend to establish farms as they move through the forest concessions and abandoned farms seem to provide wildlife with new sources of food. Deer in particular are quite fond of old farms. New growth at road sides produce food for many herbivores; for example, tapirs are very fond of young *Cecropia* (Congo pump) trees. Jaguars are known to have a preference for forest roads.

Cumulative impacts

Many field operatives capture live fish suitable for aquaria, reptiles, some birds (parrots and macaws preferred) and the young of animals such as Agouti paca for commercial trade. This represents a very useful form of income and once legal can improve the quality of life of field operatives considerably. Many field operatives have stopped working with such enterprises after making more money trapping wildlife. Further, entire families are involved in animal trapping. At the national level, the whole country could benefit from wild life exports

6.4.3 Ecological relationships

Description and analysis

VWL's concession contains hundreds of species of fauna and flora respectively. However, the relationships between species and between species and the physical environment are not always apparent to the observer. These relationships are the essence of luxurious plant growth that provides a variety of commercial timber species, the basis for sourcing the forest concession.

The interventions into the timber resources need to be planned with great care, for while there is the opportunity to acquire substantial economic gains, there is the opportunity to destroy the ecological relationships and ecological functions that these forests provide. More importantly, substantial financial risks are involved in road construction costs.

Impacts

Timber harvests alter ecological relationships (plant-plant, plant-animal, and animal-animal) and generally puts one or the other at a disadvantage. Tree felling alters conditions in the under storey and jeopardize some fauna and flora; for example plants that thrive in shade (shade tolerant trees, or shade demanders) will lose vigour and probably die from shock if suddenly exposed to light. Similarly, an increase in light may result in an increase in the regeneration of non-commercial tree species in gaps created by tree felling. Animal-animal predation is likely to increase after logging, due to easier access for predators and less cover for prey.

Cumulative impacts

It is not possible at this time to quantify the value of biodiversity as well as the forest functions that produce, support and maintain such biodiversity. Neither is it possible to establish with any certainty the cultural or spiritual consequences of the loss of such biodiversity. Therefore logging forests is a serious **risk** with possibly serious potential cumulative impacts.

6. 5 Processing and other Waste

Description and Analysis

Bark is a major form of waste and not always suitable for land fill. Bark will be heaped, allowed to dry out and spread on the forest floor. Wood ends may be used for domestic cooking. Domestic garbage includes a mix of bottles, bags, cans, boxes, Styrofoam, plant residues, excess food and old clothing, paper, and paint. (These will for the most part be buried). Residual liquids from domestic sources (from washing wares and clothing, and from bathing), from washing vehicles, and from workshops also represent waste. Finally there is waste from machinery, including: old tyres, filters (air, fuel, transmission, and hydraulic), rags, seals, tubes, plugs, waste oil. Untreated waste has a potentially potent chemical mix comprising carbohydrates, inorganic solutions, sulphur compounds, methanol,

and nitrogen oxides all with the potential to pollute the environment, especially in Guyana, where there isn't the practice of recycling cans, bottles and paper.

Impacts.

Waste pollutes the surface of the ground and ground water. Decomposing garbage produces unpleasant odours. Waste facilitates the breeding of vectors such as flies, rats and cockroaches. When garbage contains water, there is an increase in the risk of typhoid, malaria and dengue fever. Waste materials create poor aesthetic appeals.

6.6 Other impacts

Indigenous, archaeological assets

Description and analysis

A number of assets of considerable cultural and historical significance are believed to occur within the concession area, given the proximity of communities in the North Rupununi. VWL intends to preserve such assets to the maximum extent possible. Any such assets are expected to be discovered during pre-harvest inventories and VWL will ensure that crews are trained to identify such assets (petroglyphs, caves, old tombs, old utensils or artefacts)

Impacts

Logging operations could potentially destroy assets of indigenous or archaeological value.

Cumulative impacts

The permanent loss of major information on Guyana's early history could be lost forever with grave implications for a shared understanding of Guyana's history.

Table 14: Potential environmental impacts generated by VWL's operations

Environmental Component	Nature of Impact	Impact Significance
Physical Environment		
Earth works	Grubbing and scarification of soil surface, sub-soil exposure , erosion, soil compaction	Ex: Ir: Lt: Un:M: Sig: Hp
Air quality	Dust and smoke (especially along roads), minor changes in microclimate, partial smothering of roadside dwellings	Lo: Ir: St: Un: Im: In: Hp
Water resources	Excessive sediments in waterways, decreased infiltration rates, modifications in water temperature, turbidity, ph; Pollution with oil	Lo: Ir: St: Un: Im: Sig: Hp Lo: Ir: Lt: Av: Im: In: Lp.
Soil	Excessive leaching (and consequent chemical, biological changes), water logging Pollution with oil	Lo: Ir: St: Un: Im: Sig: Hp Lo: Ir: Lt: Av: Im: In: Lp.
Biological/ecological environment		
Timber harvesting	Destruction of juvenile trees, genetic erosion of species decline in soil fertility due to removal of biomass from poor soils, Increased potential for blow downs of residual trees due to freer flow of air though the canopy/under-storey	Ex: Rev: St: Un: Im: In: Hp. Lo: Ir: Lt: Un: Im: In: Lp.
Wildlife	Modification, destruction of habitats (especially in terms of cover and food sources); depletion in number,/variety of some species	Ex: Rev: St: Un: Im: In: Hp
Ecological relationships	Major modifications of prevailing ecological relationships: plant-plant, plant-animal, animal-animal (for example predation)	Lo: Rev: Lt: Un: M: Sig: Hp.
Socio-economic Environment		
Conflicts	Restriction of access, alienation of rights, unplanned changes in life style (restrictions on hunting for example)	Lo: Rev: St: Av: M: Sig: Hp.
Employment	Skills transfer , training opportunities job creation, higher ore new incomes and cash flows	Ex: Ir: Lt: Un: Im: Sig: Hp
Social problems	Crime; use of alcohol; health risks, disagreeable behaviour	Ex: Rev: Lt: Av: M: Sig: Hp
Road hazards	Probability of fatal road accidents	Ex: Rev: Lt: Av: M: Sig: Hp.
Waste	Pollution of the air and water sources; the accelerated proliferation of vectors for various diseases such as malaria, typhoid and dengue fever	Ex: Rev: Lt: Av: M: Sig: Hp
Regional Development	Improvement of infrastructure	Ex: Irr: Lt: Un: Sig: Hp
Indigenous, archaeological assets	Loss, destruction or modification of the assets	Lo: Ir: Lt: Av: M: Sig: Lp.

Impact Significance (parameters)

Lo-**localised,** Ex-**Extensive/** Rev-**Reversible,** Ir-**reversible;/** St-**short term,** Lt-**long term/** Av-**Avoidable,** Un-**Unavoidable;**

M-**Mitigable,** Im-**Immitigable/** Sig-**Significant,** In- **Insignificant/**Hp-**High probability,** Lp-**Low probability**

SECTION 7: ANALYSIS OF ALTERNATIVES

7.1 Basic considerations

'No Logging' is not an option anymore for the simple reason that the ***entire*** concession area has been alienated for mining purposes. In addition, all the areas around the concession have been identified for logging. (Even within Iwokrama there is logging as provided for in its mandate.

Logging systems vary with the technology used and with timber product forming the primary output. Traditionally, the large logging companies have always opted to extract full length logs, giving sawmilling staff the option of choosing the desired dimensions of sawn timber.

Logging systems such as helicopter based extraction methods or the use aerial cable systems have not been tried in Guyana due primarily to challenging interior conditions, mainly fog, low clouds and frequent rain in the interior. In addition, many of the larger trees are covered with lianas that virtually tie them to several other trees, which could prove either dangerous or extremely time consuming if the aforementioned technologies were used. Another consideration is the variation in the basal form of trees; many local species of trees have huge buttresses or flutes that mitigate against the use of mechanized tree felling and/or self-loading equipment such as those that are popular in North America and Europe. Each tree requires special attention, in terms of verification of its form, its vigour, its location on the terrain and its position relative to other trees; in other words, local loggers must carry out *'tree marking'.*

There is the option of deploying portable sawmills on the concession area; however the company already has a huge established sawmill at Bamboo Landing and haul distance is manageable in the short term (because VWL maintains total control of 90% of its primary access road).

VWL has the option of pre-processing of logs at the Charabaru area conveying cants to Bamboo Landing, thereby conveying less waste and optimizing the use of the logging trucks.

7.2 VWL's logging option

VWL has three major advantages in planning the development of the concession area. Firstly, the company has experience through the management of WCL 1/2007 Limited. VWL is familiar with all the variables impacting on a typical logging operation in the Demerara-Berbice Watershed.

Secondly, VWL will plan a proper logging operation based on the principles of reduced impact logging. *Enough is already known to strongly recommend that all timber-harvesting operations should include* ***RIL*** *measures in their design and implementation, RIL is fundamental to improvement of forest growth and yield and the improved retention of biodiversity* (Fimbel, Grajal, & Robinson, 2001). *The financial costs of logging and the detrimental effects of selective logging on stand structure, biodiversity and forest soils can be reduced substantially through the use of RIL (Ghazoul, Jaboury & Sheil, 2010; Primack & Corlett, 2005)*

Since the concession area is a virgin area, VWL has the opportunity to plan all roads, forward camps, log markets and skid trails, well before any major intervention within the concession. This implies too that VWL has the opportunity to sell every tree before it is cut thus managing timber flows more efficiently and preventing stock piles of timber and the required sanitary treatments such as spraying with pesticides.

Thirdly, and more importantly, VWL has the opportunity to plan for other land users, especially the mining community. For example, VWL has the chance to work out with the mining community the conditions for the use of its roads even before the roads are constructed. There are no roads into the

area at this point and VWL will therefore control all access, including the use of its bridge across the Maam River.

7.3 Truck transportation and Road densities

The road network outlay is planned with great care because (see Map 2). Transportation costs make up about 50-60% of total operating costs (Conway, 1982) and is a function of topography while secondary roads are based on the nature and extent of the forest stocking. The decision to harvest any area is also based on the markets available to the company.

Transporting logs by river via rafts, ballahoos or barges is not practical. Also the selective nature of logging coupled with the typical distribution of commercial species would make log haul aerial methods or by railway prohibitive.

Trucks are widely used in Guyana for road transportation. VWL opts for 6x6 trucks (tractors) equipped with 400-500hp engines with pole trailers capable of carrying 35-40m^3 per trip. The bunks on the truck and the trailer respectively can swivel up to 360° and trucks can therefore easily negotiate sharp turns typical of logging roads.

7.4 Felling cycles

The company has opted for a 60 year felling cycle which allows for a higher intensity of logging on the one hand, but a longer recovery period on the other hand. Although the yield is higher, at the concession level, a 60 year cycle is least disruptive to functional aspects of the ecosystems. Other cycles are also feasible: a twenty-five year cycle for example is popular because the corresponding yield of 833m^3/100ha is typical for most logging enterprises in Guyana.

7.5 Technology employed

The technology employed is typical for tropical countries with natural un-evenaged forests. The technology employed within the context of reduced impact logging allows VWL administration to maintain total control over logging operations and compliance with prescriptions of the COP. Key features of the technology employed are as follows:

a) Data from management level inventories (MLI) help determine productive and non-productive forests, the AAC, primary road alignment, the geographic location of compartments and the sequence for their development, and provisional locations for forward camps. Data from MLI are also used to compile a FMP.
b) The preparation of stock maps based on pre-harvest inventory on which the merchantable stock is preselected in line with the agreed AAC. The stock map allows for the alignment of skid trails, the location of log markets, and when several blocks are considered together, the alignment of secondary and access roads.
c) Tree marking for final determination of merchantable stock and the determination of the felling direction for each tree in line with the prescriptions of the COP, including those relating to proximity trees and buffer zones
d) Directional felling of trees, tagging of stumps
e) Skidding of logs to log markets
f) Sorting and pre-grading of logs
g) Loading logs unto logging trucks
h) Hauling them to point of processing
i) Ancillary activities (including scheduling road construction and road maintenance, setting up forward camps , attending to issues of CSR and partnerships).

7.6 Logging sequence

VWL will work with a 40 year felling cycle. This cycle will allow for conservation of all the functional aspects of the forest resources: operations will be localized and the company will only return to a logged block after 40 years.

7.7 Availability of skills sets

VWL is prepared to invest in the training of its operatives. VWL has already exposed staffs at every level to training offered by the Forestry Training Centre Incorporated, an associate body of the Guyana Forestry Commission.

7.8 Species and product mix

VWL excels in the production of high grade sawn timber, dimensioned and profiled to meet the requirements of the market. VWL subscribes to the view that the market drives the product….it is also the only way to attract premium prices for its products.

7.9 Conclusion and recommendations

In carrying out the proposed logging operation the company will have to build up capacity to address its capability to plan and execute a reduced impact logging operation **and to manage stakeholder issues**.

VWL's draft forest management plan identifies a considerable number of employees and the skills set required to conduct a proper logging operation.

VWL will have to develop capacity to deal with stakeholders, including the following:

a) Regional Democratic Council Region #s 6 and 10
b) Other loggers (Kwakwani, Ituni, UNAMCO Road).
c) The mining community
d) The business community- (including persons engaged in the transportation sector)
e) Agencies in the natural resources sector (GFC, GGMC)
f) THAG
g) Ministry of Indigenous Peoples' Affairs
h) Ministry of Public Infrastructure

The issue of road signage is of major concern. VWL will place signs along the road containing various advisory or warning content for the safety of its own employees but also for the benefit of other road users. It is important that other stakeholders demonstrate appreciation for and observe the warnings set down.

Other issues are as set out in the Environmental Management Plan.

8.0 THE ENVIRONMENTAL MANAGEMENT PLAN

8.1 INTRODUCTION

This Environmental Management Plan identifies practices to be implemented to manage the impacts that may arise from the project. It comprises the following:

a) A Mitigation plan
b) A Monitoring plan
c) An Emergency response plan
d) A Closure plan
e) An environment management plan

8.2 Mitigation measures/Mitigation Plan

As outlined in Table 14, impact significance has been taken as a function *primarily* of the following criteria:

a) Magnitude and extent.
b) Reversibility.
c) Longevity.
d) Probability of occurrence.

Based on these criteria and as outlined in Table 14, the main significant impacts, which need to be mitigated, are as follows:

a) Impacts associated with physical environment: earthworks of various kinds and for various purposes, air quality, water resources, and soil resources.
b) Impacts related to the biological/ecological environment: timber harvesting activities, wildlife, and ecological relationships
c) Impacts related to the socio-economic environment: conflicts over land use, social problems, road
d) safety, waste management

These matters are presented in Table 15 in terms of the following:

- Predicted impact.
- Proposed mitigation measure.
- Institution responsible for implementation.
- Time frame for implementation.

Table 15: Potential negative impacts and corresponding mitigation measures

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
Physical Environment			
Earthworks Grubbing, cut and fills, scarification of soil surface, sub-soil exposure , erosion, compaction, water logging	• Plan roads, bridges and culverts paying attention to topography and the use of stock maps. • Use appropriate machines for all earth works to reduce the time taken to complete each activity. • Consider the weather pattern before initiating major earthworks. • Follow the recommendations of the CoP (see Annexes VIII, IX & X)	VWL	During the entire time frame for the project.
Air quality: Dust and smoke (especially along roads) minor changes in micro-climate	None. In any event, dust and smoke do not represent a major impact. However, Occupational Health and safety must be an integral part of planning and carrying out all operations; for example VWL's staff would use dust masks (as well as safety helmets, goggles and ear muffs during normal work. Vehicles will travel slowly <25 km/hr whenever they pass homesteads or communities.	VWL	During the entire time frame for the project.
Water resources: negligible increases in turbidity, temperature, ph; oil spills	• Strict adherence to RIL principles and prescriptions of the CoP, especially regarding buffer zones along waterways. • Maximum care to be taken to ensure all vehicles and machinery are in a proper state. Dispense or change lube oil only in designated areas. • EPA's Brochure on Water conservation to be placed at all public points around the concession. • Regular briefing sessions for field staff would be formalised. • Care taken to avoid excessive spillage of borax solutions whenever used to treat (some species of) timber	VWL, GFC	During the entire time frame for the project.
Biological/ecological environment			
Timber harvesting: destruction of juvenile trees, genetic erosion of species, decline in soil	• Implement a system for conducting pre-harvest inventories and preparing stock maps • Use directional felling techniques for felling trees	VWL	During the entire time frame for the project.

fertility, spillage of oil, increased potential for blow downs	• Plan skid trails on the basis of stock maps; • Use winching techniques. • Use heavy duty machines that are fully functional • Train all field operatives in RIL practices		
Wildlife: modification, destruction of habitats, depletion in number ,variety of species	• Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on (and animals can return). • Restrict hunting activities by placing advisory notices at strategic points in and around the concession area. • Unique ecosystems, habitats and species will be conserved, by restricting logging in areas where they occur.	VWL	During the entire time frame for the project.
Ecological relationships; Modifications of ecological relationships. Increased potential for pests,	• Implement proper RIL practices and prescriptions of the CoP 'standard operating procedures'.	VWL, GFC	During the entire time frame for the project.
Socio-economic environment			
Conflicts: restrictions of access, alienation of rights	• Engage residents in discussion and consultations to address mutual concerns.	VWL	As required
Social problems: crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	• Work with public agencies (Police, staff of the Ministry of Health, and staff of the Ministry of Regional Development) in Region 6 to address emerging issues. • Keep proper records of emerging problems and pass these on to the appropriate agencies.	VWL	As required
Road safety: high probability of road accidents.	• Work with the police and the UNAMCO Road community and other stakeholders to ensure adherence to proper road use practices and to identify road locations requiring special attention. • Make sure that each vehicle is in a full functional state prior to its use on the roadways, within and outside of the concession area. • Place appropriate cautionary signs at sharp turns, steep grades, and bridges and near populated areas. • Promote proper skills set among drivers through training.	VWL	During the entire time frame for the project.

Waste management: illnesses resulting from a polluted environment	• Observe prescriptions of the Code of Practice. • Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management. • Distribute and put up EPA's brochure on waste management at all camps.	VWL	Monthly
Indigenous, archaeological assets: loss , destruction modification of habitats, landscapes	• Identify and isolate any assets encountered and post appropriate advisory signs and notices; • Ensure such sites are placed on all stock maps • Build fences around assets and place appropriate signs after consultation with MOA. • Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered • Collaborate with communities to address the conservation of existing and emerging assets. • Offer training & incentives where appropriate	VWL	As required

8.3 Development and Implementation of an Emergency Response Plan

VWL will put together an ***Emergency Response Plan*** to be adopted in case of emergencies. It would include detailed information on the following:

a) Accident prevention procedures, including sustained operator training.
b) Notification measures.
c) Preparation of reports.
d) List of personnel on the emergency response team and their tasks.
e) An analysis of hazards and accident prone areas and the anticipated response.

In addition, information would be provided to workers on the chain of command, coordination procedures, and lines of communication in the event of an emergency. Elements of the plan would be reinforced on a regular basis with the conduct of emergency drills.

8.4. Occupational health and Safety and *EMERGENCY RESPONSE PLAN*

8.4.1. Introduction

VWL is aware of the potential health and safety hazards and risks that its employees and contractors will face while carrying out their responsibilities and the company is committed to protecting them, and conforming to the Occupational Health and Safety Acts, 1997, as well as the Safety Rules and Procedures established within the company's operations.

An OH&S Committee would be established to address and monitor the Occupational Health and Safety issues that are expected to arise during the course of the operations:

In the event of any serious injury to any employee both road and riverine transport would be readily available for swift transportation to the nearest hospital (at Kwakwani).

8.4.2 Occupational Health &Safety

OHS committee

The OH&S Committee would comprise not less than 5, and not more than 12 members. Half of the members would represent the management and the other half selected from workers' representatives from each major work-group, unit or department.

Terms of reference for OHS Committees

The terms of Reference *for the OHSC include:*

a) Promoting a safe working environment, via standard operating procedures known to each employee and the regular use of safety equipment
b) Developing procedures for medical and emergency evacuation
c) Providing for access to para-medical services and treatments on a 24 hour basis,
d) Providing safety training for staff
e) Carrying out internal investigations of major accidents and making appropriate recommendations
f) Enforcing safety rules and discipline
g) Reviewing safety rules and safe work or operating procedures.
h) Reviewing accidents and forwarding reports to the competent authorities

OHSC Agenda, Meeting & Minutes of Meeting

OH&S Committees must meet at least once every quarter. However any work-group, unit or department may, through its representative member in OHSC, request a special (unscheduled) meeting, citing pertinent/urgent reasons, issues or agenda for such meeting.

Industrial Accident Reports

Every incidents with serious industrial implications or resulting in fatality, or temporary or permanent disability, or requiring hospitalization due to injury or trauma, or resulting in major equipment/facility damages/losses) whether or not involving any third party would be immediately reported by the unit/departmental head or the Safety Officer to the Forest Manager within 24 hours. The forest manager shall make further reports to the police and medical authorities as necessary.

Investigations on Reported Industrial Accidents

An internal investigation (irrespective whether or not a police investigation is conducted) would be carried out within 7 days of the incident. The investigation team would comprise of the Chairperson, Committee Member(s) from the work-group or unit where the incident occurred, and the Unit or Departmental Head concerned.

The purpose of the internal investigation would be to identify probable causes, and to recommend any necessary review of work procedures/processes or any additional measures to prevent recurrence of similar accidents.

8.4.3 Recommended Safe Working Procedures

8.4.3.1 Introduction

Recommended safe working procedures would be documented. OH&S committee members must be fully briefed on these recommended safe working procedures for their respective work-groups, units or departments.

8.4.3.2 Recommended Personal safety gear (PSG).

Personal safety gear would be issued to all workers: the minimum will be a safety (high visibility) vest and a safety helmet. Chainsaw operators, machine operators and some machine operators will be issued with safety shoes, gloves, ear muffs and goggles. Every worker issued with PSGs must use and wear them at work; Failure to do so shall be liable to disciplinary actions.

8.4.3.3 Fire Fighting Equipment

At the work places, basic firefighting equipment are necessary. Fire extinguishers, water hoses, sand boxes, fire axes and first aid kits are basic requirements. These would be placed at strategic locations within easy reach in and around work places.

Safety equipment such as fire extinguishers and contents of first aid boxes with specific shelf-lives would be replaced or replenished before the expiry date. It is highly recommended that near-expiry equipment be used for training and refresher training rather than discarded, replaced or replenished.

8.4.3.4 General Health and Hygiene

The OHSC would also look into issues of hygiene, including garbage and waste disposal, quality of drinking water, meals provided in company mess halls, provision of mosquito nets, general site hygiene and access to para-medical care and treatments.

A small medical facility would be set up at the base camp to serve employees. The facility will be equipped to treat minor injuries and illnesses and to test for Malaria.

8.4.3.5 Fuel and Lubricating Oils

Diesel and gasoline fuels in bulk quantities, lubricating oils and hydraulic fluids in drums are used by timber camps to support the field operations.

Diesel fuel in bulk quantities would be stored in steel tanks sitting on concrete trough that has the capacity to hold not less than 110% of total fuel storage, and the fuel depot would be sited a safe distance from any river or stream, offices, work areas and living accommodations. Site location, designs and specifications of the bulk fuel depot would be approved by an approved authority.

Gasoline, lubricating oils and hydraulic fluids would be stored in steel drums and kept in a well-ventilated shed, preferable next to the bulk fuel depot away from rivers/stream, offices, work areas and living accommodations.

All waste oils and used engine oils would be kept in drums clearly labelled and held in secure storage for disposal or reuse.

The proper protective gear must be used at all times.

8.5 Emergency Response Plan

8.5.1 Introduction

The Emergency Response Plan (ERP) for VWL is intended for use by VWL personnel and based on potential hazards that may arise during its logging operations. The ERP specifically provides information and guidance to assist Company personnel in preventing, reporting, responding to accidents. It also sets out responsibilities and a chain of command for responding to emergencies.

8.5.2 Purpose

The purpose of the Emergency Response Plan is

a) To eliminate the potential causes of fire and other emergencies, prevent loss of life and damage to property and the environment
b) To set out procedures to be followed in case of emergencies
c) To establish a command chain in responding to emergencies

8.5.3 Policies

All personnel must be aware of and take steps to manage hazards in their work area. In addition, all personnel are expected to alert security if they discover a fire or oil or chemical spill in keeping with the procedures set out in this plan. However, only duly trained personnel would respond to fires. Response procedures shall be posted at strategic points in all work areas.

Emergency Response Teams (ERT) must be identified and trained to respond to fire, oil spills, chemical spills and medical emergencies. These teams will be drawn from the relevant departments based on the nature of the potential hazards associated with each section

8.5.4 Responsibilities/ chain of command

(a) Forest Operations Manager

i. Ensure implementation and maintenance of this plan.
ii. Report to relevant authorities in case of an emergency
iii. Review event analysis reports with relevant line managers/ supervisors and the Administrative Manager.

(b) Security

iv. Get as much information as possible on the nature of the emergency from the caller
v. Ensure that the Administrative Manager and members of the relevant ERT are immediately alerted and given the information obtained on the emergency.
vi. Ensure the Operations Manager is informed of the emergency.

(c) Line Managers or Supervisors

vii. Ensure personnel under your supervision are aware of the potential hazards of their work area and take the necessary precautions as they carry out their tasks.
viii. Ensure staff under your supervision is familiar with and trained in emergency response procedures.
ix. Ensure personnel are provided with and use the prescribed safety equipment to carry out their duties safely.
x. Ensure an inspection of electrical wiring in your section/ department on a yearly basis. Conduct regular visual checks to ensure wiring is safe and in good condition.

xi. Ensure that oil and other petroleum products used by staff are labelled, safely stored and handled in accordance with the ERP and any other guidelines provided by the Company.

xii. Ensure that all incidents of fire are reported on in accordance with this plan. Prepare an Event Analysis of any fire, or oil spill that occurs in your Department with the assistance of the Administrative Manager. Provide a copy of this report to the Administrative Manager and the General Manager.

(d) Administrative Manager

xiii. Provide on-going safety training and briefing sessions for staff related to operational hazards.

xiv. Oversee and conduct regular inspections of all emergency response/ clean up equipment to ensure they are in working order.

xv. Ensure that the ERTs receive appropriate training to respond to fire, oil or chemical spills.

xvi. Assist line managers/ supervisors with the completion of the spill report and incident investigations after any spill or fire.

xvii. Assist line management with the preparation of an Event Analysis for any oil product spill that exceeds 5 gallons.

(e) Emergency Response Teams (ERTs)

xviii. Fire Response Team: Promptly respond to and put out fire as trained and as set out in this plan.

xix. Medical Response Team: Promptly respond to medical emergency as trained and as set out in this plan.

(f) All personnel

xx. Be aware of the potential hazards of your work area and take precautions to prevent them from occurring in the course of carrying out your duties.

xxi. Follow good housekeeping practices to prevent accidents, fires and other emergencies.

xxii. Be alert for fire, oil or chemical spills in your work area.

xxiii. Sound the alarm and call security immediately upon notice of any fire

xxiv. Call security immediately once you notice an oil sheen, spill or unplanned release of any chemical anywhere.

xxv. Follow the emergency response procedures set out in this document.

8.5.5 Fire prevention and response

(a) Potential Fire Hazards

Fires can be prevented if potential hazards are identified and managed. Good housekeeping is a major factor in prevention of fires. Discarded combustible material would not be allowed to accumulate. Each work area would be provided with a sufficient number of non-combustible waste or trash receptacles. Use of flammable cleaning solvents to clean floors,

walls, furniture and equipment would be avoided. Some potential fire hazards to be avoided are listed below:

i. Overloaded electrical circuits, unsafe wiring and defective extension cords
ii. Improper disposal of smoking material e.g. throwing cigarette butts on the ground.
iii. Improper use, handling and storage of flammable material e.g. gasoline, waste oil, paint
iv. Improper housekeeping resulting in accumulation of flammable material e.g. paper, cardboard boxes, oil-soaked rags, flammable liquids
v. Improper use of welding torches and batteries

(b) Types of Fires and Fire Extinguishers

There are different types of fires and these determine the type of extinguisher to be used in an emergency. Fires can be classified into four general categories based on the type of materials or fuels involved:

i. Class A Fires: involve ordinary combustible material such as wood, paper, rags, rubbish and other solids.

ii. Class B Fires: involve flammable or combustible liquids such as gasoline, fuel oil, paint and hydraulic fluids.

iii. Class C Fires: involve electricity or electrical equipment

iv. Class D Fires: involve combustible metals such as magnesium

Classes A, B and C fires are the ones of major concern.

(c) Fire Response Procedures:

If one discovers a fire:

i. Activate the fire alarm
ii. Call security (number to be established) and report the location of the fire. (Security will inform the emergency response personnel who will respond to the fire as trained.)
iii. Ask for help if someone needs rescuing
iv. Confine the fire by closing doors, windows and other openings if time permits and if possible.
v. Evacuate the area and wait in the nearest designated waiting and meeting area.
vi. Provide as much information as you can to emergency response personnel

8.5.6 Oil (petroleum product) spill prevention and response

(a) Storage of Oil

Mismanagement of waste oil can lead to the contamination of water and soil. Many components of oil are toxic to living organisms. Contamination from waste oil results mainly from improper storage or disposal. Waste oil must therefore be carefully stored.

The following practices would apply:

i. Waste oil must be stored in drums. Use of rusting drums must be avoided as they may leak at a future time. Each drum must be labelled with the date that the accumulation started as well as the terms "Hazardous Waste", "Waste Oil", and "Toxic".

ii. All drums containing waste oil must be stored in the waste oil storage area which will have retaining walls and floor made of material which is impervious to the migration of oil. The storage area must have a clearly legible sign stating: "Waste Oil." The storage area must also be protected from the weather by a shed.

iii. The drums will be stored off the ground on raised pallets to facilitate detection of any leakage.

iv. Monthly inspection of the waste oil storage area must be carried out to check for any leakage or potential leaks. During these inspections the condition of the drums must be checked. The floor and the palettes must be checked for any sign of oil leakage.

(b) Oil Spill Response Procedures

In the event of an oil spill the following steps must be taken

i. Evacuate the area and warn others as necessary

ii. Contact security immediately

iii. Ask for help if anyone is injured and/ or needs rescuing

iv. The security staff responding to the call will notify the Administrative Manager, the Oil Spill Response Team and the Forest Manager

v. If possible stop the release e.g. by turning off any valve left open

vi. Visually inspect the site of the oil spill to obtain enough information to describe the situation to security and response personnel (see Box 2). Be careful, be alert and keep clear if any hazardous chemical (see Box 3) may be involved. The following minimum information would be gathered :
   - Spilt material (e.g. used oil or gasoline)
   - Estimated quantity of spilt material (or surface area covered or rate of flow)
   - Location and direction of the spilt material and direction of flow
   - People involved, injuries

vii. Help to direct response personnel to location of the spill

viii. Response personnel must ensure the release is stopped and clean up the released oil and manage the resultant contaminated material.

ix. On the same day of the spill submit event information to your line manager/supervisor and Administrative Manager. This will assist them in completion of the Oil Spill Report Form.

x. Line management with assistance from the Administrative Manager and relevant Department Personnel will perform an Event Analysis.

8.5.7 Plant maintenance

Regular drills would be carried out to ensure the functional aspects of the ERP. The initial draft plan must be refined within three months of start-up of operations. After this, the plan would be reviewed on a yearly basis and updated as necessary.

Table 16: Specimen of Oil Spill Report Form

EVENT	REMARKS
Date/time discovered	
Name of responder	
First reported by	
Reported Injuries	
If so was the medical response team dispatched	
Fire Hazards	
If so, was the fire response team dispatched?	
Type of Oil or Fuel discharged or spilled:	
Quantity Spilled	
Exact Location of Spill	
Is it flowing/contained?	
Weather Conditions:	
Ground Conditions	
Action Taken:	

VWL develop an Emergency Response Plan[13] for general field operations in case of emergencies (see Figure 41). It will include detailed information on the following:

a) Accident prevention procedures.
b) Notification measures.
c) Preparation of reports.
d) Location of clean-up equipment.
e) List of personnel on the emergency response team and their tasks.
f) An analysis of possible accident areas and the anticipated response.

[13] For the next few years, no administrative base will be established on the concession; operatives will be based at Charabaru

In addition, information would be provided to workers on the chain of command, coordination procedure, and lines of communication in the event of an emergency. Elements of the plan would be reinforced on a regular basis with the conduct of emergency drills. These mitigation measures outlined can help to prevent and minimize potential negative impacts of the project operations. The challenge however, is to put these measures into place in a timely and effective manner.

This Emergency Plan describes the general background issues of the types of emergency and actions required to be followed, would an emergency occur. This preliminary ERP has identified the following:

a) Emergency Contact Details (see Table 17)
b) Emergency Procedures
c) Description of an emergency
d) Authority of Control
e) Identification of potential scenario
f) Fuel and Material Inventory

A copy of this plan will be displayed at the main administrative building, the field offices, and at the log pond.

Table 17: Emergency Contact List

#	PARTY/AGENCY	PHONE #(s)
1	VWL Head Office:	226-8556; 225-7507; 227-0381
2	Kwakwani Police Station:	440-2222
3	GFC, Kwakwani Forest Station	440-2589
4	GFC, Commissioner:	226-7271-4
5	Regional Executive Officer	444-6056
6	Regional Chairman:	444-6121
7	Environmental Protection Agency:	225-4679; 225-5469; 255-4173; 225-6048
8	Air Services Limited:	222-4537; 222-4368; 222-2993
9	Georgetown Hospital:	227-8210-2
10	Kwakwani Hospital:	444-2224

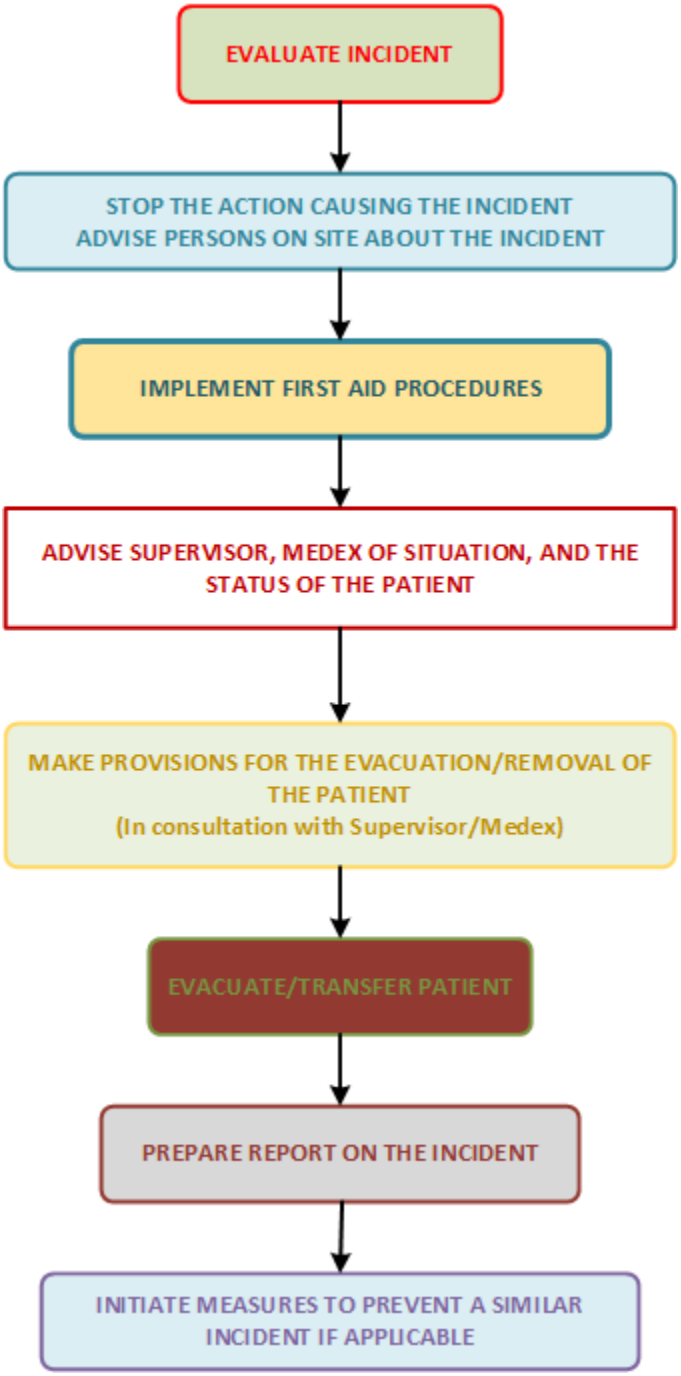

Figure 41: Provisional emergency procedures for VWL

CAPACITY BUILDING AND TRAINING PLANS

9.1 Introduction

VWL intends to build capacity to address obligations emerging from this EIA Report and to better implement approved forest management prescriptions. The objective is to ensure that each worker at the company takes responsibility for good environmental behaviour generally and good forest management practices in particular. To address the requirements of lead agencies and to better comply with national

9.2 Training content

Training for selected staff will be as set out in Table 18. VWL will conduct a training needs analysis to develop a more detailed training

Table 18: Initial Training options identified for Capacity Building

#	Target group	Subject areas	Agencies
1	Senior staff	Reduced Impact Logging (Decision Makers Course)	FTCI
2	Senior Staff	Conflict Management	To be determined
3	Forest Managers, Block Inspectors, Senior Supervisors	Reduced Impact Logging Foundation Course	FTCI
4	Technicians	Timber Grading Course	GFC
5	Technicians	First Aid	Guyana Red Cross

9.3 Methodology

A variety of mechanisms will be used to build capacity, including:

a) Workshops (Trainers provide workshops to groups of participants, usually ranging from three days to fourteen days)
b) Onsite internship or field work:
c) Training of Trainers
d) Training materials:
e) Briefing sessions

10. MONITORING

10.1 Monitoring Plan

This *monitoring plan* is intended to address the mitigation measures in a timely and consistent manner. VWL needs to collaborate with several agencies to ensure that the mitigation measures are addressed in a meaningful and realistic manner. Table 18 lists the agencies and the particular type of collaboration anticipated. Table 20 provides details of monitoring activities, Table 21 provides a checklist for monitoring activities and Table 22 provides a budget for monitoring the environment management plan.

Table 19: List of agencies and the type of collaboration anticipated.

#	Agency	Nature of collaboration
1	Iwokrama International Centre	Co-Monitoring of Essequibo River Corridor; Wildlife studies
2	Ministry of Public Infrastructure (Meteorological Department)	Collection of Rainfall data
3	EPA	Collection/monitoring of environmental data;
4	Guyana Forestry Commission	Consultations, training, forest management
5	CDC-Kwakwani, Reg. 6	Consultations
6	Upper Berbice Forest Producers Association, other loggers' associations in the district	Consultations (road use and maintenance, purchases
7	FTCI	Training
8	Ministry of Health	Consultations
9	Rong-An Inc.	Consultations (roads)
10	GGMC	Consultations (mining)
11	GGMDA	Consultations (mining)

It is important to note that VWL, as part of its routine operations, will be maintaining a large set of records.

Table 20: Monitoring Plan for VWL

Parameter	Institution (s) Responsible	Frequency of Monitoring	Location of monitoring
Physical Environment			
EARTHWORKS • Field operatives have stock maps • Field operatives have copy of the Code of Practice • All roads, skid trails, sawmill sites, log markets and borrow pits are marked • Machines are in a proper functional state	VWL, GFC	Quarterly	Sites where earthworks are occurring, field camps
WATER QUALITY: • *SURFACE WATER* DRAINAGE OFF ROADS, LOG MARKETS AND OTHER CLEARINGS; • CLEANING OF DRAINAGE STRUCTURES (BRIDGES, CULVERTS) ALONG ROADS AND SKID TRAILS; • OBSERVANCE OF THE INTEGRITY OF BUFFER ZONES ALONG WATER WAYS	VWL, GFC	Quarterly	Areas being logged; logged over areas; primary roads and associated drainage structures.
AIR QUALITY: • Number of illnesses among field operatives apparently related to smoke or dust	VWL	Monthly	Camp site, Medex records, Kwakwani Hospital
Biological/Ecological Environment			
Timber harvesting • canopy openings, • retention of seed trees, • integrity of Biodiversity Reserves. • quality of stock maps	VWL	Quarterly	Active logging areas, permanent sample plots and Biodiversity reserves
Wildlife Trapping /hunting • Movement of live animals away from the concession area • Trade in wild meat • Traps, firearms, shells	VWL VWL VWL	Random checks Random checks Random checks	Kwakwani crossing Kwakwani Concession area

Ecological Relationships • Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes or other fauna	VWL, GFC	On observance	Concession area
Socioeconomic Environment			
Conflicts • No. of mining camps, type of mining, vehicle movements, • Complaints lodged with the company • Complaints lodged with the RDC or other public agency	VWL, GFC,RDC #6 GGMC, Ministry of Reg. Dev., Min. of Human Services	**Quarterly**	**Concession area,**
Social & Employment issues • Number of persons recruited from the Kwakwani district • Number of persons trained • Increase/decrease in number of families within the concession area • Rate of absence from work • Drunken persons • Disciplinary measures taken	VWL	**Biannually**	**Concession area**
Road safety • Number of accidents/records • Number of fatal accidents/records • Number, type and position of advisory road signs/records	VWL	**Quarterly**	**Kwakwani Police Station,**
Health and Safety • Emergency Response Plans, • Health and safety committees, • Status of first aid kits, fire hydrants, • Implementation of OHS practices & the regular use of safety gear	VWL, GFC	**Biannually**	**Sawmill site, field locations, housing quarters**
<u>WASTE MANAGEMENT</u> • Waste accumulation & waste disposal procedures • Apparent increase in vectors (rats, roaches & ,flies)	VWL	Monthly	Sawmill complex, field camps
<u>Indigenous/Archaeological assets</u> • Auditing of archaeological and anthropological resources	VWL	On observance (Quarterly if observed)	Logging operations [blocks] and sawmill complex

Table 21: General checklist for monitoring operations

ITEM	STATUS (Y-OK/ R-REQ. ATTN.)
Office Area/Field Camps/Sawmill sites: ▪ Emergency Response Plan posted and visible ▪ First Aid box complete and clean	
Personnel : • Records of issue of safety gears • All personnel have and are using safety equipment	
Fuel Storage Tanks and Fill Point – Transit Log Yard and Camp ▪ Fire extinguishers and other firefighting aids available nearby ▪ Physical condition of storage tanks, hoses, valves (evidence of leaks)	
Communication Equipment ▪ Check base station radio set is in working order and signal strength is good with base and with handset for field personnel ▪ Check all field hand sets are in working order and fully charged	
Fire Fighting Equipment and Emergency Equipment ▪ Check that all fire extinguishers are present, fully charged and the correct number are present with no sign of damage ▪ Check sand buckets are full of dry sand ▪ Check contents of First Aid box are all present and correct	
Warning/Advice Notices ▪ Check all notices and signs are posted as required, are undamaged, clean and legible at Transit Log Yard and Camp and on secondary roads	
Soak away/Filter at Transit Log Yard and Camp ▪ Soak away filter is clear of all solid particles ▪ Check drains are not blocked or full	
Stock maps ▪ Updated stock maps are available for use by all field crews	
Basic equipment ▪ Compass, clinometers, flagging tapes and GPS are available for use by staff ▪ Equipment tailored for the needs of specific departments (fire extinguishers-workshop; flasks for water collection-forest management division; etc.)	
Vehicles ▪ All vehicles equipped with horns, lights and rotating amber lights ▪ All vehicles are equipped with appropriate tools, first aid kits ▪ All trucks/lorries are equipped with basic communication equipment ▪ All vehicles have chains, rope or straps as appropriate ▪ Maintenance schedules for vehicles are in force.	
Security ▪ All employees have a security badge, carry and display them on their uniforms	
Camp Hygiene ▪ All camps are provided with potable water ▪ All camps are cleaned regularly, equipped with fires extinguishers, lights and pesticides, other supplies ▪ Waste disposal practices/mechanisms are monitored	
COMPLETED BY: (***signature and date***)	

Table 22: Annual Budget for effecting mitigation measures

Impact/Event	Actions	Equipment/tools	Duration	Annual cost (G$)
1.Earthworks & soil	Field visits, briefing sessions, review of stock maps & other records; review of SOPs	Stock maps, GPS, Compass, Clinometer, vehicle	3 days every three months	200,000
2. Air quality	Review of medical records of field operatives; consult medical personnel		2 days every three months	200,000
3. Water quality	Review of medical records of field operatives/ consult medical personnel Biannual monitoring of water quality		2 days every three months One day every six months	200,000 400,000
4. Timber Harvesting	Visits to field crews to verify the use of stock maps, CoP, etc.1	Vehicle	3 days every three months	100,000
5. Wildlife	Recruitment of wild life expert; physical check for traps and shells along frequently used concession roads	Vehicle, camera	One week, about six times per year	500,000
6.Eco-relationships	Recruitment of a consultant; field tour across logged over sites within the concession area	Vehicle, camera	One week, about six times per year	500,000
7. Conflicts	Discussions with community leaders, representatives of miners, public officials (RDC)	Vehicle, camera	2 days every three months	200,000
8. Employment	Review of company records		2 days every six months	150,000
9. Social problems	Discussions with public officials (Police, RDC) and community leaders	Vehicle, camera	2 days every six months	100,000
10. Occupational Health & safety	Verify the use safety gear, SOPs; check on the frequency of briefing sessions	Vehicle, camera	2 days every six months	150,000
11. Road safety	Install, replace and rehabilitate road signs; review safety records	Vehicle, camera, carpentry tools	3 days every three months	200,000
12. Fire equipment	Verify the state of all firefighting equipment		2 days every six months	150,000
13. Training	Review performance of trained personnel, identify new training opportunities		2 days every six months	1,000,000
14. Archaeological sites, indigenous assets	Replace or rehabilitate signs, fences or remove debris.	Vehicle, camera, carpentry tools	Approximately 3 days every three months	300,000
15. Co-monitoring of the Essequibo River Corridor	Joint patrols, faunal surveys, other consultations	Boat & o/b engine; digital camera; radio/phone	10-15 trips per year	1,000,000
15. Contingencies				250,000
		TOTAL		**5,600,000**

NB. While some activities may be conducted 'in-house', others require the recruitment of experts

11.0 ECONOMIC EVALUATION

11.1 Land use

Mild fishing and hunting respectively along the banks of the Essequibo and Berbice Rivers respectfully, are the only form of land use within the concession area, and even these are basically restricted to river (bank for a depth of about 500m) and occur primarily in the dry season (March-April and August to October).

This SFEP provided the first effort to establish any form of land use within the entire concession area. Developers in the mining sector have acquired the entire concession area for gold mining purposes but to date there is no active mining.

11.2 Public benefits/community involvement/regional development

Access to the area will generate interest within the mining community, developers in the agricultural sector and businessmen in the wildlife trade sector, non-timber forestry sector, and wild meat harvesting (if allowed).

It is expected that all lawful activity will contribute to regional development, conserve or increase employment levels, and contribute to improved rural livelihoods in upper Region 6.

The academic community and NGOs such as Panthera.org and WWF-Guianas will have improved access for evaluating fauna and flora in the upper Berbice River. Public departments such as the GFC, the GGMC, and the Meteorological Department will have new access points for improving their data sets.

11.3 Monitoring costs

Monitoring costs for all events except the Essequibo River Corridor will be integrated into operational costs such as forest inventory, road alignment and road construction.

If mining develops to a major extent, VWL anticipates sharing forest monitoring costs with other developers.

11.4 Beneficial/adverse long term residual benefits of the project

Many of the major road networks in Guyana's interior have been built to improve access and move heavy goods to rural areas by circumventing rivers that are not navigable: for example, the Bartica Potaro Road -circumventing the Essequibo and Mazaruni River, the Kartabo-Puruni Road built to circumvent the Mazaruni River, the UNAMCO Road circumventing the upper Berbice River, and the Moruca-Kwebana Road built to circumvent the Moruca River and tributaries of the Waini River. In these cases heavy goods are moved rapidly to more rural points. Currently it takes at least nine hours to travel between Apoteri and Kurupukari by boat with a maximum of about 300kg of goods; and whenever there is rain or fog, or the peak of the dry season the trip can take up to 11 hours. In another six years it would be possible to drive from Kwakwani to a point opposite Apoteri in about six hours.

11.5 Long term strategies for the logging project and the area

The long term strategies for the area depend on the extent to which VWL maintains control over the forest resources allocated to it and whether demands from the conservation community allows the operations to be feasible.

VWL is prepared for the long haul and has deliberately sought a 40 year felling cycle.

11.6 Labour issues and institutional requirements for OHS

Recently, labour issues linked to diets, religion and health issues-specifically the probability of being infected with malaria have all determined whether people want to work in the field or not. Other critical labour issues for field operatives are: the need for treated water at field camps, the availability of cell phone signals, wage levels and the availability of electricity (via portable generators or the use of an inverter with a DC battery.

VWL does all that is reasonable to ensure the proper welfare of its field operatives. There is no compromise with the use of personal safety gear.

11.7 Conclusion

VWL is familiar with all the variables impacting on a logging operation. VWL is willing to invest and run a viable operation once it has sufficient control over timber stocks and its access roads.

12.0 INTERAGENCY AND STAKEHOLDER RELATIONS

In Sections 7.9, 10.1, and Table 18, VWL identified the agencies with which it will work to mitigate environmental impacts in the concession areas. These are the same primary agencies with which VWL will work.

Specifically however, VWL will set up a website on which it will post its half- yearly environmental report or part thereof and at the same time set up a mechanism to respond to feedback or reasonable information requirements from stakeholders.

VWL has been using one to one relations with various stakeholders in Region 6 to discuss operational issues and it will continue to do so.

13.0 CLOSURE PLAN

13.1 Factors that may lead to the closure of VWL Operations:

The expected life of the project is 40 years following which the company could exercise the option for a renewal of their TSA for another 40 years. At this stage VWL has not prepared a Closure Plan though consideration has been given to actions to be taken. These are outlined below:

a) If the GFC does not grant an extension of the TSA, after its expiry;

b) If the commercial species required by the company are exhausted;

c) If the UNAMCO Road deteriorates or its use becomes too problematic (given the increasing number of stakeholders) to such an extent that log transport on it is no longer feasible;

d) If there is an increase in mining activities within the compartments, or the mining activities in the compartments make the situation inoperable and unprofitable for VWL to continue logging operations

e) If , for any reason there is a heightened threat to safety and security, crime and illegal activities

The principal objectives of the closure actions are to:

a) Conclude all contractual agreements with employees and their Union

b) Conclude all obligations to the Government of Guyana (taxes, royalties, fees, etc.)

c) Decommissioning and removal of all fixtures and structures, equipment, machinery, and other infrastructure from the concession

d) Clean up all debris (tyres, machine parts, oil drums, etc.) from the forest floor.

13.2 Closure Actions:

a) In event of the Company's closure, the GFC, the employees, the Trade Union, RDC and relevant Government authorities, institutions and organizations would be notified. The notification would be given six (6) months prior to the closure of the field operations.

b) If the Company would ever change ownership, or transferred to any other entity, the employees, their Trade Union, and relevant Government authorities, institutions and organizations would be notified. As the only fixed community in the area, the CDC of Kwakwani would be notified. The notification would be provided six (6) months prior to the change in ownership.

c) NIS and PAYE contributions for staff be discontinued; employees would be advised of the status of their payments, that is whether all the appropriate contributions have been handed over to the NIS, GRA respectively.

d) Severance Pay for Employees/Workers will be paid and other moneys due to them as required by Labour Act and the Termination and Severance Payment Act (TESPA).

e) Acreage fees, royalties and taxes of all descriptions required by the Laws of Guyana shall be honoured.

f) Disposition of social infrastructures of the Company will be managed in collaboration with the GFC and the RDC.

g) Expatriate staff will be repatriated in accordance with national immigration procedures.

h) In the event of Company's closure the relevant Government Authorities and the Employees/Workers and local communities will be informed at least three months in advance.

i) If the Company would have logging or sawmilling operations in other locations in Guyana, the transfer of employees/workers would be considered.

A detailed Closure Plan will be prepared during the first year of operation of the enterprise.

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Annex 1: Draft Terms of Reference

VWL ESIA STUDY

TERMS OF REFERENCE FOR ESIA STUDY

1.0 BACKGROUND

1.1 Context

VWL acquired a State Forest Exploratory Permit (SFEP) for an area of 132,863.21 ha of State forests situate in the Essequibo-Corentyne Watershed (see Figure 1). The SFEP allows the company, inter alia, to access the area and gather such information from reconnaissance activities as would allow it to determine the feasibility of conducting logging operations in the area. Once such feasibility is established, then VWL would apply to the Guyana Forestry Commission (GFC) for a Timber Sales Agreement (TSA) which would grant rights to harvest timber from the area of in line with the provisions of the TSA itself and other applicable conditions prescribed or agreed primarily with the GFC and the Environmental Protection Agency (EPA). Specifically, the GFC would require a Forest Management Plan for a 5 yr. period as well as an Annual Plans of Operations prior to the initiation of logging activities.

VWL requires an *Environmental Permit* from the EPA as a *prerequisite* for the acquisition of a TSA from the GFC. In order to obtain the Environmental Permit, VWL must undertake an Environmental and Social Impact Assessment (ESIA) study of the concession area and adjacent areas in accordance with the provisions of the EIA Guideline Volume 5-Forestry, set out in Part IV of the Environmental Protection Act 11 of 1996.

1.2 Study Objective

The ESIA study is intended to provide decision makers in the natural resources sector, especially the EPA and the GFC, and other stakeholders with sufficient information to justify acceptance or modification (or rejection) of the logging project proposed by VWL.

1.3 Results of the ESIA study

VWL will recruit a team of experts (the consulting team) to undertake the ESIA study.

The consulting team will, in the main, review the technical aspects of the logging project, study the applicable policy and legal framework for such projects, study the biophysical, land-use and socio-economic conditions that characterises the concession area and adjacent areas, consult with stakeholders, identify and analyze the impacts generated by the project and identify negative impacts that require attention; and develop a management plan for managing mitigable negative impacts.

The ESIA study, *in essence*, organizes and analyses the information obtained, synthesizes the results of the studies and presents a concise account of mitigable impacts and their management and the significance of residual effects for review by decision makers.

1.4 The Project

1.4.1 Objectives

The **primary** objective of VWL is to harvest timber (in the form of logs) from the concession area. (The logs will be conveyed to Charabaru, right bank Demerara River and to Bamboo Landing, left bank Berbice River for processing). **No sawmilling** (or any other form of wood processing is contemplated within the concession area). Timber harvesting will be carried out on a **selective basis**: trees will be

selected based on the species, the diameter at breast height, and consideration of restrictions based on site conditions such as slope %, proximity to waterways and other prescriptions of GFC's Code of Practice for Forest Operations 3rd Ed. in TSAs and WCLs.

A **secondary** objective is to conserve intact not less than five percent of the concession area (6,643ha) in line with national policies and standards. VWL (whose principals have been in logging for more than 50 years) is well known in the forestry sector for its *documented* interest in forest resources conservation, specifically, its commitment to the use of the principles and practices of reduced impact logging, its *voluntary* protection of areas where nesting Harpy eagles (*Harpia harpyja*) and Giant Otters (*Pteronura brasiliensis*) are sighted, and its interest in *corridors* for cats and other mammals based on its partnership with **Panthera (please see www.panthera.org)**.

1.4.2 The project area

The concession area is situate, mostly on right bank Essequibo River: however, about 25% of the area lie on right bank Berbice River. VWL's natural western boundary on right bank Essequibo River starts from the mouth of Maam Creek, right bank Essequibo River and about 12km above Kurupukari, and then extends southwards for a distance of about 72km to the mouth on an unnamed creek on right bank Essequibo River, having approximate UTM coordinates of 21N 0338500, 0463200. On the left bank Essequibo River there is a corresponding natural boundary representing the eastern boundary of Fairview Amerindian Village to the north and of Iwokrama forests to the south.

The Essequibo river, which separates the SFEP from the Fairview-Iwokrama Forest eastern boundary, varies in width from about 300m, at a point about 800m below Kuratoka Rapids to more than 4 km near Pisham-Pisham Rapids. There are numerous islands along the entire river corridor but these *do not* fall within the boundary of VWL's forest concession *and will not form part of any activity by VWL. VWL will however monitor the entire river corridor in partnership with IIC.* There are forest concessions to the north, north east, and south of the SFEP area.

Access to the SFEP area is currently accomplished by a logging road originating at Wood Cutting Lease(WCL) 1/07 near Canister Fall via TSA 3/91 (held by Demerara Timbers Limited) where logging roads link Maam creek with Canister Fall and also with Kurupukari. Potentially, access to the area would be possible from the north eastern side by extending the southern end of 'UNAMCO' Road. Access may also be accomplished via the Essequibo River and the Berbice Rivers but such access is only useful for reconnaissance purposes as the rivers are very shallow in the dry season, with prominent rapids, sandbars and rock outcrops.

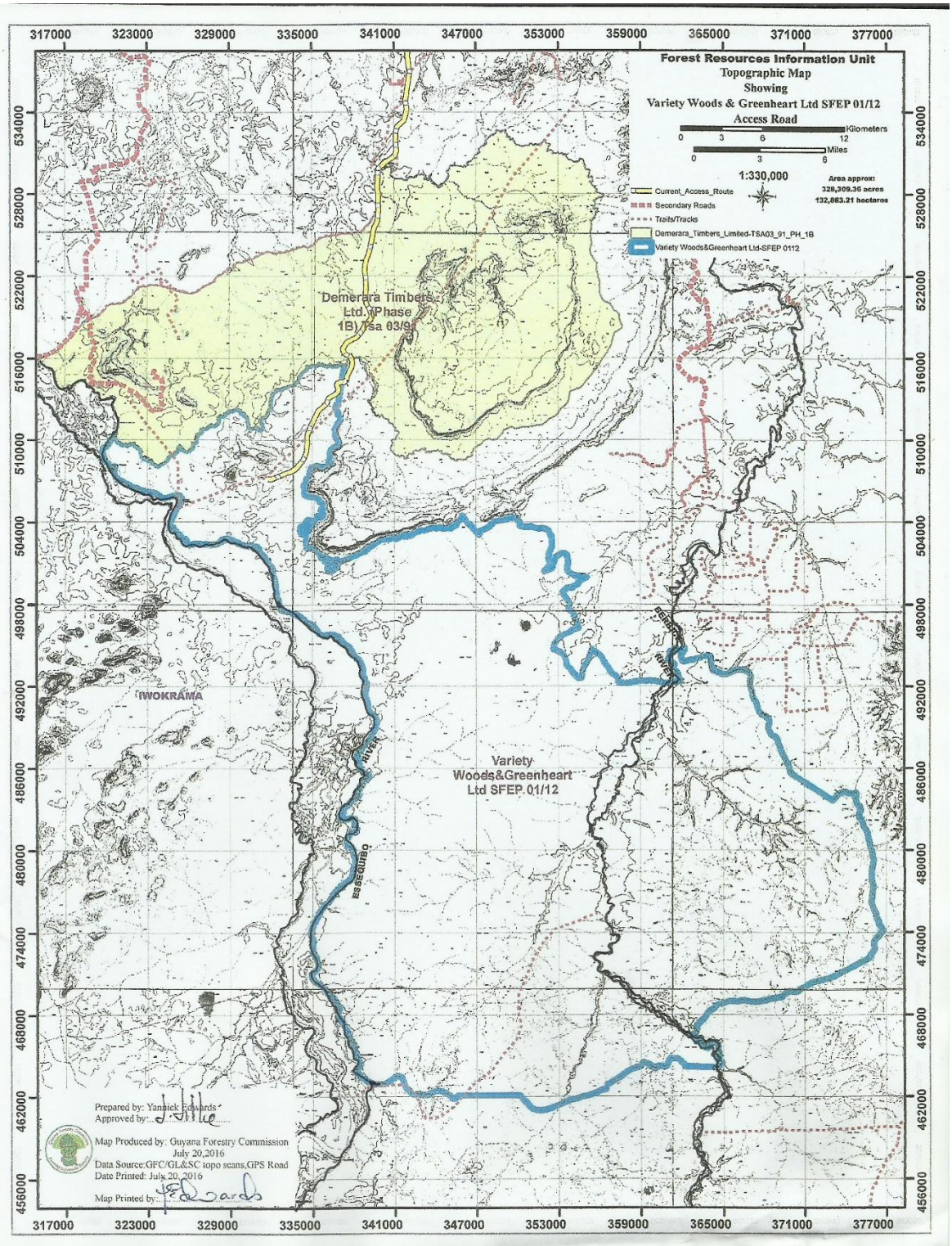

Figure 1: Map showing outline of SFEP area with access road at the NW segment

1.4.3 Investment criteria

In arriving at the decision to invest in the area, VWL gave consideration to four primary issues:

(a) *the policy and legal framework for logging, including but not limited to:*
- the Forests Act and the Forestry Regulations; and
- forest management standards prescribed by the GFC, including Codes of Practice.

(b) Parameters of the forest resources, including:
- access options to the forest resources ;
- the proportion, stocking and spatial distribution of the primary merchantable species.

(c) Current and potential land use issues, including:
- current land use(s) within the concession area; specifically whether there are any persons or communities traversing or living or working within or adjacent to the concession area;
- proximity to other forest concessionaires and opportunities for collaboration; and
- proximity to protected areas.

(d) The demand for primary merchantable species on the local, regional and overseas markets.

1.4.4 Core timber harvesting tasks.

The core timber harvesting operations to be conducted by the company will be done in four phases:

1.4.4.1 Reconnaissance work:

The company will conduct general *reconnaissance work* mainly in respect of the following:

(a) Determining whether roads, footpaths or trails exist in, or adjacent to the area and who uses them and planning access routes;

(b) Determining the nature and extent of current land uses in and around the concession area, and particularly whether any communities exist in and/or adjacent to the concession area;

(c) Estimating the proportion of merchantable timber stocking and its spatial distribution; and

(d) Estimating the availability and skills of potential workers near to the concession area.

(GFC has maps that provide a preliminary but reliable information on vegetation, terrain and stream configuration; however, reconnaissance surveys are still necessary to validate the condition of the vegetation and actual or current land uses, if any).

1.4.4.2 Planning phase:

The planning phase entails light interventions into the forest resources, creating impacts mainly from traverses of the forest resources linked to line cutting activities and data collection.

On the basis of reconnaissance work and other information gleaned from maps, reports and first-hand information from stakeholders, VWL will, in the main, undertake the following:

(a) organize the productive area into compartments which generally sets out areas to be logged during five year intervals and allows for sequential development of the concession area. Compartments are normally given a code name;

(b) determine the primary access road alignment based on terrain, stream network configuration and the extent and spatial distribution of productive forests; and determine the schedule for road construction;

(c) determine (in function of land use and vegetation types) the extent and location of **productive forests** within the concession area;

(d) identify and set aside a minimum of 4.5% of the productive forests;

(e) determine what felling cycle the company will opt for-either 60 years, 40 years or 25 years and this has implications for the yield per hectare; and consult the GFC on the annual allowable cut from the concession area;

(f) organize each compartment into 100 ha blocks, with each block assigned a unique alpha-numerical code, carry out 100% pre-harvest enumeration of a specified number of blocks, prepare stock maps for each block (in accordance with standards prescribed by the GFC) and plan the alignment of access roads, skid trails and log markets;

(g) develop standard operational procedures for field work, including matters of occupational safety and health and GFC's Code of Practice for Forest Operations 3rd Ed. ;

(h) determine the need, location and scheduling of forward camps; and

(i) prepare forest management plans and annual plans of operations (in accordance with guidelines of the Guyana Forestry Commission (GFC)) for the approval of the GFC.

1.4.4.3 Operations Phase

The operations phase necessitates major interventions into the forest resources which may be summarized as road works (including bridge and culvert construction), skid trail construction tree felling and the use of heavy-duty equipment for extracting logs. Heavy-duty equipment produce dust, noise, and scarifies and compact soils.

On the basis of an approved forest management plan covering a period of about 5 years and an annual plan of operation for the calendar year under consideration, the company will undertake the following operations:

(a) set up a forward camp if required;

(b) construct primary roads, access roads, skid trails and log markets respectively;

(c) tree marking: assessing trees earmarked for felling, assess site conditions such as slope or proximity to buffer zones or protected trees, cleaning vines that may affect tree fall and determining the felling direction of each merchantable tree to be harvested;

(d) felling and bucking of trees and skidding of logs from trees felled to log markets; and

(e) conveying logs from the concession.

1.4.4.4 Monitoring Phase

The company will put measures in place to monitor all aspects of its logging operations, including safeguarding the integrity of biodiversity reserves and concession boundaries, establishing that all standard operating procedures are being followed, and verifying that there is full compliance with operational requirements (such as buffer zones and tagging of tree stumps).

2.0 SCOPE OF THE ESIA STUDY

The nature and scope of the ESIA study will include the following:

2.1 Description and evaluation of the logging project

A detailed description of the logging operation that VWL intends to undertake in the area. This section will include:

(a) a review of the methods used for acknowledging known land uses or stakeholder use of the area, the including the use of maps for geo-referencing

(b) a review of plans for demarcating the boundaries of the concession and the location of notice boards;

(c) a review of plans for the organization of the concession area into compartments, the use of natural boundaries for delineating compartments, and plans for the sequence in which compartments will be developed;

(d) a review of the proposed alignment for the primary road network and the scheduling of works for the various segments of the road;

(e) a review of proposed locations for forward camps;

(f) a review of the design for the management level inventories relative to the variety and spatial distribution of the forest types

(g) a review of the criteria used to set aside forest resources as biodiversity reserves in line with the existing ecosystems; a biodiversity impact assessment will be carried out.

(h) a review of the technology and processes to be used by the company to fell trees and extract logs, relative to the agreed annual allowable cut for the concession, and a review of alternative technologies and methods.

(i) a review of the measure to which field operations is aligned with GFC's Code of Practice for Forest Operations 3rd Ed.

(j) the extent to which maps area used for planning and coordinating field work and communicating information to stakeholders.

2.2 Review of the Policy and Legal framework for the project

The review and documentation of the array of local legislation, policies and standards that impact on forest resources management-including the management of wildlife, biodiversity, protected areas and logging operations respectively.

In addition, there will be a review and documentation of applicable regional and international agreements, conventions as well as relevant international policies, practices and standards that impact on this project.

2.3 Baseline information

2.3.1 Care with data collection

The analysis of the baseline information is critical to the feasibility of the proposed project. *Methods used to collect data on environmental, biological and edaphic items will be developed and described in detail and presented in the report. Care will be taken to ensure the sampling framework covers the whole concession area. All data collection points will be geo-referenced and represented on (thematic) maps of the concession area. Similarly, methods used for biodiversity assessment and the criteria used for selecting areas for biodiversity conservation will be described in detail and included in the ESIA Report. Maps will be used as often as possible to illustrate data collection (sample) points, the location of biodiversity reserves and other physical features described in the report.*

2.3.2 Data from public agencies

Discussions with representatives of MNRE, and the various public agencies that have responsibility for managing natural resources, with a view to gathering as much information as possible about the area, including ongoing or planned developments or land use. Thematic maps covering overarching issues including issues of biodiversity management, protected areas management and land use plans respectively will be reviewed. The potential issues or conflicts pertaining to any mining in the project area will be recorded (for subsequent analysis).

2.3.3 Environmental and biophysical data

The collection of baseline information on all the natural resources within the area, and for areas adjacent to the concession, including but not limited to: the topographic conditions, the forest resources-including information from vegetation maps, that allow for observation of the prevailing forest types and their spatial distribution on the concession area, as well as for adjacent areas on the perimeter of the concession area, the faunal resources, the soil resources, and existing land use(s).

2.3.4 Socio-economic data and issues

The methodologies used to identify and analyse stakeholders and their interests will be documented and presented with the ESIA Report. Similarly, methods used to collect baseline information on social issues will be described in detail and presented in the report.

Particular attention will be paid to issues highlighted by participants at the scoping meetings, including in relation to residents (of Fairview) traditional use of forest resources in the Maam River basin, right bank Essequibo River for hunting, fishing and sourcing timber, and also their desire for training and employment opportunities. In addition, the communities of Apoteri, Rewa and Crash Water will be consulted. Special attention will be paid to the concerns of the Iwokrama International Centre for Rain Forest Conservation and Development (IIC). The collection of baseline information on social issues will include consultations with public agencies, miners, environmental NGOs active in the natural resources sector, communities associated in any way with the forest concession area, holders of forest concessions of any kind, civil society groups, farmers, hunters, fishermen, the business community-including ecotourism enterprises, and any other persons or group with an acknowledged interest in the concession area. On the basis of consultations, agreements of some sort may be required with a stakeholder. For example, there will be discussions between VWL and IIC for the co-management of the Essequibo River Corridor.

2.3.5 Data on Physical infrastructure (especially road works) in or adjacent to the project area

A detailed description of *existing* roads, trails or footpaths, and any other existing physical infrastructure such as airstrips within or near to the project area. *Planned* roadways, forward camps and any other physical infrastructure contemplated will also be described. All existing and planned physical infrastructure will be displayed on a maps.

2.4 The analysis of impacts

The identification and elaboration of the nature of all environmental and social impacts that the timber harvesting and ancillary operations would generate; these include elaborating the sources of impacts, the receptors of impacts, describing in detail the environmental impacts in terms of socio-economic impacts, impacts from harvesting timber, impacts on the ecosystem and wildlife, air quality, and impacts on water resources. In particular, the physical impacts associated with all road works, and the socio-economic impacts of increased public access shall be described in detail.

2.5 The Development of an environmental management plan

The development of an environmental and social strategy to address the negative social impacts of the logging project in the long term as well as the development of an Environmental Management Plan to mitigate negative environmental impacts of the logging project in line with the requirements of the EPA and the GFC.

The environmental management plan shall include 'components' which shall be developed as part of the ESIA study, including plans for:

(a) (solid) waste management;

(b) air quality management;

(c) the management of noise and vibration;

(d) the management of the Essequibo River corridor (between the concession area and IIC)

(e) the management of road corridors, especially the management of erosion; and

(f) spill contingency (for fuel, oil and lubricants and any other substance that could become a pollutant)

In addition, the consultants will also develop plans in relation to:

(g) wildlife conservation;

(h) protection of biodiversity reserves;

(i) equipment maintenance and management; and

(j) rehabilitation of skid trails and log markets.

2.6 Risk assessments

On the basis of stakeholders' concerns and details of the project, determine what risks are associated with the project. (*Risk assessment will consider direct use values, indirect use values and optional*

values for the forest resources. Risk assessment will also include projected costs for a given period mainly in respect of: road construction and maintenance costs (price per km); felling, extraction and transport costs; and forest protection costs (including costs for conserving the integrity of biodiversity reserves and maintaining the boundaries of the concession and of compartments within the concession).

3.0 METHODOLOGY FOR UNDERTAKING THE ESIA STUDY

3.1 Overview

The Consulting team will undertake a number of tasks in pursuit of the ESIA Study. These tasks will include:

(a) Gather as many thematic maps as are available for the targeted area and prepare as many synthesis maps as are necessary to support the ESIA study

(b) Review any literature available for the targeted area or the general district

(c) Identify or develop methodologies for collecting socio-economic data and bio-physical data Identify tools such as matrices for evaluating, analysing or presenting information; also identify criteria for evaluating sites for biodiversity reserves; identify methodologies for a biodiversity impact assessment and identify indicators for monitoring purposes.

(d) Undertake reconnaissance activities to the target area as well as adjacent areas

(e) Extensive discussions with VWL to understand and evaluate the (technical scope of the project)

(f) Review the policy and legal framework for forest resources based activities

(g) Participate in scoping meetings organized by the EPA

(h) Schedule field work (taking into account the dry season and the wet season)

(i) Acquire (or rent) the equipment necessary to collect field data

(j) Recruit such technicians and boat operators as are necessary to undertake the field work.

(k) Undertake as many field trips to the concession area and adjacent areas to gather data;

(l) Consult with the EPA for clarification if required

(m) Develop the elements of the environmental management plan

(n) Conduct all analysis and assessments required

(o) Draft the ESIA report for review of the concessionaire

(p) Discuss the contents of the ESIA report (at the level of the consultants) taking care that the terms of reference have been addressed in entirety.

The more important tasks are described in Sections 3.2 through

3.2 Evaluate the logging project

(a) Study and document the details of the logging project put forward by the developer, including the appropriateness of the technology, the duration of the logging project, longer term development options for the project, and options for partnerships with other developers utilizing the same area and adjacent areas.

(b) Describe access options for taking personnel and equipment into the forest and for extracting timber.

(c) Assess and describe the skills sets available to the concessionaire in respect of a logging operation based on reduced impact logging, identify training gaps, and recommend appropriate training.

(d) Study and assess the company's standard operating procedures

(e) Compute the provisional productive area for timber harvesting within the concession area and identifying suitable areas for protection as biodiversity reserves after establishing the criteria for such biodiversity reserves in the context of the prevailing ecological parameters.

3.3 Review the policy and legal framework for forest resources utilization

(a) Study and document the array of local policies, legislation, standards and guidelines relevant to forest resources utilization and conservation generally and timber harvesting in particular.

(b) Review applicable regional and international agreements and conventions to which Guyana is a signatory or a party.

(c) Review applicable international policies and practices linked to forest resources utilization and cull items applicable to the project at hand.

3.4 Consultations with stakeholders

(a) List and categorize stakeholders and describe how each category impacts or is impacted by the project, in the short and in the long-term; this item will be placed in an annex in the ESIA Report.

(b) Visit and consult public agencies managing natural resources in or adjacent to the concession area to determine what land use or regional development plans exist for the area and how the project fits into any existing or strategic regional development plan(s). Special attention will be paid to any plans or opportunities for common or shared use of access roads or waterways. Maps illustrating current and potential land uses within and adjacent to the concession areas will be provided in the report. Numerical data and maps for mineral claims within the concession area and adjacent areas will be sourced and duly presented in the ESIA Report. Wherever convenient, staffs within field offices linked to the various public agencies will also be consulted.

(c) The consults will under field work specifically to consult with residents of communities in proximity to the concession area including residents of Apoteri, Rewa, Crash Water, Fairview and Kurupukari and representatives of the Iwokrama International Centre for Rain Forest Development and Conservation. Questionnaires, group meetings or *one to one* interviews will be the main tools used for consultations.

The consultants will seek out base line information on the interests, needs and problems of people in the area; specifically, the consultants will estimate how many people will be affected by the project, their differing socio-economic situations, and what role forests play in subsistence or income earning or livelihoods, especially what products are harvested (when and in what quantities). Any formal partnerships or contract agreement or memorandum for cooperation contemplated with any party will be documented and included in the ESIA Report.

(d) As far as is practicable, consult with other parties (communities, loggers, miners, relevant civil society groups, other special interest groups and NGOs) who have an interest in the development of the logging project. *Any formal partnership, contract agreements, memorandum for cooperation or memorandum of understanding contemplated between the developer and any party will be documented and included in the ESIA Report.*

(e) Participate in scoping meetings organized by the EPA, the GFC and /or VWL (the developer) and document any remarks made in relation to the project for further consideration.

(f) Describe (and highlight in the ESIA Report) the extent to which submissions garnered from consultations were incorporated into the ESIA Report, and also to what extent stakeholder comments were used to modify the project proposed by the developer, DWL.

3.5 Field surveys-concession area and adjacent areas-to gather baseline information

The consultants will review existing data on the concession area, identify data gaps, and as far as possible, develop and implement methods to collect the additional data required. Every effort will be made to collect data that captures all the variation in ecological types on the concession area and adjacent areas. Maps will be used to plan all field work. Synthesis maps will be prepared in line with the information to be presented.

Specifically the following will be undertaken:

(a) Review land use characteristics of the area and its significance for the proposed project; areas of conflict will be examined and opportunities for shared resource use and partnerships explored.

(b) Review the sectored studies available, especially strategic and action plans linked to biodiversity reserves, protected areas and land use.

(c) Identify or develop methodologies for gathering specific baseline data and for evaluating areas proposed for conservation as biodiversity reserves and wetlands conservation, respectively. Baseline data will capture the ecological variation within the concession area.

(d) collect baseline data on the following:

- topographic data, including stream network patterns and seasonal changes in water flows;
- soil parameters;

- the occurrence and location of indigenous assets of significance or importance;
- environmental data including temperature, noise, and water quality tests (against the Guyana National Bureau of Standards (GNBS) Interim Guidelines for Water Quality Testing);
- seasonal trends in the fluvial fluxes of water in the primary waterways in the concession area.

(e) collect data and also review existing data for flora within the concession area, addressing all forest types, ecological systems, and estimate merchantable stocking; endemic species will be identified.

(f) collect data for fauna via nocturnal and diurnal surveys and during the wet and dry seasons, and also review existing data for fauna in the district and in the process characterize threatened, endangered and protected species

(g) identify any wetlands within the concession area, if any, and describe their biodiversity data and water quality

3.6 Assess the technical feasibility of the project identifying all challenges and risks associated with the project.

This will include a review of:

(a) The decisions taken for organization of the concession area into compartments and blocks and whether there are other (better) options;

(b) The nature of soils long road alignments and the need and cost for bringing in additional soil material from quarries or borrow pits;

(c) The primary road and secondary road densities respectively and the scheduling of road works

(d) The felling cycle adopted and annual allowable cut (m^3/yr.).

(e) The technology options, logging systems and species mix chosen by the company

(f) The planned sequence for the harvesting of blocks and compartments

(g) The skills sets and capacity building opportunities available.

(h) The consideration of the long term sustainability of the project

3.7 Study, analyze and describe all impacts expected to generated by the logging project

3.7.1 Characterization of impacts:

(a) Type and nature -whether they are positive or negative, direct or indirect, cumulative

(b) Magnitude -severe, moderate, low

(c) Extent -the spatial extent or zone of impact of influence

(d) Timing -the phase of operation at which a particular impact occurs

(e) Duration -short term, long term, intermittent, continuous

(f) Reversibility -reversibility versus irreversibility

(g) Likelihood -the level of certainty/uncertainty/probability that an impact is likely

(h) Significance –a measure of the impact in relation to a prescribed standard

3.7.2 Recipient/sources of impacts

As far as possible impacts on the biophysical environment- including impacts linked to tree harvesting; impacts on ecosystems and wildlife; impacts on air quality; impacts on water resources; impacts related to noise, soil and vibration ; and impacts related to socio economic issues (including land use) will be elaborated and documented

Specific actions will include the assessment of the following:

3.7.2.1 The forest resources environment

(a) Key geographic attributes of the area (drainage density and hydrology, special sites, indigenous assets, merchantable forest stocks, etc. and how these would be impacted by the logging operation).

(b) The merchantable timber stock relative to planned extraction levels.

(c) The ecological parameters of the area (in *terms of its abundance and variety of biological resources* and the meteorological, geological and edaphic attributes of the concession area) and the effects of logging on these.

(d) Potential (residual) changes in forest structure and species composition due to logging.

(e) Possible impacts, consequences for wildlife.

(f) Current land use(s) within and on the perimeter of the concession area and how these would be affected.

(g) Maps illustrating the location of sample points for ML Inventory.

(h) Analysis of biodiversity.

3.7.2.2 The Physical environment

(a) Assessing the physical status of the environment (characterising the baseline conditions for various parameters such as water quality, evidence of pollution, fragile or vulnerable areas, and establishing parameters for measuring or estimating changes in those conditions).

(b) Quantifying and assigning economic values to environmental damage wherever practicable; in addition, the methods used to assess environmental damages will described in detail and justified.

3.7.2.3 Socio-economic Impact Analysis

Base line information for social issues. The consultants will conduct an analysis of the interests, needs and problems of people in the area (who are the people that will be involved or affected by the project, their differing socio-economic situations, their differing needs and interests, preferences for tree species, reasons for current forest practices).

(a) Scope of the social Impacts

- The baseline (pre-project) situation (with respect to current forest practices: what products are harvested and by whom, what products are processed and marketed and by whom, what role do forests play in subsistence or income earning).
- *Social impacts on defined groups of people (*Social impacts on the indigenous peoples of Apoteri, Rewa, Crash Water, Fairview and Kurupukari)
- Social impacts on other (unorganized groups) such as hunters, fishermen, tourists
- *Directness of social impacts:* effects on persons affected directly by interventions resulting from project activities.
- *Indirect social impacts*: effects on persons affected by the project, as an indirect consequence of project activities

(b) Nature of the social impacts

- *Positive impacts* (in terms of poverty alleviation, promotion of socio-economic status of people, including women, fostering human development, through access to better vocational education, improving levels of participation in local forestry developments)
- *Negative social impacts*-effects on the people affected by the project (developments that lead to higher levels of poverty, etc.
- *Cumulative impacts (including probable synergistic effects)*
  a. Review the potential impacts of the project on protected areas on left bank Essequibo River within Iwokrama and also any impacts that the Protected Area within Iwokrama may exert on the Project Area

  b. Review of existing tenure and usufruct rights (the way these impact on the use of forests in the concession area).

3.8 Develop an environmental management plan:

The environmental management plan would include the following elements:

(a) Environmental Management plan (Identification of the impacts; feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels; and costs of those measures to mitigate them including proposed work programmes, budget estimates, schedules, staffing, training requirements, and other necessary support services to implement the mitigation measures).

(b) An Environmental Monitoring Plan: A plan that will be developed and used primarily for monitoring the implementation of mitigation measures and the impacts of the project during implementation, and safeguarding the integrity of biodiversity reserves and other protected items. This will include an estimate of the capital and operational

costs and a description of other inputs such as training and institutional strengthening needed to carry it out.

(c) Other units of the Environmental Management Plan

- A waste management plan (setting out steps to be taken to manage all forms of waste)
- A Road Management Plan that addresses the impacts associated with existing and new road networks as well as shared road use with other developers in the area if necessary. This will also include specific measures for controlling erosion.
- An emergency response plan (setting out standard procedures for addressing contingencies, especially those actions or mishaps or incidents (for example oil spills, with potential for polluting or altering the environment).
- An Essequibo River corridor monitoring plan (based on some form of agreement with IIC).
- A wildlife management plan, including measures to protect threatened and endangered species.

3.9 **Address all concerns over the ESIA Study identified by EPA/EAB, the GFC, and other stakeholders.**

4.0 STRUCTURE OF THE ESIA REPORT

The ESIA Report outline for the study is as follows:

4.1 Executive summary

A summary of the **main findings** and recommendations in the report ***including***:

(a) A brief overview of current land use in the general region

(b) A brief overview, based on consultations with public agencies of future plans for the region where the concession is situate

(c) Key elements of the logging project

(d) The terms of reference for the ESIA study

(e) A summary of public consultations

(f) Alternatives considered

(g) Major impacts and their significance

(h) Proposed mitigation measures

(i) The environmental management plan

(j) Any other significant matter

(k) Consultants' recommendation.

4.2 Introduction:

4.2.1 Brief overview of the forestry sector-

(a) a brief overview of recent significant (overarching) developments in the natural resources sector generally and the forestry sector in particular,

(b) applicable (regional) land use plans and biodiversity strategy and action plans and how these may impact on forestry practices in the concession area and adjacent areas;

(c) State forest exploratory permits and their objectives; non timber developments in the forestry sector;

4.2.2 A brief profile of the company

(a) objectives and their obligations under the SFEP,

(b) geographic location of the SFEP Project area,
(c) objectives of the developer.

4.3 The Legal framework and policy context for the Project:

The following will be described in detail:

(a) the national policy and legal framework for logging activity, including the EPA Act 11 of 1996; recent natural resources based development strategies, action plans, and implementation mechanisms, public agencies involved generally with natural resources, including agencies concerned with fauna, biodiversity and climate change; intersectoral policy linkages.

(b) Applicable regional and International agreements and conventions related to the sector , to which Guyana is a signatory or party

(c) Applicable regional and international policies and standards for logging projects

(d) A brief overview of forestry issues and concerns of (environmental) NGOs, civil society groups, communities, the business community and the mining community already in the public domain.

4.4 The Nature and Scope of the Project

(a) Access options to the resource (duly represented on maps): detailed description of the methods used to access the concession and route(s) for the extraction of timber

(b) The nature of the logging project: output targets; details of the variables involved in logging operations, the economic potential of the merchantable timber stocks of the area in line with GFC's guidelines relating to felling cycles and sustainable yield; appropriateness of the technology proposed, the phases of the logging operation, organization of the concession area and the proposed sequence of development of the concession area and the manner in which these impact on the physical, biological and socio-economic environments. (Schedules for road works, forest inventory, and actual logging will be presented)

(c) A *technical* feasibility of the project (the relationship of the technical, economic, social and environmental features of the proposal.

(d) A comparison of alternatives and options (structure of the logging operations, species mix, alternative technologies, etc.);

(e) The extent of the alignment of the project with other (sectored) developments in the area or adjacent to the area, and the alignment of the project with overarching land use plans for the general area. Partnerships at the local and regional levels, if any, required for carrying out the logging activities in an environmentally responsible manner). Copies of contract agreements, memorandum for cooperation and memorandum of understanding at hand shall be attached to the report.

4.5 Description of the concession area and environs

4.5.1 Boundaries of the area, overview of neighbouring concessions and neighbouring sectored developments

4.5.2 Biophysical, land use and socio-economic conditions

4.5.2.1 Biophysical data

(a) Core parameters of the forest resources garnered from management level forest inventory: species composition, distribution of diameter classes, forest types and their spatial distribution, estimated mean volume of timber/hectare for all species; and estimated mean volume of timber/hectare for all species with diameter at breast height (dbh) ≥30cm and for merchantable species for trees with dbh≥30cm and dbh≥40cm respectively. A note also on the primary *non-timber* plant species present in the concession area and also adjacent areas. All plots will be geo-referenced and placed on a vegetation map of the concession area-the map will include areas adjacent to the concession.

(b) Data on wildlife recorded for the concession area

(c) Topographic data for the general zone where the concession is situate including the drainage pattern of the waterways.

(d) Geological maps and soil maps respectively. *Soil samples* will be collected in line with the variation in soil types indicated on soil maps: soil analysis data will be presented in tables in the document

(e) Environmental data: meteorological data, water analysis for samples at various points (including Maam River), and noise levels. All sample points will be geo-referenced and placed on maps

4.5.2.2 Land use

(a) Land use status of the area: in particular, mining sites if any will be geo-referenced and recorded on a map of the concession area (with adjacent areas); all established use of the area by communities will be recorded and if certain areas are more popularly used, such areas will be geo-referenced and produced on a map of the concession area

4.5.2.3 Socio-economic data

(a) A description of existing interests in the area recorded for neighbouring communities-especially Fairview, Apoteri, Crash water and Rewa and also the IIC; and information garnered from public consultations with public agencies and local authorities; interests by civil society groups, NGOs and other stakeholders garnered from social surveys.

(b) Environmentally-sensitive areas or aesthetically valuable features, or assets of archaeological significance requiring protection

(c) Major trends and anticipated future conditions if the project does not go ahead

4.6 Environmental and social impacts analysis

4.6.1 Socio-economic impacts

Impacts on the human environment (land tenure issues, effects on forest dwellers, intrinsic values, other impacts on communities (labour, gender issues, alteration in life styles), etc.

4.6.2 Impacts on the bio-physical environment

(Impacts from timber harvesting- mainly forest structure, road works, noise, vibration); impacts on ecosystems and wildlife; impacts on air quality, impacts on water quality, etc.).

Re 4.6.1 and 4.6.2, a matrix will be used to present this information; the matrix will include a description of the impacts identified, their characteristics and likely consequences. Each impact will be described in terms of their:

- Type and nature-whether they are positive or negative, direct or indirect, or cumulative (with additive, multiplicative or synergistic effects)
- Magnitude-severe, moderate, low
- Extent-the spatial extent , local or widespread
- Timing-the phase of operation at which a particular impact occurs
- Duration-short term, long term, intermittent, continuous
- Reversibility-reversibility versus irreversibility
- Likelihood-the level of certainty/uncertainty/probability that an impact is likely
- Significance –a measure of the impact in relation to a prescribed standard

4.6.3 Recommended measures and justification for assessing environmental damage and for avoiding, minimising and remedying each impact;

4.6.4 Evaluation of significance of the residual impacts (stating the methods or criteria used)

4.6.5 Limitations associated with impact prediction and evaluation, as indicated by assumptions made, gaps in knowledge and uncertainties encountered.

4.7 Project Alternatives

The content of this section will include reviews of:

(a) the nature of soils along road alignments and the implications of bringing in additional soil material from quarries or borrow pits;

(b) the primary road and secondary road densities respectively and the scheduling of road works; estimated costs for road works;

(c) the felling cycle adopted and annual allowable cut (m^3/yr.) computed;

(d) the technology options employed, logging systems and identification of (environmentally) preferred options

(e) the planned sequence for the harvesting of blocks and compartments;

(f) the skills sets available versus costs for capacity building opportunities and costs; and

(g) species mix chosen by the company and a brief overview of the current market (local and overseas) for Guyanese timbers.

An explanation of methods used for analysis and any assumptions made will be duly noted in this section.

4.8 Management Plan to Mitigate Negative Impacts

This section will include the following:

(a) Recommended mitigation measures for the mitigable impacts identified

(b) Assignment of responsibilities for plan implementation

(c) A schedule of actions to be taken to implement the plan and a related budget

(d) An (environmental) monitoring plan against agreed targets including:
- A plan or protocol for conserving biodiversity reserves, including monitoring protocols for monitoring of specific indicators
- A plan for monitoring the Essequibo River corridor
- A plan for monitoring concession roads, including measures to control erosion (and dust, if necessary), reduce stream pollution, and monitor public use/access.
- A plan for wildlife conservation

(e) An impact management strategy to correct larger than predicted changes

(f) Capacity building and training plans

(g) Contingency and emergency response plans

4.9 Economic Evaluation

(a) A review of all the factors impacting on the project (based primarily on Sections 3, 5, 7 and 8) including but not limited to:
- Land use
- Public benefits/community involvement/regional development
- Monitoring costs
- Beneficial/adverse long term residual benefits of the project
- Identification of long term strategies for the logging project and the area
- Labour issues and institutional requirements for occupational safety and health.

(b) A statement (and justification) setting out the consultants' opinions on the value and feasibility of the project.

4.10 Inter-Agency and NGO/Public Involvement

(a) a list of persons consulted along with their categorisation into primary, secondary and tertiary stakeholders

(b) methods used for involving stakeholders in the study

(c) an analysis of the views and concerns expressed

(d) the geographical range of persons consulted.

4.10 A Closure plan

A Closure Plan summarising steps to be taken in the event of the closure of the Project (concession scale) or any phase of the project, including the closure of logging activities at the level of compartments, blocks.

4.11 Annexes

Annexes in the document will *include*:

(a) Methodologies used for the collection of data on forest stocking

(b) Criteria for evaluating and setting out biodiversity reserves

(c) Copies of (or templates for) MOUs or other partnership agreements

(d) An array of thematic and synthesis maps

(e) Minutes of scoping meetings

(f) Copies of questionnaires used for consultations with stakeholders

(g) A list of persons consulted, along with the location where contact was made and contact details of the persons consulted as far as possible.

(h) A record of strong, critical or extraordinary arguments made by stakeholders' worthy to retain without modification.

(i) Extracts from recent policy statements applicable to the general context for the project.

(j) CVs of consultants (see Annex 1)

5.0 DURATION

The Company is already engaged in extensive data collection within the concession area and has garnered information from a previous ESIA for some areas of the current concession. The team of consultants has already benefitted from consultations at Fairview.

For these reasons, the team of consultants expect to complete the first draft of the ESIA Report within three months of the EPA's approval of the TOR.

6.0 ESIA REPORT SUBMISSION

The Consulting Team will provide the EPA with electronic copies and a minimum of eight duly signed hard copies of the ESIA Report.

Godfrey Marshall, Team Leader

Other members of consulting team:

Eustace Alexander

Environmental Engineering Solutions Inc

Annex II: Minutes of Scoping Meeting

Environmental Protection Agency

Environmental Protection Agency
7/7/2014
Environmental Management Compliance Division

July 10, 2014

Mr. Shiek Niamatali
Managing Director
Variety Woods & Greenheart Limited
99, Laluni Street,
Queenstown,
Georgetown.

Dear **Mr. Niamatali,**

Minutes of Sector Agency and Public Scoping Meetings for Variety Woods and Greenheart Ltd. proposed Logging and Sawmilling project within SFEP 01/2012

Please find attached, the Environmental Protection Agency's (EPA) minutes of the Sector Scoping Meeting held on May 07, 2014, at the EPA Boardroom, Ganges Street, Sophia, Georgetown, and the Public Scoping Meeting held at Fairview Community Centre, Fairview Village, Iwokrama, North Rupununi, on May 14, 2014.

Further, issues/concerns highlighted therein shall be incorporated in the Terms of Reference (ToR) for the Environmental and Social Impact Assessment study. In addition, the Agency is currently awaiting the Environmental Assessment Board's (EAB) comments for the draft Terms of Reference (ToR).

Should you have any questions or need clarifications, please feel free to contact our Office.

Yours sincerely,

Kemraj Parsram
Director
Environmental Management Compliance Division
for Executive Director

Attach.

- EPA's minutes of the Sector Scoping and Public Agency Scoping meetings held on May 07, 2014 and May 14, 2014, respectively.

C. Mr. Veetal Rajkumar, Chairperson, Environmental Assessment Board.
Mr. Godfrey Marshall, ESIA Team Leader – Forestry Training Centre Inc.

Page 1/1
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Minutes of Scoping Meeting: Page 2 of 13

Variety Woods and Greenheart Ltd. Proposed Logging and Sawmilling Project Region 9.
Public Scoping Minutes at Fairview Amerindian Village.

Date: May 14, 2014.

Time: 11:00 h

Venue: Fairview Community Centre.

Objectives:

- To facilitate a Public Scoping exercise for the Environmental and Social Impact Assessment (ESIA) for the above-mentioned project.
- To provide stakeholders the opportunity to highlight issues/ concerns regarding the proposed Logging Operation to be established by Variety Woods and Greenheart Limited which will be incorporated into the final Terms of Reference (ToR) for the ESIA study.

Environmental Protection Agency's (EPA) Representatives:

- Mr. Kemraj Parsram, Director, Environmental Management Compliance Division.
- Ms. Teijvarti Persaud, SEO (M&F), Environmental Management Permitting Division.
- Ms. Shamin Joseph, EO II (M&F), Environmental Management Permitting Division.

Environmental Assessment Board (EAB) Representative:

- Mr. Veetal Rajkumar – Chairperson, Environmental Assessment Board.

Guyana Forestry Commission (GFC):

- Tasreef Khan – Deputy Commissioner of Forests, Forest Monitoring Division(FMD)

Ministry of Natural Resources and the Environment (MNRE):

- Mr. Gavin Agard – Forestry Specialist.

Guyana Geology and Mines Commission (GG&MC):

- Kerion Husbands – Senior Environmental Officer.

Representative from Variety Woods and Greenheart Ltd.:

- Mr. Rommel Niamatalli – Operations Director.

Representatives from ESIA Consultant Team:

- Mr. Godfrey Marshall – ESIA Coordinator, Technical Team Leader

Attached list of Attendees from respective Communities:

Minutes of Scoping Meeting: Page 3 of 13

Variety Woods and Greenheart Ltd. Proposed Logging and Sawmilling Project Region 9.
Public Scoping Minutes at Fairview Amerindian Village.

Minutes

The Public Scoping Meeting for Variety Woods and Greenheart Ltd. proposed Logging and Sawmilling project was held at the Fairview Village Community Centre, Region 9, and commenced at 11:00 h.

The Deputy Toshao of Fairview officially opened the meeting by asking a community member to offer a word of Prayer followed by the audience reciting the National Pledge; he then proceeded to ask Ms. Samantha Andres – community member to present welcoming remarks to representatives of the Sector Agencies. Subsequently, the Deputy Toshao introduced the Chairperson (Mr. Kemraj Parsram -Director EMCD, EPA). The Chairperson thanked the Deputy Toshao for his welcoming remarks and thanked the Community for attending the consultations. Mr. Parsram proceeded to introduce the members of the head table and other representatives from the Sector Agencies. Mr. Parsram then introduced the project and outlined the steps for the project in the Authorisation process and indicated the current stage of the project, after which he informed the Community of the purpose of the meeting and the importance of their contribution during discussions. The Chairperson informed the audience of the members of the head table who would deliver their respective presentations.

After the Chairperson's remarks, he invited the following speakers to deliver their respective presentations which are summarized below:

Ms. Sharmin Joseph – EO II / MF, EMPD, EPA

The presentation delivered by Ms. Joseph focused on the Environmental Impact Assessment (EIA) process for the project. She highlighted the functions of the EPA and the sequence of events for the project from the receipt of the Application for Environmental Authorisation to Environmental Permit. She further defined what the ESIA study was about and what it is expected to be achieved in the study particularly to mitigate the impacts resulting from the project. Ms. Joseph further stressed that the Community of Fairview would be involved in subsequent consultations which are part of the ESIA process and the Community's comments would be incorporated into the study. She further highlighted that upon completion of the ESIA Study, various sector agencies and the Community of Fairview would review the document. Upon reviews, the Agency would then determine whether an Environmental Authorisation can be granted to the Company.

Mr. Romell Niamatalli – Representative of the Company

Mr. Niamatalli's presentation focussed on an overview of the Company's background and reasons for undertaking the proposed project. He further highlighted the various Applications that were submitted by the Company to the GFC and the EPA and proposed activities to be undertaken prior to the onset of the project, including road alignments. Mr. Niamatalli indicated that the project was conducting its exploration phase. The Company would usually employ 55% of its workforce from the Community and they will provide accommodations, water and electricity for them.

Mr. Godfrey Marshall – ESIA Coordinator, Technical Team Leader

Mr. Marshall thanked the Deputy Toshao and Village for hosting the meeting and proceeded to outline the approach of the team in conducting the study. He indicated that the ESIA study would be done in accordance with guidelines established by the EPA. Mr. Marshall illustrated on Maps the area where the ESIA study would be conducted as well as the average distances away where the neighbours were located. He also indicated that the Company will not be

Minutes of Scoping Meeting: Page 4 of 13

logging the entire area all at once but they will be logging the area in compartments which will be divided into blocks. Mr. Marshall also plans to further consult with the Amerindian communities that are closest to the concession for the ESIA study. He intends to ensure both the social and environmental aspects are covered as recommended by the EPA.

After the presentations were delivered, the Chairperson thanked all the presenters for their contributions and proceeded to open the floor for comments.

Questions/Comments/Suggestions

The Chair then invited the attendees to raise any concerns they may have that should be included in the final terms of reference

1. **Mr. Johnny Ignacia – Villager, Fairview Community** – enquired as to what benefits/ agreement the Company intends to provide to the Community.

2. **Mr. Kemraj Parsram, Director, EMCD** – In response, Mr. Parsram indicated the phase in the Agency's Authorisation process that the project was to enquire the concerns of the villagers and to identify if there were any key parts in the concession that are used by the villagers, e.g. religious grounds, hunting and fishing, etc.

3. **Ms. Samantha Andres – Community member** – expressed that there were concerns raised by the villagers during a Community consultation by the EPA at the time of their site visit and it has been handled by the EPA. She further stated that the opening of roads by the developers will allow other persons that are not from within the community to enter and invade their hunting and fishing grounds.

4. **Mr. Romell Niamatalli – Representative of the Company** – In response stated that the Company has constructed a road which is on the Right Bank of the Demerara River in the Mamm Creek area. He further indicated that the Company has check points for their roads and they are able to monitor who enters the concession. Mr. Niamatalli also stated that the Company has strict policies in place against hunting in their concession.

5. **Lawerence Edwards – Villager, Fairview community** – commented on the intrusion of Gold miners in the area of the proposed logging concession to obtain meat and fish for their camps and this action will have a significant impact on the community since that is the area where they depend on for their food source.

6. **Kerlon Husbands – SEO, GGMC** – Enquired on the location of the mining camp that was observed by Mr. Edwards and when it was observed. He then indicated that the GGMC will have to investigate the situation.

7. **Lawerence Edwards – Villager, Fairview community** – Further stated he made the observation last September when he started hunting for the Christmas season and in April, 2014 as well. Also, in the Mamm Creek area, there were leases given the villagers to carry out farming activities.

Minutes of Scoping Meeting: Page 5 of 13

Variety Woods and Greenheart Ltd. Proposed Logging and Sawmilling Project Region 9.
Public Scoping Minutes at Fairview Amerindian Village.

8. **Kevin Moses – Villager, Fairview community** – stated that the Community would hunt and fish in the area of the proposed logging concession (Mamm Creek) not for commercial purposes but for domestic supplies.

9. **Tasreef Khan – Deputy Assistant Commissioner, Forest Monitoring Division (FMD)** - Mr. Khan made brief remarks about the Company indicating that they are currently undertaking the exploratory phase to assess the impacts in order to verify the feasibility of the project. He also stated that the road that was constructed by the Company was across the Mamm Creek to the Demerara River and the length is approximately 4 kilometres. Mr. Khan also highlighted that the Company, if granted the relevant permission for the Concession, will have to undertake selective logging with a rotation cycle similar to the one done by Iwokrama.

There being no further issues and concerns raised, Mr. Parsram expressed thanks to the gathering for attending the Public Scoping Meeting and concluded by updating the audience on the preceding activities in the ESIA process as it relates to the project including the role of the EAB. The meeting concluded at 12:15 h.

Pictures

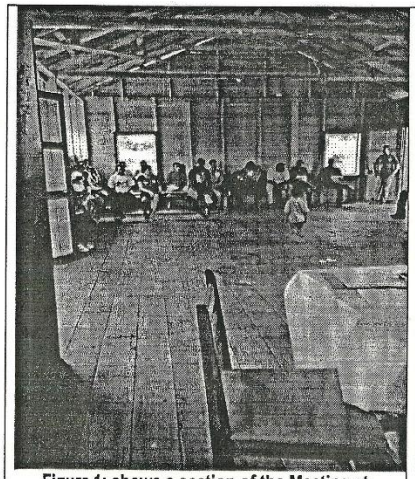

Figure 1: shows a section of the Meeting at Fairview Community Centre.

Figure 2 : Shows the Head Table.

Minutes of Scoping Meeting: Page 6 of 13

Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Public Scoping Meeting
Fairview Community Centre
Wednesday May 14, 2014

No	Name	Address	Telephone #	Email Address
1.	KEMRAJ PARSRAM	EPA	624-3080	
2.	CHRISTOPHER PERSAUD	LETHEM	626-9676	
3.	[illegible] *	Fair View		Deputy T
4.	Rommel Nizamali	99 [illegible] St Queenstown	6535071 6627856.	
5	[illegible] Allicock	Fair View		
6	Kelvin Moses	Fair View Village		
7	Raechun Jacobus	Apaita Valley	647-8987	Forest Ranger
	[illegible]	Arampata Valley		
	Orma Berhand	Fair View		
	Bertilla Bernard.	Fair-View		

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Minutes of Scoping Meeting: Page 7 of 13

Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Public Scoping Meeting
Fairview Community Centre
Wednesday May 14, 2014

No	Name	Address	Telephone #	Email Address
1	Stanley Andries	Fairview	-	-
2	Kelvin Moses	Head Teacher		
3	Sarah Reonge	Fair View (CHW)	648-1679	
4	Kimberly Williams	Fair View - (councillor)	6262567	
5	Nyota Peters	Fair View "	6175961	nyotapeters@yahoo.com
6	Kevin Allcock	Fair View (CSO)		
7	Thelma Alcock			
8	Laurence Edwards	Fair View		
9	Johnny Francis	Villager		
10	Judy Daniels	Fair View (CSO)		
11	Theresa John	Fair View (Teacher)	6222582	
12	Renecia Leo	Fair View		
13	Clifford Peters	Fair View		
14	Orville Lee	Fair View		
15	Jason Thomas	Fair View		
16	Dean Bernard	Fairview	6119244	
17	Kevin Husbands	GGMC	610 7009	Kevin.husbands@gguil.com

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Minutes of Scoping Meeting: Page 8 of 13

Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Public Scoping Meeting
Fairview Community Centre
Wednesday May 14, 2014

No	Name	Address	Telephone #	Email Address
	Tasreef Khan	GFC	6230509	tasreef_khan@hotmail.c
	Veetal Rajkumar	MNRE	231-2506-11	vrajkumar@nre.gov.gy
	Godfrey Marshall	FTCI	523-5062	yemar@guyana.net.gy

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Minutes of Scoping Meeting: Page 9 of 13

Variety Woods and Greenheart Ltd. Proposed Logging and Sawmilling Project Region 9. Sector Scoping Minutes at the Environmental Protection Agency's (EPA) Boardroom.

Date: May 07, 2014.

Time: 10:35 h

Venue: Environmental Protection Agency

Objectives:

- To facilitate a Sector Scoping exercise for the Environmental and Social Impact Assessment (ESIA) for the above-mentioned project.
- To provide stakeholders the opportunity to highlight issues/ concerns regarding the proposed Logging Operation to be established by Variety Woods and Greenheart Limited which will be incorporated into the final Terms of Reference (ToR) for the ESIA study.

Environmental Protection Agency's (EPA) Representatives:

- Ms. Savitri Itwaru – EO 2 / MF / EMD
- Ms. Sharmin Joseph – EO 2 / MF / EMD
- Mr. Khemraj Parsram– Director / EMCD
- Ms. Sonia Gumbs-Luke – SEO IIE / EMPD
- Ms. Gregoria Vaughn – EO 2 / IIE / EMPD
- Ms. Khadija Ali – EO 1 / AFT / EMPD
- Ms. Latoya Farihna – EO 2 / HWAQ / EMPD
- Ms. Nalissa Persaud – EO 2 / MF /EMPD
- Ms. Teijvarti Persaud – SEO / MF / EMPD

Environmental Assessment Board (EAB) Representative:

- Dr. Bendita Lachmansingh

Ministry of Natural Resources and the Environment (MNRE):

- Mr. Gavin Agard – Forestry Specialist.

Guyana Geology and Mines Commission (GG&MC):

- Mr. Qunicy Thom – Senior Environmental Officer.

Representative from Variety Woods and Greenheart Ltd.:

- Mr. Rommel Niamatalli – Operations Director.

Representatives from ESIA Consultant Team:

- Mr. Godfrey Marshall – ESIA Coordinator, Technical Team Leader

Attached list of Attendees from respective Communities:

Minutes of Scoping Meeting: Page 10 of 13

Variety Woods and Greenheart Ltd. Proposed Logging and Sawmilling Project Region 9. Sector Scoping Minutes at the Environmental Protection Agency's (EPA) Boardroom.

Minutes

The Scetor Scoping Meeting for Variety Woods and Greenheart Ltd. proposed Logging and Sawmilling project was held at the Environmental Protection Agency and it commenced at 10:35 h.

The Chairperson, Mr. Kemraj Parsram, officially opened the meeting by welcoming representatives of the sector agencies to the scoping meeting and proceeded to introduce members of the head table. Subsequently, Mr. Parsram provided a background on the project and invited designated persons to deliver their respective presentations which are summarized below.

Ms. Sharmin Joseph – EO II / MF, EMPD, EPA

The presentation delivered by Ms. Joseph focused on the Environmental and Social Impact Assessment (ESIA) Process which the Company is required to undertake prior to the issuance of an Environmental Permits for the project. Phases of the ESIA process that were already concluded were highlighted during the presentation.

Mr. Romell Niamatalli – Representative of the Company

Mr. Niamatalli's presentation focussed on an overview of the Company and reasons for undertaking the proposed project. He further highlighted the various Applications that were submitted by the Company to the GFC and the EPA and proposed activities to be undertaken prior to the onset of the project.

Mr. Godfrey Marshall – ESIA Coordinator, Technical Team Leader

Mr. Marshall's presentation focussed on the approach that would be taken to conduct the ESIA study.

After the presentations were delivered, the Chairperson thanked all the presenters for their contributions and proceeded to open the floor for comments.

Questions/Comments/Suggestions

The Chair then invited the attendees to raise any concerns they may have that should be included in the final terms of reference:

Mr. Peter Persaud – Representative from The Amerindian Action Movement of Guyana

- Indicated that the Company did not mention "climate change" and the "low carbon development strategy" and ways in which the project will impact the afore-mentioned;
- Enquired whether the Guyana Forestry Commission (GFC) will have a monitoring base at the project site;
- Enquired whether an airstrip will be constructed;
- Enquired why the Crashwater Amerindian Community has been omitted from the list of impacted communities;
- Enquired whether no-hunting extends to non-Amerindians or whether it applies to both non-Amerindians and Amerindians;

Minutes of Scoping Meeting: Page 11 of 13

Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Sector Scoping Meeting
Environmental Protection Agency Boardroom
Wednesday May 07, 2014

No	Name	Address	Telephone #	Email Address
	Esther Robinson	11 Camp St, N/Burg	6706092 2262814	moruca10@yahoo.com
	Bendita Lachmansingh	Ministry of Health	645-6213	blachmansingh@health.gov.gy
	Quincy Thom	GGMC	225-6691 Ext 280	quincy.thom@gmail.com
	Lauren Grant	94 Carmichael St. G/T	225-6071 223-7146	nationaltrustgy@gmail.com
	Khadija Ali	19 Cove & John, E.C.D.	229-2571	khadijaali34@yahoo.com
	Latoya Farinha	E.P.A	225-0506	[illegible]@gmail.com
	Sonia Luke	EPA	" "	[illegible]@yahoo.com
	[illegible]	Variety Woods & Greenheart Ltd	2268556	[illegible]@gmail.com
	Godfrey Marshall	FORESTRY TRAINING CENTRE INC	223-5062	gemar@guyana.net.gy
	[illegible]	TAAMOG	227-1803	[illegible]@yahoo.com
	Gregoria Vaughn	EPA	225-0506	gregoriavaughn01@gmail.com

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Minutes of Scoping Meeting: Page 12 of 13

Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Sector Scoping Meeting
Environmental Protection Agency Boardroom
Wednesday May 07, 2014

No.	Name	Address	Telephone #	Email Address
	Esther Robinson	11 Camp St, N/Bug	6706092 2262814	morucaioe@yahoo.com
	Bendita Lachmansingh	Ministry of Health	645-6213	blachmansingh@health.gov.gy
	Quincy Thom	GGMC	225-6691 Ext 280	quincy.thom@gmail.com
	Lauren Grant	94 Carmichael St. G/T	223-5071 223-7146	nationaltrustgy@gmail.com
	Khadija Ali	19 Cove & John, E.C.D.	229-2571	khadijaali34@yahoo.com
	Latoya Farinha	E.P.A	225-0506	[illegible]farinha@gmail.com
	Sonia Luke	EPA	" "	gumbssonia@yahoo.com
	[illegible]	Variety Woods & Greenheart Ltd.	2268576	[illegible]@gmail.com
	Godfrey Marshall	FORESTRY TRAINING CENTRE INC	223-5062	gemar@guyana.net.gy
	Peter Persaud	TAAMOG	227-1803	[illegible]@yahoo.com
	Gregoria Vaughn	EPA	225-0506	gregoriavaughn01@gmail.com

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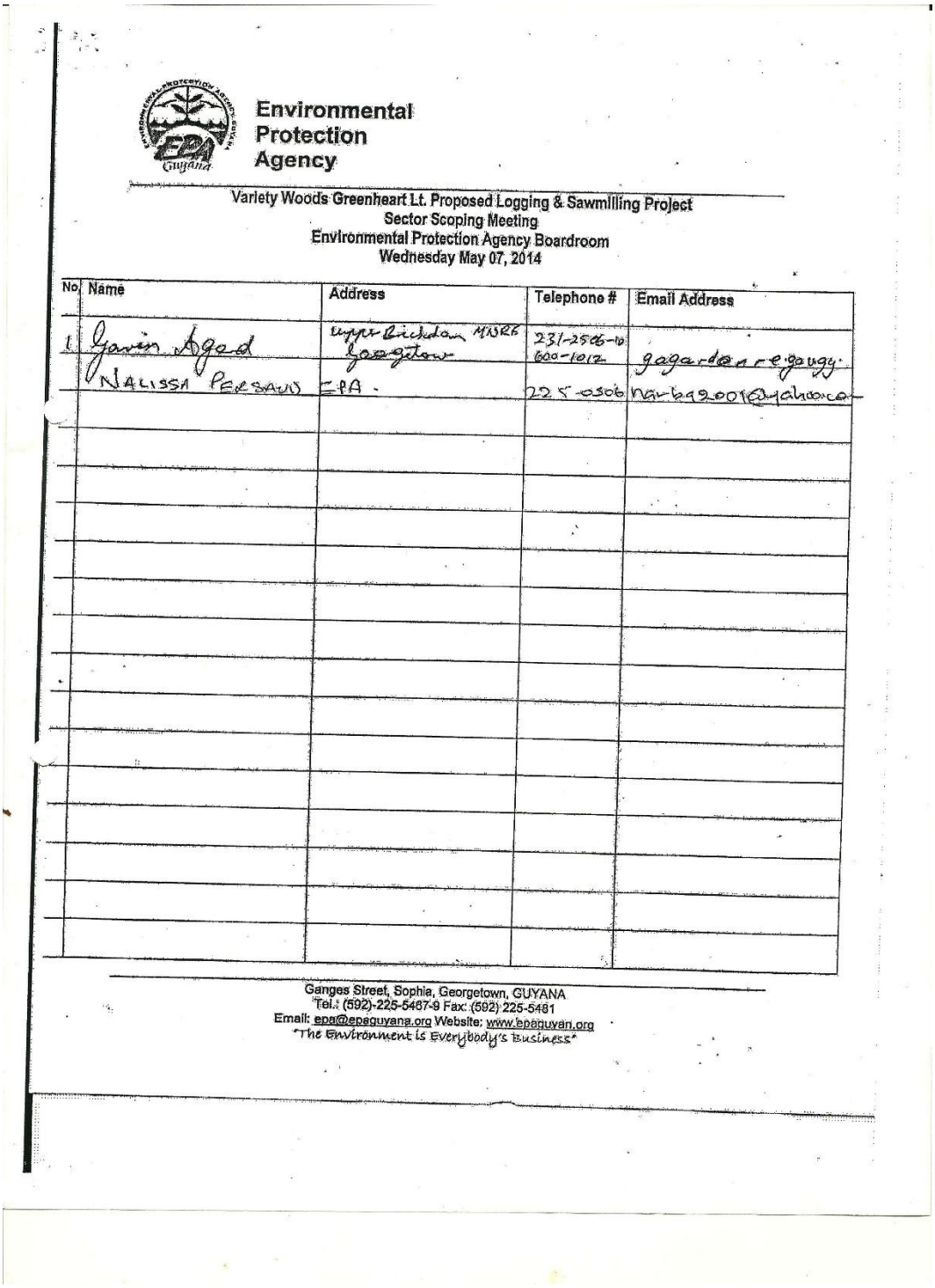
Minutes of Scoping Meeting: Page 13 of 13



Environmental Protection Agency

Variety Woods Greenheart Lt. Proposed Logging & Sawmilling Project
Sector Scoping Meeting
Environmental Protection Agency Boardroom
Wednesday May 07, 2014

No.	Name	Address	Telephone #	Email Address
1	Gavin Agard	Upper Bickdon MSRD Georgetown	231-2506-10 600-1012	gagard@epaguyg.
	NALISSA PERSAUD	EPA	225-0306	narba9001@yahoo.co

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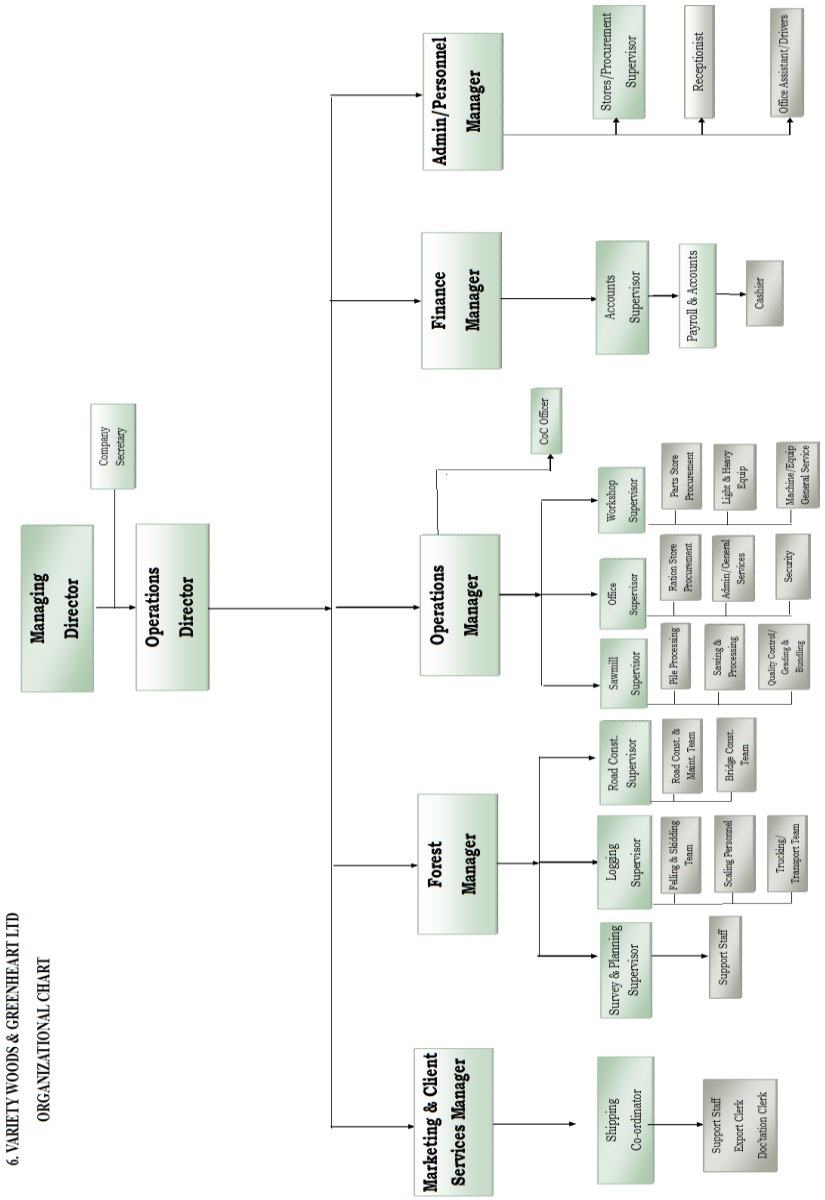
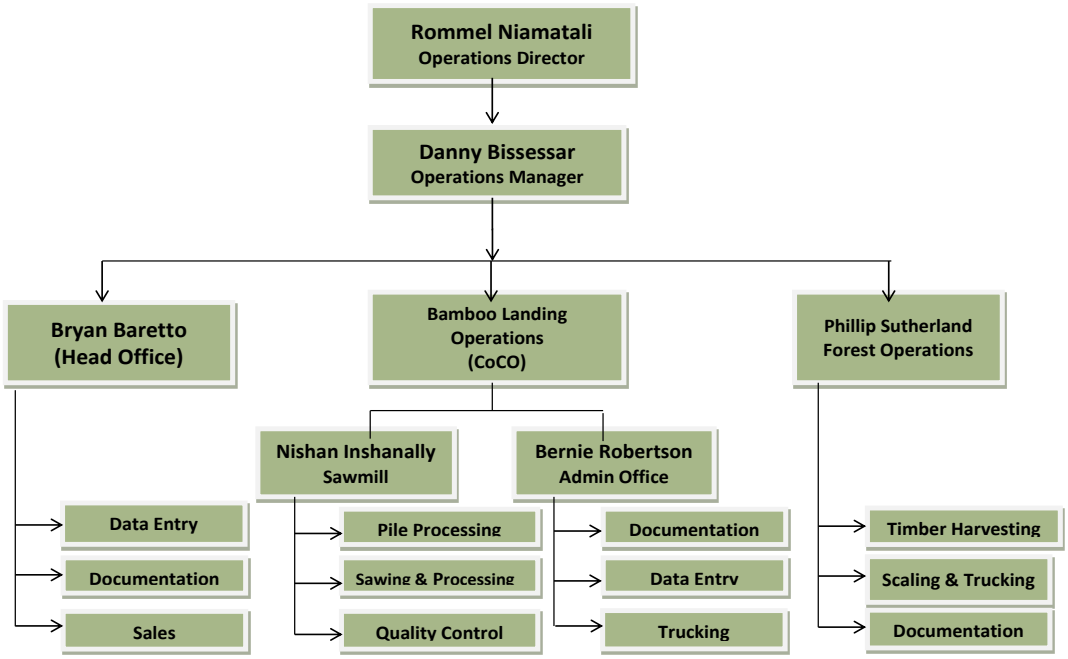
Annex III: organizational Chart (a)-VWL



Annex III (b): Organizational chart for field operations



Annex IV: Description of the concession area

Variety Woods & Greenheart Ltd. SFEP 01/12

Left and Right Bank Berbice River, Right Bank Essequibo River, Left Bank Maam River;

Commencing at the mouth of an unnamed tributary on the right bank Essequibo River having approximate UTM coordinates of 21N 0338559 E, 0463336 N;

thence down the right bank Essequibo River to the mouth of the Maam River having approximate UTM geographic coordinates of 21N 0320702E, 0510223 N;

thence up the left bank Maam River for approximately 27.3 km to a point having approximate UTM geographic coordinates of 21N 0337353 E, 0515478 N;

thence by a cut line in a South-westerly direction for approximately 2.9 km to a point having approximate UTM geographic coordinates of 21N 0336871 E, 0512593 N;

thence along the Makari Mountain Ridge in a Southerly and easterly direction for an approximate distance of 34.1km to a point on an unnamed tributary having approximate UTM geographic coordinates of 21N 0345929 E, 0504503 N;

thence down the right bank of this unnamed tributary for an approximate distance of 1.9 km to a point opposite the mouth of another unnamed tributary having approximate UTM geographic coordinates of 0347187E 0503086N;

thence across and up the left bank of this unnamed tributary to a point near its source having approximate UTM geographic coordinates of 0348136E, 0503904 N;

thence by a cut line in a North-easterly direction for an approximate distance of 0.2 km to a point having approximate UTM geographic coordinates of 21N 0348219 E, 0504078 N;

thence along the Makari Mountain Ridge in an easterly direction for an approximate distance of 2.1 km to a point having approximate UTM geographic coordinates of 0350168 E, 0504071 N;

thence by a cut line in a Southerly direction for an approximate distance of 0.3 km to a point near the source of an unnamed tributary having approximate UTM geographic coordinates of 0350152 E, 0503753 N;

thence down the right bank of this unnamed tributary for an approximate distance of 5.4 km to the intersection with a road having approximate UTM geographic coordinates of 0351976 E, 0500428 N;

thence along this said road in a north-easterly direction for an approximate distance of 2.2 km to a point having approximate UTM geographic coordinates of 0353471 E, 0501735 N;

thence by a cut line in a South-easterly direction for an approximate distance of 0.2 km to a point near the source of an unnamed tributary of the Duck River having approximate UTM geographic coordinates of 0353648 E, 0501621 N;

thence down the right bank of this unnamed tributary to its mouth on left bank Duck River having approximate UTM geographic coordinates of 0355067 E, 0499995 N;

THENCE UP THE LEFT BANK Duck River for an approximate distance of 3.2km to the intersection with a road having approximate UTM geographic coordinates of 0353311E, 0498943 N;

thence along this road this road in a south-easterly direction for an approximate distance of 3.0km to a point on an unnamed tributary having approximate UTM coordinates of 0354468E, 0496300N;

thence up the left bank of this unnamed tributary for an approximate distance of 2.6km to a point on a road having approximate UTM geographic coordinates of 0352601E, 0494768 N;

thence along this road in a south=easterly direction for an approximate distance of 3.6 km to a point on an unnamed tributary having approximate UTM geographic coordinates of 0354706 E, 0492601 N;

thence across and down the right bank of this unnamed tributary for an approximate distance of 2.3km to the intersection with a road having approximate UTM geographic coordinates of 0355440E, 0494741 N;

thence along this road in a south-easterly direction for an approximate distance of 6.9km to a point on the left bank Berbice River having approximate UTM geographic coordinates of 21N 0360983E, 0492229 N;

thence across and down the right bank Berbice River for an approximate distance of 4.7km to the mouth of the Rupununi River having approximate UTM geographic coordinates of 0362160E, 0494839N;

thence up the left bank Rupununi River to a point near its source having approximate UTM geographic coordinates of 0370008E, 0485619N;

thence by a cut line in a south easterly direction for an approximate distance of 3.6km to a point near the source of a small unnamed tributary of a large unnamed tributary of the Berbice river having approximate UTM geographic coordinates of 0373076 E, 0483681 N;

thence down the right bank of this small unnamed tributary to its mouth on the left bank of the large unnamed tributary of the Berbice River having approximate UTM geographic coordinates of 0374740 E, 0484256 N;

thence up the left bank of this large unnamed tributary for an approximate distance of 10.7km to a point where it intersects a Trail having approximate UTM geographic coordinates of 0376735 E, 0474133N;

thence along this trail in a south westerly direction for an approximate distance of 17.4km to a point on the Berbice River having approximate UTM geographic coordinates of 0362674E, 0466518N;

thence across and up the left bank Berbice River for an approximate distance of 5.6km to a point having approximate UTM geographic coordinates of 0364279E, 0464191 N;

thence by a cut line in a westerly direction for an approximate distance of 2.1 km to a point on an unnamed tributary of a large unnamed tributary of the Berbice River having approximate UTM geographic coordinates OF 0362146E, 0464216N;

thence down the right bank of this unnamed tributary to its mouth on the right bank of the large unnamed tributary of the Berbice River having approximate UTM geographic coordinates of 21N 0361142E, 064831N;

thence across and up the left bank of this unnamed tributary for an approximate distance of 1.5km to the mouth of an unnamed tributary having approximate UTM geographic coordinates of 0360024E, 0464080N;

thence up the left bank of this unnamed tributary for an approximate distance of 1.6 km to a point where it intersects a trail or road having geographic coordinates of 0358619 E, 0464148N;

thence along this trail in a south westerly direction for an approximate distance of 9.8km to a point having UTM geographic of 0350132E, 0462123 N;

thence by a cut line in a westerly direction for an approximate distance of 4.4km to a point near the source of an of an unnamed tributary of a larger unnamed tributary of the Essequibo River, having approximate UTM geographic coordinates of 0343991E, 0462469N;

thence down the right bank of this unnamed tributary to its mouth on the left bank of a larger tributary of the Essequibo River having approximate UTM geographic coordinates of 0345647E, 0462093N;

thence across and down the right bank of this unnamed tributary to its mouth on the right bank Essequibo River, this being the point of commencement.

Save and except all lands legally held.

Approximate area: 132,863.21ha (328,309.36 ha).

Maps: 51SE; 52SE, SW; 57NE, NW, SE, SW.

Annex V: Water Quality Standards

A. GNBS Standards for Industrial Effluent Discharge (Page 1 of 2)

Point source discharge Limits for Industrial Effluent for Operations other than Mining, Forestry and Agriculture/**Parameter and Maximum Allowable Limits**

(All values expressed as mg/L except pH, temperature and as otherwise noted)

Sector	pH	Temp.	BOD5	COD	DO	TSS	N as HN3	Total N	P	CN (Tol.)	P04	C1	Surfac-tant	Phenols	Coli-form	O &G	Other and/or Comments
Breweries	5.0-9.0	< 40	<100 (t.v<50)	<250		<100 (t.v. <50)	<50	N as NH3								10	
Cement bagging, manufacturing	5.0-9.0	<40			>4.0	50											WHO Standards for Industries Manufacturing Operations. Turbidity NTU: Max. dy: <150
Citrus processing plants	5.0-9.0	<40	<50	<250		<50	<50									<10	
Distilleries-(a) Blending halls & wineries	5.0-9.0	<40	<50			<50	<50										
Distilleries –(b) Fermentation/ Distillation units	5.0-9.0	<40	<500 (t.v. 100)														
Edible oils	5.0-9.0	<40	<50	<250		50		<10								<10	
Meat & seafood processing	5.0-9.0		<100 (t.v.<50)	<250		<100 (t.v. <50)		<50								<30 (t.v.<10)	
Metal finishers	5.0-9.0	<40				<100 as settle-able solids				<0.5	<10						CD:2.0; Cr(tot):2.0; Hg: 1.0; Cu: 3.0; Pb: 0.1; Zn:3.0; Ni:3.0; Fe:5.0; Ba:10; Cr VI: 0.5
Milk based industries	5.0-9.0	<40	<100 (t.v.<50)	<250		<100 (t.v. <50)	<50									<30 (t.v.<10)	
Paint & ink manufacturing	5.0-9.0		<100			<100								<1.0		<30 (t.v. <10)	Cu:<3.0; Ph:<1.0; Cr: <2.0; Cr VI: 0.5; Ni: <3.0; Zn: <3.0; Hg:<1.0
Pharmaceutical/ chemical production	5.0-9.0			<150	>4.0								<0.2	<0.5		<10	Secondary parameters: No3: 40; SO4 2: 1000; CI: 300; NH4 as N:1.0
Petroleum bulk terminal	5.0-9.0	<40	<50	,250		<100										TPH:<40	Pb: 0.1, Cr GT 0,.1 Cr (+A) 05
Printers & photo-processing establishments	5.0-9.0	<40	<30	<150		<50										<10	Ag:0.5; Cd:0.1; Cr VI: 0.1; Cr (tot): 0.5; Cu: 0.5 Zn: 2.0
Soft drinks plants	5.0-9.0	<40	<100 (t.v. <50)	<250		<100 (t.v.<50)	<50										

A. GNBS Standards for Industrial Effluent Discharge (Page 2 of 2)

Point source discharge Limits for Industrial Effluent for Operations other than Mining, Forestry and Agriculture

Parameter and Maximum Allowable Limits

(All values expressed as mg/L except pH, temperature and as otherwise noted)

Breweries	5.0-9.0	< 40	<100 (t.v<50)	<250		<100 (t.v. <50)	<50	N as NH3								10	
Sugar factories	5.0-9.0	<40	<250 t.v.<100	<250	>4.0	<250 (t.v.<100	<250 t.v.<100										
Textiles	5.0-9.0			<250	>4.0	<500 (t.v. 100)						300	<0.2 detergts	<0.5	400 MPN Per 100 mls	<10	Cr(tot): 0.5 Cu:0.5; Ni: 0.5; Zn: 2.0; Co: 0.5
Thermal power	5.0-9.0	<40									5	<free Cl: 0.5				<20	WB Stds for metals: Cr(tot): 0.2; Fe: 1.0; Zn: 1.0; Cu:1.0; New units are to meet these stds. Old units will be phased out within 3 yrs or pollution equipment will be installed. New WB stds available. No WB std for phosphate, limit taken from India and Sir Lanka.
General environmental guidelines	5.0-9.0	<40	<50	<250		<50 as TSS	<10		<2	<1 Free: 0.1		<Cl:0.2		<0.5	<400 MPN per 100 mls	<10	WB Std: Fluorine: 20; No limits given for metals.

Annex VI: US EPA Standards and World Health Organisation Guidelines

(i) Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife

Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife		
Parameter	Fresh	Marine
Phosphorous (mg/L)		≤ 0.1
pH	6.5-8.5	6.5
Faecal Coliform (CFU/100ml/day)	800	800
Dissolve Oxygen (mg/L)	< 5	<5

(ii) WHO Drinking Water Guidelines

WHO Drinking Water Guidelines	
Parameter	Guideline
pH	6.5-8.5
Turbidity (NTU)	<5
Conductivity (µS)	1500
Sulphates (mg/L)	500
Nitrate (mg/L)	10
Total Dissolved Solids (mg/L)	1000
Faecal Coliform (CFU/100ml)	0

Annex VII: Illustration of VWL's quest for 3rd Party validation of its forest management systems

Rainforest Alliance

Rainforest Alliance
665 Broadway, Suite 500
New York, NY 10012 USA
http://www.rainforest-alliance.org/

12 November 2012

Rommel Niamatali
Variety Woods and Greenheart Ltd.
Guyana

Dear Mr. Rommel Niamatali:

I am pleased to advise you that as a result of our recent evaluation, Rainforest Alliance has Verification of Legal Origin for Variety Woods and Greenheart Ltd.. The enclosed verification statement and verification agreement are valid from November 12, 2012 to November 11, 2015. Your organization specific verification code is **RA-VLO-006142.**

Depending on your verification type and scope, you may be granted a limited license to reproduce the Rainforest Alliance Verified™ mark. For specific guidance regarding how you may represent your verification in business-to-business communications and other promotional materials, please refer to Section 2 of the Verification Agreement, "Verification Claims and Trademark Usage."

Congratulations on your verification and continued commitment to sound forest stewardship.

Sincerely,

Allin Salguero de López
Certification Services and Trademark Associate

Annex VIII: Master List Of Equipment Used for VWL's Operations/Sawmill and Logging

Item No.	Quantity	Description
1	1	CAT 518 Skidder
2	3	F68 CLARK SKIDDER
3	2	F67 CLARK SKIDDER
4	2	D6H DOZER
5	1	D6D DOZER
6	1	MOTOR GRADER 12 G
7	1	320 CL EXCAVATOR
8	5	950 E LOADER
9	1	8210 FORD TRACTOR
10	10	MODEL M BEDFORD
11	3	AEC MILITANT TRAILER
12	1	AEC MILITANT LOWBED
13	3	KENWORTH LOGGING
14	1	EX-ARMY - LOGGING/LOWBED
15	1	FREIGHTLINER TRACTOR UNIT
16	1	BEDFORD TANKER
17	1	FORD DUMP TRUCK
18	1	660 CHAINSAW - 173740846
19	1	051 CHAINSAW - 363247710
20	6	070 CHAINSAW - 1-120208057, 2-122909536, 3-160102821, 4-163729757, 5-141501002, 6-118288126
21	1	25 HP YAMAHA ENGINE

Item No.	Quantity	Description
22	1	15 HP YAMAHA ENGINE (ALUMINIUM BOAT)
23	6	6 CYLINDER CUMMINS GENERATOR SET
24	2	6 CYLINDER DORMAN GENERATOR SET
25	1	LISTER GENERATOR SET
26	1	JOHN DEERE GENERATOR SET
27	3	MEADOWS CIRCULAR MILL @ 6 CYC CUMMINS ENGINE
28	2	MEADOWS EDGER @ 50 HP MOTORS (3 BLADES)
29	2	6 HEAD ROBINSON MOULDER
30	1	5 HEAD ROBINSON MOULDER
31	1	INGERSAL RAND COMPRESSOR
32	2	EXCAVATOR (DUST)
33	4	WELDING PLANT
34	2	FS - 280 BRUSH CUTTER
35	1	SR 420 MIST BLOWER
36	1	WADKIN HYDRAULIC CROSS-CUT SAW
37	1	CAT 320L EXCAVATOR
38	1	WADKIN PROFILE GRINDER
39	1	BRENTA BRAND RESAW
40	1	FORD FUEL TANKER
41	4	NISSAN PATROL PICK-UPS
42	2	KENWORTH DUMP TRUCKS

Annex IX: Copy of Rental Agreement

Page 1 of 5

NORTH WEST DISTRICT

REPUBLIC OF GUYANA

RENTAL AGREEMENT

This rental agreement is entered into by and between Variety Woods & Greenheart Ltd of 99 Colony St Queenstown, Georgetown hereinafter referred to as the **"Lessor"** of the first half of the second part and Upper Berbice Forest and Agricultural Producers Association of ..... hereinafter referred to as the **"Lessee"** of the second half of the second part, jointly referred to as the 'parties'

WHEREAS the Parties are desirous of entering into an agreement to facilitate the Lessor renting to the Lessee certain equipment for a specified period, strictly for use on the latter's concession and have approached the Commission for approval.

The Commission being cognizant of the steady decline of the sector's performance over the last five years and in the interest of assisting the sector to become more viable, hereby grants its approval for the rental of the equipment for the abovementioned purpose pursuant to its powers under s. 16(2)(c) of the Forests Act 2009; provided that the following terms and conditions are strictly complied with.

The parties agree that the following equipment shall be leased from the Lessor to the lessee, along with the respective driver, operator etc.

1. Allied System Ranger Skidder - Engine No. 6CTA4596320A Chassis Number F68C0858, Plate No. 21122
2. .....
3. .....
4. .....

That the abovementioned equipment shall be leased on the condition that

a. The said equipment and the respective controller i.e. driver, operator etc shall from the date of the signing of this agreement to its expiry, be deemed to be under the sole control and employment of the lessee and for all intents and purposes be treated as such by the parties.

1

b. The Lessee shall be responsible for the maintenance and upkeep of the equipment during the lifetime of the rental agreement and shall maintain the said equipment to the same standard as handed to him, fair wear and tear accepted.

The parties agree jointly that

i. The lessee shall pay the lessor the sum of US$ 35.00 per cubic meter (m^3) or the equivalent in Guyana Dollars at the rate of exchange at Demerara Bank Limited on the day of the signing of this agreement for services provided to extract 200 pieces logs on SFP Bce 01/05 from stump to market not exceeding a distance of 2 Kilometers (Km)

ii. Alternatively, the Lessee shall pay to the Lessor, the sum of GY$ ..... on a weekly/monthly basis for the rental of the aforementioned equipment or

iii. The Lessee shall pay to the Lessor, the sum of GY$..... per cubic metre as harvested by way of the rental equipment

iv. The Lessor shall cause the abovementioned equipment to be delivered to the Lessee within Three (3) working days after the signing of this agreement

v. This agreement shall be valid for a period of ..... 55 DAYS ..... Months/ years from the date of signing this agreement – Until the End of December, 2014

vi. From the signing of this agreement to its expiry, the equipment and controller shall not be removed nor interfered with by the Lessor except with the written approval of the Commission being first had and obtained.

vii. The Parties will confirm to the Forests laws, codes of practice, policies etc as in force at the time of the signing of the agreement and any other such laws, codes etc that may subsequently come into force.

viii. In the event of a breach of this agreement where the said breach also amounts to a breach of the forests laws, policies, codes etc the party in breach shall be penalized by the Commission.

2

ix. In the event of such a breach, as mentioned at para. (vii) & (viii) the Commission reserves the right to determine this agreement; notwithstanding the fact of the relevant compensation being paid by the offending party to the Commission in accordance with the Forests Act 2009.

x. If any penalty levied by the Commission is not paid within two weeks of the date levied, the Commission reserves the right to seize the equipment used in breach of (para. vii & viii) and suspend the operations of the Lessee until such time as the compensation is duly paid and the Commission is of the view that the Lessee intends to faithfully continue working in compliance with the relevant laws and guidelines.

xi. The Commission reserves the right to revoke its approval of this agreement in the event of a breach mentioned at (vii & viii) thereby rendering any continued action under this agreement illegal.

xii. If the parties are desirous of renewing this agreement then they shall jointly apply to the Commission at least three clear calendar months prior to the expiry of this agreement to do so.

AS TESTIMONY OF THEIR INTENTION TO CREATE LEGAL OBLIGATIONS, THE PARTIES HAVE HERETO AFFIXED THEIR SIGNATURES BEFORE ASCRIBING WITNESSES.

.....

Lessor

ID # 13255273 2

.....

Lessee

ID # 1986231

.....

Commissioner of Forests

Witnesses

3

CERTIFICATE OF REGISTRATION

Sec. 5 *Motor Vehicles and Road Traffic Act.*

GUYANA

Identification Mark ... - 21122

Type ... Skidder

Colour ... Yellow & Black

Manufacturer's Specification —

Name ... Allied System Company LtD

Description of Vehicle ... Skidder Tractor

Engine Number ... 6CTA4 5963209

Chassis Number ... SERIAL No - F68C0858

Propulsion ... I.C

Horse Power ... 230 cc

Unladen Weight ... 15,880 kgs

New or Second-Hand ... New

If Second-Hand, previous registration ... —

Seating capacity ... (1) One Seats

PARTICULARS OF OWNERS

Date of first Registration —

14th day of August 2000

Name ... Ebrado Enterprise INC

Address ... 99, Lamini Street Q/Town

Licensing Officer, Revenue Dept. Official, AUG 14 2000

PARTICULARS OF OWNERS — (Cont'd).

First Change —

Date 12 day of June 19 2008

Name Variety Woods & Greenheart Ltd

Address 99 Lalini St Queenstown G/town

LICENCE REVENUE DEPARTMENT, 70948, 9/06/08

Second Change —

Date ... day of ... 19 ...

Name ...

Address ...

Third Change —

Date ... day of ... 19 ...

Name ...

Address ...

Fourth Change —

Date ... day of ... 19 ...

Name ...

Address ...

Fifth Change —

Date ... day of ... 19 ...

Name ...

Address ...

Sixth Change —

Date ... day of ... 19 ...

Name ...

Address ...

GUYANA FORESTRY COMMISSION
1 Water Street, Kingston, P.O. Box 1017, Georgetown, Guyana.
Tel Nos. 592-226-7271-4, 592-226-6407 Fax: 592-226-8956
Website: www.forestry.gov.gy

November 04, 2014

Mr. Romel Niamatali
Variety Woods & Greenheart Ltd.
99 Laluni Street
Queenstown, Georgetown

Dear Mr. Niamatali,

The Guyana Forestry Commission (GFC) acknowledges receipt of your Rental Agreement between your company and the Upper Berbice Forest and Agriculture Producers Association (UBFAPA) for the UBFAPA to utilize the under-mention equipment and grants approval for same.

One Allied System Ranger Skidder – Chassis No. F68C0858 - Engine No. 6CTA45963209, Plate No. 21122.

Please be advised that approval is granted according to the terms and conditions outlined in your agreement, and it is effective until December 31, 2014. The GFC encourages good environmental practices as it relates to extraction of forests produce.

Kindly liaise with the Forest officers in your area to agree on the logistics for this exercise.

With best regards,
Guyana Forestry Commission

.....
Tasreef Khan
Deputy Commissioner of Forests
Forest Monitoring Division

C.c. Mr. G. Manoo (ACF – Bce/Dem)
Forest Officer – Variety Woods/Kwakwani FS
Chairman - UBFAPA

Annex X: Proposal for managing the Essequibo River Corridor

VARIETY WOODS AND GREENHEART LIMITED:

Proposal for managing the River Corridor between Iwokrama International Centre For Rainforest Development and Conservation (IWOKRAMA) and Variety Woods and Greenheart Limited's Forest Concession Agreement, Right Bank Essequibo River.

Context

Variety Woods & Greenheart Limited (VWL) is the holder of State Forest Exploratory Permit (SFEP) 1 of 2012 and in the pursuit of its environmental and social impact assessment the company is required to take IWOKRAMA's concerns into consideration in the development of the SFEP. Some of these concerns were expressed by representatives of IWOKRAMA at an EPA Consultation at Fairview. Consultants engaged in the ESIA study will shortly be conducting a more formal consultation with IWOKRAMA (*as well as residents of Fairview, Crash Water, Rewa and Apoteri*) and plan to use this note as the **basis** for initiating consultations.

VWL's natural western boundary on right bank Essequibo River extends from the mouth of Maam Creek for a distance of about 72km to the mouth on an unnamed creek on right bank Essequibo River, having approximate UTM coordinates of 21N 0338500, 0463200. On the left bank Essequibo River there is a corresponding natural boundary representing the eastern boundary of Fairview Amerindian Village to the north and of Iwokrama respectively.

The river separating the SFEP from the Iwokrama-Fairview boundary varies in width from about 300m, at a point about 800m below Kuratoka Rapids –indeed one of the narrowest points of the Essequibo River-to more than 4km near Pisham-Pisham Rapids. There are numerous islands (see Figure 1) along the entire river corridor but these *do not* fall within the boundary of VWL's forest concession *and will not form part of any activity by VWL.*

Figure 1: View of Essequibo River from a point near Maipuri Landing, VWL's SFEP

The areas on right bank Essequibo River, below Acromakra Falls are fairly flat, though there are low ~2m cliffs near the river bank and it is apparent that the area floods during the rainy season. For areas

above Acromakra Falls, the areas on right bank Essequibo River are swampy for the most part, and will be unsuitable for logging.

There are a large number of trees of popular commercial species along the river bank, however many have poor form, crown damage and defects. There are also many trees of non-commercial value, for example extensive tracts of Dakama (*Dimorphandra sp*).

Reconnaissance surveys on right bank Essequibo River indicate that there is considerable movement of birds, including toucans, parrots, macaws, and green flamingos from one side of the river to the other. On the basis of tracks observed, it is apparent that species such as caimans, otters and capybaras regularly cross the river from one side to the other. This situation is also very much likely for mammals such as tapir and deer, especially in the dry season when water levels drop and a relatively large number of rock outcrops and sand bars are exposed.

Reconnaissance surveys undertaken along the right bank Essequibo River also revealed evidence of activities by fishermen and hunters: this evidence included old camp frames, pieces of seine and a *Wabini (-a structure used by hunters to set ambush for animals)*. This bears out remarks made by residents at Fairview village that their traditional hunting and fishing activities extend to right bank Essequibo River. No huts or farms were encountered and at no point did the recce teams encounter anyone. There was however a large plot of *wild pineapple* (*Ananas sp*.) plants which is reportedly used extensively by indigenous peoples for medicinal purposes.

VWL Management

VWL has a passion for environmental conservation and closely follows the principles of reduced impact logging. In the management of its *Wood Cutting Lease 1/ 2007* VWL has allowed third party scrutiny of its forest management systems by Rain Forest Alliance and currently the company has an environmental permit from the EPA for the concession as well as its administrative operations at Bamboo Landing. On its *own initiative*, VWL established forest reserves at three sites within WCL 1/2007 where nesting Harpy eagles (*Harpia harpyja)* were encountered. The company established biodiversity reserves in an area where Otters (*Pteronura sp*.) were sighted and also on right bank Demerara River, in the vicinity of Canister Falls. VWL partnered with *Panthera.org* for a couple of years to study the large cat populations in the concession area. Finally, hunting and fishing are restricted on WCL 1/2007. VWL will bring to bear the same level of corporate discipline and responsible behaviour to its new forest concession.

It is VWL's policy to preserve and safeguard all indigenous assets and the company has a long tradition of material support to foster the lifestyles of indigenous peoples, including communities in the North Rupununi. VWL is also fully aware of the laudable forest resources conservation objectives and efforts of Iwokrama and will support those to the maximum extent possible.

VWL will not convey logs or goods along the Essequibo River; its activities within the river corridor will be limited to forest reconnaissance and forest monitoring purposes respectively.

For the first **three** years, VWL plans to extract timber from its forest concession agreement via a logging road linking the concession area its existing road network within WCL 1/2007 via Demerara Timbers Limited (DTL). Thereafter, VWL may choose to use the UNAMCO Road, on left bank Berbice River.

VWL will implement the following as part of its concession management practices:

a) Isolate and protect all indigenous assets encountered on the concession area and duly consult with the relevant agencies (Ministry of Indigenous Peoples, National Trust, Amerindian Research Unit-UG, etc.);

b) Restrict hunting and commercial fishing by its employees;

c) Consider restricting logging to a depth of 1500m away from right bank Essequibo River; in other words a buffer zone of 1500m will be maintained along the right bank Essequibo River (see Annex 1) and this buffer zone will generally be free from logging;

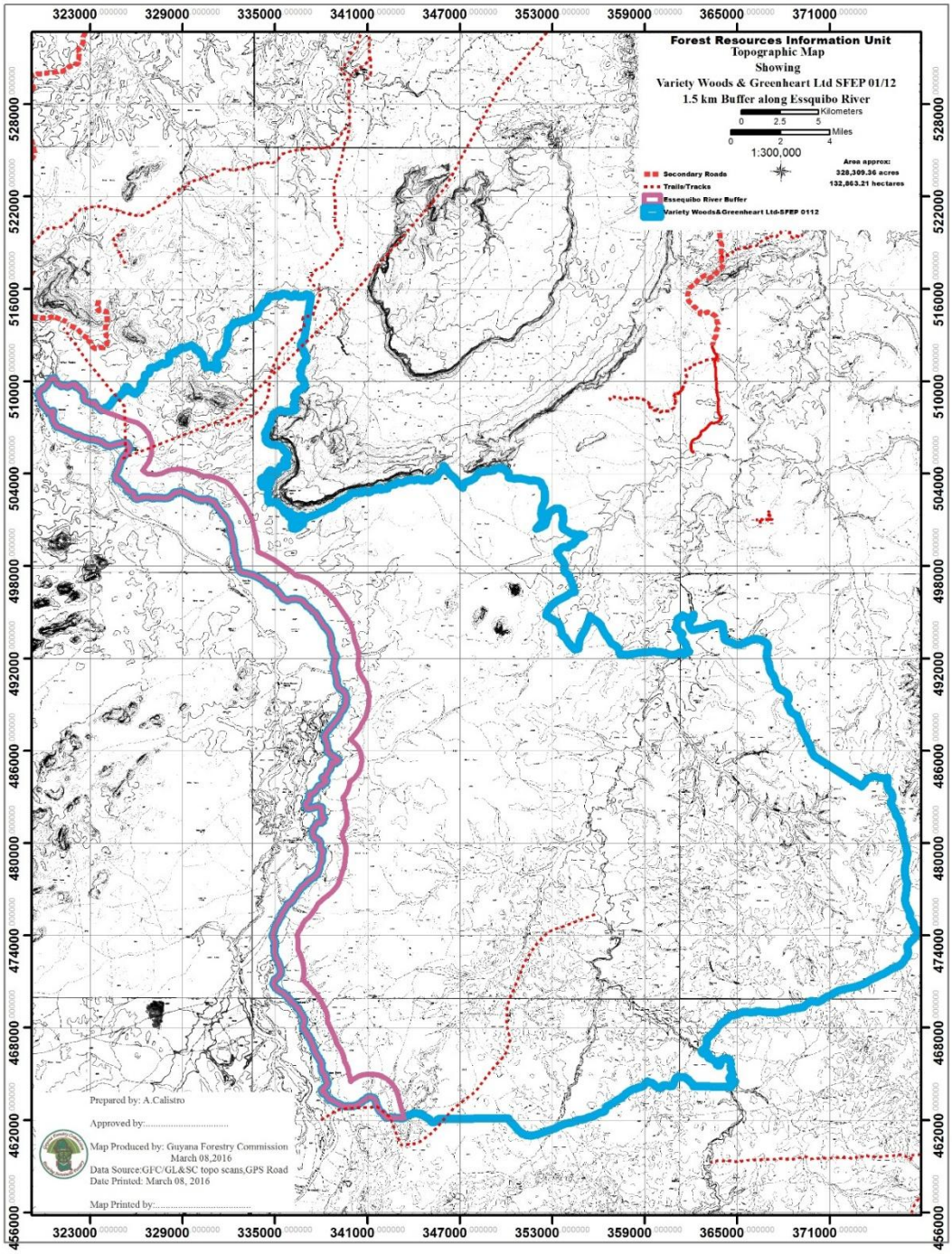
d) Allow residents of the North Rupununi unrestricted access to the concession area, including the use of its roads, trails and *inactive camp sites*, at their own convenience and costs;

e) Implement measures to avoid pollution and to reduce undue siltation in the waterways within the concession, including those flowing into the Essequibo River;

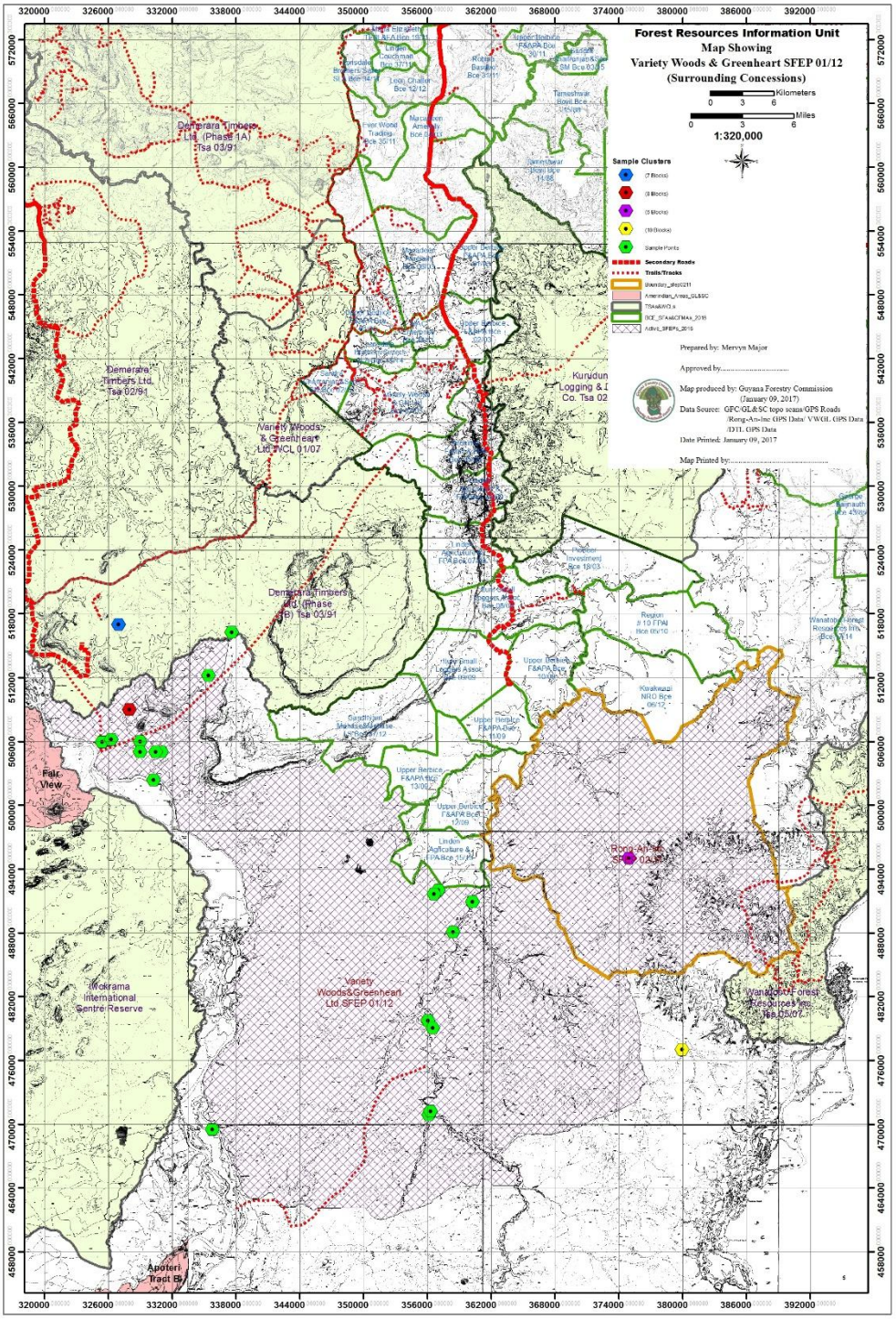
f) Take measures to avoid any significant alteration to the landscape; especially aesthetic values associated with the Essequibo River;

g) Develop an MOU with Iwokrama specifically for the joint monitoring of the river zone between the two areas; an outpost will be set up by VWL on right bank Essequibo River for the mutual use of representatives of Iwokrama and VWL respectively for the monitoring function.

Annex XI: Map of concession area showing buffer zone on right bank Essequibo River



Annex XII: Map of Sample Points



Annex XIII: List of merchantable species recorded to date within VWL's concession

#	Common name	Botanical name	Family name
1	Baromalli	Catostemma	Bombacaceae
2	Brown Silverballi	Licaria canella	Lauraceae
3	Bulletwood	Manilkara bidentata	Sapotaceae
4	Burada	Parinari campestris	Chrysobalanaceae
5	Cow-Wood	Bagassa tilifolia	Moraceae
6	Darina	Hymenolobium sp.	Leguminosae (Papilionoideae)
7	Dukali	Parahancornia amapa	Apocynaceae
8	Dukaliballi	Brosimum rubescens	Moraceae
9	Dukuria	Sacoglottis guianensis	Humiriaceae
10	Fukadi	Terminalia	Combretaceae
11	Futui	Jacaranda copaia	Bignoniaceae
12	Greenheart	Chlorocardium rodiei	Lauraceae
13	Hububalli	Loxopterygium sagotii	Anacardiaceae
14	Huruasa	Pithecellobium jupunba	Leguminosae (Mimosoideae)
15	Itikiboroballi	Swartzia	Leguminosae (Papilionoideae)
16	Kabukalli	Goupia glabra	Celastraceae
17	Kakaralli, Black	Eschweilera subglandulosa	Lecythidaceae
18	Kakaralli, Wina	Eschweilera corrugata	Lecythidaceae
19	Karohoro	Didymopanax morototoni	Araliaceae
20	Kereti	Ocotea oblonga	Lauraceae
21	Letterwood	Brosimum guianensis	Moraceae
22	Limonaballi	Chrysophyllum	Sapotaceae
23	Locust	Hymenaea courbaril	Leguminosae (Caesalpinioideae)
24	Maho	Sterculia rugosa	Sterculiaceae
25	Moraballi	Pouteria minutiflora	Sapotaceae
26	Morabukea	Mora gonggrijpii	Leguminosae (Caesalpinioideae)
27	Muniridan	Siparuna guianensis	Monimiaceae
28	Purpleheart	Peltogyne pubescens	Leguminosae (Caesalpinioideae)
29	Sawari	Caryocar nuciferum	Caryocaraceae
30	Shibadan	Aspidosperma excelsum	Apocynaceae
31	Simarupa	Simaruba amara	Simaroubaceae
32	Suradan	Hyeronima alchorneoides	Euphorbiaceae
33	Suya	Pouteria speciosa	Sapotaceae
34	Tatabu	Diplotropis purpurea	Leguminosae (Papilionoideae)
35	Tauroniro	Humiria balsamifera	Humiriaceae
36	Tonkabean	Dipteryx odorata	Leguminosae (Papilionoideae)
37	Ulu	Trattinickia sp.	Burseraceae
38	Wadara	Couratari calycina	Lecythidaceae
39	Wallaba, Soft	Eperua falcata	Leguminosae (Caesalpinioideae)
40	Wamara	Swartzia	Leguminosae (Papilionoideae)
41	Waramadan	Dicorynia guianensis	Leguminosae
42	Washiba	Tabebuia sp.	Bignoniaceae

Annex XIV: Extracts of VWL's Standard Operating Procedures

1. PURPOSE OF THE SOP (VLO/CoC)

Variety Woods and Greenheart Ltd (VWL) is committed to ensuring that its timber supply chain and processing operations in Guyana are in accordance with the Government of Guyana Legal requirements and the Rainforest Alliance Verification of Legal Origin standard for Forest Management and Chain of Custody. VWL has developed and implemented Standard Operating Procedures to facilitate the continued legal compliance of its operations and an accurate log tracking and documentation system to ensure traceability exist to its origin, as required by Rainforest Alliance.

The purpose of this Standard Operating Procedure (SOP) is to define the Chain of Custody System in place and to detail the Administration and Sales procedures of timber products based on their verification status and subsequent determination of the appropriate systems of control.

This document defines the procedures that must be followed in order to attain full traceability. This includes "systems on the ground" and "in the office." The entire collection of procedures is set out within the framework of long term company objectives and aspirations.

VWL is committed to Sustainable Management and Responsible practices in all aspects of the company operations. VWL will continue to pursue these goals and objectives in the interest of all stakeholders and in compliance with all laws and regulations of the Government.

As a reputable and committed corporate entity, VWL will continue to conduct its operations in a fair and transparent manner. The company's objective towards the processes of international forest certification can be regarded as a further step in the development of the forestry sector in Guyana.

2. SCOPE OF THE SOP

This Standard operating Procedure (SOP) is designed to satisfy the requirements of Rainforest Alliance Chain of Custody Standard for certification of Verified Legal Origin. It defines procedures and protocols that must be followed immediately after tree(s) are felled in the forest; through the various stages of transport and processing; and up to the time of transfer of possession of the material, at the forest gate.
It also gives an overview of aspects of VWL operations, while not strictly within the scope of Chain of Custody, serves to provide information to the reader regarding the procedures and Work Instructions and other details.

Details on the legal, administrative and documentary control system(s) which ensures legal operation(s) and facilitate independent verification are outlined within this SOP. The procedures and work instructions in this document are intended to track and document each piece of forest product handled by the company. Our product, at any stage of processing must be traceable to the previous stage, and ultimately, to the forest of origin.

This document contains procedures, protocols and work instructions/activities that must be routinely followed on a daily basis, to meet the required standard for third party verification of Chain of Custody Traceability. It also sets out the corrective actions that must be taken if any problem develops and assigns responsibility to various individuals for each aspect of the procedure(s).

This Standard operating Procedure (SOP) is the definitive standard for Chain of Custody issues within VWL. It is not intended to constrain personnel from exercising initiative to solve individual CoC problems that may arise. Instead, it is to be viewed as the standard of operations, to which staff must conform, to meet the company's expectations and third party verification standards.

7. FOREST RESOURCE DEVELOPMENT PLANNING

Note:

The Kamwatta Operation (SFP 07/03) is based on the Laws and Regulations of the Guyana Forestry Commission. As such, VWL does not require inventorying and mapping of trees. Nevertheless, VWL feels obligated to conduct its felling operations in compliance with the GFC Code of Practice for Timber Harvesting. The company has always been committed to Sustainable Forest Management and Reduced Impact Logging. In keeping with the spirit of the laws and regulations our operations on the ground consistently emphasizes this fact.

7.2 FOREST MANAGEMENT PLANNING OVERVIEW

7.2.1 Sourcing a Forest Concession Agreement

The first step for the company is the sourcing of a forest concession agreement that grants the right to harvest timber from State forests. To begin the process, the company scrutinizes parcels of forest resources available for allocation from lists which the Guyana Forestry Commission usually publishes from time to time.

Once the company is of the view that a given area is interesting, it makes an application to the GFC in the required format, making the argument that it has the capability (experience, skills sets, financial assets, mechanical assets, sawmilling assets and the markets) to conduct a viable logging operation

7.2.2 Concession Administration

Once the company sources the concession, the first step is to establish the boundaries of the concession and the second step is to determine the nature and extent of the merchantable stocking on the concession. Once the stocking is known, the company consults with the GFC regarding the actual yield per hectare, allocation of tags, etc. For large concessions, such as the Wood Cutting Lease currently held at Charabaru, the company must prepare a five (5) year Forest Management Plan, as well as an annual plan of operations, setting out specific the scope and timing for various parameters including skills sets, road construction and maintenance, forest inventory, timber harvesting practices, machinery assets and employee welfare.

VWL currently has two concessions where logging occurs

(a) State Forest Permission ("Kamwatta") ~7,871 ha; issued on January 24, 2012
(b) Wood Cutting Lease Wood Cutting Lease (WCL) 01/2007 – 21,267 hectares "Charabaru Concession" issued on December31, 2007.

7.3 Forest Planning

In tropical forests where planning is practiced, this is a critical component for managing costs. Planning may be divided into three (3) principal areas: -

- Resource assessment, pre-planning and mobilization
- Pre-harvest assessment operations
- Forest Inventory

7.3.1 Resource Assessment, Pre-planning and Mobilization

The forest resource planning and management team led by the Operations Director is required to ensure that the following tasks and activities are completed at least six (6) months before the start of pre harvesting/logging operations.

It must be noted that the Standard Operational Practices listed below will vary depending on the type or category of concession (SFP, WCL, TSA and SFEP) approved along with the management and log harvesting standards required by the Guyana Forestry Commission.

a) Prepare activities and budget to successfully complete the resource planning and mobilization phase.

b) Identify and source funding to cover all expenses.

c) Source vegetation and topographic maps of the forest concession.

d) Identify and recruit a reconnaissance team including surveyors, line cutters, and tree spotters, and the equipment required;

e) Finalize all mobilization activities.

f) Commence and complete reconnaissance activity and 2% Management level inventory assessment survey to establish basic information on: the boundaries of the forest concession; competing land uses with third parties, topographic parameters, and access route(s); soil type(s), composition of forest species and stock needed for log production and market/sales planning.

g) Demarcate, and establish sign boards, on the boundaries of the concession

h) Conduct engineering survey to identify the road location and alignment, (slopes >20% must be avoided, fragile ground), prepare engineering design for constructing the main access roads, secondary roads and borrow pits to reduce soil erosion, to locate and identify creeks and streams crossing points, the design of culvert(s), bridge or bridges, and the location of camp site(s).

i) Submit the verified and organized field data to the Data Entry Clerk to establish database to facilitate the planning and forecasting of log harvest and production management operations. This includes GPS coordinates for the laying out of production blocks, to evaluate and inform decisions on mitigation measures to reduce environmental impact.

NB: Soil types are important when considering the design and construction of a road. An open canopy may be desirable for clay and loam compacted soils to allow for fast drying after rainfall. A closed canopy may be desirable for loose sandy soils to retain moisture and reduce wind erosion.

Depending on the type or category of concession (SFP, WCL, TSA and SFEP), the planning team will prepare and submit a (5) year forest management plan (FMP) and/or an Annual Operational Plan (AOP) to the Guyana Forestry Commission (GFC) for approval.

7.3.2 Pre-Harvesting Assessment Operations

The *Survey and Inventory Team* using information accessed from database including data obtained from 2% inventory survey: -

a) Prepare map(s) of the boundaries of forest compartment approved by the GFC to be harvested within the year of production;

b) Set up forward camps wherever feasible;

c) Identify and define on the ground and on map, blocks of 1,000 m x 1,000m (100ha) – to which feasibility studies are to be conducted to determine the potential for harvesting to be approved by the GFC for harvesting within the year of production;

d) Confirm on the ground the location of main access roads, secondary roads, skid trails/feeder roads, slopes (>20% must be avoided), creeks, streams, buffers, culverts and bridges and log market(s);

e) Identify inventory/enumeration, road construction teams including the mobilization of all equipment to execute all pre-harvest activities prior to commencing the logging operations;

f) Identify and secure timber to construct bridges, crossings, decking where appropriate, to access roads, secondary roads, skid trails/feeder roads and culverts;

g) Conduct 100% enumeration of all commercial species within each block, identify, marking and tagging on the ground and indicate on map(s) within each block all commercial tree species 35cm and above to be harvested and trees to be protected under specific categories but not limited to shade, seed, food supply chain and nesting site; general topography will also be noted at this stage and reflected on the relevant maps prepared

h) Identify and demarcate on the ground and on map(s) biodiversity conservation zones, buffer strips/zones, fragile ground and sample plots

i) All field team leaders are to prepare daily and weekly records on the progress of all pre-harvesting activities and submit same to management.

j) All field teams are to prepare and maintain daily and weekly records on equipment operational hours, oil and fuel consumption, particulars of equipment breakdown, preventative and repair maintenance.

k) Camp Attendants are to implement measures to observe and maintain clean camp sites ensuring the occupational health and safety of all teams.

l) All field teams are to prevent hunting and ensure the protection and conservation management of the concession's wildlife.

m) Data Entry Clerk must update database with information and data submitted by the Survey and Inventory Team upon completion of the Pre-harvest Assessment Operations.

Management team to: -

- Prepare an Annual Operational Plan according to the guidelines specified by the GFC for submission and approval. This plan details activities on harvesting operations, infrastructural works, inventory, production projections etc.

Reminder to Teams - for all Technical Guidelines Please Refer to: -

- *The GFC Forestry Training Centre Manual on Reduced Impact Logging*
- *The GFC Code of Practice for Timber Harvesting*

7.3.3 100% Enumeration

As previously outlined in section 7.3.2 (G), the Company conducts a 100% pre-harvest enumeration within blocks earmarked for harvesting.

7.3.3.1 Forest Harvesting Approval Procedure

The Harvesting team's work becomes easier when the logging operations are well planned and executed according to the Annual Operational Plan.

Using the updated information and data accessed from database including data obtained from 100% pre harvest inventory survey the harvesting team must also: -

a) Confirm that the areas approved for harvesting have been properly outlined on the concession map.

b) Confirm within each block the location of all commercial species and the trees to be earmarked for protection.

c) Confirm on the ground that biodiversity conservation reserves and buffer zones are clearly demarcated and identifiable.

d) Ensure all signage are in place.

e) Finalize sequence of harvesting activities

7.4 Harvesting Activities

7.4.1 Skid Trail Construction, Log Market & Tree Marking

NB: It should be noted that all harvesting and construction activities within the forest is in accordance to the GFC's CoP for Timber Harvesting and FTCI's Reduce Impact Logging Guidelines

a) Construct and layout log market(s) taking into account gradient, soil type, size etc.

b) Ensure log market is effectively laid out for receiving, assessing, bucking, sorting and storing of logs/piles and for ease of access and loading for transporting to sawmill log yard.

c) Construct skid trails and feeder roads to log market(s). Tree marking process is executed; all trees identified for harvesting are marked with paint and easily identifiable.

d) Ensure that trees are felled in a specific direction to assist with easy extraction and shortest skidding distance to log market.

e) Ensure all obstructions are cleared prior to felling and future crop and restricted tree species are not damaged in the process.

f) Ensure the machine involved is in a functional state.

7.4.2 Felling and Log Identification

VWL conducts its felling operations in compliance with the GFC Code of Practice for Timber Harvesting and The Forestry Training Centre (FTCI) Manual on RIL.

The company has always been committed to sustainable forest management and reduced impact logging; as reflected in VWL's Forest Management Plan (FMP) and Annual Operational Plan (AOP).

The GFC Code of Practice for Timber Harvesting requires that a tree be more than thirty-five (35) cm at breast height; VWL has intentions to increase same to thirty-seven (37) cm at DBH.

Directional felling has been standardized within the WCL's operations. Careful planning and attention in regard to detail ensures that future crop trees are not damaged.

The following steps are followed after felling exercise:

a) Affix a GFC Stump Tag and Enumeration Tree Number tag to the respective stump

b) The Block Number, Tree Number, GFC Tag Number and Chain Saw Operator Initials marked with paint on the felled Log/Pile.

c) An initial measurement of each log/pile is taken at stump to verify log volume, record data on Tally Sheet and daily review accumulated data in order to prevent overharvesting of each block.

d) Submit daily harvesting record to CoC representative for documentation.

e) Clean, check and service chainsaw(s) at the end of each day's operations and each morning before the start of the day's production operations.

f) Immediately report to production supervisor any condition or situation that would require immediate attention so as to prevent high cost maintenance and reduce down time.

7.4.3 Skidding

Skidding is the moving/transferring of the felled log from the stump to a temporary storage site (Log Market) – the CoP and RIL guidelines are considered during this process.

The Skidding Team must: -

a) Ensure that log(s) are extracted in a manner consistent with the layout of skid trails and feeder roads minimizing damage to vegetation and the forest floor.

b) Ensure skidding machine never enters buffer zones or fragile grounds.

c) Commence skidding from the furthest point within the block and proceed along the main skid trails to log market

d) Ensure machine approaches the log in reverse along skid track so as to reduce damage to vegetation and soil. Operator should exercise winching of log/piles.

e) At all times, operator should avoid skidding for more than (1) km to log market.

f) As far as possible, skidding is avoided over wet, slippery and rutted ground conditions.

g) Take all necessary steps to prevent damage to standing trees and natural regeneration along skid trails.

h) Take all necessary safety precautions including the use of all personal protective gear and equipment provided by the company during operations

i) Ensure that all felled trees/logs and usable materials are removed from stump.

j) Clean, check and service machine at the end of each day's operations and each morning before the start of the day's production operations.

k) Immediately report to production supervisor any condition or situation that would require immediate attention so as to prevent high cost maintenance and reduce down time.

7.4.4 Scaling & Tagging

The log market is a temporary site to receive, assess, grade, scale and record information and production harvested within a respective block destined for onward transportation to Sawmill log yard. At this point Logs/Piles are assessed for Royalty by the Scaler and GFC Officer.

Log loader operator and Scaler work together at log market to ensure the following:

a) Ensure that log market is effectively organized for receiving, assessing, bucking, sorting and storing of logs/piles and for ease of access and loading for transporting to sawmill log yard.

b) Ensure skidder operations are not slowed down by inefficient receipt and removal of logs/piles from market area.

c) Immediately check log identity, scale/measure, verify and record volume of each log/pile skidded to market area. Affix GFC tag to log/pile.

d) Inspect each log/pile and assess grade quality.

e) Direct Chainsaw Operator on cross-cutting/bucking of logs/piles and remove defective/rejected/waste material if necessary.

f) Long logs are sometimes junked into (2-3) pieces (A, B or C) with all relevant identity numbers maintained on each piece. This is done to secure safe transporting of log trucks to sawmill log yard.

g) Sort, repaint log identity where required and update stock records.

h) Apply gang nails as necessary to tip(s) and butt(s) of piles to maintain grade quality.

i) Locate and store logs/piles according to species, sizes, grade and possible end use for ease of access and loading for transporting to sawmill log yard.

j) Ensure all safety measures are taken to prevent accidents.

k) Prepare daily Scaling sheets and ensure that the following is accurately recorded: -

- Concession Number
- Date
- Block Number
- Species
- Enumeration tree # as recorded in felling record
- Log/pile production
- GFC Tag Number
- Chainsaw operator initials on felled log/pile.
- Number of pieces.
- Log/pile Diameter measurement, lengths and volume
- Total Volume

- Use information from the Scaling Sheets to prepare Trucking Slips and Transshipment Permits for removal of stock from log market to sawmill log yard.

- Submit Scaling sheets to the production supervisor for onward transport to Bamboo Landing for the attention of the CoC officer

- Ensure that all felled logs/piles are removed from log market before closing operations and leaving/vacating area.

All machine operators in the Log market must: -

- Clean, check and service machine at the end of each day's operations and each morning before the start before the day's production operations.
- Immediately report to production supervisor any condition or situation that would require immediate attention so as to prevent high cost maintenance and reduce down time.

7.4.5 Trucking

a) Truck Driver and Log Loader Operator must: -

- Define Loading area and ensure the area is clear of obstructions

- Ensure trucks are clearly positioned, braked and operations area is easily accessible to loading machine.

- Check and insist that load is secured before leaving loading area.

b) Loader Operator must: -

- Ensure the sorting of logs/piles from storage/stock pile area does not cause other logs/piles to dislodge, thereby endangering and or compromising safety standards.

- Observe that all measures are taken when sorting and loading logs/piles to safeguard integrity and grade quality.

- Ensure logs/plies are correctly placed and secured when loaded onto log truck.

- Observe and maintain all loading guidelines.

c) Scaler/Dispatch Clerk must: -

- Record the description, specifications, measurement, volume and support data of each log/pile loaded onto the truck for transportation to Log Yard.

- Prepare Serial numbered Trucking Slip in triplicate ensuring the following verifiable information appears: -
    - Date
    - Concession Number
    - Truck Registration # and Name of Truck driver
    - Block number (#),Species, and Enumeration tree # as recorded on stock map/sheet,
    - Log/pile production # and GFC tag #,
    - Number of pieces, Log/pile volume and total volume

- Ensure the status of the load is clearly indicated on the Trucking Slip.

- Prepare Transshipment Permit(s) to accompany Trucking Slip

- Ensure that the Trucking Slip is checked and signed by the Scaler and Truck Driver.

- Driver departs log market with load for sawmill log yard with Trucking Slip and relevant Trans-shipment permit.

d) All truck drivers/machine operators in the Log market must: -

- Clean, check and service machine at the end of each day's operations and each morning before the start before the day's production operations.

- Immediately report to production supervisor any condition or situation that would require immediate attention so as to prevent high cost maintenance and reduce down time.

Delivery to Bamboo Landing Log Yard:

- Upon arrival at Sawmill log yard, the truck driver declares the Trucking Slip and Transshipment permit issued by the Scaler to the log yard supervisor

Annex XV: FAUNA RECORDED WITHIN THE CONCESSION AND ADJACENT AREAs

(O-Observed; FT-Feeding; R-Reported by residents/hunters)

#	Common Name	Scientific Name	O	FT	R	CITES
	1. MAMMALIAN SPECIES					
	1.1 OPOSSUM	MARSUPIALIA/DIDELYPHIDAE				
	1.1.1 Murina Mouse opossum	Marsosa murina	x			
	1.1.2 Brown Four-eyed opossum	Metachirus nudicaudatus	x			
	1.2.3 Common Opossum	Didelphis marsupialis	x			
	1.2 ANTEATERS, SLOTH, ARMADILLOS	**ZENARTHRA**				
	1.2.1 Ant eater	Myrmecophidae				
	1.2.1.1Tamandua	Tamandua tetradactyla	x			
	1.2.1.2 Pygmy Anteater	Cyclopes didactylus	x			
	1.2.2 SLOTHS	Bradypodidae				
	1.2.2.1 Three toed sloth	Bradypus tridactylus	x			
	1.2.2.2 Two toed sloth	Choloepus didactylus	x			
	1.2.3 ARMADILLO	Dasyprocidae				
	1.2.3.1 Armadillo	Cabassus sp.	x			
	1.3 MONKEYS	**PRIMATES CEBIDAE**				
	1.3.1 Squirrel Monkey	Saimuri sciurieus	x			
	1.3.2 Brown capuchin monkey	Cebus apella	x			
	1.3.3 Wedge capped Capuchin	Cebus olivaceus	x			
	1.3.4 Howler Monkey	Alouatta seniculus	x			
	1.3.5 Spider Monkey	Ateles pansicus	x			
	1.4 CARNIVORES	**CARNIVORA**				
	1.4.1 Coatis	Procyonidae				
	1.4.1.1South American Coati	Nasua nasua	x			
	1.4.1.2 Kinkajou	Protos flavus	x			
	1.4.2 Cats	FELIDAE				
	1.4.2.1 Ocelot	Leopardus pardalis			x	
	1.4.2.2 Puma	Puma concolor	x			
	1.4.2.3Jaguar	Panthera onca	x			
	1.4.3 Weasels	MUSTELIDAE				
	1.4.4 Giant Otter	Pteronura brasiliensis	x			
	1.5 Tapirs	**PERISSODACTYLA**				
	1.5.1 Tapir	Tapirus terrestris	x			
	1.6 Peccaries	**ARTIDACTYLA, TAYASSUIDAE**				
	1.6.1Collared peccary	Tayassu tajacu		x		
	1.6.2 White lipped peccary	Tayassu pecari		x		
	1.7 Deer	**CERVIDAE**				
	1.7.1 Red Brocket Deer	Mazama americana	x			
	1.7.2 Gray Brocket Deer	Mazama gouazoubira	x			
	1.8 Rodents	**RODENTIA**				
	1.8.1 Rodents	Sciuridae				
	1.8.1.1 Guianan squirrel	Sciurus aestuans	x			
	1.8.2 Pacas	Agouitidae	x			
	1.8.2.1Labba	Agouti paca	x			
	1.8.3 Agoutis	Dasyprocidae	x			
	1.8.3.1 Red rumped agouti	Dasyprocta agouti	x			

#	Common Name	Scientific Name	O	FT	R	CITES
	2.BATS	CHOROPTERA				
	2.1 Emballonuridae					
	2.1.1 Sac-winged bat	Couria brerirostris	x			
	2.1.2 River bat	Rhynchonycteris naso	x			
	2.2 Leaf Chinned Bat	Mormoophidae				
	2.1.2 Mustached bat	Preronotus purnelli				
	2.3 Leaf Nosed bats	Phyllostomidae	x			
	2.3.1 False vampire bats	Chrotopterus auritus	x			
	2.3.2 Big eared bats	Miconycteris megalotis	x			
	2.3.3 Hairy-nosed bat	Mimon crenulatum	x			
	2.3.4 Round eared bat	Tonatia silvicola	x			
	2.3.5 Frog eating bat	Trachops cirrhosus	x			
	2.4 Stenodermatinae					
	2.4.1 White shouldered bat	Ametrida centurio	x			
	2.4.2 Little fruiting bat	Artibus glaucus	x			
	2.4.3 Large fruiting bat	Artibus planirastris	x			
	2.4.4 Tent making bat	Uroderma bilobatum				
	2.5 Vampire Bat/Desmodontinae					
	2.5.1 Vampire bat	Desmodus rotundus			x	
	2.6 Vesperilinotidae					
	2.6.1 Black evening bat	Myatis nigricans	x			
	2.7 Molossidae					
	2.7.1 Free-tailed bats	Molossus molussus	x			
#	Common Name	Scientific Name	O	FT	R	CITES
	3.BIRDS					
	3.1 Tinamous/Tinamidae					
	3.1.1.Great Tinamou	Tinamous major	x			
	3.1.2 Little Tinamou	Crypturellus soui	x			
	3.2 Vultures/Cathartidae					
	3.2.1 King Vulture	Sarcoramphus papa	x			
	3.2.2 Turkey Vulture	Cathartes aura	x			
	3.3 Hawks & Eagles/Accipitridge					
	3.3.1 Harpy Eagle	Harpia harpyja	x			
	3.3.2 Swallow tailed kite	Elanoides forficatus	x			
	3.3.3 Roadside hawk	Buteo manirostris	x			
	3.3.4 Gray Hawk	Buteo nitida	x			
	3.3.5 Bicolored hawk	Accipiter bicolor	x			
	3.3.6 Short tailed hawk	Buteo brachyurus	x			
	3.4 Falcon & Cara Caras/ Falconidae					
	3.4.1 Black Cara Cara	Daptirus ater	x			
	3.4.2 Red-throated Cara Cara	Ibycter americanus	x			
	3.4.3 Bat falcon	Falco rufigularis	x			
	3.4.4 Laughing Falcon	Herpetotheres cachinnans	x			
	3.5 Trumpeters /Psophiidae					
	3.5.1 Trumpeters	Psophia crepitans	x			
	3.6 Doves & Pigeos/Columbidae					
	3.6.1 Ruddy Quail Dove	Geotrygon montana	x			
	3.6.2 Pale-vented Pigeon	Columba cayennensis	x			
	3.6.3 Gray fronted Dove	Leptotila rufaxilla	x			
	3.6.4 Ruddy Ground Dove	Columba talpacoti	x			
	3.7 Parrots/Psittacidae					

#	Common Name	Scientific Name	O	FT	R	CITES
	3.7.1 Red & Green Macaw	Ara chloropterus	x			
	3.7.2 Scarlet Macaw	Ara macao	x			
	3.7.3 Blue & Yellow Macaw	Ara ararauna	x			
	3.7.4 Blue Headed Parrot	Pionus menstrus	x			
	3.7.5 Red Bellied Macaw	Orthopsittaca manilatus.	x			
	3.7.6 Dusky Parrot	Pionus fuscus	x			
	3.7.8 Yellow-headed Parrot	Amazona amazona	x			
	3.7.9 Yellow Crowned Parrot	Amazona ochrocephala	x			
	3.7.10 Red-fan Parrott	Deroptyus accipirrinus	x			
	3.7.11 Black-headed Parrot	Piontes melancephala	x			
	3.8 Cuckoos/Cuculidae					
	3.8.1 Black-bellied Cuckoo	Piaya cayana	x			
	3.9 Hummingbirds/Trochilidae					
	3.9.1 Rufous-breasted Hermit	Glaucis hirsuta	x			
	3.9.2 Long tailed hermit	Phaethornis supercilious	x			
	3.9.3 Reddish hermit	Phaerthornis ruber	x			
	3.9.4 Fork-tail wood nymph	Thalurania furcata	x			
	3.10 Trogons/Trogonidae					
	3.10.1 Violaceous Trogon		x			
	3.10.2 Violaceous Trogon	Trogon violaceus	x			
	3.10.3 White tailed trogon	Trogon viridis	x			
	3.11 Toucans/Ramphastidae					
	3.11.1Red-billed toucan	Ramphastos tucanus	x			
	3.11.2 Channel Billed toucan	Ranphastos vitellinus	x			
	3.11.3 Black-necked aracari	Pteroglossus aracari	x			
	3.12 Puffbirds/Bucconidae					
	3.12.1 Black Nunbird	Monasa atra	x			
	3.12.2 Swallow wing	Chelidoptera tenebrosa	x			
	3.12.3 Spotted puffbird	Bucco tomatia	x			
	3.13 Jacamars/Galbulidae					
	3.13.1Paradise jacamar	Galbula dea	x			
	3.13.2 Green tailed jacamar	Galbula galbula	x			
	3.14 Wood Peckers/Picidae					
	3.14.1 Chestnut Woodpecker	Celus elegans	x			
	3.14.2 Waved Woodpecker	Celus undatus	x			
	3.14.3 Lineated Woodpecker	Dryocopus lineatus	x			
	3.14.4 Golden spangled Piculet	Picumnus exilis	x			
	3.15 Wood creepers/ Thamnophilidae					
	3.15.1 Giant Ant shrike	Taraba major	x			
	3.15.2 White plumed antbird	Pithys albifrons	x			
	3.15.3 Fasciated Ant shrike	Cymbilaimus lineatus	x			
	3.15.4 Streaked Ant wren	Mymrotherula surinamensis	x			
	3.16 Tyrant Flycatchers/Tyrannidae					
	3.16.1 Yellow bellied Elaenia	Elaenia flavogaster	x			
	3.16.2 Forest Elania	Myiopagis gaimardii	x			
	3.16.3 Tropical kingbird	Tyrannus melancholicus	x			
	3.16.4 Piratic flycatcher	Legatus leucophaius	x			
	3.16.5 Painted Tody flycatcher	Todirostrum pictum	x			
	3.17 Cotingas/Cotingidae					
	3.17.1 Pompadour Cotinga	Xipholena punicea	x			
	3.17.2 Spangled Cotinga	Cotinga cayana	x			
	3.17.3 Crimson fruit crow	Haematoderus militaris	x			

#	Common Name	Scientific Name	O	FT	R	CITES
	3.17.4 Screaming pia	Lipaugus vociferans	x			
	3.18 Tanagers/Thraupidae					
	3.18.1 Silver beaked tanager	Ramphocelus carbo	x			
	3.18.2 Blue clacnis	Dacnis cayana	x			
	3.18.3 White-lined tanager	Tachyphonus rufus	x			
	3.18.4 Violaceous tanager	Euphonia violaceae	x			
	3.19 Black birds/Loteridae					
	3.19.1 Crested Oropendola	Psarcolius decumanus	x			
	3.19.2 Green Oropendola	Psarcolius viridis	x			
	3.19.3 Yellow rumped cacique	Cacicus cela	x			
4	4. AMPHIBIA	ANURA				
	4.1 Anura					
	4.1.1 Bufonidae					
	Land toad	Bufo marinus	x			
	Spotted Land Toad	Bufo guttratus	x			
		Bufo typhonius	x			
		Allophryne ruthveni	x			
	4.1.2 Hylidae					
	Map tree frog	Hyla geographica	x			
	Barking tree frog	Hyla boans	x			
		Hyla granosa	x			
		Hyla minuta	x			
	4.1.3 Dendrobatidae					
		Colostethus sp.				
		Epipdobatus femoralis				
	5. REPTILIA					
	5.1 Lizards and Iguanas					
		Ameiva ameiva	x			
		Alica umbra	x			
		Tupinanbus nigropunctatus	x			
		Iguana iguana	x			
		Kentropyx calcarata	x			
		Mabuya mabouya	x			
		Cnemidophorus lemniscatus	x			
		Anolis sp.	x			
	5.2 Boa Constrictors/Boidae					
	Anaconda	Eunectes murinus			x	
	Emerald Boa	Corallus caninus			x	
	Parrot snake	Chironus fuscus			x	
	Vine snake	Oxybelis aeneus	x			
	Rainbow Boa	Epicrates cenchria			x	
	Salipenter snake	Spillotes pullatus	x			
	Yellow tailed snake	Drymarchon corias	x			
	Viperidae					
	Labaria	Bothros atrox	x			
	Tree labaria	Bothriopsis bilineata			x	
	Bush master	Lachesia muta			x	
	Rattlesnake	Crotalus durissus			x	
	Coral snake	Micururus surinamensis			x	

#	Common Name	Scientific Name	O	FT	R	CITES
	Turtles/Testudinidae					
	Yellow foot turtle	Geochelone dentriculata	x			
	Red-foot turtle	Geochelone carbonaria	x			
	Crocodilia/Alligatoridae					
	Spectacled caiman	Caiman crocodilia	x			
	Dwarf caiman	Paleosuchus palpebrosus	x			
	5. FISHES					
	5.1 Ostglossidae					
	5.1.1 Arawana	Osteoglossum bicirrhosum	x			
	5.1.2 Crenoluciidae					
	5.1.3 Pike characin	Boulengerella lucia			x	
	5.2 Erythrinidae					
	5.2.1 Yarrow	Erythinus erythrinus	x			
	5.2.2 Huri	Hoplias malabaricus	x			
	5.2.3 Yarrow	Hoplerythrinus unitaeniatus	x			
	5.2.4 Haimara	Hoplias marcpthalmus	x			
	5.3 Serrasalmidae					
	5.3.1 Piranha	Serrasalmus nattereri	x			
	5.3.2 Silver dollar	Metynnis hypsauchen			x	
	5.3.3 Wimple piranha	Catoprian mento			x	
	5.3.4 Wabre	Serrasalmus denticulata			x	
	5.4 Doradidae					
	5.4.1	Acanthodoras spinosissimus				
	5.4.2	Amblydoras hancocki				
	5.4.3	Oxydoras niger				
	5.5 Auchenipteridae					
	5.5.1 Imehri	Paroachenipterus galeatus			x	
	5.5.2 Boots	Trachycorystes obscurus			x	
	5.6 Characiformes					
	5.6.1 Striped headstander	Anostomus anostomus	x			
	5.6.2 Tailspot tetra	Bryconops caudomaculatus	x			
	5.6.3 Hump back	Charax gibbosus	x			
	5.6.4 Hemigramus	Hemigrammus sp.	x			
	5.6.5 Dog fish	Acestrorhynchus guianensis	x			
	5.6.6 Biara	Hydrolicus scomperoides	x			
	5.6.7 Banded leporinus	Leporinus falcatus	x			
	5.6.8	Curimatus microcephala				
	5.6.9 Silverbait	Astyanax bimaculatus	x			
	5.7 Cichlidae					
	5.7.1 Lukanani	Cichla ocellaris	x			
	5.7.2 Patwa	Cichlasoma bimaculatum	x			
	5.7.3 Flying patwa	Cichlasoma festivum	x			
	5.7.4	Cichlasoma severum	x			
	5.7.5	Geophagus jurupari	x			
	5.7.6 Sunfish	Crenicichla alta	x			
	5.7.7 Lazy patwa	Acaronia nassa	x			
	5.7.8 Lazy patwa	Aequidens sp.	x			
	5.8 Loricariidae					
	5.8.1 Smoke hassar	Hypostases plecostomus	x			
	5.8.2 Long tailed hassar	Loricaria sp.	x			
	5.9 Doradidae					
	5.9.1	Platydoras costratus	x			

#	Common Name	Scientific Name	O	FT	R	CITES
	5.10 Auchenipteridae					
	5.10.1 Wood catfish	Trachycorystes galeatus	x			
	5.8.4	Ageneiosus sp.	x			
	5.8.5	Hoplosternum thoracatum	x			
	6. INSECTA					
	6.1BUTTERFLIES/Lepidoptera					
	6.1.1 SATYRINAE					
		Euptychia chloris	x			
		Euptychia tricolour	x			
		Cassia hermes	x			
		Cassia terrestris	x			
		Tagetris virgilia	x			
		Haetera piera	x			
		Pierella lena	x			
		Bia actorion	x			
	6.1.2 Brassolinae					
		Caligo idomenus	x			
	6.1.3 Morphinae					
		Morpho helenor	x			
		Morpho menelaus	x			
	6.1.4 Nymphalinae					
		Colbura dirce	x			
		Anantia jatrophe	x			
		Hamadrygas feronia	x			
	6.1.5 Ithominae					
		Melinaea sp.	x			
	6.1.6 Heliconidae					
		Heliconius sara	x			
		Agraulis vanillae	x			
	6.2 BEETLES/Coleoptera					
	6.2.1 Cerambycidae					
	Long horned beetles		x			
	6.2.2 Curuculionoideae					
	Snout beetles		x			
	6.2.3 Chrysomelidae					
	Leaf beetles		x			
	6.2.4 Coccinellidae					
	Ladybird beetles		x			
	6.2.5 Carabidae					
	Ground beetles		x			
	6.2.6 Buprestidae					
	Wood boring beetles		x			
	6.3 Bugs/Homoptera					
	6.3.1 Cicadidae					
	6.3.1.1Cicadas		x			
	6.3.2 Cicadellidae		x			
	6.3.2.1 Leaf hoppers					
	6.4 Orthoptera/Grass hoppers		x			

Annex XVI: Questionnaire used for social surveys

Page 1 of 17

FORESTRY TRAINING CENTRE INC.

QUESTIONNAIRE FOR SOCIAL COMPONENT OF ENVIRONMENTAL IMPACT ASSESSMENTS

APRIL 14, 2015

17 Access Road, Kingston, Georgetown, Guyana

1

Questionnaire used for social surveys

Page 2 of 17

QUESTIONAIRE FOR SURVEYS (SOCIAL) UNDER ESIA FOR LOGGING PROJECTS IN THE NORTH RUPUNUNI, GUYANA

Background

Environmental and Social Impact Assessments (ESIAs) in Guyana require a social survey to complement the data collection process to determine the socio-economic and cultural impacts (direct and indirect) of developing projects – such as timber harvesting on all categories of stakeholders (i.e. organisations/institutions with a stake in the resources within or close to the project boundaries). This questionnaire is designed to garner feedback from all major groups (local and otherwise) of stakeholders; however, not all questions are applicable to all stakeholders. The consultants preparing the ESIA are interested in the interviewees' general opinions on timber harvesting and ancillary activities in areas which they consider they have a stake.

Specifically, the aims of the questionnaire are as follows:

- To identify the stakeholders for the project presented and to establish the nature of the social impact for each category of stakeholder
- To determine how much the public knows about the project or are informed on the project goals, objectives, location duration and components.
- To determine public perspectives and views on the benefits and risks of the project identified on livelihoods and well-being.
- To identify the nature and scale any actual (competing) land uses within the project area
- To determine if there are any current and/or future grievances (e.g. policy issues) that might emerge during project life.
- To be informed on the social capital that exists within the vicinity of the project. This is invaluable to the project success as will provide opportunities for jobs and beneficial partnerships between the developer and stakeholders. To provide information to guide the development of Project Management Plans, particularly the sections on Social Planning and Community Development. This is important not only for the intended beneficiaries, but also for Project success, as the information will guide plans to support activities that are mutually beneficially to both parties without any additional negative social and/or environmental impacts.

Design

Since ecosystem services are important for human well-being and development, the questionnaire takes the pattern as an ecosystem services survey. It is also divided into three main sections, each for a specific group of stakeholder. The Sections are as follows:

i) Section One: General i.e. for all stakeholders;
ii) Section Two: Local Stakeholders (i.e. Communities)

2

Questionnaire used for social surveys

Page 3 of 17

iii) Section Three: Private Sector, NGOs (e.g. neighbouring concessionaires, training/research institutions) and State Sector Agencies.

The questions of each section are grouped into topics based on the perceived interests of the each group of stakeholders. Furthermore, the ecosystem services listed in Table One were deduced from reviews of reports on previously conducted ESIAs for commercial timber production and other development projects in the North Rupununi.

Methodology for Execution

This questionnaire as a compiled document is designed for one-to-one interviews, but might not allow for interviews of all major groups of stakeholders to take place simultaneously, unless sections are excised.

For the local stakeholders, the questionnaire should be executed simultaneously with the community-based consultation process, which must also include a Resource Use Mapping Exercise (or a revision of previously approved community resource use maps).

Gaining permission and cooperation is crucial to the success of the survey. Hence, letters seeking permission of Village Councils and Heads of Departments to conduct the survey must be dispatched at least two weeks before date planned for execution of questionnaire. Additionally, Letters of Consent will need to be pre-prepared and given to each respondents (particularly those in communities) for their perusal and signatures before asking any question on the questionnaire.

Data Analyses and Reporting

The information being sought can be easily collated to get a general pattern (qualitatively) of responses from each group of stakeholder, but quantitative analyses should be conducted at the levels of means (averages) and standard deviation i.e. sufficiently simple to be interpreted by forest communities. These values should then be reported using simple diagrams and less text. The graphs most appropriate for this questionnaire are Venn Diagrams; Bar Graphs and Pie Charts.

3

Questionnaire used for social surveys

Page 4 of 17

QUESTIONNAIRE

Name of Village:

Interviewee Reference Number:.....

Interviewee Data: Age ☐ **Gender** ☐

SECTION ONE: GENERAL PUBLIC ASSESSMENT

Question Group #1: An Assessment of general sentiments on Project:

1. **Before this interview did you know anything about the Project?**

   Yes ◯

   No ◯

   If yes, please place an **X** in the circle indicating what you know.

   Project Owners ◯
   Project location ◯
   Project size ◯
   Project Life ◯

2. **Do you know of any reason(s) why this project should BE delayed or CANCELLED?**
   Yes ◯
   No ◯
   If yes, state reason(s)?

   _____

   _____

   _____

Question Group #2: Assessing general knowledge on concepts of well-being and the environment:

3. **How much do you know of the terms 'BIODIVERSITY' and what it means?**
   Formal definition provided ◯
   Reasonable explanation given ◯
   No response/Not knowledgeable ◯

4

Questionnaire used for social surveys

4. **How much do you know of the term ECOSYSTEM SERVICES and what it means?**
   - Formal definition provided ◯
   - Reasonable explanation given ◯
   - No response/Not knowledgeable ◯

5. **How much do you know of the term LIVELIHOOD what it means?**
   - Formal definition provided ◯
   - Reasonable explanation given ◯
   - No response/Not knowledgeable ◯

6. **How much do you know of the term HUMAN WELL-BEING and what it means?**
   - Formal definition provided ◯
   - Reasonable explanation given ◯
   - No response/Not knowledgeable ◯

7. **Do you know what is meant by the term Critical Natural Habitat?**
   - Formal definition provided ◯
   - Reasonable explanation given ◯
   - No response/Not knowledgeable ◯

8. **To your knowledge what is an endangered species?**
   - Formal definition provided ◯
   - Reasonable explanation given ◯
   - No response/Not knowledgeable ◯

SECTION TWO: COMMUNITY-BASED ASSESSMENT

Question Grouping #3: Assessing local communities' perception on project impacts on important biodiversity and critical ecosystem services i.e. those important to culture, well-being and livelihoods:

9. **How do you rate the likely impacts of the project on the provision of Ecosystem Services?**
   - Only Positive impacts ◯ → skip table below
   - Only Negative Impacts ◯ → skip table below
   - Both positive and negative impacts ◯

Please put an **X** where you think impacts will be either positive or negative in table below:

Ecosystem Services	Positive	Negative
a) Provisioning Services		
Capture Fisheries		
Crop production		
Fibres and resins		
Freshwater supplies/flows and quality		
Fuels (firewood and Charcoal)		

5

Questionnaire used for social surveys

Livestock rearing/Ranching		
Natural Medicines		
Ornamental resources		
Timber and lumber		
Wild meat supplies		
b) Cultural Services		
Art and Craft		
Camping grounds		
Hiking and free roaming		
Historical and spiritual sites		
Language		
Peaceful environment		
Security		
Species protection		
Sports		
Swimming		
Traditional Foods and Medicine		
Traditional Tools and Utensils		
c) Regulating Services		
Air quality		
Water/Flood Regulation		
Erosion control		
Disease Control		
Pollination and seed dispersal		
Soil fertility		
Climate regulation		
Natural hazards		

Any additional information?

_____

_____

_____

_____

_____

_____

10. How do you think these Ecosystem Services will change from current state due to the project? Use the ranking provided below:

3- Excellent (abundant); 2—good (sufficient); 1- poor (scarce/diminished)

Ecosystem Services	Current State	Expected Change

6

Questionnaire used for social surveys

d) Provisioning Services		
Capture Fisheries		
Crop production		
Fibres and resins		
Freshwater supplies/flows and quality		
Fuels (firewood and Charcoal)		
Livestock rearing/Ranching		
Natural Medicines		
Ornamental resources		
Timber and lumber		
Wild meat supplies		
e) Cultural Services		
Art and Craft		
Camping grounds		
Hiking and free roaming		
Historical and spiritual sites		
Language		
Peaceful environment		
Security		
Species protection		
Sports		
Swimming		
Traditional Foods and Medicine		
Traditional Tools and Utensils		
f) Regulating Services		
Air quality		
Water/Flood Regulation		
Erosion and natural hazards control		
Disease Control		
Pollination and seed dispersal		
Soil fertility		
Climate regulation		
Natural Hazards		

11. **Do you know of any particular group (e.g. wildlife club, hunters, housewives, carpenters, etc.?) or person (s) within Village that is heavily dependent upon any of the Ecosystem Services (ESS) in the Table above?**

Yes ◯

No ◯

If yes, state at least five groups/persons (not names but positions/skills) and the ecosystems services you think they depend upon

GROUP/PERSONS — DEPENDENT ESS

7

Questionnaire used for social surveys

---------- ----------

---------- ----------

---------- ----------

---------- ----------

12. What do you think will be the main (give at least six) reasons for project impacts on the provision of Ecosystem Services?

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____

13. Base on the location between your village and the project boundaries, do you think the Project will impact on any of following?

Farming Grounds	Yes ◯	No ◯
Nearby waterways/creeks	yes ◯	No ◯
Atmosphere/Air	Yes ◯	No ◯
Hunting Grounds	Yes ◯	No ◯
Wildlife (Animals)	Yes ◯	No ◯
Medicinal Plants	Yes ◯	No ◯
NTFP (, boat wood, craft, thatch, etc.)	Yes ◯	No ◯
Peace and quietness	yes ◯	No ◯
Spiritual/archeological sites	yes ◯	No ◯
Wetlands	Yes ◯	No ◯
Community Conservation sites	yes ◯	No ◯
Fishing grounds	yes ◯	No ◯
Walking trails to other places	yes ◯	No ◯
Current or future ecotourism sites	yes ◯	No ◯

If yes, to any of these, please explain below:

8

Questionnaire used for social surveys

---

14. **Do you know of any current and future resource use areas not identified on the Resource Use Maps produced by the village?**

    Yes ◯

    No ◯

If yes, please name or try to explain locations of the other Resource Use Areas below:

Question Group #4: An Assessment of local communities' perception on project impacts on general well-being and well livelihoods, including governance and collaboration on the management of natural resources:

15. **Please list at least six main ways in which people make a living in the community.**
    a. ---
    b. ---
    c. ---
    d. ---
    e. ---
    f. ---

16. **Please indicate (Y) for Yes; (N) for No and (NS) for Not Sure how you think the project will impact the well-being/livelihood of your Village(see Table below)**

Perceived Impacts	Perceptions(Y; N; or NS
Residents will receive **Increase knowledge** on the biological/cultural resources and ecosystems on their Titled Lands and Customary (Resource Use Areas) Lands.	
Villagers will benefit from **Training opportunities** in Forest Resource Use and Management.	
There will be increased **employment opportunities** for residents	

Questionnaire used for social surveys

There will be **illegal removal** of wildlife and other biological resources by outsiders employed by the Company.	
Outsiders employed by the Company will **damage spiritual/cultural/historical sites** within the village and areas adjacent to project site	
The Village Council will **receive finance, equipment and training to improve monitoring** of village lands and surrounding environment.	
There will be a **reduction in area earmarked for expansion** of Village Lands	
Reduction in the current size of Titled Lands	
The Village will **receive assistance to improve the levels of health and educational services** provided in Village	
Ground and water patrols by the security personnel attached to the Project will **improve the security of resources** in the area.	
Increase risk to communicable diseases e.g. TB/HIV	
Villagers will be prevented from accessing Customary Lands i.e. resource use areas outside of Titled lands	
Friendly and **cordial relationship/partnership developed** between Project Owners/workers and the community.	
Increase noise in the area	
Infrastructure **(housing and other buildings) will improve** through the supply of sawn lumber at cheap or no cost.	
Opportunities to **market Village produce** (crops, craft/food) to Project staff	

17. Does the project boundaries overlap with Titled Lands

Yes ◯

No ◯

If yes, please explain below:

---

18. If there are any other boundary issues, please explain below:

---

19. Who or which Organizations that represents your interest should be major stakeholders for the Project? Please list below:

Questionnaire used for social surveys

Question Grouping #5: Personal data

20. **Please state your current age:----------**

No response ◯

21. **What is your personal occupation?**

Farmer ◯
Fisherman ◯
Mining ◯
Forestry/logging ◯
Office worker ◯
Tour Guide/Ranger ◯
House wife ◯
Craft producer ◯
Teacher ◯
Student ◯
Health Worker ◯
Restaurant/Hotel ◯
Pensioner ◯
Cattle rearing ◯
Shop keeper ◯
Others, please specify_____

22. **Where do you work or who do you work for?**

Self Employed ◯
National Government ◯

Questionnaire used for social surveys

Regional Office ◯

Village Office ◯

Private businesses ◯

NGOs (e.g. CI, Iwokrama, BHI, NRDDB) ◯

Others, please specify_____

23. Number of family members, including yourself?

One ◯

Two ◯

Three ◯

Four ◯

Five and more ◯

No response ◯

24. Number of Family members earning an income - either employed or self-employed?

One ◯

Two ◯

Three ◯

Four ◯

Five and more ◯

No response ◯

Questionnaire used for social surveys
Page 13 of 17

SECTION THREE: PRIVATE SECTOR (e.g. neighbouring concessionaires, training/research institutions); NGOs and STATE SECTOR AGENCIES

Name of Organisation:_____

Interviewee Reference Number:_____

25. **How do you rate the likely impacts of the Project on the Administration, Operation and Management of your Organisation?**
    - Only Positive impacts ◯
    - Only Negative Impacts ◯
    - Both positive and negative impacts ◯

Please explain below:

_____
_____
_____
_____

26. **Is the Project Plan of Operations contrary to the mandate of your Organisation?**

Yes ◯

No ◯

If yes, please explain how contrary and if no, please state how it complements using the space below:

_____
_____
_____
_____
_____
_____

27. **Do you know of any Policy and Legislative issues that Project Principals need to be forewarned on or take into consideration i.e. at any stage of project life?**

Yes ◯

No ◯

If yes, please state:

13

Questionnaire used for social surveys

28. **Do you know of any Critical Natural Habitat and/or endangered species that lies within the project boundaries or downstream of its operations?**

Yes ◯

No ◯

If yes, please state:

29. **Were any data collected within and/or nearby the project site collected and archived by your Organisation?**

Yes ◯

No ◯

If yes, please indicate by placing an X in the circles below:

Fish ◯

Soil and geological ◯

Water quality and flows ◯

Aquatic invertebrates ◯

Mammals ◯

Birds ◯

Insects ◯

Arachnids ◯

Herpeto-fauna ◯

Vascular Plants ◯

Questionnaire used for social surveys

Fungi ◯

Viruses ◯

Socio-economical ◯

Cultural/Historical ◯

Others, please specify_____

30. Does your Organisation support a liberal data sharing Policy?

Yes ◯

No ◯

31. What is the general nature of your Organisation?

Private Sector ◯

- Mining ☐
- Logging ☐
- Tourism ☐
- Agricultural ☐
- Other_____

State Sector Agency ◯

- Mining ☐
- Logging ☐
- Tourism ☐
- Agricultural ☐
- Environmental Monitoring ☐

Community Based NGO ◯

International NGO ◯

Training and Research ◯

Questionnaire used for social surveys

32. Please state which Organisations you think should be stakeholders for the Project? Please list below:

33. Please provide guidance on community-based programmes you think might be relevant to address the socio-economic and cultural issues in the Project area.

---

34. Please state your position and major role(s) at this Organisation:

Position: ----------

Roles:

- ----------
- ----------
- ----------
- ----------
- ----------
- ----------

END

THANK YOU

16

Questionnaire used for social surveys
Page 17 of 17

BACK PAGE

Thank you taking time off to complete the survey. Your contribution will inform the development of a management plan to monitor and mitigate most, if not all, of the identified impacts.

Please use the space below to provide additional comments/information that you think will help us with the management plan for the project.

Should you have any further questions or concerns about the interviewer/survey or its questions, please feel free to contact Mr. Godfrey Marshall, Consultant, (Tel 592-642-1901 or email address gemar@guyana.net.gy , and/or Mr. Quacy Bremner, Manager of FTCI, at 223-5302.

17

Annex XVII: CV of Consultants

A. Environmental Engineering Solutions EES

Page 1 of 7

ENVIRONMENTAL ENGINEERING SOLUTIONS

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

GENERAL INFORMATION

Business Name :	ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)
Address (main office) :	356 Block B, Farm, East Bank Demarara. Georgetown. Georgetown, Guyana. Tel.: +(592) 6500373 E-Mail: isidro_eem@yahoo.com.mx E-Mail: eesguyana@gmail.com
Business No.:	Certificate 130433
Management Staff:	M. Sc. & Eng. Isidro Ubaldo Espinosa (Director) M. Sc. Env. Osbert Ellis (Project Manager)
Services Offered:	Environmental Engineering (Design and Supervision): • Air Pollution Control • Solid Waste Management • Wastewater Treatment • Contaminated sites: prevention, control and restoration Environmental Studies: • Environmental Impact Assessment • Environmental Management Plan • Environmental Annual Report • Environmental Planning • Project Development • Research /Training • Site Inspections

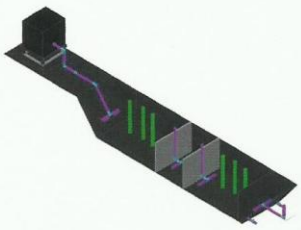
Fields of activity and services provided

EES was founded in 2011. EES is the first consultant company in Guyana that offers environmental engineering based on demands in the engineering field. EES is rapidly gaining recognition as a technical qualified company by the Government of Guyana and the Private Sector. Projects developed for the private sector are examples of EES ability to provide local assessment, design and engineering that helps to prevent, control and mitigate the environmental impacts from the public, residential, commercial and Industrial sectors.

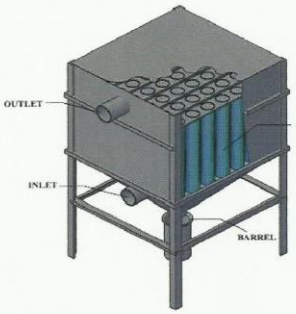
A. Environmental Engineering Solutions EES-Page 2 of 7

EES has carried out the following projects for the Private Sector and the Government of Guyana:

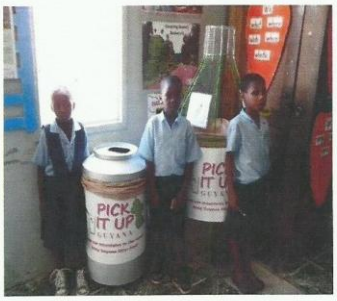
Constructed Wetland Design (2011).
The project implied a conceptual design of a wastewater treatment system – Subsurface Flow System type.
Project beneficiary: Beharry Company Limited.



Dust Collector System Design (2011).
The project implied a conceptual design and supervision of a dust collector system, for the air pollution control.
Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters

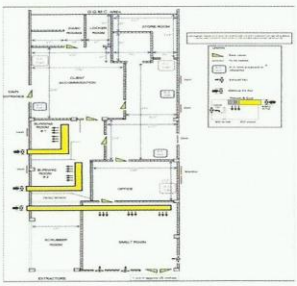


Integrated Solid Waste Management Initiatives (2011).
The project also included the design of bins, containers and the routes collection for recyclable waste for the city of Georgetown. It is supported by the Ministry of Natural Resources and the Environment in collaboration of the University of Guyana and primary and secondary schools.



A. Environmental Engineering Solutions EES Page 3 of 7

Preliminary Design, Fabrication and Installation of a Dilution Ventilation System to Remove Hot Air from Room Spaces and to Dilute Toxic Gases at the Guyana Gold Board Lab Facilities (2011).
Project beneficiary: The Geology and Mines Commission from Guyana.



"Converting Rice Husk Waste into Building Material (Particleboard)" using rice husk and styrofoam from the waste stream – 2012
Project beneficiary: University of Guyana.

"Environmental and Social Impact Assessment (ESIA) for Logging Concessions A, B & C- 2014 (in progress).
Project beneficiary: Baishanlin International Forest Development Inc.

Environmental Management Plan (EMP) for the Construction of a Septage Treatment Plant in Bartica- March 2015).
Project beneficiary: Countrywide Disposal Services (CDS).

A. Environmental Engineering Solutions EES-Page 4 of 7

Environmental and Social Impact Assessment (ESIA) Update for Sherwood Forrest Inc. Logging Concession (March, 2015).

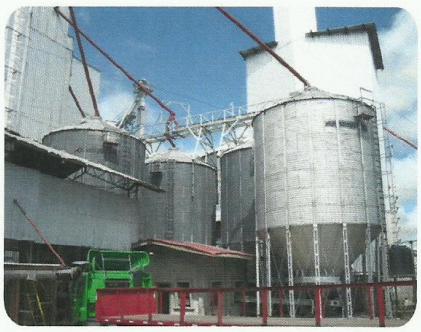
Project beneficiary: Baishanlin International Forest Development Inc.

Environmental and Social Management Plan (ESMP) for Sanitary Landfill Operation in Bartica (April, 2015).

Project beneficiary: General Sanitation Enterprise.

Consolidated Annual Report for Cayume Hakh and Son Cane Grove Rice Mill Operation (April, 2015).

Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters



A. Environmental Engineering Solutions EES: Page 5 of 7

Environmental Management Plan (EMP) for the Wood Processing and Ship Building Facility at Linden (June, 2015).

Project beneficiary: Baishanlin International Forest Development Inc.

Consolidated Annual Report for Golden Grove Rice Mill Operation (June, 2015).

Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters

Environmental and Social Management Plan (ESMP) for Sanitary Landfill Operation in East Berbice (June, 2015).

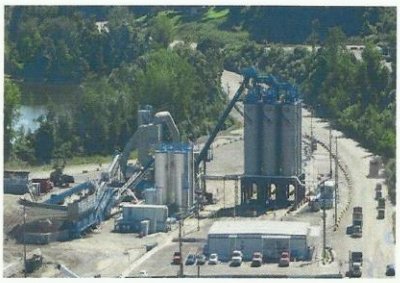
Project beneficiary: Advanced Environmental Solutions (AES)

A. Environmental Engineering Solutions EES: Page 6 of 7

Consolidated Annual Report for Service Station (Bartica) (July, 2015).
Project beneficiary: David Coates Service Station

Environmental Report for the Asphalt (Bitumen) Plant Project, Upper Demerara-Berbice (August 2015).

1. Project beneficiary: Region 10, Environmental Impact Assesment.



Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter Forest Concession (August 2015).
Project beneficiary: Rong-An Inc.

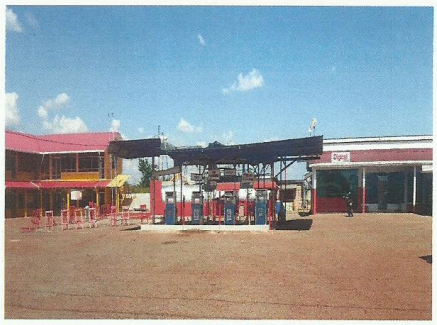
A. Environmental Engineering Solutions EES: Page 7 of 7

Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter for Forest Concession (August 2015).

Project beneficiary: Variety Woods and Greenheart Ltd.

Consolidated Annual Report for s Service Station (Lethem) (November, 2015).

Project beneficiary: David Coates Service Station



Environmental Engineering Solutions (EES) works in accordance with international specifications and the Environmental Protection Agency in Guyana to comply with the Environmental Standards and Regulations.

B. Eustace Alexander

Page 1 of 10

EUSTACE EMERICK ALEXANDER
Home address: 3632 Christiani Street, North Ruimveldt. Georgetown. Guyana
Tel: (592) - 218 – 0098 (home)
(592) – 678-3859(cell)
Email: eustacealexander@gmail.com

PERSONAL PROFILE

I am a Sustainable Development Specialist with well-developed skills in project management and research. For almost fourteen (14) years I've been participating in field and community-based (indigenous) surveys while successfully managing projects aimed at maximizing the synergies between natural resources (including ecosystem services) management and sustainable development at both the national and rural community levels.

My academic training and overall professional experience allowed me to harness multi-disciplinary skills and knowledge, including:

- familiarity with international and national policies and programmes on sustainable development and the environment;
- a comprehensive understanding of socio-economic and cultural issues of indigenous Amerindian communities in Guyana;
- an awareness of the opportunities and challenges of sustainable natural resources management in indigenous Amerindian communities;
- the principles of strategic project planning and management;
- an understanding of the principles of Free Prior and Informed Consent (FPIC);
- an understanding of the effects of national developmental projects (e.g. the Georgetown-Lethem road and Amaila Falls Hydropower) on the peoples' culture and livelihoods (particularly indigenous communities) and the environment as a whole;
- forming and maintaining strategic partnerships and alliances at local-community, national and global scales;
- the reporting and other requirements of international donor organizations;
- to conceptualise and manage and research projects and;
- to prepare and publish scientific papers and reports.

I speak a little Spanish and possess very good computer, research, communication and report writing skills.

EXPERIENCE

INDIVIDUAL CONSULTANT – Preparation of Project Implementation Form (PIF) for GEF 6 Project: 7th March - 31st March 2016.

- Provided support to the UNDP Country Office and an International Consultant to develop a robust project concept proposal addressing drivers of deforestation and ecosystem degradation linked to the mining sector in Guyana.
- Coordinated the collection and organisation of inputs from national counterparts for the development of the PIF.

- Provided support to the development of the budget that includes a breakdown of co-financing.

STAKEHOLDER CONSULTATION FACILITATOR- Individual Contractor at UNDP on the GEF Project to Strengthen Technical Capacities to Mainstream and Monitor Rio Convention (UNFCC, UNCBD, UNCCD) Implementation through Policy Coordination.
15th September – 23rd November, 2015.

- Project Developer with sole responsibility for execution of the Social and Environmental Screening Procedures.
- Fully responsible for the stakeholder engagements and analysis process to receive inputs to guide design of the Project document.
- Collaborating with the Department of Governance, Natural Resources and the Environment (DGNRE) to host a focus group discussion on preparation of a Capacity Development scorecard for the Project.
- Collaborating with the UNDP and the DGNRE to host a national workshop for validation of the Project document.
- Collaborating with an international cross-cutting capacity development expert to draft Project proposal in-line with GEF's requirements for funding.

NATIONAL EXPERT - Sustainable development and the environment: Individual Contractor at UNDP for Elaboration and Validation of a Stocktaking Report on Sustainable Development for the Amazon Region in Guyana
1st – 30th June, 2015

- Developed the procedures for collecting relevant information.
- Fully responsible for analyses and composition of the stocktaking report.

SOCIAL SURVEY SPECIALIST: Independent Consultant for the Guyana Forestry Training Centre Incorporated (FTCI)
2nd – 9th March 2015

- Developed a questionnaire for the FTCI and the Guyana EPA to achieve the following:
  - Garner opinions on timber harvesting and ancillary activities in areas of interest to stakeholders.
  - Present clear ideas on interviewees' opinions on the project at hand.
  - Sufficiently simple (without compromising quality) to be executed by forest communities, and at the same be used for dealing with heads and employees of public agencies and NGOs.

FIELD SURVEYS AND ASSESSMENT COORDINATOR: Independent Consultant for CI-Guyana on IDB-funded Project - "Assessing the Social and Environmental Impacts of the Georgetown o Lethem Road".
2nd May 2014 - 15th August 2014

2

- Fully responsible for the development of project document (including procurement plan, communication plan, safety plan, M&E plan and budget) for the conduct of the survey.
- Coordinated logistics for all researchers involved in the surveys, including ensuring availability of required equipment and coordination of entry and exit of Guyana for international researchers.
- Fully responsible for assembling an appropriately capacitated team of Scientists and Field Assistants.
- Coordinated compliance with all permitting requirements for the surveys.
- Responsible for the revision and approval of reports by the Researchers on Birds and Herpeto-fauna, Fish, Aquatic Insects, Water Quality, and Village Surveys.

ECOSYSTEM SERVICES COORDINATOR: Conservation International Guyana
1st July 2009 – 31st December 2013

- Assisted in the preparation of Conservation International Guyana's strategic plans, annual work plans and budgets.
- Conceptualised and contributed to the development of strategy documents for incorporation of mining into the LCDS.
- Provided training for the implementation of community-based biodiversity and water quality monitoring programmes in Amerindian communities.
- Coordinated community consultations in indigenous Amerindian communities to enhance awareness on environmental management and protected areas.
- Participated in the initiation, planning and control phases of the Inter-American Development Bank (IADB) funded project to promote low carbon development livelihoods (based on agriculture and tourism) in the communities of the Rupununi Region, Guyana.
- Participated in an IDB funded programme to assess the application of REDD+ to the mitigation of environmental and social impacts with the upgrade of the Georgetown – Lethem- Manaus Transport Corridor i.e. the final component of plans for Integrated of Regional Infrastructure for South America (IIRSA) Project to link countries of the South American continent.
- Contributed to the preparation of winning proposals to international donors (e.g. KfW and Government of Norway) for funding to support Guyana's preparation for REDD+ including plans for an effective implementation of a national Monitoring, Review and Verification (MRV) programme.
- Co-authored Conservation International (CI) global strategy for Food Security.
- Overall responsibility for strategic planning, implementation, monitoring and evaluation of activities for the Upper Essequibo Conservation Concession (the World's first Conservation Concession) and the Wai-Wai Kanashen Community-Owned Conservation (first of its kind in the Guiana Shield Region).
- Prepared Scope of Work and Terms of References for hired consultants (local and international) and supervised their outputs.

MANAGER – CONSERVATION SCIENCE/Biodiversity Analyst: Conservation International Guyana

1st July 2006 – 30th June 2009

- Responsible for CI-Guyana's approach to scientific initiatives to inform plans for biodiversity conservation and socio-economic development.
- Coordinated the development and implementation of a sheep and mutton project in the village of Apoteri under the Voluntary Community Investment Fund (VCIF) supported by CI's Global Conservation Fund (GCF).
- Provided training to indigenous communities for enhanced capacity in ecosystem management and sustainable natural resource utilisation.
- Participated in the fish survey of BBC funded "*Expedition Guyana*" "in the Upper Essequibo Conservation Concession, Guyana and co-authoured the technical report.
- Participated in Rapid Biological Assessments of mammals (camera trapping), fishes and herpetofauna in the Wai-Wai Community Owned Conservation Area of the Konashen District and contributed to data analyses and technical report write-up.
- Managed the operations and equipment of a Field-Office at Apoteri Village with a staff of four persons.

MANAGER – PROTECTED AREAS PLANNING: Conservation International Guyana
1st July 2003 – 30th June 2006

- Participated in a process to form alliances with partner institutions to implement community development projects.
- Participated in a learning system to monitor, document and share lessons learned as part as an adaptive management strategy for protected area establishment and management in Guyana.
- Supervised the execution of social surveys in selected communities of the Rupununi Region.
- Collaborated with the Wai-Wai of Konashen District to collect baseline biological surveys at sites of resource extraction.

MANAGER – CONSERVATION CONCESSION & PROPOSED SOUTHERN GUYANA PROTECTED AREA: Conservation International Guyana
1st July 2002 – 30th June 2003

- Overall responsibility for strategic planning and implementation of field activities for the Conservation Concession and the proposed Southern Guyana Protected Areas.
- Negotiated an innovative 'Conservation Concession' Agreement under Guyana's Forest Act (1951);
- Prepared and monitor budgets for all projects in the Conservation Concession and Southern Guyana.
- Prepared and provided financial requests and reports.
- Formulated guidelines for the conduct of a timber inventory, supervised project progress and reviewed the Report prior to submission to the Guyana Forestry Commission.
- Documented and analysed lessons learned (Monitor and Evaluate project success) during project implementation as a part of CI's adaptive management strategy.

4

- Designed and managed the implementation of a Voluntary Community Investment Fund (VCIF) for the promotion of sustainable enterprises in three indigenous communities of the North Rupununi Region.
- Prepared Terms of References for hired contractors and supervised the successful delivery of project deliverables. .
- Coordinated community consultations on plans to establish a protected area in the Southern Guyana Region.
- Reviewed Consultant's Reports for endorsement.

PROGRAMME ASSOCIATE –BIODIVERSITY CORRIDOR PROGRAMME: Conservation International Guyana
3rd Jan. 2002 – 30th June2002

- Provided support to the Corridor Manager for project implementation and monitoring of the USAID-funded Biodiversity Corridor Conservation Programme.
- Coordinated the reproduction and distribution of reports on local and regional stakeholder meetings.
- Developed and coordinated reports for conferences and workshops associated with the biodiversity corridor programme.
- Provided support for planning and preparation of detail budgets for programme activities.
- Reviewed and provided inputs to technical documents developed under the Biodiversity Corridor Programme.
- Provided monthly updates on the status of project activities and budgets.

RAP COORDINATOR: Conservation International Guyana
15th June 2001 – 15th Oct. 2001

- Coordinated logistics for CI's Rapid Assessment expedition to the Eastern Kanuku Mountains and participated in the review process to document and share lessons learnt.
- Created and managed a database of biographic and other information of participants.
- Participated in the review process for the RAP Report and documented lesson learnt and submitted a report on RAP logistics.

RESEARCH SCIENTIST (intern): Tropenbos International-Guyana
10th Nov. 1999 – 13th June 2001

- Conducted studies to determine the fire susceptibility of a selectively logged tropical rainforest in Central Guyana.

LECTURER (full time): Guyana School of Agriculture

5

1995 Nov. - 1996 Nov. and 1998 Nov - 1999 Sept.

- Designed, implemented and managed the School's first Crop Museum Project.
- Lectured in Soil Science, Forest Ecology, Agricultural Zoology and Agricultural Entomology.

PROJECT MANAGER/RESEARCH ASSISTANT: Nat'l Agricultural Research Institute (NARI)
Feb 1992 – Oct. 1995

- Conceptualised, implemented and monitored field-based rice research projects at the National Agricultural Research Institute.
- Head of Department – Agronomy Section – supervised and evaluated the outputs of staff and independent contractors.
- Managed and supervised 17 persons including one Research Technician.
- Prepared and submit budgets requests for the Agronomy Department.

QUALIFICATIONS AND EDUCATION

Master of Science in Forest Ecology (Plant Eco-physiology) – 2001: University of Guyana (UG), Turkeyen Campus in collaboration with Utrecht University, Netherlands. ***Thesis based on the regeneration and distribution of tropical rainforest seedlings in response to the solubility of toxic metals in soils of logged out sites***

Bachelor of Science: Agriculture – 1991: University of Guyana

Diploma in Agriculture – 1985: Guyana School of Agriculture, Mon Repos. Guyana

PROFESSIONAL COURSES ATTENDED

2013: **Advance Diploma in Project Management:** Project Management Institute. USA. PM Body of Knowledge (PMBOK).

2012: **Ecological Mangrove Restoration Training:** Guyana Mangrove Restoration Programme.

2010: **Standard Operation Procedures for Carbon Stock Assessment in Guyana's Rainforests** – by WinRock International of the USA and conducted in Guyana.

2008: **Climate Models: Scenarios of Future Climate Change for Impacts and Adaptation studies** – Environmental Canada and Smithsonian Institute. Panama City, Panama

2007: **Carbon Analyses Training Workshop** – CI Climate Change Initiative Programme. Quito, Ecuador

2007: **Principles of Environmental Law and Enforcement** – USEPA, USAID, GFC and the Guyana Ministry of Agriculture. Georgetown, Guyana

2007: **Human Health and Global Environmental Change** - Harvard University and University of Guyana. Georgetown, Guyana

6

2006: **Techniques for successful Proposal Writing and Resource Mobilisation** - Inter-American Development Bank (IADB) and Caribbean Policy Development Centre (CPDC):

2005 **Monitoring and Assessment of Biodiversity Projects** – Smithsonian Institute, Conservation and Research Centre, Front Royal, Virginia. USA (one month)

2003: **Amerindian Anthropology** – University of Guyana (two weeks).
2002: **Monitoring and Evaluation for Biodiversity Corridors in Practice** – CI's Biodiversity Corridor Planning and Implementation Programme (BCPIP) and USAID. Ben Lemond, California. USA (nine days).

1999: **Internship at Utrecht University, Utrecht, Holland (three months)**
Attended classes in Tropical Ecology and Conservation Biology. Participated in study-tours of reclaimed ecosystems, natural temperate forest ecosystems, nature based resorts and plant physiology laboratories at Utrecht and University of Wageningen. Attended workshops, academic lectures and participated in-group discussions.
1994: **Introduction to Geographic Information Systems** - University of Guyana, National Data Management Authority and University of West Indies (one week).
1992: **Technical Report Writing and Presentation** - NARI and the Caribbean Agricultural Research Institute (CARDI) – one week.

WORKSHOPS ATTENDED

2013: Iwokrama; COBRA and NRDDD: Discovering Innovative Methods for Local Community Engagement in Guyana.

2012: Ministry of Agriculture (Guyana) and UNFAO: Workshop to formulate National Policy and Strategic Plan for Inland Fisheries in Guyana.
2010: Conservation International: South America Workshop on Ecosystems Services.
2010: Iwokrama International Centre and indigenous communities: Development of Fisheries Management Plan for the communities of the North Rupununi Wetlands.

2010: GFC and the EU: Exploratory Workshop on the EU Forest Law Enforcement Governance and Trade Initiative.

2010: Ministry of Agriculture and IICA: Promoting Climate Smart Agriculture in Guyana.

2009: GFC: Developing a Monitoring Reporting and Verification System for Guyana2009: GOG/UNDP Enabling Activities for Preparation of Guyana's Second National Communication to the UNFCCC.

2009: CI, GFC and IDB: Options and recommendations for Guyana to pursue a REDD Programme.

2008: PAHO and MOH: Protecting Health from Climate Change.

2007: CARICOM, GOG, CREDP, IADB and IICA: Expanding Bio-energy Opportunities in the Caribbean
2007: Amazon Cooperation Treaty Organisation (ACTO) and the Guyana Environmental Protection Agency (EPA): Workshop on Management of Amazon Region Biodiversity in Guyana
2007: The Guyana Environmental Protection Agency (EPA) National Consultation Workshop on Guyana's Biodiversity Action Plan
2006: Inter-American Development Bank (IADB) and Caribbean Policy Development Centre (CPDC): Fundraising Training Seminar on Techniques for successful Proposal Writing and Resource Mobilisation.
2006: Inter-American Development Bank (IDB) and the Guyana Environmental Protection Agency (EPA): National Capacity Building Workshop for Key Stakeholders in Environmental Management
2006: UNDP, GEF and Guyana EPA: National Workshop for Capacity Self Assessment on Environmental Issues:
2006: ITTO Workshop on Guidelines for Restoration, Management and Rehabilitation of Degraded and Secondary Tropical Forests.
2006: UNESCO - Man and Biosphere (MAB) and University of Guyana (UG) National Workshop on Biosphere Management.
2005: UNDP/GOG Workshop to Design and Build Capacity for Community Based Natural Resources Management

COMMITTEE MEMBERSHIP

- Former Chairman, Faculty Committee, Faculty of Agriculture and Forestry, University of Guyana
- Previous Member of the National Committee for the Amazon Cooperation Treaty Organisation (ACTO) to Validate Priority Indicators for sustainable management of the Amazon Forest.
- Former Member of National Work Group of the Guyana National Initiative for Forest Certification (GNIFC).
- Former Member of National Committee for Sustainable Management of the North Rupununi Wetlands.
- Former Member National Climate Change Committee.

PUBLICATIONS

Alexander, E; Singh, D; Bernard, C; Laing, T; Balraj, D and S. Kandaswamy (unpubl.): Experiences and Impacts of the Conservation Concession Model in Guyana. Conservation International Guyana. Guyana.

8

Willink, P.W; Alexander, E & C.C.Jones. (2013). Using fish assemblages in different habitats to develop a management plan for the Upper Essequibo Conservation Concession, Guyana. Biotoa Neotrop.13 (4).

Weikel M, Alexander E, Savy CE, Bernard, C. 2012. Preliminary Assessment to Inform Amaila Falls Hydropower Project Biodiversity Offset Scoping. Conservation International, USA & Guyana.

Alexander, E.; Singh, D,; Shoch, D,; Killeen, T,; O'Sullivan, R,; James, D., *et al* (2009). Reducing Deforestation and Forest Degradation while promoting Sustainable Development. South American Regional Infrastructure Development, Forest and REDD: Implications for Guyana. Conservation International Guyana.

Alexander, E. (2008): Case Study of the Upper Essequibo Conservation Concession – as an innovative legal mechanism for biodiversity conservation and a viable option for avoiding degradation/deforestation. In Fenech, A.; D. MacIver and F. Dallmeier (eds.) ***Climate Change and Biodiversity in the Americas***. Environmental Canada, Ontario, Canada

Alonso, L.E.; J. McCullough; P. Naskrecki; E. Alexander and H.E. Wright (2008). A rapid biological assessment of the Kanashen Community Owned Conservation Area, Southern Guyana. RAP Bulletin of Biological Assessment 51. Conservation International, Arlington, VA. USA.

Lasso, C; J Hernandez-Acevedo; E. Alexander; J. C. Senaris; L. Mesa; H. Samudio; J. Mora-Day; C Magalhaes; A Shushu; E. Mauruwanaru and R. Shoni (2008). Aquatic Biota: Fishes, Decapods Crustaceans and Molluscs of the Upper Essequibo Basin (Konashen COCA), Southern Guyana. In L.E Alonso et al (2008). *A rapid biological assessment of the Konashen Community Owned Conservation Area, Southern Guyana. RAP Bulletin of Biological Assessment 51. Conservation International, Arlington, VA. USA.* Pp 43- 54.

Sanderson, J; E. Alexander; V. Antone, V and C. Yukuma (2008). Non-volant mammals of the Konashen COCA, Southern Guyana. In L.E Alonso et al (2008). *A rapid biological assessment of the Konashen Community Owned Conservation Area, Southern Guyana. RAP Bulletin of Biological Assessment 51. Conservation International, Arlington, VA. USA.* Pp 69-71.

Thijs, P., Alexander, E.E.; Houter, N.C.; Rose, S.A; and Toon Rijkers. (2005)
Ecophysiological Patterns of Guiana Rainforest Plants. In: *Tropical Forest of the Guiana Shield Ancient Forest in a Modern World* (Ed. David Hammond) CABI BioScience.

Alexander, E. E. and Roderick Zagt (in prep). Predicting the susceptibility of Guyana's Rainforest to fire.

9

REFERENCES

Prof George Mentore Associated Professor University of Virginia Charlottesville, Virginia. USA Email: gm3c@virginia.edu	**Dr. Patrick Chesney** Assistant Resident Representative Environment, Extractive Industry and Energy United Nations Development Programme 42 Brickdam and UN Place Georgetown Tele (work) : 592-223-6564 Mobile : 592- 623-3107 Email: patrick.chesney@undp.org	**Mr. Arnold D'Mendonca** Sustainable Development Specialist IICA Office Guyana Tele: 592-226-8347 (work) Email arnold.demendonca@iica.int

C. Godfrey Marshall

CURRICULUM VITAE: GODFREY EMERSON MARSHALL: FORESTER

42 years with the Guyana Forestry Commission, and exposure to forestry field tours in Brazil, Malaysia, Sweden, Trinidad & Tobago and the United Kingdom.

A. PERSONAL DETAILS:

Name:	Godfrey Emerson Marshall
Date of birth:	12 November, 1954
Place of birth:	Bartica, GUYANA
Nationality:	Guyanese
Address:	1393 Section A, Block X, Diamond Housing Scheme, East Bank Demerara, GUYANA
Email:	gemar@guyana.net.gy
Phone:	592-216-4602 (H); 592-642-1910 (Cell)

B. EDUCATION:

2000: Executive Diploma in Business, University of the West Indies School of Business (sponsored by Guyana Forestry Commission), Georgetown, Guyana.

1999: M.Sc. Forestry – Department of Plant Sciences, University of Oxford, United Kingdom.

1992: B. Sc. Forestry - Universidade Federal de Lavras (*formerly Escola Superior de Lavras),* Lavras, Minas Gerais, Brazil.

1982: Diploma in Forestry - Eastern Caribbean Institute of Agriculture & Forestry, Trinidad & Tobago.

C. PROFESSIONAL EXPERIENCE:

Appointed a Forest Officer, Guyana Forestry Commission on December 7, 1972 within the Guyana Forestry Commission and served in various positions (see below) before secondment to Forestry Training Centre Incorporated as a Project Coordinator in September, 2002 and as Director, 2005-2014. Formally retired from the Guyana Forestry Commission in December 2014 after 42 years.

Key positions held at the GFC are as follows:
2015: *Technical Adviser/Consultant* with the GFC; provided technical support to the Forestry Training Centre Incorporated

2005 to 2014: *Director, Forestry Training Centre Incorporated*: Managed two ITTO projects, while maintaining collaboration with several partners/donors including the Tropical Forest Foundation, Virginia (USA), Tropenbos International, WWF (Guyana), Iwokrama International Centre, Basic Needs Trust Fund (Guyana), and Board of Industrial Training (Guyana).

2002-2004: *Project Coordinator*, Forestry Training Centre Incorporated: *understudied the Project*

Director, Peter van der Hout PhD.

2001-2002: *Head, Planning & Development Division*: *Assisted in identifying and developing strategic goals for the GFC. A strategy for managing research sites and a local forest zonation paper were produced during that period.*

1995-2001: Deputy Commissioner of Forests-Forest Resources Management Division: *Assisted with the development of forest management standards and practices, including leading a task force that prepared the first draft of GFC's Code of Practice and draft guidelines for the preparation of forest management plans and annual plans of operations.*

1992-1995: *Senior Assistant Commissioner of Forests*-Field Operations. *Coordinated Guyana Forestry Commission's forestry extension, enforcement and monitoring functions.*

D. Field Tours

I have been exposed to field tours in various countries, including Malaysia, Sweden, Brazil and the United Kingdom.

E. Languages

I am fluent in English and Portuguese. I can interpret most *written* Spanish.

F. Recent Publication

Marshall, G. & Kerrett, R. 2010. The Chainsaw milling subsector in Guyana. ETFRN NEWS Issue No. 52, December 2010. Pages: 91-97.

G. Projects/Consultancies

I have successfully written project proposals for FAO, ITTO, and WWF and for EU funded local projects. On a personal basis, I have done consultancies for FAO and ITTO projects, respectively. Also, I have written a large number of Forest Management Plans and Annual Plans of Operations for logging **companies in** Guyana. I am currently engaged in the preparations of ESIAs for local developers.

H. Other

Served for one year as a member of the Board of Directors, Guyana Mining School and Training Centre (Since January -December 2014).

Received a *national award*: Medal of Service: November 2015
