

# ROYAL TIMBERS INC.

STATE FOREST EXPLORATORY PERMIT 2/2020

REPORT ON

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT



*Photo: Segment of Kartabu-Puruni Road ©FTCI*

**JULY 19, 2022**

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## **NON-TECHNICAL SUMMARY**

## FOREWORD

*This **Non-Technical Summary** gives an overview of RTI's ESIA process. The summary describes, inter alia: the main elements of RTI's proposed logging and sawmilling project; the baseline conditions at the concession area; and the company's measures for mitigating negative impacts due to its activities.*

*The summary also presents the consultants' conclusions on RTI's capability for managing its project in line with national requirements and stakeholders' expectations, respectively.*

***The consultants have recommended that the EPA grants an Environmental Authorization to RTI.***

### 1.0 OVERVIEW OF THE ESIA PROCESS

The core outcomes of the ESIA process are as follows:

- a) Royal Timbers Inc. (RTI) will invest US\$ 2.8m to develop the 107,650.54 ha of forest resources embodied in SFEP 2/2020. The company will harvest just 2,100ha (2% of the concession area) *per annum*. The maximum annual log output will be approximately 17,500<sup>3</sup> of timber from 32 species.
- b) The company will develop and utilize about 30km of *existing* mining roads within the concession area and construct another 90km of roads which in turn it will share with the mining community.
- c) All stakeholders consulted were supportive of RTI's project due mainly to the projected expansion of economic activity in the district, and the consequent forward and backward economic linkages.
- d) RTI's planning horizon is based, in part, on progress, with the imminent rehabilitation of the Kartabu-Puruni Road and improvements at the Puruni Crossing, respectively. RTI expects to engage in full production mode by Q02-2023. The airstrip is expected to be fully functional at the same time.
- e) RTI's economic analysis all point to a positive return on investment within a comfortable period. RTI is also delighted with the current pro-business climate. RTI believes that trading concerns and inflationary trends at the *global level* will not impact in any significant way on its operations.
- f) RTI is pleased with its ESIA process. Notwithstanding a long history of gold mining, the area is well stocked with merchantable timber and critical environmental parameters for air quality and water quality are within the established standards. Engagement with stakeholders and managing their expectations are well within the scope of RTI's 'social corporate responsibility

### 2.0 INTRODUCTION

#### 2.1 The Developer

ROYAL Timbers Inc. (RTI), of Lot 15 Garnett Street, Campbellville, Georgetown, Guyana, was incorporated as Company # 8612 under the Companies Act of Guyana on November 23, 2016. The Company garnered experience via timber harvesting operations it conducted near Port Kaituma, Northwest District, Region 1, Guyana.

In early 2020, Royal Timbers Inc. (RTI) analysed conditions prevailing at an area of 107,650.54 ha, designated State Forest Exploratory Permit (SFEP) 2/2020, on right bank Puruni River (see Figure A), that the GFC advertised as *vacant*, and concluded that a long-term logging project is feasible. RTI applied successfully for SFEP 2/2020, which the GFC granted to the company in March 2020. Subsequently, in line with local policies, RTI applied to the Environmental Protection Agency (EPA), for an *Environmental Authorization* (EA). The EPA determined that an Environmental and Social Impact Statement (ESIA) is a prerequisite for the granting of the EA and shared the relevant terms of reference for the ESIA and *Report* with the company. The EPA will grant RTI an EA providing it is satisfied with the ESIA report, particularly RTI's plans to manage stakeholders' expectations. Once the company acquires an EA, the GFC will grant RTI a large forest concession to facilitate the implementation of its logging (and sawmilling) project and environmental management plan.

RTI recruited the Forestry Training centre Incorporated (FTCI) to take forward its ESIA process.

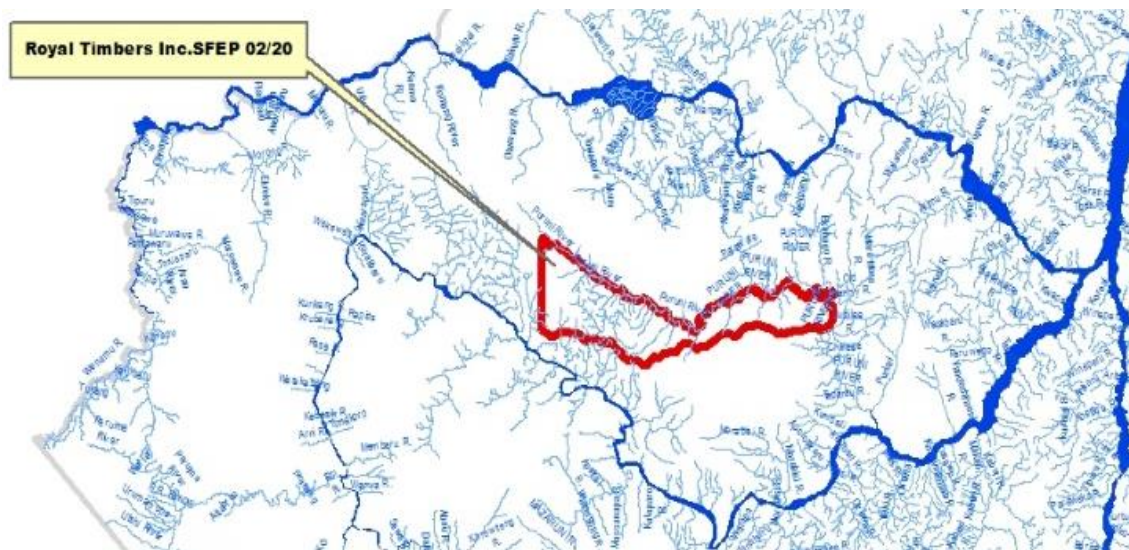


Figure A: Diagram showing the general location of RTI's concession.

## 2.2 Profile of FTCI, the consultant

Forestry Training Centre Inc. TCI, based at 17 Access Road, Kinston, Georgetown, Guyana has been doing ESIA's since 2006. In undertaking consultancies, FTCI in turn hires other consultants to ensure that it brings to bear the expertise necessary to address multi-disciplinary work such as ESIA's.

## 2.3 Summary of field work

The consultants spent about 20% of their time reviewing information published on the websites, of public agencies and local NGOs. FTCI also reviewed data garnered from its work on **three** SFEPs in the Puruni District over the past 15 years.

FTCI's latest trip to the area April 11-15, 2022, was significant because FTCI deployed an ATV for the exercise, which allowed the team to access a *broader geographic area* than in previous trips. (*During previous trips, the poor state of the upper KPR stymied field work*). During period April 12-14, 2022, sample data on ('total') mercury was collected for the first time.

Four external consultants, seven FTCl staffs, and two resource persons conducted the ESIA. The team included members fluent in Spanish and Portuguese. FTCl used five-person teams for field work logistical reasons; and team composition varied with the data sets required; for example, faunal surveys, and social surveys respectively required different teams.

Field trips to SFEP 2/2020 were confined to five to seven days, to conserve water samples in good condition, prior to their analysis at Kaizen Laboratory in Georgetown.

### **3.0 BASELINE INFORMATION**

#### **3.1 The Physical environment**

##### **3.1.1 SFEP Location and Access**

SFEP 2/2020 is situated west of Puruni Landing, between right bank Puruni River and the KPR, Kartabu Triangle, Region 7. The northern boundary of the concession extends upriver along right bank Puruni River for 175km; while the Southern boundary, extends along the KPR, west of Puruni Landing, for 99.8km. SFEP 2/2020 has shared boundaries with three other forest concessions in the area; and in addition, there are two forest concessions (LC 2/2022 held by RLSS and SFEP *in transition to an LC*, held by TPTTI) opposite SFEP 2/2020 on left bank Puruni River.

The concession is situated about 220 km by road from Bartica, the administrative centre for region #7.

The KPR represents the primary access route to the Kartabu Triangle and forest concessions there. The KPR has two segments, the eastern segment from Iteballi to Puruni Landing and the western segment from Puruni Landing to Papishou, left bank Mazaruni River; the two segments are connected by a barge service at Puruni Landing.

##### **3.1.2 Climatic conditions**

- Rainfall parameters

Guyana has a tropical climate. Temperatures are high with maximum temperatures around 30-31 degrees Celsius (86-88° Fahrenheit) all year round and night temperatures around 22 to 24 degrees Celsius (71-75°F).

Mean annual rainfall in Guyana is 2,387mm. Overall, Guyana has two rainy seasons: the short one runs from December to early February while the longer one runs from late April to mid-August, with peaks during the May-June period.

Annual rainfall patterns vary by region: annual rainfall varies from 2300mm on the coastal belt to 3,000mm in the forests belt to 1600mm in the (Rupununi) Savannas. In the rainy season). In the dry season, the annual rainfall varies from 720mm to 2160mm. Annual and monthly rainfall varies by sub-region and location. Mean monthly rainfall data for Kamarang, Upper Mazaruni District is presented here to estimate rainfall patterns at the concession area.

- Wind speed & cloud cover

In view of RTI's plans to construct an airstrip within the concession area (see Section 4.0), available indicative data on windspeed and cloud cover for Kamarang are included here. Wind speeds at Kamarang vary from 4.0km/hr to 5.2km/hr. Cloud cover varies from 62.25% to 76.5%.

- Air Quality

Various parameters for air quality were assessed in April 2022. Two parameters of major concern are inhalable particles or particulate matter and noise: these can cause serious health effects in humans. Fortunately, the values recorded for *inhalable* particulate matter and noise respectively during last April (2022) are not a cause for concern. PM2.5 refers to particulate matter with sizes less than 2.5µm: the values recorded range from 13.6 to 18.9 mg/m<sup>3</sup>, with a mean of 15.65 mg/m<sup>3</sup>. Similarly, PM10 refers to particulate matter less than 10µm: the range was 14.3 to 28.2 mg/m<sup>3</sup> with a mean value of was 20.86 mg/m<sup>3</sup>.

For Noise (or unwanted sound), the values recorded ranged from 38.6 to 54.8 dB and the mean value was 46.74dB.

### 3.1.3 Landform and Hydrology

- Landform

The general configuration of the area is flat to undulating and hilly terrain. The north-western and the eastern districts are characterized by *very hilly terrain*. The highest elevation is the East Puruni Peak reaching 427 meters (1,500 feet).

- Hydrology

The central and eastern areas of the concession are drained by right bank tributaries of the Puruni River, including the Kamiguin (Kumung-Kumung) River and the Pashanamu River. The western end of the concession area is drained primarily by the Putareng River, itself a left bank tributary of the Mazaruni River. The average drainage density for the entire concession area is about 0.8km/km<sup>2</sup> but there are areas where the drainage density reaches 2.5km /km<sup>2</sup>. During the rainy season, segments of the road become inundated, including the timber bridge across the Kumung-Kumung River (see Figure B).



Figure B: Photograph showing 5-day overtopping of the Kumung-Kumung bridge, KPR, April 2022

- Surface water quality

Overview



In April 2022, the rainy season was still very noticeable and temporary flooding, or waterlogged conditions allow leachate from ponds created through mining activity to enter streams and waterways. Although there has been a long history of mining in the area, environmental parameters for water quality and air quality do not provide any cause for alarm, and the consultants are of the view that logging would not add significantly to the parameters recorded.

For this non-technical summary, three parameters of water quality, based on data collected last April 2022, are cited here: pH, temperature, and mercury content.

- pH

Ph is a major determinant for the livelihoods of aquatic organisms: the optimum range for the growth and reproductive health of these organisms is 6.5-9.0. Values outside this range will disrupt the growth or reproductive capability riverine organisms; further pH values  $\leq 4.0$  or  $\geq 11$  will lead to the mortality of aquatic organisms. For humans, pH values of 6.5-8.5 are ideal.

Last April 2022, the range of values based on eight water samples was 5.72 to 8.69, with a mean of 6.98.

- Temperature

Water temperature is related to solar radiation and temperature, and it varies the rainy season and the dry season. The temperature of water influences the rate of biological and chemical reactions as well as the kind of species and their populations. Data collected last April for eight water samples showed temperature ranges of 19.3°C to 27.5°C, with a mean of 23.84°C.

- Mercury

Mercury is potentially a dangerous pollutant: Mercury, once ingested by animals, is not excreted, it is stored in the organism; it reaches toxic levels leading to mercury poisoning. In humans, mercury '*poisoning*' produces various neurotic diseases in adults such as weakness, twitching and headaches.

Values for mercury were recorded from eight water samples last April 2022: seven samples yielded values  $< 0.0005 \mu\text{g/l}$ , while one sample gave a value of  $< 0.0009 \mu\text{g/l}$ . These values are consistent with natural water bodies.

### **3.1.4 Geology & Soils**

- Geology

The concession area is situated within Guyana's Northern Province where the dominant lithology is the Greenstone Belt. The greenstone belt comprises metamorphic rocks and are reputed to be common in the Earth's oldest rocks, including the Guiana Shield.

- Soils

The GFC has at hand detailed soil maps for the concession area. The dominant soil type, Kanhapludults, occupy 84.45% of the concession area. Kanhapludults are very deep well drained soils, with slight to high erosion hazard. The other major soil type present is Ustchrepts, occupying 9.89% of the concession area: Ustchrepts are deep alluvial soils, poorly drained soils, with pronounced mottling in the subsurface.

## **3.2 Biological Environment**

### **3.2.1 Overview**

Mining appears to have had minimal impact on the biotic component of the ecosystem that characterizes the concession area. Although (sub-surface) soil flora and fauna were not sampled directly, the

consultants did take note on factors that perturb soil ecology and its impacts nutrient cycling and on geochemical cycles.

### 3.2.2 Flora

Forests cover about 90% of the concession area. Major interventions have been made along right bank Puruni River where most mining activities are concentrated. Road engineers have removed timber from the road corridor to provide materials for bridges, culverts, and corduroy works.

The forests within the concession area may be described as *Central Wet Forests*. More details on the forest types are available based on data at the GFC (see Table A).

On receipt of the SFEP, RTI chose an area of 3,931 ha for a biodiversity reserve. The Bio-Reserve contains all forest types in the concession area; and the presence of creeks and altitudinal gradients ensure a diversity of plant species and fauna. No mining activities were detected in the area.

RTI conducted reconnaissance (management level) inventory data using 491 x 0.1ha plots distributed across 33 transect lines. the methodology used was based on GFC's recommendations. For trees of dbh>10cm, seventy-four (74) potentially commercial species occur with the concession area.

Table A: Basic parameters of the vegetation on the concession area (GFC, 2020)

Forest Type	Area (ha)	% Of area	Remarks
1: Mixed Forest on undulating to hilly terrain	61,870.65	57.5	Productive forests:
1b: Mixed Forest on flat to undulating terrain	23,289.95	21.6	Productive forests: Typical species:
1c: Mixed Forest on deeply dissected terrain	2,206.39	2.0	Non-productive ( <i>subject to verification</i> )
1h: Mixed Forest on high hills	18,986.40	17.6	Non-productive ( <i>subject to verification</i> )
3: Low swamp forests	1,308.07	1.2	Non-productive ( <i>subject to verification</i> )
<i>No data</i>	<i>9.08</i>	<i>0.0</i>	
<b>Total</b>	<b>107,670.54</b>		

Black Kakaralli and Mora occur throughout the concession area, while Greenheart, for example, does not occur throughout the concession area. For prime commercial species, Greenheart represents 10.4% of total volume, with Wamaradan (4.1%), Purpleheart at 2.6% and Locust (0.1%). Previous work by PWPI estimated mean volume for prime commercial species across the concession area is 32.2m<sup>3</sup> (which is well above the 8.33m<sup>3</sup>/ha that RTI will be authorised to harvest, based on the felling cycle (25 yrs.) the company adopted.

### 3.2.3 Fauna

No hunting and fishing have been observed in the concession area. At the most populous area nearby, Puruni Landing, meat fish and fresh vegetables are brought in by various merchants. Pork knockers have been observed minding parrots, wild hogs, and monkeys as pets.

The consultants used several methods to detect the nature of fauna on the concession area, including trail cameras and a seine. Useful aids for detecting fauna included tracks and scat. The team also recorded numerous sightings. There were numerous sightings of various classes of animals.

The main faunal survey was conducted in September and October 2020, but the consultants sought every opportunity to record fauna present.

### 3.3 Social Environment

#### 3.3.1 Overview

RTI estimates that about 300 persons *occupy the concession area*: 90% of the persons encountered are miners and about 10% constitute various business establishments supporting the mining community. Women constitute about 15% of the persons 'working' within the concession area. *80% of the persons at the concession area only work there; they are transient, following 'gold shouts' across Regions 7 and 8. In repeated trips to the area, it was difficult to find the same persons in the place they 'occupied' during the first encounter with them.* (In fact, the entire village of Oranapai, cited in the previous ESIA Report for PWPI's SFEP 5/2004) in 2007, has disappeared completely).

RTI also estimates that on average twenty vehicles *per day* traverse its southern boundary. (When the forest concessions south of RTI becomes active, the number of vehicles would increase by about 30%).

GFC staffs (based at Iteballi or Georgetown) and GGMC staffs based at Puruni Landing and Olive Creek, respectively visit the concession area on a regular basis.

The main commercial centre in the area, just on the outskirts of the concession area is Puruni Landing. (Please see Section 3.3.4)

#### 3.3.2 Consultations

Since 2007, FTCI has been conducting passive, informal consultations occur during every visit to the concession area (SFEP 05/2004). FTCI used every engagement with a boat captain, sailor, miner, logger, chainsaw operator, businessperson, or public officer, to gather socio-economic data. FTCI also benefitted from formal consultations it conducted for other concessionaires in the area.

For this work, FTCI depended on interviews conducted in March 2021, and April 2022 that included persons at Bartica, Batavia, Kartabu, Iteballi, Puruni Landing, Upper Puruni River, Takutu Basin, Kumung-Kumung, and Pashanamu. Additional *informal* interviews were done in April 2022.

For **this** report, communities at Puruni Landing and of Kumung-Kumung were considered **primary** stakeholders. Residents of Batavia, Kartabu and Iteballi were considered **secondary stakeholders** because those communities are situated more than 115 km from the concession area. Further, the consultants estimate that RTI's log flows to Iteballi will not exceed 4% of the total vehicular traffic traversing Iteballi on any given day.

#### 3.3.3 Land Use

- Road networks

The southern boundary of the concession constitutes a 98.5km segment of the KPR (between Puruni Landing and Papishou) and is used by persons conveying heavy equipment and fuel to Olive Creek, Papishou and mining sites in the upper Puruni District.

A major issue with the KPR is the Puruni Crossing. In the rainy season, water levels at either end of the bridge raise by at least 3-4 meters, and flooding at the western end of the bridge extends about 50m inland. Any bridge should also be high enough to allow the passage of riverine craft and dragas during the rainy season. MNR has advertised publicly for '*expressions of interest*' for the construction of the bridge, and RTI hopes that there will be concrete plans in place for the bridge by December 2022.

Another issue with the KPR, a public road, is the apparent absence of any formal road maintenance programme for the road.

RTI is expected to share the use of about 30 km of *existing* mining roads within the concession area: these links the KPR with mining sites or landings on right bank Puruni River. All roads will require major upgrades in order to accommodate and sustain the passage of 40-ton logging trucks.

*(RTI expects to construct about 90km of logging roads which it will share, under agreed conditions, with the mining community).*

- Mining

The concession area falls within the Mazaruni Mining District (District # 3) and currently mining is the primary land use within the concession area.

There has been a long history of mining in the area since the late 1920s, with a particular surge in scale of mining the past 30 years with a significant increase in the use of excavators and 'Dragas'. Fortunately, for RTI, the greater part of the actual areas under intense mining activity lies along the right bank Puruni River, including the Alphonso Group's *Million Dollar Mountain mines*. *(At the extreme north-western point of the concession area, there is the Toraparu mines, run by the ETK Inc.).*

All miners consulted supported the advent of a new developer.

- Logging

RTI shares common boundaries with three large concessions on its southern border, the KPR forming a common boundary. Currently the three concessions are *inactive*: and a major reason for their suspended development *is the size of barge at the Puruni River*. At least one company has been exploring other options for crossing the Puruni River.

As is customary, miners fell trees for mining related infrastructure

- Other Land Use

The consultants have not recorded any commercial scale farming, fishing, or hunting. Also, no ecotourism-based enterprises lie within or around the concession area.

There is an airfield at Olive Creek, and another at Toraparu; both are outside the boundaries of SFEP 2/2020. Olive Creek is about 90 mins by road from RTI's proposed base camp (providing the road is in a state that permits vehicular speeds of 65km/hr).

There is the Papishou Landing at the western extremity of the KPR. Both areas lie *outside* the concession area but persons travelling there by road will be sharing the use of the KPR with RTI.

### **3.3.4 Communities**

There are no Indigenous communities within (the vicinity) of the concession area. Puruni Landing, lie on the eastern boundary of SFEP 2/2020 and would be impacted directly by RTI's logging operations. The only 'community' within the concession area is Kumung-Kumung and Pashanamu. There are, of course various miners' camps and shops scattered throughout the concession area.

**Puruni Landing**, situated at the junction of the KPR and the left bank Puruni River has a resident population of about 300 persons. Puruni Landing has critical strategic value due to the barge crossing there. (There are ongoing discussions at the level of the MOPW, MNR, GGMC and GFC regarding the construction of a bridge at Puruni Landing. MNR has invited public tenders for the construction of a bridge).

The village evolved from a mere cluster of shops that constituted the Landing in 2005 to a major commercial hub that supports the regional mining industry. There are Guyanese, Brazilian, and Chinese

businesses. The community has large grocery stores, hotels with moderate basic amenities and restaurants. Private wells and satellite dishes are common in the area. A DIGICEL cellular network is available. Recently, there have been hair salons, barbershops, vehicular wash bays, and a steadily increasing number of roadside vendors established there.

There is a GGMC station there, a MEDEX Centre, and a Police Outpost. Officers from the MOH, MOPW, and the GFC conduct extension type activities there on a regular basis. There was a GDF unit stationed there in early 2021. It is anticipated that the GFC will set up a station there before the end of 2022.

**Kumung-Kumung** is a small Landing situated on left bank Kumung-Kumung River, at the confluence of Kumung-Kumung River and right bank Puruni River. That village has immense strategic value in the dry season: it is situated about 5km from the KPR, and the landing is used in the dry season for transporting fuel to mining operations in the upper Puruni River. The Landing is a convenient location for persons based in the upper Puruni River, to source goods, entertainment, and Wi-Fi.

Unlike Puruni Landing, Kumung-Kumung has fallen on tough times and has lost more than 70% of its population over the past five years, in line with the varying scenarios of 'gold shouts'. The regular population there now is about 30 persons trading in goods and fuel. Only about twelve Guyanese live their full time: the others are non-Guyanese. The entire area in a two-kilometre radius around Kumung-Kumung has been mined out and is devoid of merchantable timber.

There are small clusters of miners and/or businesses along the western segment of the Kartabu-Puruni Road: the main ones adjacent to the concession area are Pashanamu (10 persons) and Turtle Creek (20 persons). Recently, Jettoo Lumberyard & Sawmills operated on the southern side of the Puruni Road, west of Puruni Landing, but operations were suspended due to challenges at the Puruni Crossing.

### **3.3.5 Stakeholders' general response**

No person or agency consulted made any objection to (additional) logging operations on right bank Puruni River, west of Puruni Landing, or to the consequent increase in log flows projected for the Puruni Road.

Regional officials and the business community—including traders and transporters of fuel and goods, and hoteliers—welcome additional economic development that increases the volume of commerce in the area. Large miners are disinterested about emerging forestry activity: miners do welcome logging they *dislike* the wastage of *merchantable trees when they have to clear and bulldoze forests*. 'Small' miners look forward to RTI's logging road networks to access their mineral properties.

Communities' welcome additional economic activities because of the options and opportunities for employment and the expansion of regional commerce. Everyone believes that additional economic activity will attract more attention from central Government and Regional authorities, and that would lead for example, to more attention to public roads. However, there is widespread demand for the developer to **engage residents in discussion as often as necessary** to pre-empt and manage potential or emerging conflicts.

There is widespread support for the proposed airstrip: the main reasons cited were the evacuation of sick persons from the area and the opportunity to source urgent engine spares and other critical supplies.

## 4.0 RTI'S PROJECTS

### 4.1 Overview

RTI will be involved in two projects. The main project will be the logging/sawmilling project, RTI's primary business, and the second project will be the construction of an airfield.

### 4.2 RTI's logging & sawmilling project

#### 4.2.1 Overview

RTI will invest US\$ 2.8 million to set up and implement its integrated logging and sawmilling operations. The operations will be geared to produce 17,500m<sup>3</sup> of logs from an area of 2,100ha each year, in line with GFC's forest management prescriptions, and in full compliance with the provisions of RTI's *Environmental Authorization*.

RTI will run a two-phased operation, producing both logs and lumber, in line with marketing requirements. For example, timber species for plywood production will be extracted as logs. The upgrade of the barge plying the Puruni Crossing or the availability of a bridge at the location is a major consideration over the next two years, in the determination of RTI's product mix.

A portable mill will be used for salvaging timber from defective logs of prime merchantable species. The mill will also be used for processing timber species with lower commercial value rather than transporting them more than >115km to Iteballi (and beyond).

In pursuing timber harvests, RTI is guided by its principles, including:

- a) **Optimum production.** RTI will harvest the forest at an optimum, but sustainable level in line with GFC prescriptions.
- b) **Optimal use of technology.** RTI will optimize the use of available technology to enhance the efficiency of its fieldwork.
- c) **Multiple use of forest resources.** RTI recognizes the rights of Indigenous peoples, miners, and other persons to the use of the forest resources on the concession area. RTI will protect any assets with Indigenous and archaeological significance. RTI will also foster a shared responsibility for road maintenance.

#### 4.2.2 Preparatory work

RTI's first actions on receipt of a large concession would be to:

- a) Develop a temporary field camp and transfer core logging and equipment at hand to the concession area.
- b) Recruit staffs (*see Figure C*) and organize appropriate training courses for them. The resources for the training will include standard operational procedures and policies being developed by the company, GFC's Code of Practice for Field Operations, and manuals for equipment at hand.
- c) Demarcate the boundaries of the concession and post sign boards at appropriate locations to assert ownership of the concession area.

- d) Organise and demarcate the four compartments already determined and the biodiversity reserve and start/continue the block demarcation process (see Figure D).
- e) Start 100% inventory for blocks already demarcated.
- f) Conduct a detailed assessment of the current road network (based in part on topography, mining sites, and merchantable stocking).
- g) Develop RTI's base camp (after expensive surveys on flooding regime and considerations for potable water). (See Figure E).
- h) Identify points for permanent monitoring stations
- i) Conduct detailed surveys for the airstrip
- j) Prepare a forest management plan for a five-year period and an annual plan of operations.

#### **4.2.3 Field Operations**

Logging operations will be cyclic events (see Figure F), merely occurring at different geographic locations. The basic activities will involve:

- a) Putting in many survey lines (at least 20km/100 hectares) and conducting forest inventories (see species targeted at Table B).
- b) Major earthworks: site preparation, road building, skid trail construction, laying out culverts and bridges and log/lumber depot construction.
- c) Stock map preparation, selection of harvesting stock, and tree marking.
- d) Selective and directional felling of trees, skidding logs to log markets, and conveying the logs to log markets or portable mill sites.
- e) Processing logs into lumber and sorting the lumber by species, dimensions, or product type.
- f) Hauling logs and/or lumber to timber/lumber depots to Iteballi and beyond.



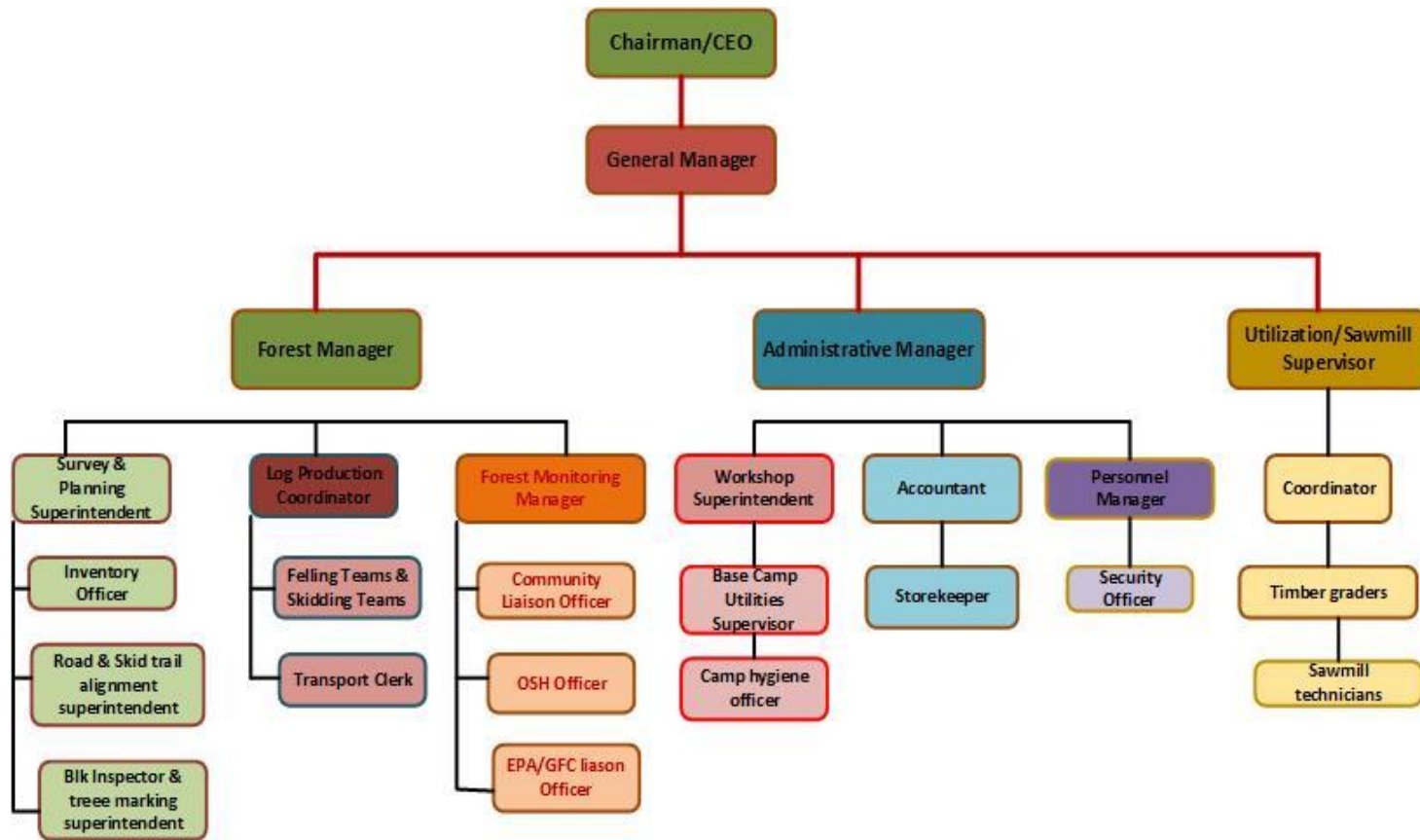


Figure C: RTI's organizational chart

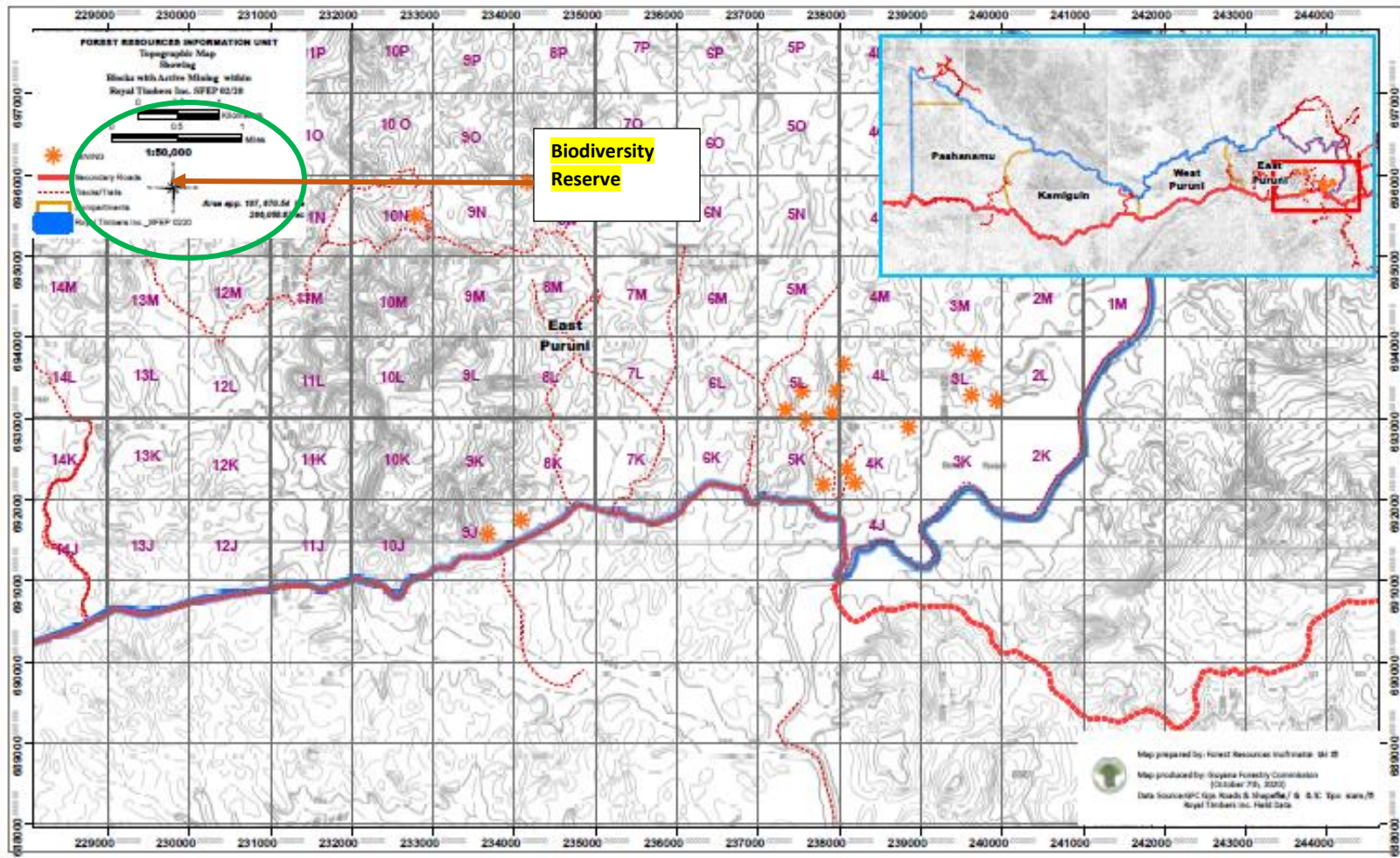


Figure D: Illustrations of layout of 1000m x 1000m (100ha) blocks with alpha-numerical codes

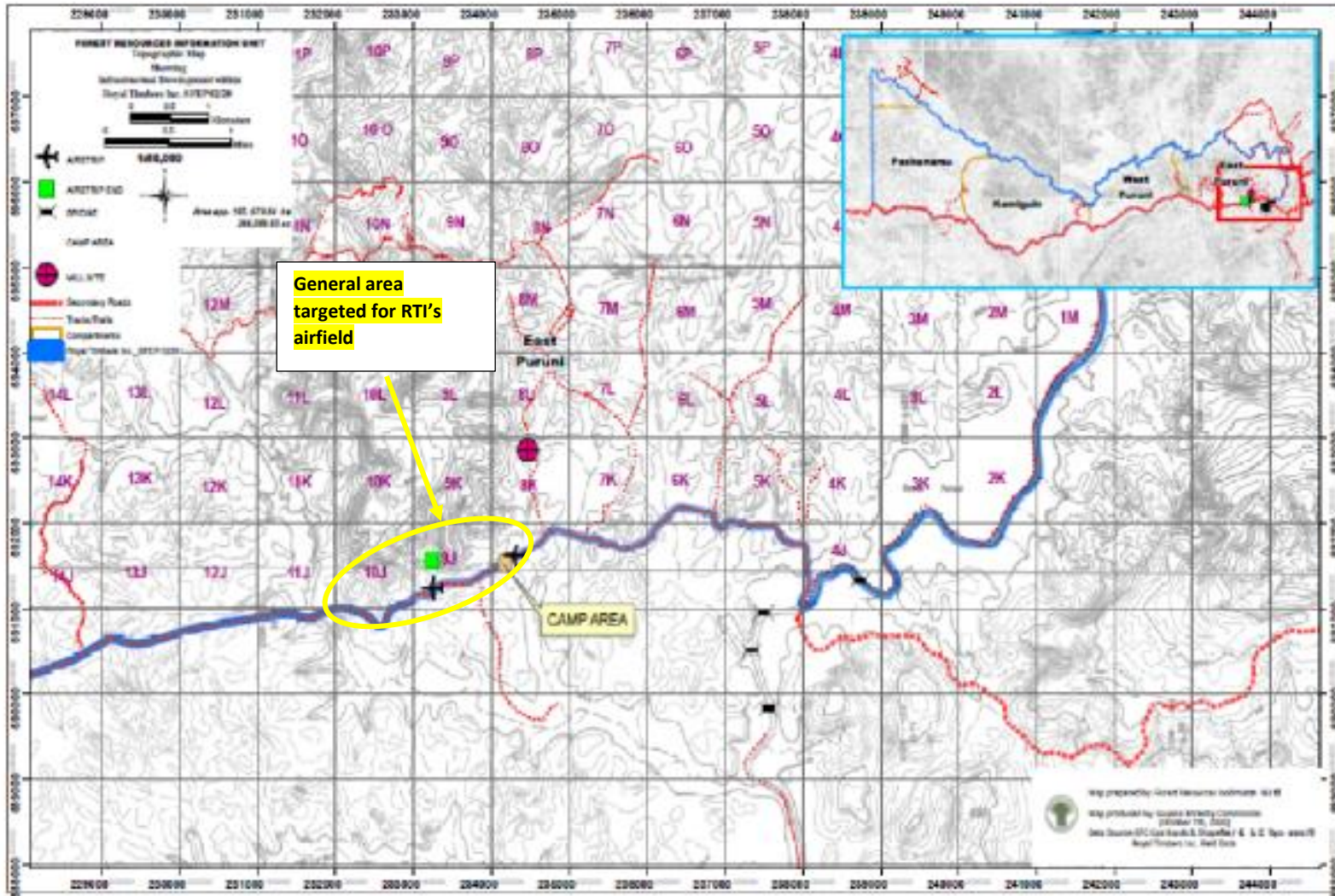


Figure E: Indicative map showing the proposed location of RTI's base camp & airfield zone

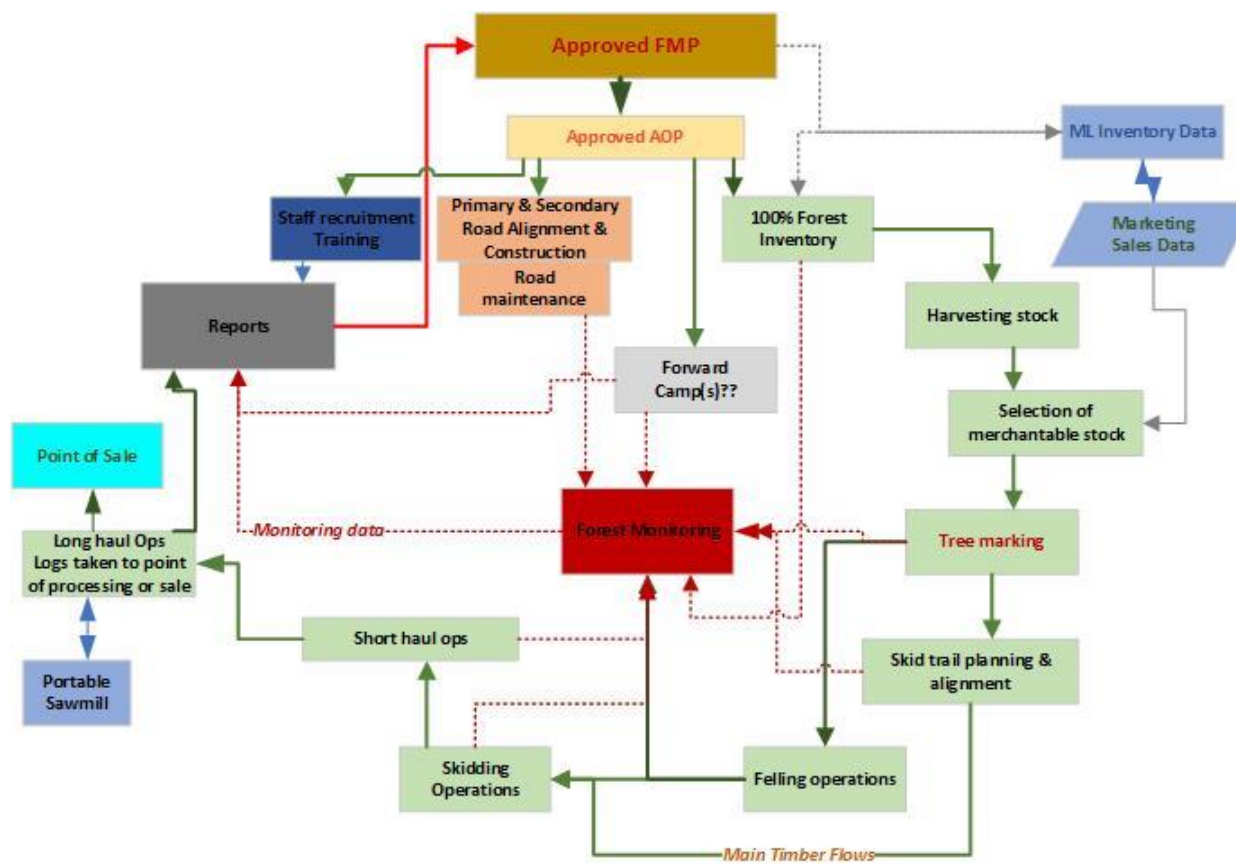


Figure F: Illustration of cyclic flow of RTI's annual field operations.

Table B: List of 32 species targeted by RTI

No.	Local Name	Scientific Name
<b>Lumber</b>		
1	Crabwood	<i>Carapa guianensis</i>
2	Huruasa	<i>Pithecellobium jupunba</i>
3	Purpleheart	<i>Peltogyne spp.</i>
4	Kabukalli	<i>Goupia glabra</i>
5	Locust	<i>Hymenea spp.</i>
6	Shibadan	<i>Aspidosperma spp.</i>
7	Tatabu	<i>Diploptropis purpurea</i>
8	Mora	<i>Mora excelsa</i>
9	Manni	<i>Symphonia globulifera</i>
10	Monkey Pot	<i>Lecythis davisii</i>
11	Greenheart	<i>Chlorocardium rodiei</i>
12	Washiba	<i>Tabebuia sp.</i>
13	Limonaballi	<i>Chrysophyllum pomiferum</i>
14	Tonka-bean	<i>Dipteryx odorata</i>
15	Silverballi	<i>Aniba ovalifolia</i>
16	Wamara	<i>Swartzia leiocalycina</i>
17	Morabukea	<i>Mora gonggrijpii</i>
18	Tauroniro	<i>Humiria balsamifera</i>
19	Bulletwood	<i>Manilkara bidentata</i>
<b>Plywood</b>		
1	Baromalli	<i>Catostemma spp.</i>
2	Maho	<i>Sterculia spp.</i>
3	Simarupa	<i>Simaruba amara</i>
4	Cedar	<i>Cedrela odorata</i>
5	Dalli	<i>Virola surinamensis</i>
6	Haiawa	<i>Protium spp.</i>
7	Karahoro	<i>Didymopanax morototoni</i>
8	Kurokai	<i>Protium decandrum</i>
9	Moraballi	<i>Pouteria minutiflora</i>
10	Barakairo	<i>Ormosia spp.</i>
11	Soap wood	<i>Pithecellobium spp.</i>
12	Cow-wood	<i>Bagassa tilifolia</i>
13	Futui	<i>Jacaranda copaia</i>

#### 4.3 Establishment of an Airfield

##### 4.3.1 Overview

RTI plans to construct an airstrip on or adjacent to the concession area. The airstrip is a special project as it requires that any subterranean gold resources be locked down. (There are local cases where mining activity has approximated airstrips, jeopardizing their integrity; also, there are instances where logging roads have been shifted when gold was ‘discovered’ near to or under them). Therefore, consultations with the mining community and a suitable MOU or Agreement are a prerequisite for securing the 20ha required.

The reasons for the airstrip may be summarized as follows:

- a) To allow directors to visit the main camp: a trip by road takes about 8 hours under normal road conditions, in the rainy season this can easily extend to 10hours. Further a trip by road from Georgetown currently requires the use of three barges (across the Essequibo, Mazaruni and Puruni Rivers) in addition to the bridge across the Demerara River: all these crossings are very time-consuming events.
- b) To allow for the rapid conveyance of critical supplies, such as spare parts to RTI's operation centers.
- c) To allow for rapid evacuation of ill persons to medical facilities at Bartica or Georgetown.

RTI hopes that it can eventually extend its services to the wider community

#### **4.3.2 Basic specifications for the Airfield**

All modalities and licences for operating airfields will require the approval of the Civil Aviation Department, Ministry of Public Works.

RTI intends to construct and maintain, an airfield non-towered airstrip in the vicinity of its main camp x) to support its logging operations. RTI proposes to start with an airfield, and then move on to an airstrip (with passenger accommodation and other amenities).

The runway will be 800 meters to accommodate Cessna 206, Britten-Norman BN2 Aircraft, Cessna 208 Caravan Aircraft, and SKYVAN aircraft all immensely popular in Guyana for use on unpaved surfaces. The airfield will require turning nodes of 25m x 25m at each end. Normally, the longitudinal grade for the airstrip will be about 2%

The total area for the airfield will be 1000m x 200m (20ha). This implies that the airstrip will occupy an area of a clearing of about 1000 m x 200 m (20ha).

Facilities for passengers will depend on stakeholders' interest in the facility.

#### **4.3.3 Airstrip management**

RTI would take a decision about the way it would manage the airstrip and accommodate stakeholders' interest in the facility. Two immediate scenarios are normally used in rural areas or mining zones. Firstly, RTI can have scheduled passenger trips or cargo trips, allowing enough seats or space for other parties. The other option is to allow other parties to do their own independent charters and to pay a 'landing fee' every time the airstrip is used. In any event, RTI will have to add the management and maintenance of the airstrip to its administrative load. Initially, the Administrative Manager will be responsible for the airstrip.

#### **4.3.4 Environmental considerations**

RTI considers the runway as a special road surface, duly compacted to accommodate the weight of loaded aircraft in a safe manner. Exceptional care will be taken to ensure that the runway has sufficient drainage features (grades and side drains) so that it remains dry at all times.

As far as possible, RTI will apply asphaltic to the runway itself, to improve its functionality; for example, it would be easy to add 'centre-line markings' or 'touch down zone markings.' Solar powered edge lights may be added if approved by the CAD.

## **5.0 SUMMARY ASSESSMENTS OF ENVIRONMENTAL AND SOCIAL IMPACTS CREATED BY RTI'S OPERATIONS**

### **5.1 Overview**

Timber harvesting operations necessitate major interventions into the forest resources, and such interventions generate negative impacts on the forest resources. Also, in hauling timber to Iteballi, RTI's vehicles will traverse a total of about 200km of the entire KPR and will share that route with other businesspeople, including loggers, transporting cargo. An outline of negative environmental impacts is considered at three levels: impacts from RTI's base camp; impacts at the concession level; and impacts generated from hauling timber between the concession area and Iteballi.

### **5.2 RTI's base camp**

RTI will set up a base camp at the concession area, to accommodate at least 25 persons, and therefore this base camp will be a source of noise, fumes, and liquid and solid waste. There will be mechanical workshop, generators, a portable sawmill, and vehicles traversing the camp area; these will produce fumes, noise, and vibration. RTI will construct storage facilities for fuel and lubricants, and miscellaneous items such as kg cooking gas, paint and 600ml cans of insecticides. Any mishap with petroleum-based products or inappropriate disposal of waste will have serious polluting effects on the immediate environment and jeopardize the welfare of employees.

### **5.3 Impacts at the concession level**

#### ***5.3.1 Typical impacts on the physical environment***

Earthworks for road construction represents a significant intervention in the forest resources and generate environmental impacts. For example, machines for bulldozing trees, grubbing, and cut and fills cut-and-fills produce erodible soil particles which enter the air as dust and which can also eventually enter streams, particularly when there is rainfall on sloping terrain; the machines also emit fumes and produce noise and vibration. The machines also compact the soil surface leading to restricted infiltration of water from rainstorms. Machines may shed oil or fuel on the forest floor, and these have a polluting effect on soil (biology) and, if they enter waterways, on water quality.

#### ***5.3.2 Impacts on the biological environment***

##### *Flora*

Timber harvesting entails the felling of about 300 trees per 100ha; in addition, trees will also be felled for clearing roadways, log markets, and skid trails, and for constructing timber bridges, corduroy works, and for constructing field camps. Therefore, the removal of trees during timber harvesting operations leads to forest degradation, by altering forest structure in terms of the distribution of diameter classes and species composition, respectively. Logging targets trees the trees with highest commercial value and trees of good form, respectively and this implies that there could be creaming-economic degradation, and genetic erosion in the logged over forest. The removal of trees at the level of the canopy allows more light onto the forest floor, modifies wind flows and relative humidity in the understory which may stymy the development of seedlings of merchantable trees felled.

##### *Fauna*

Slow moving arboreal animals such as sloths and juvenile birds trapped in nests may be killed during tree felling activities. Noise, vibration, and tree removal disrupts the habitats of animals in the canopy and the understory, placing them under stress and forcing their *temporary* migration. The temporary forced

migration of fauna affects forest functions such as seed predation and seed dispersal. Animals forced to migrate or flee *under stress* may become more vulnerable to predators.

### 5.3.3 Impacts on the social environment

RTI may be forced to apply restrictions on the use of concession-based roads to address safety concerns and soil and water conservation. For example, RAI will post signs relating to speed limits or avoidance of animals traversing the road corridor (see Figure G). Although, RTI is committed to multiple use of the forest resources, RTI will monitor any hunting or fishing activity beyond subsistence levels in the concession area. **NO HUNTING** signs will be posted.

**All restrictions may be a source of conflict if stakeholders do not support them.**

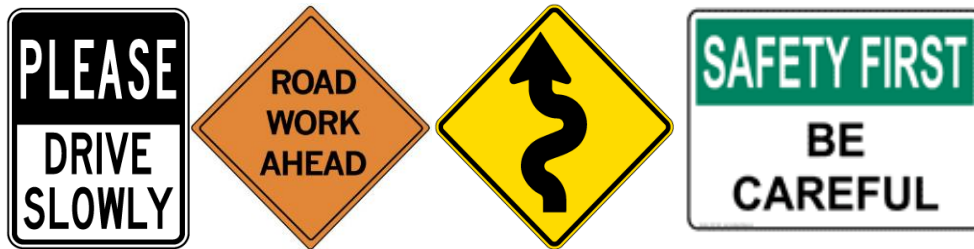


Figure G: Example of signs RTI will place at appropriate locations.

A major fallout from RTI's operations, that impact on RTI's staffs as well as other parties, would be dust, noise and vibration on a regular basis, especially along primary roadways used regularly.

### 5.4 Impacts generated from hauling timber between the concession area and Iteballi.

RTI will share the use of the KPR with a broad range of vehicles varying from motorcycles and ATVs to tractor trailers hauling excavators and bulldozers. RTI's trucks will traverse Puruni Landing, Takutu 'village' and Iteballi producing dust clouds, noise, and vibration. RTI will make just two trips per week to Iteballi, and the consultants estimate that for any given period, RTI's vehicles will comprise less than 2% of the vehicles traversing Iteballi Village. No direct physical and biological impacts are projected for Kartabu Point and Batavia, respectively.

Other loggers on the southern side of the KPR (west of Puruni Landing) will also be deploying heavy-duty (40 ton) trucks with pole trailers will also be using the KPR. It has been the case on the KPR that any major deterioration or flooding of the roadway or any large vehicle with serious mechanical problems have blocked the KPR, leading to major delays in the movement of vehicles and their cargo. RTI's vehicles could contribute to blockage scenarios and complicate the situation, causing conflict with stakeholders.

## 6.0 ENVIRONMENTAL MANAGEMENT

### 6.1 Overview

As a company that exhibits high corporate discipline, RTI will ensure that it is **prepared to manage** environmental impacts.

The key measures RTI will take, include:

- a) Develop an environmental management plan (see elements in Tables C and D) alongside its forest management plan



- b) Set up eight permanent forest monitoring stations within the concession area and a meteorological station near the base camp
- c) Regular briefing sessions with staffs to ensure that they share responsibility for proper environmental management. (Materials used for briefing sessions will include publications by the EPA and the GFC.
- d) Making annual budgetary provisions and furnishing staffs with the tools for forest monitoring activities.

RTI's Environmental management plan will ensure consistency and transparency in its commitment to responsible behaviour in managing environmental impacts produced by its operations.

## **6.2 Summary of mitigation measures for significant negative impacts**

The key actions RTI will take to mitigate negative impacts are shown in Table C.

## **6.3 Summary of monitoring programme**

A robust forest monitoring system is critical for putting in place any remediation events to improve environmental management.

Table C: Summary of Potential Environmental Impacts and proposed mitigation measures

Potential Impacts	Proposed mitigation measures	Responsibility	Proposed Period for implementation
<b>Physical Environment</b>			
<b>Earthworks:</b> <ul style="list-style-type: none"> <li>Scarification of soil surface,</li> <li>sub-soil exposure, erosion,</li> <li>soil compaction (except for roads)</li> <li>water logging</li> </ul>	<ul style="list-style-type: none"> <li>Conduct quarterly regular briefing sessions with</li> <li>Use maps to optimize road alignment and plan bridges and culverts (paying attention to water course configuration).</li> <li>Use appropriate machines for specific earthworks: for example, excavators are ideal for making borrow pits,</li> <li>Schedule major earthworks for the dry season</li> <li>Follow the recommendations of the COP.</li> </ul>	RTI	During the entire period for the project.
<b>Air quality:</b> <ul style="list-style-type: none"> <li>Dust and smoke (especially along roads)</li> <li>minor changes in micro-climate</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that vehicles are well serviced so that exhaust emissions are in line with manufacturers' standards.</li> <li>Undertake major earthworks in the mornings when it is less breezy and soil moisture keeps down the dust.</li> </ul>	RTI	During the entire period for the project.
<b>Water resources:</b> <ul style="list-style-type: none"> <li>modification in turbidity, temperature, &amp; ph.</li> <li>pollution from fuel and oil spills</li> </ul>	<ul style="list-style-type: none"> <li>Strict adherence to RIL principles and prescriptions of the COP, especially regarding:                             <ul style="list-style-type: none"> <li>Minimum distances between waste pits and waterways</li> <li>buffer zones along waterways,</li> <li>parameters for side drains/ditches and</li> <li>precautions during bridge and culvert construction.</li> </ul> </li> <li>Maximum care to be taken to ensure all vehicles and machinery are in a proper mechanical condition.</li> <li>Clean and service vehicles only in designated areas.</li> <li>Institute regular briefing sessions for field staff and highlight the need for water conservation during such briefings.</li> <li>Post signs as appropriate to restrict human interventions in water bodies</li> </ul>	RTI, GFC	During the entire period for the project.

Potential Impacts	Proposed mitigation measures	Responsibility	Proposed Period for implementation
<b>Biological/ecological environment</b>			
<b>Timber harvesting:</b> <ul style="list-style-type: none"> <li>• destruction of juvenile trees,</li> <li>• spillage of fuel, oil and grease that impacts on soil biology</li> <li>• forest fragmentation, increased potential for blow downs/tree fall</li> <li>• modification of forest structure (diameter class distribution as well as species composition)</li> </ul>	<ul style="list-style-type: none"> <li>• Implement a system for conducting pre-harvest inventories and preparing stock maps for the efficient identification of trees to be harvested.</li> <li>• Use tree marking practices.</li> <li>• Use directional felling techniques for felling trees</li> <li>• Plan skid trails based on stock maps-specifically for the identification of the harvesting stock.</li> <li>• Use tractors that permit winching techniques.</li> <li>• Use heavy duty machines that are fully functional (no leaking of oil or fluid anywhere).</li> <li>• Train all field operatives in RIL practices</li> </ul>	RTI	During the entire period for the project.
<b>Wildlife:</b> <ul style="list-style-type: none"> <li>• Accidental mortality of arboreal fauna</li> <li>• Modification, destruction of habitats leading to stress, temporary dislocation of fauna, and the potential for accelerated animal-animal predation</li> <li>• (Accidental) animal mortality, depletion in population and variety of species</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on (and animals can return).</li> <li>• Restrict hunting activities (by non-Indigenous groups) by placing advisory notices at strategic points around the concession area.</li> <li>• Drivers/Operators of vehicles to slow down when encountering animals on the roadway.</li> <li>• Inspect trees to be felled for nesting birds such as the harpy eagle (<i>Harpia harpyja</i>) or slow, arboreal animals such as sloths (<i>Bradypus torquatus</i>).</li> <li>• Avoid</li> </ul>	RTI	During the entire period for the project.
<ul style="list-style-type: none"> <li>○ <b>Ecological relationships:</b> Modifications of ecological relationships. Increased potential for pests.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement proper RIL practices and prescriptions of the COP 'standard operating procedures'</li> </ul>	RTI, GFC	During the entire period for the project.

Potential Impacts	Proposed mitigation measures	Responsibility	Proposed Period for implementation
<b>Socio-economic environment</b>			
<b>Conflicts:</b> restrictions of access, alienation of rights	Engage miners, residents in discussion and consultations to address mutual concerns.	RTI	As required
<b>Social problems:</b> crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	<ul style="list-style-type: none"> <li>• Work with public agencies (Police, staff of the Ministry of Health, staff of the Ministry of Local Government) in Region 7 and other forest/mining concessionaires in the Puruni District to address emerging issues.</li> </ul>	RTI	As required
<b>Road safety:</b> Probability of road accidents.	<ul style="list-style-type: none"> <li>• Collaborate with the police to ensure adherence to proper road use practices and to identify road locations requiring special attention.</li> <li>• Ensure that each vehicle is in a full functional state prior to its use on the roadways, within and outside of the concession area.</li> <li>• Place appropriate cautionary signs at sharp turns, steep grades, bridges and near populated areas.</li> </ul>	RTI	During the entire period for the project.
<b>Poor waste management:</b> illnesses resulting from a polluted environment.	<ul style="list-style-type: none"> <li>• Observe prescriptions of the Code of Practice.</li> <li>• Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management.</li> </ul>	RTI	Monthly
<b>Indigenous, archaeological assets:</b> loss, destruction modification of habitats.	<ul style="list-style-type: none"> <li>• Identify and isolate any assets encountered and post appropriate advisory signs and notices.</li> <li>• Ensure such sites are placed on all stock maps</li> <li>• Build fences around assets and place appropriate signs</li> <li>• Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered.</li> </ul>	RTI	As required

Table D: Key elements of RTI's forest monitoring protocols

Parameter	Responsible Party	Frequency	Location of monitoring
<b>Administrative measures</b>			
<b>Budgetary Allocations:</b> <b>Check that funds are available for:</b> <ul style="list-style-type: none"> <li>Establishment &amp; maintenance of permanent monitoring stations</li> <li>emergencies</li> <li>stakeholder consultations</li> <li>routine inspections</li> <li>Personal safety gear for employees &amp; visitors</li> </ul>	RTI (Operations Manager). )	Biannually	RTI HQ
<b>Physical Environment</b>			
<b>Earthworks:</b> <ul style="list-style-type: none"> <li>All workspaces are marked on stock maps; further all roads, skid trails, sawmill sites, log markets and borrow pits are marked on the stock maps and these stock maps are easily available in the field.</li> <li>RTI's Annual Operating Plan (APO) '<b>standard operating procedures</b>' (SOPs), GFC's COP, and selected FTCL manuals are available at RTI's base camp.</li> <li>Basic mensuration devices are available at the base camp and forward camp</li> <li>Machines are in a proper functional state</li> </ul>	RTI	Quarterly	<ul style="list-style-type: none"> <li>Sites where earthworks are occurring.</li> <li>Base Camp</li> <li>Forward camps</li> </ul>
<b>Water Quality:</b> <ul style="list-style-type: none"> <li>Side drains, bridges and culverts allow free movement of water off roads, runway</li> <li>Appropriate 'anti-pollution' signs are posted at critical points.</li> <li>Observance of the integrity of buffer zones along water ways</li> <li>Vehicles are cleaned and serviced at designated points at least 100m from a waterway.</li> <li>Records of analysis of water samples are available at the base camp</li> </ul>	RTI, GFC	<ul style="list-style-type: none"> <li>Biannually (PMS)</li> <li>Routine checks, especially in the wet season</li> </ul>	<ul style="list-style-type: none"> <li>PMS</li> <li>Areas being logged.</li> <li>logged over areas.</li> <li>Primary roads and associated drainage structures.</li> </ul>
<b>Air Quality:</b> <ul style="list-style-type: none"> <li>Collect data on air quality parameters; special attention will be paid to data on PM2.5, PM10 and Noise at prescribed forest monitoring points including roadways, base camps, and forward camps.</li> </ul>	RTI	Quarterly	<ul style="list-style-type: none"> <li>Base Camp, permanent monitoring stations.</li> <li>Random points along roadways</li> </ul>

Parameter	Responsible Party	Frequency	Location of monitoring
<b>Biological/Ecological Environment</b>			
<b>Timber harvesting.</b> <ul style="list-style-type: none"> <li>Blocks are clearly marked in the field</li> <li>quality of stock maps: buffer zones and protected areas are duly marked,</li> <li>Integrity of Biodiversity Reserves.</li> </ul>	RTI	Quarterly	<ul style="list-style-type: none"> <li>Active logging areas, permanent monitoring stations and</li> <li>Biodiversity reserves</li> </ul>
<b>Wildlife Trapping /hunting</b> <ul style="list-style-type: none"> <li>Movement of live animals away from the concession area</li> <li>Trade in wild meat</li> <li>Traps, firearms, shells</li> </ul>	RTI/GFC	Random checks Random checks Random checks	Puruni Landing Concession area
<b>Ecological Relationships</b> <ul style="list-style-type: none"> <li>Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes, or other fauna</li> </ul>	RTI, GFC	On observance	Concession area
<b>Socioeconomic Environment</b>			
<b>Conflicts</b> <ul style="list-style-type: none"> <li>Records on No. of mining camps, type of mining, vehicle movements,</li> <li>Complaints lodged with the company.</li> <li>Complaints lodged with the RDC or another public agency</li> </ul>	RTI, GFC,	Quarterly	Concession area,
<b>Social &amp; Employment issues</b> <ul style="list-style-type: none"> <li>Number of persons recruited from Kartabu Triangle.</li> <li>Number of persons trained.</li> <li>Rate of absence from work</li> <li>Disciplinary measures taken</li> </ul>	RTI	Biannually	Concession area
<b>Road safety</b> <ul style="list-style-type: none"> <li>Number of accidents/records</li> <li>Number of fatal accidents/records</li> <li>Number, type, and position of advisory road signs/records</li> </ul>	RTI	Quarterly	Puruni Police Outpost Bartica Police Station,
<b>Health and Safety</b> <ul style="list-style-type: none"> <li>Emergency Response Plans,</li> <li>Health and safety committees,</li> <li>Status of first aid kits, fire hydrants,</li> <li>Implementation of OHS practices &amp; the regular use of safety gear</li> </ul>	RTI, GFC	Biannually	Sawmill site, field locations, housing quarters

Parameter	Responsible Party	Frequency	Location of monitoring
<b>Waste Management</b> <ul style="list-style-type: none"> <li>• Waste accumulation &amp; waste disposal procedures</li> <li>• Apparent increase in vectors (rats, roaches &amp;, flies)</li> </ul>	RTI	Monthly	Sawmill complex, field camps
Indigenous/Archaeological assets <ul style="list-style-type: none"> <li>• Auditing of archaeological and anthropological resources</li> </ul>	RTI	On observance (Quarterly if observed)	Logging operations [blocks] and sawmill complex

## 7.0 POSITIVE IMPACTS OF THE PROJECT

RTI's project will contribute to the expansion of economic activity within the Kartabu Triangle. RTI's project will help eliminate unemployment within the Kartabu Triangle while energising the economy there through the direct injection of cash via employees' wages and its purchase of goods and.

RTI's project will improve access options for miners to tap mineral resources in the area, leading in turn to the expansion of economic activity. Indeed, the results of the expansion of economic activity is already seen at Batavia, Iteballi, and even at Bartica-where 90% of the residents are linked to the mining sector. The volume of economic activity and infrastructure at Iteballi where gas stations, restaurants, supermarkets, and hotels are gradually replacing the *shacks* that previously dotted the waterfront.

Similarly, there has been an increase in small businesses such as barbershops, hair dressing salons and wash bays at Puruni Landing. And at least one Chinese merchant has moved into Puruni Landing. investments will lead to improved flow of goods via Bartica and Iteballi that will eventually contribute to the development of those communities in the longer term.

RTI will assist in optimising value from merchantable timber in the concession area. Currently, timber is wasted wherever mining operations exist. The use of this merchantable timber will contribute to timber stocks on the market and contribute revenue to the GFC. Once RTI can conduct its operations, other concessionaires in the area would be encouraged to start production, generating even more revenues.

It is well known that public funds are allocated to public roads based on cost-benefit studies: the more developers there are on the western-side of the Puruni Landing, the higher the probability that Government would justify expenditure for road maintenance, and a bridge across the Puruni River (and indeed the Mazaruni River: Teperu-Iteballi, and the Essequibo River: Kumaka Sherima- Suribanna). Bridges could lead to faster flow of goods which would drive development of the gold mining and forestry sectors, and consequently, drive development of the region. Easy access to communities in the area would also facilitate improved security for residents, and extension services from, for example the Ministry of Health.

## 8.0 MANAGEMENT OF STAKEHOLDER ISSUES

RTI will adopt a four-pronged approach as the basis for managing stakeholder issues:

- a) Firstly, the company will ensure full compliance with the requirements of the GFC and the EPA.
- b) Secondly, the Forest Manager and the Forest Monitoring Manager will visit every mining camp within the concession area with the aim of assuring the miners that RTI is their 'partner' in rural development and environmental management.
- c) Thirdly RTI will support extension type activities (see Figure H) by public agencies such as the EPA, GGMC, and MOH.
- d) Fourthly RTI's forest monitoring manager will visit the NDC or Toshao at Iteballi, Kartabu, and Batavia biannually for discussions on mutually agreed issues. During such engagements, RTI will offer to share their annual operating plans with the communities.





Figure H: Illustration of extension type materials posted at Kumung-Kumung

## 9.0 PROJECT RISKS

RTI’s major concern is the state of the Kartabu-Puruni Road. Although public agencies including MOPW, MNR and GGMC provide funds for road repairs and maintenance, there are no obvious protocols in place for the regular maintenance of the road. For miners, fuel and rations are their lifeblood and they would push on through poor road conditions to get their goods to the intended destination, frequently *worsening* poor road conditions. RTI’s loaded logging trucks cannot safely traverse poor road conditions (see Figure I), and such conditions would lead to major delays in shipping timber.

Further, RTI will not be able to sustain major road repairs as its vehicles will not exceed more than 2% of the vehicular traffic on the Kartabu -Puruni Road in any given period.

The status of the Puruni Crossing is another serious thought. In October 2021, MNR invited ‘expressions of interest’ for the construction of a bridge across the Puruni River, therefore it is likely that there will be a bridge there by 2024.



Figure I: Typical conditions of the Puruni Road during the rainy season.

RTI will have to ensure that it has sufficient skilled technicians to run its operations. RTI’s operations will sit in the midst of a heavy concentration of forest concessions as well as mining concessions: these developers will use skill sets similar to those that RTI will use. Therefore, other logging operations and

mining operations will be both sources of *distraction* and *attraction* for RTI's employees, forcing RTI to match or exceed remuneration and other benefits to conserve its workforce.

RTI must ensure it engages stakeholders, particularly miners on the concession area, so that emerging matters do not escalate to the extent that they interfere with forest production.

## **10.0 PROJECT VIABILITY**

First, RTI will preside over an area well stocked with merchantable timber and will easily achieve timber output of 8.33m<sup>3</sup>/ha, especially as the company will target 32 spp. More importantly, given the current building boom in Guyana, RTI will be able to sell *all* the timber it produces, including species used for plywood.

Haul distances exceeding 130km are now the norm for most large forest concessions in Guyana. The KPR is ideal for hauling logs: it has an aged, solid, well compacted roadbed, road grades and turning radii are well within the capabilities of RTI's laden logging trucks, and the roads wide enough to accommodate two 'lanes' of heavy-duty vehicles.

RTI expects to recruit and maintain its full complement of employees. Many persons within the Kartabu Triangle prefer regular employment with predictable pay dates because their family lives are extremely important. *(Mining offers more lucrative employment, however, payment dates are unpredictable, and miners spend an inordinate amount of time away from their residences).*

RTI will invest heavily in training its forest operatives so that its operations are conducted as efficiently as possible, while in full compliance with local legislation, standards, and guidelines. RTI will also invest in modern mensuration and surveying devices for its field operations.

## **11.0 CONSULTANT'S STATEMENTS**

The consultants believe that RTI will be a catalyst for the organised development of the upper Puruni District. The mining community entrenched in the upper Puruni District have shared concerns about the ongoing destruction of merchantable timber due to (legal) forest clearing operations preceding large-scale mining. Good sustainable forestry practices in the area will ensure that merchantable timber in the area contribute to national and regional development. The combination of RIL, yield control (8.33m<sup>3</sup>/ha), and selective logging practices based on dbh limits and species, will ensure forest conservation. Moreover, good forestry practices are compatible with every other type of forest resource use. It should be noted that intense forestry activity would only occur over 2% of the concession area per annum.

RTI will follow up its best practices when logging with a robust forest monitoring system, ensuring due attention to emerging issues that need urgent resolution.

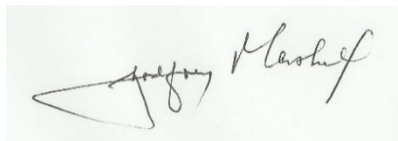
RTI's operations will be a major driver of economic development within the Kartabu Triangle. Its investments in the area that will see the injection of millions of dollars into the economy of the Kartabu Triangle through remuneration packages and purchases of fresh vegetables, meat, and fuel. There will be benefits for miners in terms of access to their resources, which could lead to expanded gold output and all the ancillary benefits that that will generate, including an expanded revenue base for the relevant public agencies.

RTI anticipates a 3% increase in national timber output once its operations get fully on stream by April 2023.

RTI's directors are shrewd, successful businesspeople. The consultants believe that RTI will abide by all local laws and forest management and environmental management standards, in line with its environmental authorization.

The consultants believe that the company is sincere in its commitment to regular engagements with stakeholders. Finally, the consultants believe that there will be major benefits for the country, and for the forestry and mining sectors, in particular. Economic development in the Kartabu Triangle will encourage central Government to expand the scope of social infrastructure that in turn would result in major improvements in the livelihoods of residents.

The consultants recommend that an ***Environmental Authorization*** be granted to RTI.

A handwritten signature in black ink on a light green background. The signature is written in a cursive style and appears to read "Godfrey Marshall".

Godfrey Marshall  
Team Leader  
ESIA Team

## MAIN REPORT

## FOREWORD

This ESIA Report has been developed in accordance with the Terms of Reference agreed with the EPA (see Annex 1). In line with the multi-disciplinary nature of an ESIA, a multidisciplinary team (see Annex II) was put together for this work.

A Non-technical Summary (NTS) is presented in pages 12-43, however a more elaborate NTS is presented separately. *(The separate NTS contains more tables and figures).*

Many of the key considerations used to identify and establish the context for RTI's operations are set out in Chapters 1 thru 5.

Chapter 6 describes the nature and extent of RTI's projects, and Chapters 7.0 through 15.0 expands on the project's impact on key (environmental and biological) attributes of the forest environment prevailing within the area designated SFEP 2/2020.

Chapter 16.0, 17.0, and 18.0 elaborate on overarching socio-economic issues and implications of the project.

Chapters 19.0 and 20.0 in detail how RTI will deal with negative socio-economic outcomes of the project, while Chapter 21.0 provides RTI's plan for managing environmental and social impacts associated with its logging and sawmilling project.

Chapter 22.0 presents the consultants' opinions on RTI's project and its reasons for recommending the issue of an environmental authorization.

## ACRONYMS

ACTO	Amazon Cooperation Treaty Organization
AOP	Annual Operations Plan
ATV	All-Terrain Vehicle
BCL	Barama Company Limited
CAD	Civil Aviation Department
CDC	Community Development Council
CI	Conservation International (Guyana)
COP	Code of Practice for Forest Operations, 2018
Dbh	Diameter at breast height
DFID	Department for International Development, UK
DOE	Department of Environment, Office of the President
EAB	Environmental Assistance Bureau
EPA	Environmental Protection Agency
EPPA	Environmental Protection and Protected Areas (Policy)
ESIA	Environmental and Social Impact Assessment
EU	European Union
FLEGT	Forest Law Enforcement, Governance & Trade
FMP	Forest Management Plan
FPA	Forest Products Association of Guyana
FTCI	Forestry Training Centre Incorporated
GDF	Guyana Defence Force
GEF	Global Environmental Facility, United Nations
GFC	Guyana Forestry Commission
GFFO	Guidelines for Forest Operations, 2018 (Large concessions)
GGDMA	Guyana Gold and Diamond Miners Association
GGI	Guyana Goldfields Inc.
GGMC	Guyana Geology and Mines Commission
GL&SC	Guyana Lands & Surveys Commission
GMSTC	Guyana Mining School and Training Centre
GOG	Government of Guyana
GPF	Guyana Police Force
GRA	Guyana Revenue Authority
ICT	Information and Communications Technology
IIC	Iwokrama International Centre
IPCC	Inter-Governmental Panel on Climate Change
ITTO	International Tropical Timber Organization
KPR	Kartabu-Puruni Road
LCDS	Low Carbon Development Strategy
LUS	Lesser Used Species
MNR	Ministry of Natural Resources
MOAA	Ministry of Amerindian Affairs
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MOPW	Ministry of Public Works
NBSAP	National Biodiversity Strategy and Action Plan 2012-2020
NDC	Neighbourhood Democratic Council

NDS	National Development Strategy 2001-2010
NFP	National Forest Plan, 2018
NFPS	National Forest Policy Statement, 2018
NGO	Non-Governmental Organization
NIS	National Insurance Scheme (Guyana)
NLEP	National Log Export Policy, 2020
NLUP	National Land Use Plan
NPAS	National Protected Area System
OCC	Office of Climate Change
OOTP	Office of the President
OSH	Occupational Safety & Health
PAC	Protected Areas Commission
PMS	Permanent Monitoring Stations
RLSS	Rong-An Inc.
RLSS	RL Sukhram & Sons
RTI	Royal Timbers Inc.
SDG	Sustainable Development Goals
SFA	State Forest Organization
SFEP	State Forest Exploratory Permit
SFM	Sustainable Forest Management
TEEB	The Economics of Ecosystems and Biodiversity
TFF	Tropical Forest Foundation (based at Virginia, USA)
TOR	Terms of Reference for the ESIA study
UNFCCC	United Nations Framework Convention on Climate Change
TPTTI	Toolsie Persaud Timber Traders Inc.
UAV	Unmanned Aerial Vehicle
VPA	Voluntary Partnership Agreement
WCED	World Commission on Environment and Development
WTCL	Willems Timber & Trading Company Ltd.
WWF	World Wildlife Fund

## GLOSSARY

**Airfield:** A runway and basic accommodation for passengers. (No aircraft maintenance facilities are contemplated).

**Base camp:** A field based administrative operations centre, over an area of about 600km<sup>2</sup> set up by forest concessionaires for managing field operations. The base camp is organized to accommodate field operatives and conduct simple preventive maintenance of machines.

**Business Community:** All persons engaged in the transport, trade or sale of fuel, oil, mining gear, rations, and beverages, or providing services in the areas of mechanical, vulcanizing, or entertainment) services in the Kartabu Triangle.

**Code of Practice (2018)** -A set of rules on ethical, environmental, technical, and social practices and protocols that the GFC published in 2018 and that embody mandatory standards for sustainable timber harvesting and ancillary practices in Guyana.

**Forward camp:** Simple, temporary tarpaulin covered camps set to accommodate forest operatives conducting forest inventory, road and skid trail construction and logging crews.

**Gold Shout:** Any news or rumours about a gold rush at a particular location.

**Guidelines for Forest Operators (GFFO)** (small concessions/large concessions): a document developed by GFC to provide forest concessionaires with guidance on timber harvesting and allied environmental and social practices in Guyana.

**Depot:** A site, on a riverbank, normally used for the temporary storage of containerized fuel or logs (see Landing).

**Draaga:** A floating, self-contained, and self-propelled barge that dredges and processes earths from riverbeds and sometimes from riverbanks for the purpose of retrieving gold.

**Landing:** A clearing on an interior riverbank used as *transit points* for people, rations, equipment, and fuel transported by boat to access land-based operations.

**Logging community:** all concession holders, their employees and contractors, and any other field operatives associated with harvesting timber on forest concessions in a given region or district.

**Mining community:** the entire array of large scale and small-scale miners, their employees and contractors, and gold traders and other persons engaged with the retrieval, sale, or purchase of gold from areas under mineral licences.

**Rapids:** A hydrological feature characterised by a river section where the riverbed has a steep gradient, causing a marked increase in water velocity and turbulence.

**Sailor:** An itinerant unskilled labourer who has no mineral license and who drifts from one mining operation to another doing odd jobs, including loading goods.

**Sustainable Development:** Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (WECD, 1987).



**Sustainable mining:** According Strongman (2002<sup>1</sup>) to Sustainable mining involves projects that are financially viable, environmentally sound, and socially responsible implemented with sound governance and it must bring lasting benefits especially for communities.

<https://www.ombudsman.gov.ph/UNDP4/wp-content/uploads/2013/01/PrimerPolicy-Brief-on-sustainable-mining.pdf>

**Timber depot:** an area, within a forest concession or a riverbank designated for the sorting and temporary storage of logs.

**Timber path:** A road or path approved by the GFC within State forests for the purpose of allowing any logger to transit areas held by another forest concessionaire.

**Timber harvesting:** The aggregation of all operations, including pre-harvest planning and post-harvest assessment, related to the felling of trees and the extraction of their stems or other usable parts from the forest, for subsequent processing into industrial products (ILO, 1998).

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<sup>1</sup> <http://siteresources.worldbank.org/INTOGMC/Resources/Madang-StrongmanPresentationCD-ROM.pdf>

## **ACKNOWLEDGEMENTS**

RTI wishes to record here all the comments from stakeholders that allowed the company to complete its ESIA.

Stakeholders' contributions have helped the company refine its approach to environmental management.

## **1.0 INTRODUCTION AND BACKGROUND**

### **1.1 The Developer-RTI**

#### **1.1.1. Introduction**

Royal Timbers Inc. (RTI) was incorporated as Company # 8612 under the Companies Act of Guyana on November 23, 2016 (please see Annexes III). RTI's registered address is Lot 15 Garnett Street, Campbellville, Georgetown, Guyana (see Annex IV).

RTI's vision is to become the most valuable company in the forestry sector in terms of profitability. RTI's mission is to achieve the ultimate blend of technology and human resource to excel at forest production and environmental management.

Mr. Jagmohan, the Chairman of RTI's BOD, is an experienced businessperson. Once the issue of a large forest concession is imminent, he will recruit his core management team comprising a General Manager, A Forest Manager, an Administrative Manager, and a Utilization Officer (please see Annexes VII-key positions and their responsibilities, and VIII-RTI's organization chart).

#### **1.1.2 Business objectives**

RTI will benefit from the established business acumen of its directors who have achieved major successes in other sectors.

RTI plans to spend US\$2.8 million during period October 2022 to July 2023 to set up a base camp at the concession area, to transfer logging & sawmilling equipment at hand to the concession area, to recruit and train field operatives and to initiate logging & sawmilling operations. RTI will also construct an airfield.

In undertaking its forestry project, RTI aims to:

- a) Achieve gross revenue of US\$5.0 million by December 2027
- b) Allocate a target of  $\geq 25\%$  of its workforce for residents of Kartabo Triangle
- c) Allocate a target of  $\geq 15\%$  of its workforce for female residents of Kartabo Triangle
- d) Establish an exemplary and sustainable model partnership with the mining community at the concession area
- e) Lead the organization of timber producers who represent loggers in the Puruni Basin

#### **1.1.3 RTI's acquisition of SFEP 2/2020 and its ESIA process**

In early 2020, Royal Timbers Inc. (RTI) analysed conditions prevailing at an area of 107,650.54 ha, designated State Forest Exploratory Permit (SFEP) 2/2020, on right bank Puruni River (see Figure 1), that the GFC advertised as *vacant*, and concluded that a long-term logging project is feasible. RTI applied successfully for SFEP 2/2020, which the GFC granted to the company in March 2020.

Subsequently, in line with local policies, RTI applied to the Environmental Protection Agency (EPA), for an *Environmental Authorization* (EA). The EPA determined that an Environmental and Social Impact Statement (ESIA) is a prerequisite for the granting of the EA and shared the relevant terms of reference for the ESIA and *Report* with the company.

The EPA will grant RTI an EA providing it is satisfied with the ESIA report, particularly RTI's plans to manage stakeholders' expectations. Once the company acquires an EA, the GFC will grant RTI a large forest concession to facilitate the implementation of its logging (and sawmilling) project and environmental management plan.

RTI recruited the Forestry Training centre Incorporated (FTCI) to take forward its ESIA process.

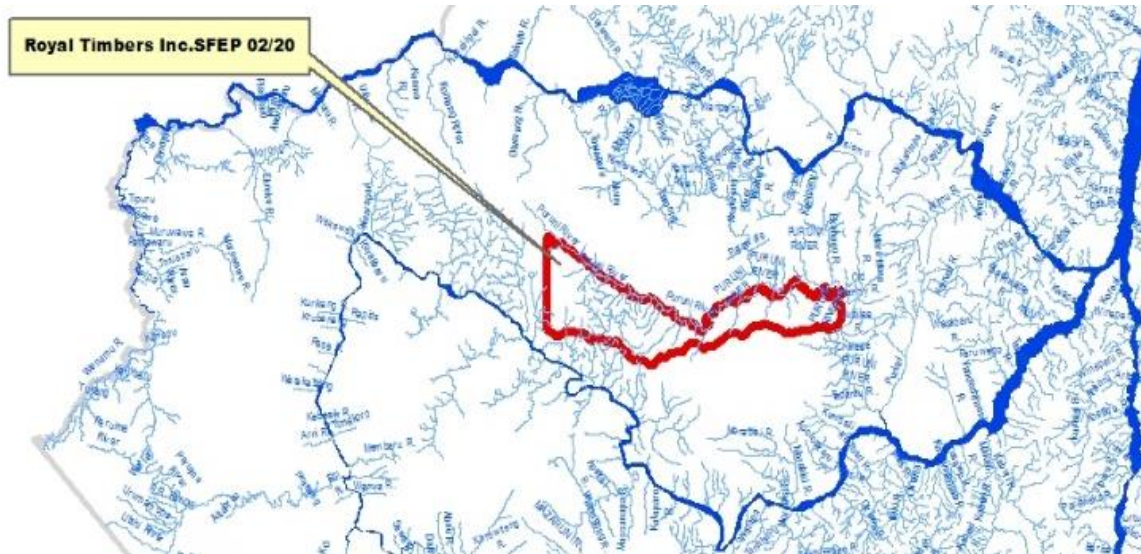


Figure 1: Diagram showing the general geographic location of SFEP 2/2020

## 1.2 The Consultant-FTCI

### 1.2.1 Profile of FTCI, the consultant

FTCI, incorporated in 2002, was established by the GFC, the FPA and Tropical Forest Foundation (TFF) (Virginia, USA)<sup>2</sup>, with financial support from ITTO and DFID. FTCI is part of a *global* network of vocational training centres under the TFF umbrella set up to provide practical direct training in reduced impact logging practices and ancillary timber harvesting skills to forestry operatives.

FTCI has been leading practical, first-hand training for students, forest operatives, and representatives of community-based forest organizations in Guyana. (FTCI has also done training in several Caribbean countries).

FTCI started doing consultancies after donor funding ended in 2005. In undertaking ESIA, FTCI hires experts from the *consultant community* wherever necessary, to ensure it brings together the array of expertise necessary to address multi-disciplinary work such as ESIA. Ironically, FTCI's first ESIA project was for Puruni Wood Products Inc. (PWPI) holder of SFEP 05/2004 over the same area currently held under SFEP 2/2020. (*The holder of SFEP 05/2004 subsequently desisted from timber harvesting operations, hence the public re-advertisement of the area.*)

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<sup>2</sup> This organization is now defunct

### 1.2.2 FTCI's work on SFEP 2/2020

FTCI has been working in the Puruni District since 2007, developing ESIA reports for three forestry developers, and was able to develop a sampling framework for baseline data as well as a stakeholder plan for garnering feedback on stakeholders' feedback on additional logging activity in the upper Puruni District.

For RTI's ESIA, FTCI relied on its experience working on **three** SFEPs in the Puruni District over the past 15 years (PWPI, 2006); (Sukhram, 2021); (TPTTI, 2021) . In addition, FTCI also made many trips to the concession area, the latest in April 2022, to update baseline information on the concession area. The trip in April 2022 was significant because FTCI deployed an ATV for the exercise, and for the first time, the team to access a *broader geographic area*.

Four external consultants, seven FTCI staffs, and two resource persons (see Table 1), were used to conduct the ESIA. Apart from persons with expertise in anthropology, forestry, botany, wildlife management, environmental science, and environmental law and policy, FTCI's team included persons fluent in Spanish and Portuguese, and ex-miners-these facilitated engagements with miners.

Table 1: List of personnel that developed the ESIA process

No.	Consultant	Area(s) of expertise
<b>External Consultants</b>		
1	Environmental Engineering Solutions (EES) ( <b>3 Environmental Engineers</b> )	<ul style="list-style-type: none"> <li>The collection and the analysis of environmental data such water quality and air quality respectively</li> </ul>
2	Phillip Odwin Wildlife Expert	<ul style="list-style-type: none"> <li>The capture and identification of fauna</li> </ul>
<b>FTCI Staffs (7 persons)</b>		
1	Robert Skeete	<ul style="list-style-type: none"> <li>Forestry, Introductory Anthropology</li> </ul>
2	Robert Kissoon	<ul style="list-style-type: none"> <li>Forestry, Wood processing</li> </ul>
3	Luann Nero (Ms)	<ul style="list-style-type: none"> <li>Environmental Management, Social Science, Community Development</li> </ul>
4	Mariea Suegrim (Ms)	<ul style="list-style-type: none"> <li>Business Administration</li> </ul>
5	Kisheiba Higgins (Ms)	<ul style="list-style-type: none"> <li>Forestry, Social Surveys</li> </ul>
6	Delyon Roberts	<ul style="list-style-type: none"> <li>Forest surveys, forest inventory</li> </ul>
7	Bevin Dundas	<ul style="list-style-type: none"> <li>Forest Botany</li> </ul>
<ul style="list-style-type: none"> <li><b>Resource Persons (2 Persons)</b></li> </ul>		
1	Jagdesch Singh	<ul style="list-style-type: none"> <li>Sustainable Forest Management; Forest Law, Policy, and Governance; Environmental Law and Policy; Sustainable Development and Climate Change.</li> </ul>
2	Godfrey Marshall <b>(Team Coordinator)</b>	<ul style="list-style-type: none"> <li>Forestry</li> </ul>

Reconnaissance patrols were done by five-person teams for logistical reasons. The composition of the team varied with the objective: for example, faunal surveys, and social surveys respectively required

different teams, field trips to SFEP 2/2020 were confined to five to seven days, to conserve water samples in good condition, prior to their analysis at Kaizen Laboratory in Georgetown.

Field work included patrols by boat along the Puruni River, patrols along the Kartabu-Puruni Road (KPR) as far as Olive Creek (Airstrip) and Papishou, left bank Mazaruni River. (Olive Creek and Papishou lie *outside* the boundaries of RTI's forest concession; however, persons living and working there traverse the Kartabu-Puruni Road which forms the southern boundary of the concession area. The teams also visited other forest concessions in the area and some mining camps. Socio-economic information gathered mostly through social surveys, was collected along the entire Kartabu Puruni Road, Iteballi, Kartabu, and Batavia.

For social surveys, interviewees included large and small miners, loggers, the business community, and residents of Iteballi, Kartabu and Batavia. Apart from residents of Kartabu and Batavia, most interviewees consider the Puruni District as their *work area*, and their homes are situated in other districts or administrative regions.

Many small miners are more ***comfortable with informal surveys***, because they were uncomfortable with their names and addresses being recorded. Formal surveys were therefore restricted to Puruni Landing, Iteballi, Kartabu and Batavia.

### 1.2.3 Challenges in undertaking field work

The consultants experienced major challenges in accessing the concession, primarily due to the state of the 98.5 segment of the Puruni Road (see Figure xxx), that forms the southern boundary of the concession area and its main point of access to the concession area (see Figure 2). Likewise, the Puruni River is only navigable for small bateau type riverine craft as far as Paiyuka Falls. The consultants were able to access the Puruni River from Kumung-Kumung and patrol right bank Puruni River for about 15km to Tumble-Down Falls.

Some mining roads had barriers (locked gates) which the consultants respected. It was challenging to traverse the concession area for more than 5km on foot (10km round trip) due to the quantity and weight of equipment that the consultants lugged and the additional weight of water samples and soil samples on the return trip.



Figure 2: Illustration of the state of KPR during field work

The last trip to the area was more productive because the use of an ATV allowed the team to traverse poor roads and ensure that a broader geographic area was covered.

### 1.3 Context -the Kartabu -Puruni district

The Kartabu Triangle is a part of region 7 and has an estimated population of about 4,000 persons of which 90 % are employed in the logging and mining sector. The primary means of accessing the Kartabu Triangle is the Kartabu Puruni Road (KPR). Prior to the construction of the KPR (and its major branch road, the Arimu Road) in the 1920s, miners accessed the upper Mazaruni (and upper Cuyuni River) by traversing the Mazaruni River and the Cuyuni River, respectively, with their numerous waterfalls, rock outcrops and sand bars, where mishaps represented a serious loss of goods and human lives. Many miners in the upper Mazaruni travelled also conveyed goods via the Bartica-Potaro Road, then via the Issano Road, then again by boat to Kurupung and other mining areas<sup>3</sup>; however, the voyage was equally time consuming and costly. The main driver for the KPR in the 1920s would have been mining operations at Peter’s Mine, near the *current* Puruni Landing.

From 1953, loggers started using the KPR, establishing the Arimu Road, a road link between the KPR and Batavia Landing, right bank Cuyuni River, and another road link between the KPR between the KPR and Iteballi. In the early 1970s, the GOG started rehabilitation of the KPR in pursuit of a hydro-power facility in the upper Mazaruni. However, the engineers opted to avoid Kartabu, installed barge crossings between Teperu-and Iteballi, and between Kumaka Serima and Suribana; and then developed the logging road between Iteballi to its junction with KPR. In effect, the KPR was in fact the Iteballi-Papishou Road, but the name KPR stuck and is used in this report. Over the years, the Iteballi -Papishou Road (KPR) facilitated an expansion of mining activities and the populating of the area. Batavia, Kartabu, Iteballi, Puruni Landing, Kumung-Kumung and Papishou became the main population centres. The barge crossings linked Bartica as well as Georgetown to Papishou by road, a situation that facilitated the expansion of mining and forestry activities in the Kartabu-Triangle. From the early 1960’s mining activities intensified in the area between Iteballi and Puruni Landing. Similarly, from the 1990’s, forestry activities extended across the entire Kartabu Triangle between Kartabu Point and Puruni River. Later, in the 1990s, forest concessions were awarded for areas west of Puruni Landing (see Figure 3).



Figure 3: Diagram showing forest concessions across the Kartabu Triangle.

<sup>3</sup> Today Jet boats do the *return trip* Parika-Bartica-Issano-Olive Creek route in about 15 hours.

## 1.4 Baseline Information

### 1.4.1 The Physical environment

#### 1.4.1.1 SFEP Location and Access

SFEP 2/2020 is situated west of Puruni Landing, between right bank Puruni River and the KPR, Kartabu Triangle, Region 7 (see Figure 2). The northern boundary of the concession extends upriver along right bank Puruni River for 175km; while the Southern boundary, extends along the KPR, west of Puruni Landing, for about 99.8km.

The concession is situated about 200km by road from Bartica, the administrative centre for Administrative Region #7. There are two commercial banks, a regional hospital, a post office, primary and secondary schools, and regional offices for the GPF and NIS.

The KPR represents the primary access route to the Kartabu Triangle and the forest concessions there. (It is also possible to travel by bateau type riverine craft from Bartica directly to Puruni Landing, using the Mazaruni and Puruni Rivers. However, safe access along the Puruni River above Puruni Landing is only possible up to Paiyuka Falls due to rapids, rock outcrops, and sand bars). The KPR has two segments, the eastern segment from Iteballi to Puruni Landing and the western segment from Puruni Landing to Papishou, left bank Mazaruni River; the two segments are connected by a barge service at Puruni Landing.

SFEP 2/2020 has shared boundaries with three other forest concessions in the area; and in addition, there are two forest concessions (LC 2/2022 held by RLSS and SFEP *in transition to an LC*, held by TPTTI) opposite SFEP 2/2020 on left bank Puruni River. FTCI worked on three concessions prior to working on SFEP 2/2020<sup>4</sup>



Figure 4: Diagram showing the three concessions where FTCI has been working since 2006

<sup>4</sup> SFEP 2/2020 was formerly held by Puruni Wood Products Inc. under SFEP 05/2004.



### 1.4.1.2 Climatic conditions

- Rainfall parameters

Guyana has a tropical climate. Temperatures are high with maximum temperatures around 30-31 degrees Celsius (86-88° Fahrenheit) all year round and night temperatures around 22 to 24 degrees Celsius (71-75°F).

Mean annual rainfall in Guyana is 2,387mm. Overall, Guyana has two rainy seasons: the short one runs from December to early February while the longer one runs from late April and to mid-August, with peaks during the May-June period. Annual rainfall patterns vary by region: annual rainfall varies from 2300mm on the coastal belt to 3,000mm in the forests belt to 1600mm in the (Rupununi) Savannahs. In the rainy season, the annual rainfall varies from 720mm to 2160mm.

Annual and monthly rainfall varies by sub-region and location. Mean monthly rainfall data for Kamarang, Upper Mazaruni District is presented here to estimate rainfall patterns at the concession area (see Figure 5).

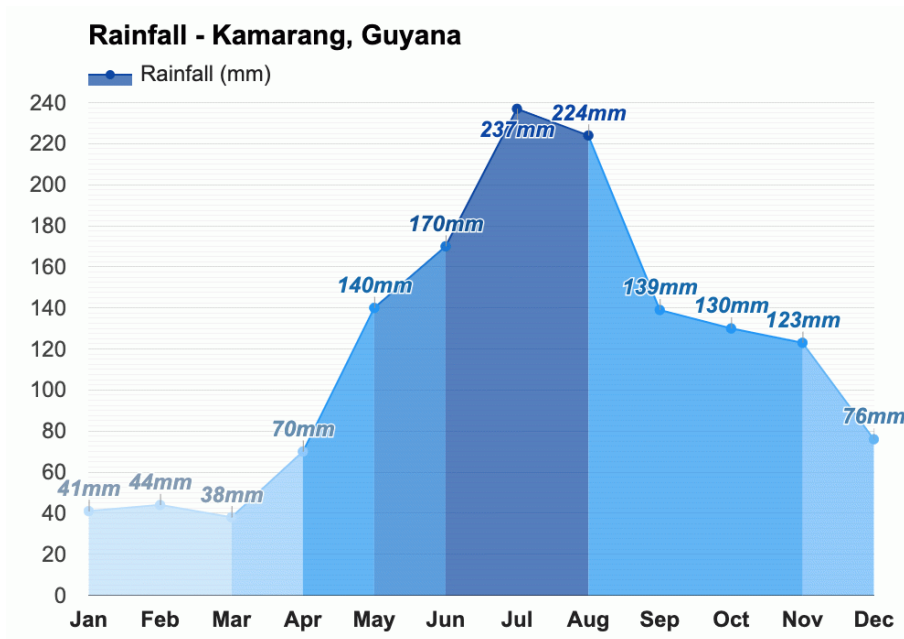


Figure 5: Chart showing rainfall data for Kamarang, upper Mazaruni River.

- Wind speed & cloud cover

In view of RTI's plans to construct an airstrip within the concession area (see Section 6.3), available indicative data on windspeed and cloud cover for Kamarang are included here. Wind speeds at Kamarang vary from 4.0km/hr to 5.2km/hr. Cloud cover varies from 62.25% to 76.5%.

- Air Quality

Various parameters have been used to assess air quality and data for the most recent samples in April 2022 (see Section 9.0). Two parameters of major concern are inhalable particles or particulate matter, including dust in the atmosphere, and noise. Both inhalable particles and noise can cause serious health

effects in humans. Fortunately, the values recorded for *inhalable* particulate matter and noise respectively during last April (2022) are not a cause for concern.

PM2.5 refers to particulate matter with sizes less than 2.5µm: the values recorded range from 13.6 to 18.9 mg/m<sup>3</sup>, with a mean of 15.65 mg/m<sup>3</sup>. Similarly, PM10 refers to particulate matter less than 10µm: the range was 14.3 to 28.2 mg/m<sup>3</sup> with a mean value of was 20.86 mg/m<sup>3</sup>.

For Noise (or unwanted sound), the values recorded ranged from 38.6 to 54.8 dB and the mean value was 46.74dB.

- Indicative Temperature and Relative Humidity

Data for Temperature and relative humidity were collected during the day and followed the sampling plan. Nine values taken at various times of the day over a three-day period in April 2022, temperatures varied from 24.2°C to 28.6°C, with a mean of 25.8°C. Relative humidity varied from 44.2% to 89.1%, with a mean of 77.25%

#### **1.4.1.3 Landform and Hydrology**

- Landform

The general configuration of the area is flat to undulating and hilly terrain. The north-western and the eastern districts are characterized by *very hilly terrain*. The highest elevation is the East Puruni Peak reaching 427 meters (1,500 feet). (Please see indicative map at Figure 6, please see also Section 7.0).

- Hydrology

The central and eastern areas of the concession are drained by right bank tributaries of the Puruni River, including the Kamiguin (Kumung-Kumung) River and the Pashanamu River. The western end of the concession area is drained primarily by the Putareng River, itself a left bank tributary of the Mazaruni River. The average drainage density for the entire concession area is about 0.8km/km<sup>2</sup> but there are several areas where the drainage density reaches 2.5km /km<sup>2</sup>. During the rainy season, some parts of the road become inundated, including the timber bridge<sup>5</sup> across the Kumung-Kumung River (see Figure 8).

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<sup>5</sup> At the time of writing this report, the bridge is underwater and residents at Kumung-Kumung must undertake a very hazardous 24 trip-scaling several waterfalls by bateau type boat, to transfer good from Puruni Landing to Kumung-Kumung.

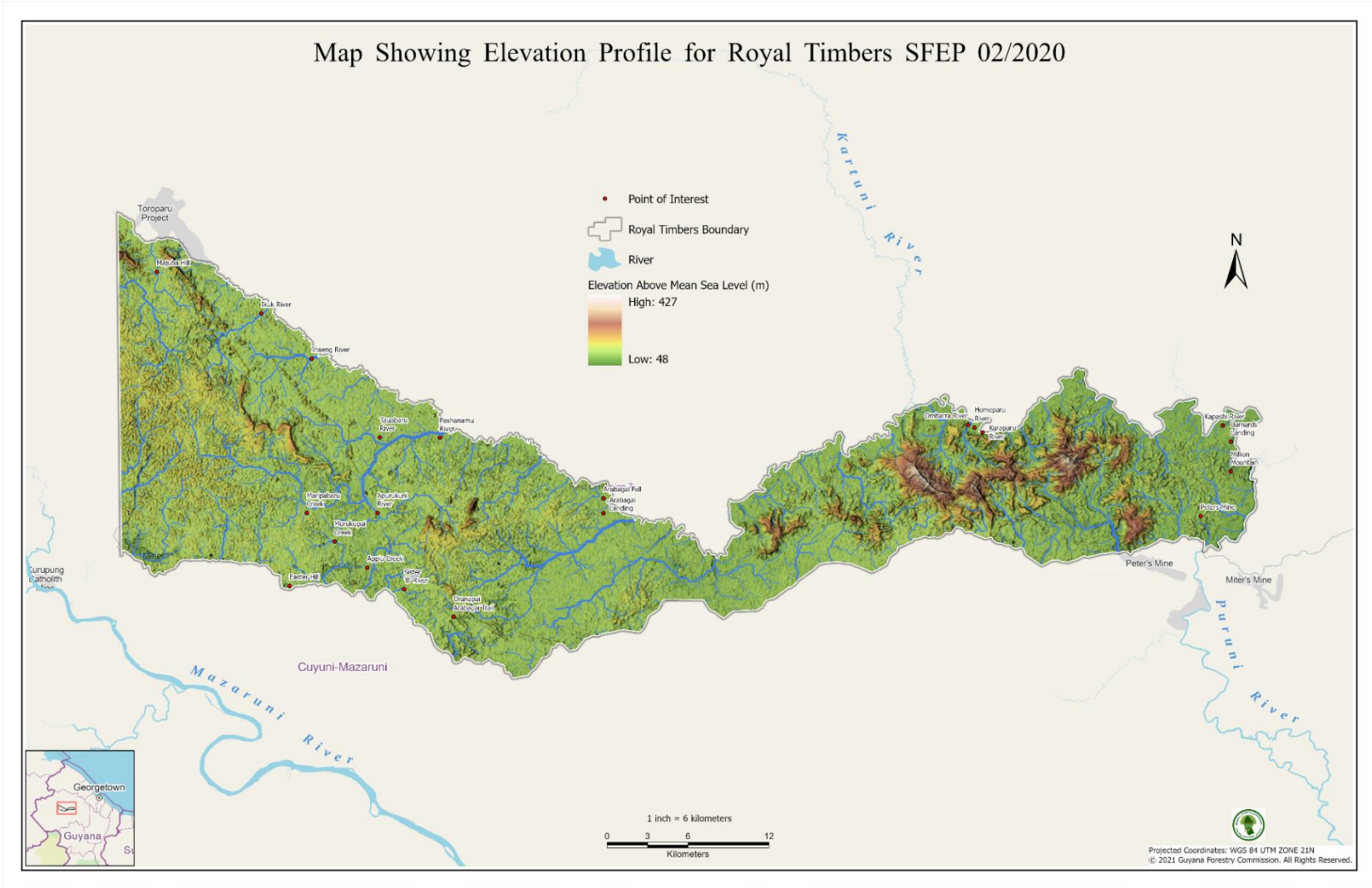


Figure 6: Indicative Map showing the elevation profile for SFEP 2/2020

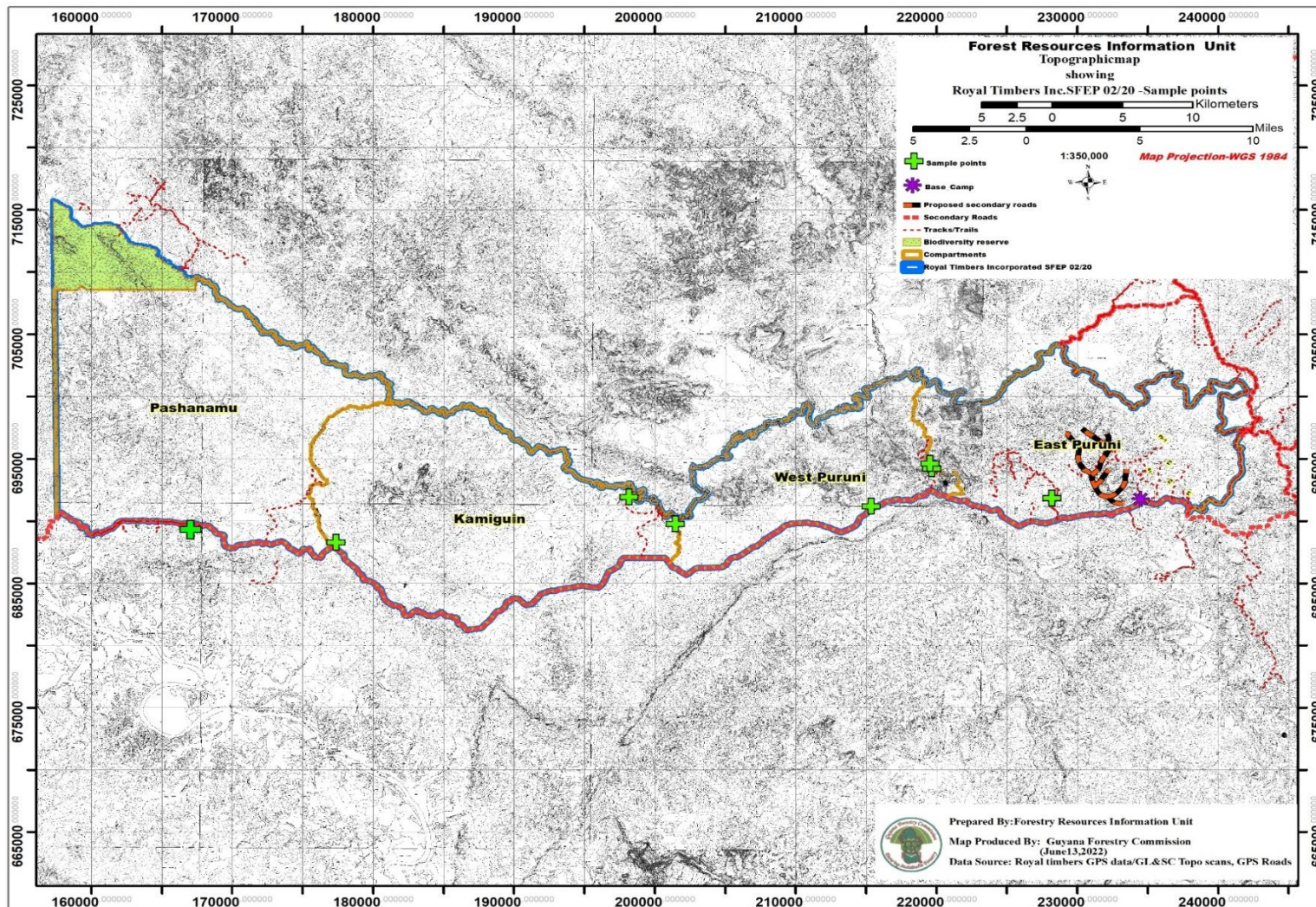


Figure 7: Map of SFEF 2/2020 showing the location of sample points (April 2022)



Figure 8: Photograph showing the overtopped state of the Kumung-Kumung Bridge, KPR

- Surface water quality

#### Overview

The survival and growth of plants and animals in aquatic ecosystems depend on the quality of water. On the other hand, living organisms in aquatic ecosystems help in the chemical degradation of organic matter and therefore help determine water quality.

In early April 2022, the rainy season was still very noticeable and temporary flooding, or waterlogged conditions allow leachate from ponds created through mining activity to enter streams and waterways.

Although there has been a long history of mining in the area, environmental parameters for water quality and air quality do not provide any cause for alarm, and the consultants are of the view that logging would not add significantly to the parameters recorded.

Three parameters of water quality, based on data collected last April 2022 are cited here: temperature, pH, and mercury content (However, please see Section 7-Water Resources).

- Mercury

Mercury is potentially a dangerous pollutant: in humans, toxic levels it produces impaired neurological development in foetuses, infants, and children. Mercury, once ingested by animals, is not excreted, it is stored in the organism and bio accumulates and goes up the food chain. For example, mercury in fish tissue will be passed on to humans who eat the 'contaminated' fish; again, it is not excreted and is stored in the human tissues. The mercury (bio) accumulates until it reaches toxic levels leading to mercury poisoning. Mercury '*poisoning*' produces various neurotic diseases in adults such as weakness, twitching and headaches.

Values for mercury were recorded from eight water samples last April 2022: seven samples yielded values <0.0005 µg/l, while one sample gave a value of <0.0009 µg/l. These values are consistent with natural water bodies.

- pH

Ph is a major determinant for the livelihoods of aquatic organisms: the optimum range for the growth and reproductive health of these organisms is 6.5-9.0. Values outside this range will disrupt the growth or reproductive capability riverine organisms; further pH values ≤4.0 or ≥11 will lead to the mortality of aquatic organisms. For humans, pH values of 6.5-8.5 are ideal.

Last April 2022, the range of values based on eight water samples was 5.72 to 8.69, with a mean of 6.98.

- Temperature

Water temperature is related to solar radiation and temperature, and it varies the rainy season and the dry season. The temperature of water influences the rate of biological and chemical reactions as well as the kind of species and their populations.

Data collected last April for eight water samples showed temperature ranges of 19.3°C to 27.5°C, with a mean of 23.84°C.

Miners have very elaborate systems for harvesting, filtering, and inoculating rainwater. Many miners 'import' bottled water for cooking and drinking purposes: fresh water from wells, duly inoculated is easily available Puruni Landing.

#### **1.4.1.4 Geology & Soils**

- Geology

The concession area is situated within Guyana's Northern Province where the dominant lithology is the Greenstone Belt. The greenstone belt comprises metamorphic rocks and are reputed to be common in the Earth's oldest rocks, including the Guiana Shield.

- Soils

The GFC has at hand detailed soil maps for the concession area. The dominant soil type, Kanhapludults, occupy some 84.45% of the concession area. Kanhapludults are very deep well drained soils, with slight to high erosion hazard. The other major soil type present is Ustchrepts, occupying 9.89% of the concession area: Ustchrepts are deep alluvial soils, mottled in the subsurface, poorly drained, and not suitable for road works.

## 1.4.2 Biological Environment

### 1.4.2.1 Overview

Miners have been removing small quantities of timber from the concession area for their use (see section 11.2.3). In addition, the previous owner of the concession area conducted light logging in 2007-2010. Areas along the road corridor have been harvested from time to time to provide materials for bridges, culverts, and corduroy works.

No hunting and fishing have been observed in the concession area. At the most populous area nearby, Puruni Landing, meat fish and fresh vegetables are brought in by various merchants. A few pork knockers have been observed minding parrots, wild hogs, and monkeys as pets.

### 1.4.2.2 Flora

The forests within the concession area may be described as *Central Wet Forests* (ter Steege, Hans, 2000). More details on the forest types are available based on data at the GFC (see Table 2).

Table: Basic parameters of the vegetation on the concession area (GFC, 2020)

Table 2: List of forest types, SFEP 2/2020 (GGFC).

Forest Type	Area (ha)	% Of area	Remarks
1: Mixed Forest on undulating to hilly terrain	61,870.65	57.5	Productive forests: Typical species: B/Kakaralli, Greenheart, Wamara, Kabukalli
1b: Mixed Forest on flat to undulating terrain	23,289.95	21.6	Productive forests: Typical species:
1c: Mixed Forest on deeply dissected terrain	2,206.39	2.0	Non-productive ( <i>subject to verification</i> )
1h: Mixed Forest on high hills	18,986.40	17.6	Non-productive ( <i>subject to verification</i> )
3: Low swamp forests	1,308.07	1.2	Non-productive ( <i>subject to verification</i> )
<i>No data</i>	<i>9.08</i>	<i>0.0</i>	
<b>Total</b>	<b>107,670.54</b>		

RTI conducted reconnaissance (management level) inventory data using 491 x 0.1ha plots distributed across 33 transect lines (Ewart Forest Service and Consultancy, 2020). The methodology used was based on GFC's recommendations. For trees of dbh>10cm, seventy-four (74) potentially commercial species occur with the concession.

Black Kakaralli and Mora occur throughout the concession area, while Greenheart, for example, does not occur throughout the concession area. For prime commercial species, Greenheart represents 10.4% of total volume, with Wamaradan (4.1%), Purpleheart at 2.6% and Locust (0.1%). Previous work by PWPI estimated mean volume for prime commercial species across the concession area is 32.2m<sup>3</sup> (which is well above the 8.33m<sup>3</sup>/ha RTI will be authorised to harvest, based on the felling cycle (25 yrs.) the company

chose. The ML Inventory did indicate that, the area is still very much intact. However, for an area impacted by mining on a regular basis, **RTI will rely on 100% preharvest data for its planning and marketing.**

One of RTI's first act was to identify an area for a biodiversity reserve. RTI chose an area of 3,931 ha that contains all forest types in the concession area (see Figure 9). The presence of many creeks and altitudinal vegetation gradients that would ensure that local and regional biodiversity is conserved. The absence of mining in the area assures that there is abundant fauna there.

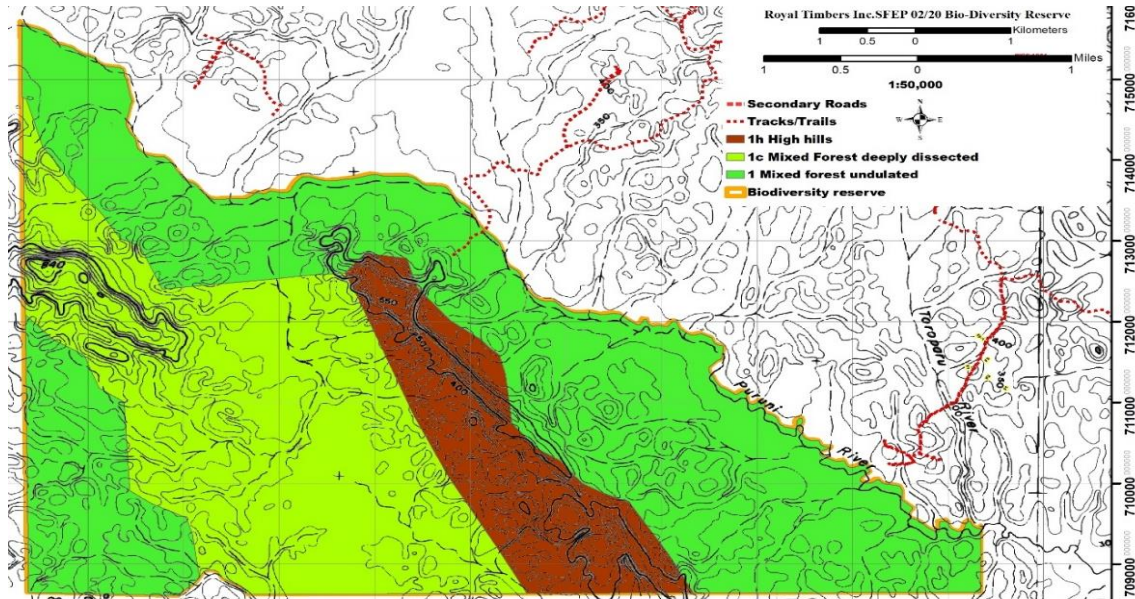


Figure 9: Diagram showing the biodiversity Reserve for SFEP 2/2020

### 1.4.2.3 Fauna

The consultants used trail cameras to detect terrestrial fauna, fishing rods and seine to detect fishes, and bird nets for birds and bats (see Figure 10). However, there were numerous sightings of large mammals such as deer (*Mazama spp.*), wild hogs (*Tayassu spp.*), monkeys and capybara (*Hydrochoeris hydrochaeris*). Useful aids included tracks and scat. The team also recorded numerous sightings of reptiles, insects, and spiders. For avian fauna, there were regular sightings of macaws and parrots



Figure 10: Photographs illustrating articles used to detect fauna on SFEP 2/2020

The main faunal survey was conducted in September 2021, but the consultants sought every opportunity to record fauna present.



### 1.4.3 Social Environment

#### 1.4.3.1 Overview

RTI's projections are that about 300 persons occupy the *concession area*: 90% of these are miners and about 10% constitute the business community, providing support for miners; with women comprising about 15% of the persons 'working' within the concession area.

The southern boundary of the concession area encompasses 98.5km of the KPR, and on average, twenty vehicles traverse that road segment every day. (When the forest concessions south of RTI becomes active, the number of vehicles would increase by about 30%).

GFC staffs (based at Iteballi or Georgetown) and GGMC staffs based at Puruni Landing and Olive Creek, respectively visit the concession area on a regular basis.

The main commercial centre just on the outskirts of the concession area is Puruni Landing, where there is a police outpost, Medex, massive business centre-including Chinese enterprises, hotels, and restaurants.

#### 1.4.3.2 Consultations

85% of the persons occupying the concession area, consider the concession area their 'place of work'; in fact, their *homes* are in other districts. In repeated trips to the concession area, it was difficult to find the same persons in the place they 'occupied' during the first encounter with them. In fact, the entire village of Oranapai, cited in the previous ESIA in 2007, has disappeared completely.

Since 2007, FTCI has been conducting passive, informal consultations occur during every visit to the concession area (SFEP 05/2004). FTCI used every engagement with a boat captain, sailor, miner, logger, chainsaw operator, businessperson, or public officer, to gather socio-economic data. FTCI also benefitted from formal consultations it conducted for other concessionaires in the area (see Annex XV).

For this work, FTCI depended on interviews conducted in March 2021, and April 2022 that included persons at Bartica, Batavia, Kartabu, Iteballi, Puruni Landing, Upper Puruni River, Takutu Basin, Kumung-Kumung, and Pashanamu. Additional *informal* interviews were done in April 2022.

For **this** report, communities at Puruni Landing and of Kumung-Kumung were considered **primary** stakeholders. On the other hand, although consulted extensively, residents of Batavia, Kartabu and Iteballi were considered **secondary stakeholders** because those communities are situated more than 115 km from the concession area. Further, the consultants estimate that RTI's log flows to Iteballi will not exceed 4% of the total vehicular traffic traversing Iteballi on any given day. Interviews were conducted in 2007.

### 1.4.4 Land Use

- Road networks

The southern boundary of the concession constitutes a 98.5km segment of the KPR (between Puruni Landing and Papishou) and is the means off access to the concession area. Persons conveying heavy equipment and fuel (see Figure 11) to the upper Mazaruni use the KPR. RTI will use the KPR to extract timber and in doing so will be sharing about **200km** of the **entire** KPR with a diversity of stakeholders moving cargo and personnel, to and from mining areas (and forestry concessions) in the Kartabu Triangle.



Figure 11: Example of typical vehicles traversing RTI's southern boundary.

A major issue with the KPR is the Puruni Crossing. Flooding in the rainy season, when water levels at either end of the bridge raise by at least 3-4 meters, and flooding at the western end of the bridge extends about 50m inland are major concerns for construction of a bridge. The bridge should also be high enough to allow the passage of riverine craft and dragas during the rainy season. MNR has advertised publicly for '*expressions of interest*' for the construction of the bridge, and RTI hopes that there will be concrete plans in place for the bridge by December 2022. Another issue with the KPR, a public road, is the apparent absence of any formal road maintenance programme for the road.

RTI is expected to share the use of about 30 km of *existing* mining roads within the concession area, many of these linking the KPR with mining sites or landings on right bank Puruni River. All roads will require major upgrades in order to accommodate and sustain the passage of 40ton logging trucks (see Figure 12).



Figure 12: Examples of road conditions unsuitable for logging trucks.

(RTI expects to construct about 90km of logging roads which it will share, under agreed conditions, with the mining community).

- Mining

The concession area falls within the Mazaruni Mining District (District # 3) and currently mining is the primary land use within the concession area. There has been a long history of mining in the area since the

late 1920s, with a particular surge in scale of mining the past 30 years with a significant increase in the use of excavators and 'Dragas'

Fortunately, for RTI, many of the actual areas under intense mining activity lie along the right bank Puruni River.

The famous Peter's mine-a mining camp and mining operations on right bank Puruni River run by the Alphonso Group, referred to as *Million Dollar Mountain*-is situate at the eastern end of the concession, opposite the mouth of Mara-Mara River (on left bank Puruni River).

All miners consulted supported the advent of a new developer.

- Logging

RTI shares common boundaries with three large concessions on its southern border, the KPR forming a common boundary. Currently the three concessions are *inactive*: and a major reason for their suspended development is *the size of barge at the Puruni River*. At least one company has been exploring other options for crossing the Puruni River.

As is customary, miners fell trees for mining related infrastructure (see Figure 13).



Figure 13: Wood utilization by miners at SFEP 2/2020

- Other Land Use

The consultants have not recorded any commercial scale farming, fishing, or hunting. Also, no ecotourism-based enterprises lie within or around the concession area.

There is an airfield at Olive Creek and another at Toraparu, both are outside the boundaries of SFEP 2/2020. Olive Creek is about 90 mins by road from RTI's proposed base camp (providing the road is in a state that permits vehicular speeds of 65km/hr). Papishou Landing at the western extremity of the KPR. Both areas lie *outside* the concession area but persons travelling to Papishou by road will be sharing the use of the KPR with RTI.

### 1.4.5 Communities

There are no Indigenous communities within (the vicinity) of the concession area. Puruni Landing lies on the eastern boundary of SFEF 2/2020 and would be impacted directly by RTI's logging operations. The only 'community' within the concession area is Kumung-Kumung and Pashanamu. There are, of course various miners' camps and shops scattered throughout the concession area.

**Puruni Landing**, situated at the junction of the KPR and the left bank Puruni River has a resident population of about 300 persons. Puruni Landing has critical strategic value due to the barge crossing there (see Figure 14). (There are ongoing discussions at the level of the MOPW, MNR, GGMC and GFC regarding the construction of a bridge at Puruni Landing. MNR has invited public tenders for the construction of a bridge).



Figure 14: The Puruni Crossing, KPR

The village evolved from a mere cluster of shops that constituted the Landing in 2005 to a major commercial hub that supports the regional mining industry (see Figure 15). There are Guyanese, Brazilian, and Chinese businesses. The community has several large grocery stores, several hotels with moderate basic amenities and several restaurants. Many businesses have their own wells and satellite dishes. DIGICEL cellular network is also available. Recently, there have been hair salons, barbershops, vehicular wash bays, and a steadily increasing number of roadside vendors established there.



Figure 15: Photos of Puruni Landing

Three issues are worth noting: firstly, the presence of a police outpost has had a very sober, calming impact on the community; secondly, miners have been taking their health very seriously, for example using treated nets to combat malaria and other mosquito borne diseases and paying attention to preventative measures for combatting the COVID-19 pandemic. Thirdly, the mining community and the business community are much more concerned about the state of their environment than they appear to be. There is a GGMC station there, a MEDEX Centre, and a Police Outpost. Officers from the MOH, MOPW, and the GFC conduct extension type activities there on a regular basis. There was a GDF unit stationed there in early 2021. It is anticipated that the GFC will set up a station there before the end of 2022.

**Kumung-Kumung** is a small Landing situated on left bank Kumung-Kumung River, at the confluence of Kumung-Kumung River and right bank Puruni River. That village has immense strategic value in the dry season: it is situated about 5km from the KPR, and the landing is used in the dry season for transporting fuel to mining operations in the upper Puruni River. The Landing is a convenient location for persons based in the upper Puruni River, to source goods, entertainment, and Wi-Fi.

Unlike Puruni Landing, Kumung-Kumung has fallen on tough times and has lost more than 70% of its population over the past five years, in line with the varying scenarios of 'gold shouts'. The regular population there now is about 30 persons trading in goods and fuel. Only about twelve Guyanese live their full time: the others are non-Guyanese. The entire area in a two-mile radius around Kumung-Kumung has been mined out and is devoid of merchantable timber.

There are small clusters of miners and/or businesses along the western segment of the Kartabu-Puruni Road: the main ones adjacent to the concession area are Pashanamu (10 persons) and Turtle Creek (20 persons). Recently, Jettoo Lumberyard & Sawmills operated on the southern side of the Puruni Road, west of Puruni Landing, but operations were suspended due to challenges at the Puruni Crossing.

#### **1.4.6 Stakeholders' general response**

No person or agency consulted made any objection to (additional) logging operations on right bank Puruni River, west of Puruni Landing, or to the consequent increase in log flows projected for the Puruni Road.

Regional officials and the business community-*including traders and transporters of fuel and goods, and hoteliers*-welcome additional economic development that increases the volume of commerce in the area. Large miners are disinterested about emerging forestry activity: miners do welcome logging they **dislike** the wastage of *merchantable trees when they have to clear and bulldoze forests*. 'Small' miners will benefit from the logging road networks to access their mineral licenses.

Communities' welcome additional economic activities because of the options and opportunities for employment. Everyone believes that additional economic activity will attract more attention from central Government and Regional authorities, and that would lead for example, to more attention to public roads.

For all communities, there is widespread demand for the developer to **engage them as necessary** so that any potential conflicts can be avoided. Communities are open to new economic developments expanded commerce at the local level, and the availability of opportunities for employment.

There is widespread support for the proposed airstrip: the main reasons cited were the evacuation of sick persons from the area and the need to source urgent engine spares and other critical supplies.

## **2.0 APPROACH AND METHODOLOGY, SIGNIFICANCE CRITERIA, AREA OF INFLUENCE**

### **2.1 Overview**

Once the consultants studied the TOR for this work, they discussed the approach to the work, including sampling methods, the nature of the data to be collected and any need for comparative data, given that, from experience, the challenges, and costs for accessing the Puruni District are challenging. For this study, the TOR prescribed that data on mercury be collected. There was the need to decide what to collect, where to collect the data, the determination of a reasonable period for holding water samples. Also, there was the need to identify the standards that will be used to assess the data collected. Finally issues of scale were reviewed: identifying who will be affected by the project.

### **2.2 Approach and methodology**

#### **2.2.1 Organization of activities**

FTCI relied on its experience doing ESIA's for three developers within the upper Puruni Basin.

The consultants' activities for this ESIA included the following:

- a) A consultants briefing session to review the TOR
- b) Discussion with the developer on its proposed project
- c) Scoping meetings
- d) Reviews of previous ESIA reports for developers in the Upper Puruni Watershed
- e) The development of a stakeholder plan
- f) Consultations with stakeholders, from Batavia to Papishou.
- g) The collection and analysis of baseline data
- h) Identification of and review of predictable direct, indirect, and cumulative impacts linked to the project
- i) Drafting of the ESIA Report

#### **2.2.2 Consultant's briefing sessions**

The Consultants met to review the data sets required to address the TOR and the modalities for field work.

#### **2.2.3 Discussions with the developer**

The developer's project was discussed prior to the preparation of the project summary submitted to the EPA. Follow up discussions were based on the nature and scope of the work as set out in the TOR, and the work that the developer was engaged in at the concession area.

The consultants also collaborated with the developer to develop a suite of activities to mitigate the adverse impacts of the logging operation and on methods to develop partnerships with stakeholders.

#### **2.2.4 Scoping meetings**

The consultants attended a scoping meeting in Georgetown on December 2, 2020, and recorded stakeholders' concerns. The consultants also took into consideration information garnered from a scoping meeting conducted at Iteballi on June 3, 2006, and at Oranapai<sup>6</sup> from June 14-30, 2006.

#### **2.2.5 Desk reviews of ESIA reports for forest concessions in the upper Puruni watershed<sup>7</sup>**

The consultants reviewed the ESIA reports prepared for concessions in upper Puruni Watershed (PWPI, 2006; TPTTI, 2021; and RLSS, 2021). This allowed the consultants to track major changes, particularly in the socio-economic environment.

Thematic maps covering topography, soils and vegetation types were sourced at the GFC. Likewise, land use data on mining permits within the concession area was also garnered from the GFC.

Consider baseline data/information was garnered from various sources:

- a) Indicative information about the major forest types and corresponding forest stocking in the concession area (ter Steege, Hans, 2000).
- b) Data on previous faunal research in the Kartabu Triangle (Cole, Townsend, Reynolds, MacCulloch, & Lathrop, 2013).
- c) Major baseline soils and water resources for the concession area. (GL&SC, 2013)
- d) Useful information and perspectives on the mining sector in Guyana (Pasha, Wenner, & Clarke, 2017); and
- e) Recent and detailed information on Kurutuku Amerindian Village, Kartabu Village and Batavia Amerindian Village (APA et al, 2019).

Finally, websites for all relevant public agencies were scanned on a fortnightly basis.

#### **2.2.6 The development of a stakeholder plan**

FTCI developed a stakeholder plan to guide its consultations (see Chapter 3.0). Unfortunately, the advent of the COVID-19 pandemic stymied the intensity and range of engagement with stakeholders and the consultants relied on previous work in the area.

#### **2.2.7 Consultations of stakeholders from Batavia to Papishou**

The consultants capitalised on social surveys that FTCl

#### **2.2.8 The collection and analysis of baseline data**

30% of the consultants' time was spent travelling between sampling points on the concession area. The consultants' trip in April 2022 was more productive than other trips because they had full time use of an ATV, which can go anywhere.

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<sup>6</sup> This community no longer exists.

<sup>7</sup> West of Puruni Landing

## **2.2.9 Identification of and review of predictable direct, indirect, and cumulative impacts linked to the project’.**

Please see Sections 16.0 and 18.0.

## **2.2.10 Drafting of the ESIA Report**

The major problem with the drafting of the report was to get concrete information on responsibility for and timelines for the maintenance of the KPR and developments with the bridge across the Puruni River. Maps are labelled indicative the scales are too small to discern the full extent of the information they contain. Traditional methods of appending large-scale maps to the report, makes their distribution to stakeholders onerous.

## **2.3 Significance criteria**

### **2.3.1 Overview**

This section describes the transformative nature of the project in terms of its socio-economic impacts and the potential impacts on key ecological elements in the area.

### **2.3.2 Impacts on mining activity**

RTI will use heavy-duty trucks carrying about 40m<sup>3</sup> of logs ~18M, using pole trailers, or alternatively 18-wheeler, flat-bed trucks capable of carrying 20’ or 40’ containers. Loggers therefore need proper roads for the efficient, cost-effective use of these vehicles. must maintain their roads in a satisfactory state to maintain unobstructed log flows, conserve their vehicle and reduce operational costs, and to reduce driver fatigue. As such roads built by loggers are ideal for miners who wish to access their mining permits but do not have the resources to construct their own roads. Road networks help the mining sector in two major ways: firstly, roads allow miners to access hitherto inaccessible claims; and secondly, road networks allow miners more options for transporting fuel and other goods to riverine areas (along the Puruni River) in the dry season.

Experiences elsewhere (for example at Mabura-Region 7, and at Siparuni-Region 8) indicate how miners populate areas along new roads as soon as these are constructed. In fact, in many areas, miners and other parties use roads built by the forest concessionaire at a higher rate than the forest concessionaires, themselves.

Many loggers have trouble in getting the mining community to adhere to the same protocols that the loggers themselves follow for the use of the roads-such as restrictions on road use during heavy Rainfall or the avoidance of littering or speed limits for certain sections-or to help share the costs for road maintenance.

Of course, loggers must take care not to fell trees anywhere without posting signs or otherwise communicating to third parties that tree felling is in progress.

### **2.3.3 Impacts on livelihoods**

Timber harvesting activities provide diverse employment opportunities. Young people at Kartabu Point, Iteballi and Batavia will benefit from these opportunities.

A major concern for parents in the district is secondary school education for their children. Once the children at primary school at Iteballi and at Kartabu Village transition to secondary schools in Bartica or a coastal location, parents must develop the means to sustain them. Employment with mining enterprises attract higher enumeration but payment dates are not necessarily predictable. Employment with mining



enterprises also require the extended absence of fathers from their homes. It follows then that nowadays, many parents prefer jobs nearer to their homes and jobs with a predictable pay date, and therefore many residents of the villages in the area prefer to work with logging enterprises.

The expansion of logging and mining activities result in the establishment of several small businesses, vending clothes, and miscellaneous goods such as small radios, flashlights, or food. At Iteballi and at Puruni Landing these small businesses provide livelihoods for many people.

### **2.3.5 Impacts on the environment**

The first major impact on the environment are the interventions associated with the establishment of a network of roads. These works are unavoidable, however the proposed network of roads in a hitherto inaccessible area will bring major economic benefits through expanded logging and mining projects, respectively. No hunting has been observed in the area to date; firearms carried by field operatives are more for their personal protection. However there has been numerous and frequent sightings of fauna: mammalian fauna such as agouti, deer, and tapir, are always encountered along roadways and they relish the new growth primary vegetation at roadsides.

## **2.4 Area of Influence**

### **2.4.1 Overview**

The scale of activities required to operationalize logging activities at SFEP 2/2020 will transform economic activity in the entire Kartabu Triangle. However, the brunt of RTI's operations will impact on Puruni Landing.

### **2.4.2 The KPR**

The KPR is the access route used by all businesses in the Kartabu Triangle. RTI itself expect to share some 200km of the KPR with other parties. However, RTI estimates that, once it gets into production, the logging community will be responsible for less than 4% of the vehicular traffic along the KPR. RTI will have its own internal controls for maintaining its vehicular fleet; however, since mechanical breakdowns and punctures are unpredictable, there will be opportunities to utilize mechanical and vulcanizing services at places such as Takutu 'village.' There will be occasional purchases of lube-oil, hydraulic fluids, and brake fluids from vendors along the KPR.

### **2.4.3 Communities**

In the hey-day of its operations in 2022, RTI will recruit a total of up to 75 persons for its operations. The company will prioritize the recruitment of forest surveyors, tree spotters, timber graders, chainsaw operators and heavy-duty machine operators. RTI will also prioritize the recruitment of field operatives from Batavia, Kartabu and Iteballi. (RTI is almost able to recruit all the unemployed persons at Batavia). RTI also expects to purchase fresh meat, fruits, and vegetables from villages in the Kartabu Triangle. Altogether, based on local purchases and remuneration packages, RTI anticipates injecting G\$60million per year into the economy of the Kartabu Triangle.

### **2.4.4 Public agencies**

More prosperous villages will attract more public services and the GOG is likely to allocate more resources for the development of those communities. For example, Puruni Landing, in just the past three years have acquired a MEDEX facility, a Police Outpost, a DIGICEL cellular service. The advent of more hotels and Wi-Fi services facilitates more visits by public agencies involved in extension work. GGMC has a large station at Puruni Landing and the GFC is expected to set up three outstations in the Puruni District.

RTI estimates that its operations will lead to an 8% increment in the volume of business in the Kartabo Triangle. That should be enough to persuade the MOPW to expend more sums on road works in the KPR and more particularly the construction of a bridge across the Puruni River, in the vicinity of Puruni Landing.

## CHAPTER 3.0: PROJECT ALTERNATIVES

### 3.1 Overview

The area embodied within SFEP 2/2020, is in a remote geographic area of Guyana. The upper Puruni District is not part of any major development, apart from mining and forestry. The only protected area in the area will be those associated SFEP 2/2020 and other large scale forest concessions in the area.

In considering regional development options, GL&SC has classified the area under 'North-western Guyana' that includes Region 1 and part of Region 7 (GL&SC, 2013). GL&SC went on to report that the area is classed as poor agricultural land on rolling to hilly terrain, save for valleys...in the Cuyuni, Puruni and Mazaruni valleys.

Currently the area is classified as 'a major mining area with the whole area covered by prospecting leases' (GL&SC, 2013).

### 3.2 The case for no action-that is no forest concession issued

If no forest concession were issued over the target area, mining would continue based on mineral licenses already issued. Mining operations would contribute to forest degradation and massive loss of merchantable timber.

### 3.3 The case for forest concessions

*"Governments can use their **forest capital** to meet socio-economic and environmental objectives, such as generating foreign exchange, creating employment, maintaining ecosystem services and earning government revenue"* **Invalid source specified.**

The GFC collects revenue from concessionaires through a combination of area-based charges and volume of timber extracted.

*"In many tropical countries, the portly size of timber production forests represents an opportunity to complement existing protected areas systems, providing critical habitat for wildlife (vertebrate and invertebrate fauna) and native plant species. Although production forests are not a substitute for nature preserves, they provide a complementary role when sustainably managed for both timber and non-timber resources"* (Fimbel, Grajal, & Robinson, 2001).

Loggers must set aside biodiversity reserves which eventually become national assets, and an integral part of the national system of protected areas. In the case of the Cuyuni-Puruni District, the proposed biodiversity reserve (see Annex XV) is the only protected area in the district.

Loggers create micro-villages, following which the Government adds social services. For example, Iteballi started as a simple log depot in the 1950s. Since then, Iteballi has evolved, and the Government subsequently moved to set up a school, medical centre, and police outpost there.

### 3.4 Peculiarities of local forest resources

Local forest resources are characterised by many species of trees of various ages and sizes distributed randomly, and not all of which are currently *merchantable*. In addition, there are standards for the minimum size (diameter) of trees to be felled, the maximum volume of timber that can be felled per hectare, and restrictions on sites where trees could be felled. This implies that local loggers follow the *selection system* (not a *clear-felling system*) for harvesting trees and therefore there will always be (residual) trees in logged over forests.

### **3.5 Peculiarities of logging activity**

Merchantable tree selection is based on stem condition, dbh, species, and site conditions. Further, looking elsewhere in the local sector, loggers retrieve on average about 8m<sup>3</sup>/ha, or less than six trees/ha. Where there is full application of RIL principles, to the extent that the timber harvest is informed by pre-harvest inventory data, directional felling is practiced and skid trails are planned, the intervention in the forest environment is minimal. Based on the residual post-harvest conditions, selective logging is compatible with other major stakeholders' interest such as watershed management, wildlife conservation and the conservation of biodiversity.

Road construction, road maintenance and related earthworks such as the establishment of borrow pits are the main sources of environmental impacts.

### **3.6 RTI's project**

RTI's timber harvesting practices will be in line with national standards and in full compliance with GFC's COP and GFFO. More importantly, RTI's practices represent *best practices*, used across the forest sector in Guyana.

The concession area will be organized in compartments and blocks in line with local standards: logging will be cyclic, where a particular area will be subject to logging for about 20 days, then left alone.... then only areas near to primary roads will continue to be impacted. *Each year, RTI will harvest less than 2% of the concession area.*

The consultants concluded that technically, RTI's operations are technologically sound and in line with what would constitute *sustainable forest management* in a natural tropical forest.

The consultants believe that the award of a forest concession to RTI would lead to a more structured development of the upper Cuyuni-Puruni District in Region 7. A forest concession would harness considerable economic value for the Guyanese society via increased timber production and subsequently increased gold production.

## 4.0 STAKEHOLDER IDENTIFICATION AND CONSULTATION

### 4.1 Overview:

Logging operations within the area embodied under SFEP 2/2020 will add to the economic, social, and environmental profile of the Kartabu Triangle. ***Specifically, RTI's extractive route for timber overlaps with that already used by every other business in the Kartabu Triangle.*** From environmental and forest conservation perspectives, an intact forest concession comprising 107,650.54 hectares, will attract stakeholders' interests. RTI estimates that less than 300 persons occupy or traverse the concession area. Most miners and shop owners occupy the right bank Puruni River, for example at Million Dollar Mountain (near Puruni Landing), 'Bush Cow Camp' and Kumung-Kumung. A few such as those at Pashanamu dwell along the Puruni Road. RTI has identified the stakeholders with whom it must collaborate in the development of the concession area (see Table 3).

Table 3: Core stakeholders for RTI's Logging project

#	STAKEHOLDER	INTEREST
<b>A</b>	<b>Public agencies</b>	
	• EPA	Environmental protection
	• GFC	Forest resources conservation
	• GGMC	Sustainable mining
	• GLSC	Land management
	• MOPW	Maintenance of the Kartabu-Puruni Road
	• GPF	Public security
	• PAC	Conservation of biodiversity, wetlands
	• RDC, Region 7	Regional Development Issues
<b>B</b>	<b>Environmental NGOs</b>	
	• WWF	Mining practices; conservation of fauna
	• CI	Mining practices, forest conservation, wildlife conservation
	• GGDMA	Sustainable mining development
<b>C</b>	<b>Logging community</b>	Shared approach to the management of the KPR corridor; collaboration on environmental management.
<b>D</b>	<b>Mining communities-</b>	Collaboration on Environmental management
	• Kumung-Kumung	Shared approach to the use of RTI' access road and concession-based roads
	• Puruni Landing	Shared approach to the use of RTI' access road and concession-based roads.
	• Tiger Creek Junction	Shared approach to the use of RTI' access road and concession-based roads, road corridors
<b>E</b>	<b>Indigenous communities</b>	
	• Kartabu Village	Conservation of livelihood values
<b>F</b>	<b>Iteballi</b>	Business matters, employment issues
<b>G</b>	<b>Business Community</b>	Collaboration on environmental management

## **4.2 Consultations**

### **4.2.1 Overview**

FTCI has conducted consultations across the Kartabu Triangle in line with work done in the area for other concessionaires between 2006 and 2022: the last set of surveys, linked specifically to the proposed development of SFEP 2/2020, was conducted from March 1-10, 2021, and April 11-15, 2022.

There were formal and informal consultations. *Formal consultations* included the culling of stakeholders' concerns at scoping meetings as well as structured interviews based on a questionnaire at the more populous communities of Puruni Landing, Iteballi, Kartabu Village and Batavia Amerindian Village.

*Informal consultations* were done at Puruni Landing, Kumung-Kumung and Pashanamu: these were ad hoc meetings with individuals or small groups-already in place at landings, business establishments or at worksites. During informal surveys, the consultation was limited to sharing information on the imminent timber harvesting operations in the area and seeking feedback from the interviewee(s) on their take on logging operations and expanded businesses in mining areas. Names were *requested* but interviewees declined to offer their names or the names of the mining enterprises with which they were associated.

### **4.2.2 Public agencies**

The concerns of public agencies and environmental NGOs, and Amerindian NGOs were articulated at a scoping meeting in December 2020. These concerns were considered in the elaboration of the TOR for the ESIA process and report.

Public officers, including Regional Officials at Bartica, were duly consulted (see Annex XIX). There was no categorical rejection of timber harvesting operations in the area. In fact, the general opinion was that more economic development in the Kartabu Triangle will be an advantage for all agencies.

### **4.2.3 Mining Communities**

#### **4.2.3.1 Mining community: Riverine Communities/Business community**

Mining communities develop from the association of miners and businesspersons. The businesspersons vend rations, fuel, mining supplies and clothes to miners in transit. Businesspersons also trade in gold.

Opportunistic informal discussions were the norm when consulting with miners or businesspersons at Kumung-Kumung and other landings. Most miners displayed disinterest in general discussions on the one hand but showed intense interest in any talks about new road networks. Interviews were restricted to 30 minutes due to concerns about the COVID-19 Pandemic. Occasionally the consultants met with friends or relatives in the area and in those instances, the consultants were able to garner more credible information.

#### **4.2.3.2 General concerns about mining activity re SFEP 2/2020**

The vagaries, modalities, and consequences of mining practices in Guyana have been addressed by various experts (Hammond D. , 2005); (Bulkan J. P., 2016); and (APA-FPP, 2016).

In the context of RTI's project, the primary challenges with mining are as follows:

- a) Each miner has his own timetable for the development of his mineral license and ***there is no overarching exploration development plan with which RTI could align its operations.***
- b) There is currently no post mining rehabilitation plan and mining pits are simply abandoned.
- c) It is easy to discuss issues with staffs of GGMC or GGDMA staffs but not the ‘small’ miners themselves. The mining community expressed a willingness to collaborate along with loggers. The general problem however is that in practice it is difficult to Organise meetings for itinerant miners and so it is difficult to get them to commit to any obligations or agreement. RTI is however encouraged by initiatives of GGMC, including the development and dissemination of Codes of Practice, including the *Draft Occupational Standards Codes of Practice on Environmental Management*. (GGMC’s initiatives provide windows of opportunity for RTI’s collaboration on environmental awareness and education for miners).

#### **4.2.4 Indigenous Communities**

##### **4.2.4.1 Overview**

There is no Indigenous Community within the concession area; the nearest ones are Kartabu and Batavia, more than 120km from the concession area.

##### **4.2.4.2 Communities-Kartabo Triangle Batavia, Kartabu Point**

The consultants conducted consultations with Iteballi on March 2, at Kartabu Point on March 3, 2021, and at Batavia March 4, 2021 (see Annex XIX).

All the communities were in favour of economic development and there were no major objections to RTI’ proposed logging project, especially as RTI’ timber harvesting operations will not occur in their vicinity. There were some general concerns about the needs for predictable pay dates for employees of timber enterprises. (Most of the concerns also dealt with logging trucks traversing Iteballi Community, but these were not applicable to RTI proposed logging operations).

##### **4.2.4.3 Other communities**

During period March 5-10, 2021, informal consultations were conducted along Puruni River, Puruni Landing, Tiger Creek Junction and Takutu ‘Village’.

All miners were in favour of the logging operation: they believed that logging roads would create new opportunities to access ‘productive’ mining areas and create new routes for critical mining inputs such as fuel to the upper Puruni River district, beyond Paiyuka Falls. They all expressed a willingness to work with RTI and indeed any other developer.

(Unfortunately, the members of the GDF, Guyana Police Force and GGMC had just arrived at Puruni Landing on transfer and they were all trying to settle in).

Note that only residents at Takutu will be impacted directly by RTI timber flows along the KPR. Residents of Takutu are used to logging trucks (from holders of large forest concessionaires such as WTTCL, TPL and JSLY) and so far, they have not had any major problems. Of course, even when RTI starts production, RTI vehicles will comprise about 5% of the number of vehicles traversing Takutu Village daily.

#### **4.3 The way forward**

In planning for stakeholders' issues in the management of the forest concession, a stakeholder map (see Table 4) was prepared and in addition detailed stakeholder analysis is set out in Table 5).

Table 4: Stakeholder map for RTI's Project, SFEP 2/2020

<b>P O W E R</b> →	<b>Disinterested Stakeholders: FMP, AOP, other reports available for scrutiny)</b>	<b>Extremely interested stakeholders: (Documents –FMP, AOP, other reports provided for scrutiny)</b>
	<ul style="list-style-type: none"> <li>• MOPW</li> <li>• MOH</li> <li>• GGMC</li> <li>• GGMDA</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• MNR</li> <li>• GFC</li> <li>• ENV. NGOS</li> <li>• Employees, RTI</li> </ul>
	<b>Disinterested parties: their interests and concerns to be monitored closely.</b>	<b>Extremely interested stakeholders: information provided on request:</b>
	<ul style="list-style-type: none"> <li>• RDC-REG 7</li> <li>• Logging Community</li> <li>• Timber Dealers</li> </ul>	<ul style="list-style-type: none"> <li>• MOHA/GPF</li> <li>• Mining Community</li> <li>• Business Community</li> </ul>
<b>I N T E R E S T</b> →		



Table 5: Stakeholder analysis-RTI' project, SFEP 2/2020

#	Stakeholders	Involvement in Project	Interest in Project	Influence/Power	Impact on Project
1	MNR	Articulates the policy framework for forestry and mining.	Facilitating the development of the forestry sector; ensuring compatibility between mining and forestry activities.	High interest/high power approves SFA-TSA based on recommendations from the GFC.	Supports company's investment framework; determines arrangements for the use of the KPR.
2	GFC	Direct responsibility for forest concession administration and forest conservation.	Support for sustainable forestry management and timber production	High interest/high power evaluates applications for SFA-TSA; approves FMPs, AOPs.	Monitors the company's compliance with the terms of the SFA-TSA, the COP and the GFFO. Monitors implementation of FMPs and AOPs.
3	GGMC	Manages mining operations in Mining Districts 3.	Responsible mining practices; fostering collaboration on environmental management.	Low Interest/High Power: Mitigates conflicts Responsible for the mining industry within the concession area	Facilitates engagements with the mining community; supports natural resources management.
4	EPA	Environmental management Grants environmental authorizations	Evaluates ESIA's. Grants Environmental Authorizations.	High interest, high power determines whether the proposed project addresses the concern of stakeholders.	Monitoring implementation of environmental management (plans).
5	Environmental NGOs-CI, WWF	National and regional scale initiatives on forest conservation and climate change mitigation.	Sustainable mining & sustainable forestry practices respectively	High interest, high power: considerable advocacy in the natural resources sector (in Guyana and abroad).	Informal oversight of natural resources management across the Guiana Shield.
6	Miners, GGMDA	Shared use of the concession area and the KPR.	Unrestricted, enhanced access to their claims or mineral licences on the concession area	High power, Low interest: Disinterested in logging, just want to promote their own business.	Could potentially stymie RTI's access to timber resources; shared use of RTI's logging roads is a major administrative burden
7	Public Agencies (MOPW)	Maintenance of the KPR	The use of the KPR and allied linkages to Arimu, Kartabu, and Batavia.	Low interest/High power; MOPW has overall responsibility for hinterland road networks	Sets standards for road construction/maintenance and the application of a toll structure for road use.
8	Public Agencies-MOH	Management of critical health hazards in rural areas.	Monitoring health hazards in the logging & mining industries, respectively.	Low interest/High Power: major interest in health matters.	RTI will be expected to provide for the accommodation of health

#	Stakeholders	Involvement in Project	Interest in Project	Influence/Power	Impact on Project
					teams during MOH's extension services to the general area.
9	Public Agencies- MOHA/GPF	Oversight of security issues	Maintenance of law and order at Aranka-historically, a community notorious for criminal behaviour.	High interest/Low Power: the actions of the agency will have negligible impact on the project	Support for checkpoints the monitoring of unlawful activities
10	Regional Administration, Region #7	Regional development: coordination of regional development initiatives.	Employee data, investment levels. Ensuring that regional initiatives reach RTI's employees.	Low interest/Low Power: helps determine which projects are a priority	RTI will be expected to support regional initiatives as part of their CPR and to accommodate regional teams on (business)
11	Logging Community	Shared use of the KPR road corridor.	Shared environmental management, especially in relation to the use and maintenance of the KPR	Low interest/Low Power; valuable ally in fostering sustainable forest management.	Co-mitigation of applicable environmental challenges.
12	Businesses-vendors, transport services.	Expanded business opportunities	Business opportunities	High interest/Low Power: RTI's business is expected to generate forward and back economic linkages	The business community will offer services to employees that RTI will not.... but worker welfare is vital to RTI
13	Employees	Direct responsibility for implementing forest management and environmental management.	Skills development, economic benefits, experience	High interest/High Power: RTI will depend on their support to meet its economic targets and its environmental obligations.	Various-cost control, production levels, compliance with GFC'S prescriptions.
14	Regional communities	Source of knowledge, skills set	Economic benefits	High interest/Low Power: RTI's business is expected to generate forward and back economic linkages	Economic and political support
15	Regional & urban timber dealers	Expanded timber trade, business opportunities.	Expanded timber trade, business opportunities.	Low interest/Low Power: demand and supply modalities for timber	Project feasibility drives competitive behaviour.

## 5.0 LEGISLATIVE AND POLICY FRAMEWORK

### 5.1 The natural resources sector

This section relates the suite of policies, legislation, standards, and guidelines applicable to the natural resources sector.

Guyana is endowed with considerable natural resources, including a diversity of forest resources. The importance of the conservation of local forest resources is reflected in the provisions of the Constitution and diverse ancillary policies, legislation, and standards across the natural resources sector. Public agencies participate in the management of local forest resources (see Figure 16). In addition, NGOs OR CIVIC groups and communities are routinely consulted about the development of sector initiatives.

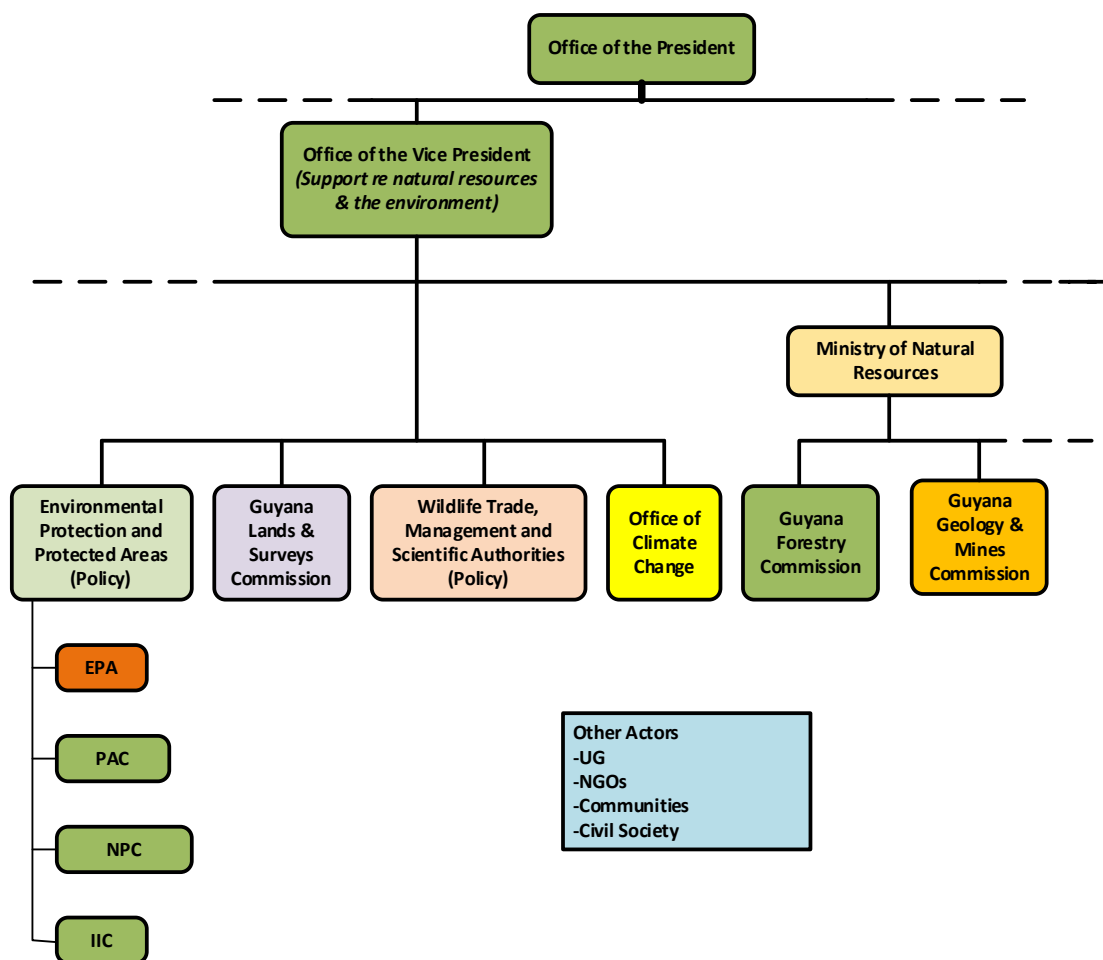


Figure 16: Chart showing the core organizational framework for the natural resources sector

Major drivers of recent changes in the forestry sector are the overarching LCDS, GSDS2040 and the FLEGT-VPA between GOG and the EU. Other drivers of change emerged from engagements with FAO, ITTO, ACTO, the NGO community, and bilateral arrangements such as that between GOG and (the Kingdom of) Norway.

RTI attends meetings that GFC organizes for stakeholders in order to be aware of developments in the natural resources sector. Similarly, RTI's staffs also scan the websites of public agencies and the NGO community, and, of course, the local print media.

## **5.2 Overarching frameworks**

### **5.2.1 The Constitution of Guyana**

Article 36 of the Constitution of the Cooperative Republic of Guyana Act (1980) is the primary 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'*. The provisions of the Environmental Protection Act, 1996 and supplementary legislation in 2000, among others, lead the translation of the provisions of the Constitution into practical measures.

### **5.2.2 National Environmental Action Plan (NEAP) 1994 (GOG, 1994).**

The major objective of the NEAP is to identify major (emerging) environmental problems and to formulate appropriate **policies** to manage them.

This ESIA study is consistent with the general aims of the NEAP1994, including the following:

- 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.
- 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 the conservation of forest resources is treated as an integral part of the planning and implementation of development activities.

RTI embraces forest resources conservation and allied areas such as the conservation of wildlife. RTI is cognizant of the fact that the UN driven SDG 15 which aims to 'protect, restore, and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity losses' informs forest management prescriptions for Guyana.

According to the UN, technology will help to address the challenges for sustainable forestry in the 21<sup>st</sup> century<sup>8</sup>. RTI's management is aware that Information and communications technology (ICT) is used for two key areas for forest management: firstly, mapping and monitoring of forest resources and environmental threats, and secondly, raising awareness of the need for sustainable forestry practices<sup>9</sup>. Further RTI has noted studies which showed that ICTs have been used effectively forest management (Castren & Pipai, 2011); (Jacob, Udoakpan, Daniel, Nelson, & KE, 2013).

RTI will employ the use of ICT and UAV technologies as well as a suite of devices to ensure effective compliance with established standards and guidelines on sustainable forest management, for example RTI will use applicable technologies, including GIS to ensure that the company is in full compliance with the GFC log tagging and tracking system.

### **5.2.3 The National Biodiversity Strategy and Action Plan (NBSAP), 2012-2020 (GOG, 2014).**

The NBSAP, 2012-2020 was developed by the MNR and the EPA in partnership with stakeholders, with funding from GEF. The NBSAP seeks to align Guyana's initiatives on biodiversity with those of regional and global partners.

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

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.

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

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.

RTI expects that any lessons learnt from the management of its biodiversity reserve can support national initiatives. On acquisition of a TSA, RTI will set up a network of permanent monitoring stations within its biodiversity reserve.

RTI recognizes and has noted the issue of illegal logging and the significance of its impacts on forest degradation, climate change, and habitat loss, and community livelihoods. In collaboration with the GFC, RTI will establish a GIS/RS database to collect and analyse geospatial data for use in monitoring land use activities within the concession area. RTI will build in-house capacity using best practice guidelines and technology to detect and prevent any illegal harvesting and land clearing activities not sanctioned by the company and will use UAV technology to map and to monitor the forest concession.

### **5.2.4 The National Land Use Plan (GL&SC, 2013)**

The National Land Use Plan (NLUP) provides '*a strategic framework to guide land development in Guyana*' and is distilled from national policies and strategies that have a direct relevance for land use and land management. The NLUP further attempts to '*provide for the co-existence of multiple land uses and provide*

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<sup>8</sup> <https://unstats.un.org/sdgs/report/2016/goal-15>

<sup>9</sup> FAO and UNEP. 2020. The State of the World's Forests 2020. Forests, Biodiversity and People. Rome.; <https://doi.org/10.4060/ca8642en>

*clear, implementable guidelines for making decisions on multiple land uses and mutually exclusive, competing land uses.* The NULP is administered principally by the Guyana Lands & Surveys Commission (see Section 5.6.1.6).

RTI believes in a multiple-use approach to natural resources management. Specifically, RTI has no specific objections to mining. RTI will always try to coordinate the development of parcels of forest resources so that its objectives and those of the miner(s) can proceed amicably.

Further RTI recognizes that mining operations trigger multiple impacts, both positive and negative. Examples of positive impacts include road upgrades, access to a greater range of health services, upgrades to community facilities and greater education and employment opportunities for surrounding communities. Potential negative impacts range from increased crime rates to higher cost of living and respiratory health risks caused by dust pollution.

In collaboration with the GFC and GGMC, RTI will compile the location of all allocated and active mining concessions/lease within the concession area. This will inform the development of a comprehensive logging and mining plan which will be submitted to GFC for approval. New roads and trails will be mapped and shared with MNRE, GFC, GGMC and EPA.

#### **5.2.5 The LCDS, 2013 (GOG, 2013)**

The Government of Guyana launched a *Low Carbon Development Strategy* (LCDS) 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 included deliberations on climate change and its consequences for Guyana's low-lying coastland, the fact that Guyana's forest resources could be used to mitigate climate change, and the dilemma that with its current development goals, Guyana cannot simply keep all its forest resources intact. Guyana was willing to put measures in place to conserve its forests providing that it could realize alternative options for meeting its developmental needs. As a policy instrument, the LCDS was intended to 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 entailed Norway contributing the sum of US\$ 250 million to the Government of Guyana provided that the *avoided deforestation rate for Guyana* can be kept within agreed values for a specific period. After a series of consultations, revised versions of the document were published in May 2010 and March 2013.

RTI is aware that the recent development of oil and gas sector will bring considerable development and benefits to Guyana. RTI notes that the recent commitment by GOG to reinstitute an expanded LCDS to include wider environmental services, water resources management, climate resilience, biodiversity, renewable energy, and the marine economy.

Guyana stands to earn substantial revenue and benefits from Payments for Ecosystem Services (PES). In light of this recent development, RTI commits to the development and implementation of policies and best practice principles that will ensure the conservation and sustainable management of the forest resources within concession areas.

The LCDS, 2013 has been subsumed by the *Draft* LCDS, 2030 (GOG, 2021).

#### **5.2.6 National Development Strategy, 2001-2010 (GOG, 1997)**

The Ministry of Finance held responsibility for the NDS 2001-2010. The strategy attempted to identify the entire array of socio-economic factors that stymie the development of Guyana. It represented the sum of

consultants' efforts firstly to collate and analyse critical statistics for each sector and secondly, to present detailed, objective, and overarching policy measures to achieve national economic development.

The NDS, 2001-2010 is organized into thematic areas; within the thematic area *'the productive sectors'*, Chapter 30 deals with *Forest Management*.

The ideas articulated in the NDS have been the basis for other developments such as the NLUP2013, the NEAP1994, and *recent* sectoral (forest) policies.

### **5.2.7 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.

### **5.2.8 Green State Development Strategy (GSDS), Vision 2040**

In April 2017, the Government of Guyana, with support from UNEP, launched the Green State Development Strategy (GSDS) to pilot the development of a *green* economy. Since then, the document evolved into the GSDS: Vision 2040, published in May 2019.

*The GSDS Vision 2040 "provides a comprehensive development policy to guide public investment over the next 20 years. It captures a holistic view of the country's social, economic, and environmental well-being in line with the United Nations Sustainable Development Goals (SDGs). It aims to foster sustained economic growth that is low carbon and climate resilient (consistent with the LCDS) but also promotes social cohesion, good governance, and careful management of finite resources in accordance with green economy principles."*

Section 2.3 Development Objective B addresses *'Sustainable Management of Natural Resources.'* There is the recognition that conflicts routinely arise from activities in the extractive sector. The document also indicates an *'immediate concern'* about the loss of forests from mining activity, and looking ahead, the loss of forests from factors including *'expanding industry, commerce, infrastructure, and settlements.* There is the assertion that henceforth *'economic development must be considered alongside social development, and source conservation practices should be adopted at every scale wherever a planning-design-implementation cycle exists within the public, private and civil space.'*

*Section 2.3.2 contains the goal that 'by 2040, Guyana preserves its natural capital through institutionalized and prudent management of natural resources (land, forests, minerals, and water) for the purposes of meeting the objectives and intent of Sustainable Development Goal #15 (land use and biodiversity)*

The GSDS, Vision 2040 has been subsumed by the **Draft** LCDS, 2030 (GOG, 2021).

RTI is fully committed to the essence of the LCDS or GSDS and will work to support the noble objectives set out therein.

## **5.2.9 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.

### **5.2.9.1 Environmental Protection (Water Quality) Regulations (Reg.6/2000)**

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. The Guyana National Bureau of Standards<sup>10</sup> has developed standards for water quality. The provisions of these regulations have been considered during baseline studies conducted by RTI.

RTI will collaborate with the EPA to monitor water quality at the *permanent monitoring stations* it will operate throughout the life of the concession. Water samples will be evaluated by recognized laboratories as mandated in the regulations RTI will establish a database to containing the location of sample stations and the corresponding water quality results. Information from the data base will be shared with the EPA, Hydro-meteorological Department and other GOG agencies involved in the management of freshwater resources in Guyana.

### **5.2.9.2 Environmental Protection (Air Quality) Regulations (Reg.9/2000).**

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.* RTI will use RIL practices which emphasize planned interventions in the forest environment and will use fully functional mechanical equipment to manage air quality in the forest environment.

Further RTI has noted the parameter limits as outlined in the regulations and will therefore develop a comprehensive database that will be populated with air quality measurements collected at various stages of its logging operations. This information will be shared with the EPA and will be made available to any other GOG agency for scrutiny. The data collected will be analysed to identify any inherent trends and patterns that may be of significance as required by the regulations.

### **5.2.9.3 Environmental Protection (Noise Management) Regulations (Reg. 8/2000).**

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 guidelines (see Table 6).

RTI will ensure that all its machines are maintained properly to keep noise levels within the manufacturers' standards and the local standards. Normally, no work will take place after 18:00 hrs. However at least one generator will be used at night at the base camp on the concession.

RTI will develop a register and comprehensive database that will be populated with noise quality measurements collected at various stages of its logging operations. This information will be shared with

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<sup>10</sup> See GNBS GYS 262: 2004: Specification for drinking water.



the EPA and will be made available to stakeholders for scrutiny. The data will be analysed to ensure that noise emanating from various stages of the logging operation are within the required parameters prescribed by the regulations.

Table 6: GNBS' Guidelines for Noise Emission into the Environment (GNBS: GYS263:2010)

Categories	Daytime (06:00h-18:00h) Limits in dB (A)	Night-time (18:00h-06:00h) Limits in dB (A)
Residential	75	60
Institutional	75	60
Educational	75	60
Industrial	100	80
Commercial	80	65
Construction	90	75
Transportation	100	80
Recreational	100	70

#### **5.2.9.4 Environmental Protection (Authorization) Regulations (Reg. 10/2000, Reg. 14/2005)**

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.

#### **5.2.9.5 Environmental Protection (Hazardous Waste Management) Regulations (Reg. 7/2000, Reg.13/2005)**

These regulations cover the management of (hazardous) substances that may modify the environment in a negative way. RTI will take due care to avoid any form of potential contaminant within the forest environment. Specifically, only petroleum products (fuel, oil, grease) and OTC drugs for the combat of mosquitoes at the base camp and at forward camps are contemplated for use on the concession area.

### **5.3 Forestry Policy & Forestry Legislation**

#### **5.3.1 Forest Policy, and applicable standards and guidelines**

##### **5.3.1.1 The National Forest Policy Statement, 2018 (GFC, 2018).**

The NFPS, 2018 is projected to cover the period 2018 to 2028. GFC is the lead agency for the implementation of the NFPS 2018, however actual implementation is carried in partnership with other stakeholders (see Section 5.5.1.2). The overall objective of the NFPS, 2018 is to *conserve, protect and utilize the State's Forest in a manner that ensures social, economic, and environmental attributes and benefits, are sustained, and enhanced for current and future generations.*

The NFPS, 2018 is the continuation of the various forest policies used by the (Forestry Department) and subsequently the GFC since its inception). The policy includes forest resourced based considerations set out in the LCDS, GSDS: Vision 2040 and other policy documents. The NFPS was developed in 1997 and was later revised in 2011 in response to the publication of the Low Carbon Development Strategy (LCDS). However, with the development of the Green State Development Strategy (GSDS) a further revision of the Policy was made in 2018 after a series of multi-stakeholder consultations countrywide.

The NFPS, 2018 reflects GFC's a focus on all the values of forest resources rather than valuing the forest resources simply for its timber stocks.

#### **5.3.1.2 National Forest Plan, 2018 (GFC, 2018).**

The National Forest Plan (NFP), 2018 complements the NFPS: the NFP comprises seventy (70) activities to operationalize and implement the overall objectives, goals, and strategies of the NFPS 2018. The NFP also outlines a performance-based framework for the goals, strategies, and activities by providing a timeframe and activity indicators for the successful accomplishment of expected outcomes. The implementation of the Plan will be facilitated by the GFC; however, due to the significant roles by multiple institutions in the Plan, the Ministry of Natural Resources and, as appropriate, the Ministry of the Presidency, will support and coordinate the planning and implementation of (non-timber) activities by other agencies.

RTI participated in consultations linked to the NFP and will continue to support its development and implementation (by methods including providing feedback to the GFC).

#### **5.3.1.3 Code of Practice for Forest Operations for State Forest Authorizations, 2018 (GFC, 2018 )**

The **original** Code of Practice for Timber Harvesting, 2nd Ed. 1996 was based on FAO's Model Code of Forest Harvesting Practice and provided applicable standards for local forest conditions. The COP was revised in 2001, 2013 and 2018.

The *Code of Practice for Forest Operations for State Forest Authorisation (COP), 2018* is a gazetted document. This 2018 version of the COP is based on practical experience locally and abroad, multi-stakeholder consultations, and the need for its alignment with other forest management standards and practices, including measures developed and distilled under LCDS, GSDS and FLEGT/VPA framework.

The Code provides *mandatory* standards, on forest harvesting and allied practices for all holders of Timber Sales Agreements, Wood Cutting License, State Forest Exploratory Permits, State Forest Permissions, and Community Forestry Management Agreements. In so doing the COP aims to ensure sustainable management of the forest; keep forest activities compatible with international directives; conserve biological diversity, help forest regeneration, and protect wildlife. The COP also aims to promote enhanced productivity, sustainability, and economic viability of forest harvesting; improve living conditions and safety of the workforce; and improve relations between logging companies and local communities.

RTI fully embraces the COP and will ensure that all its operations are fully aligned with the COP. In addition, full and continuous compliance with the GFC legality requirements and other ancillary documents and guidelines at all stages of the logging operation will ensure that the requirements for SFM are met and maintained.

#### **5.3.1.4 Guidelines for Forest Operations for State Forest Authorizations 2018 (GFC, 2018 )**

The Guidelines for Forest Operations for State Forest Authorisations are associated with the Code of Practice for Forest Operations (large concessions). The guideline requirements were developed based on the 2018 edition of the Code of Practice for Forest Operations (large concessions), which itself benefitted from research and practical experience, locally and abroad, over a period of 20 years. The guidelines developed were also informed by extensive multi-stakeholder consultations of the Code over the last four (4) years.

The document therefore provides **guidance** on the specific activities which the Forest Sector Operators of large concessions may undertake to comply with the principles and objectives of the COP for Forest Operations (large concessions). The guidelines are enforced by the GFC and thereby regulates any class

or description of forest operations for holders of SFAs. RTI intends to share responsibility for the sustainable development of the forestry sector by ensuring that all its interventions in the forest resources are in line with the GFFO. Thus, full compliance with GFC's robust forest monitoring system and guidelines will ensure that SFM principles are maintained.

#### **5.3.1.5 Forestry Management Plan Guidelines**

The Forestry Management Plan Guidelines, first published in 1999, elaborates the basis for strategic and operational planning. Guidelines for annual plans of operational (AOP) have also been published. RTI has used the guidelines to develop an FMP and an AOP for the SFEP. These documents were subject to heavy scrutiny and interrogation by the GFC before approval.

#### **5.3.1.6 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. RTI endeavours to keep track of these requirements and all changes made from time to time. RTI has taken note of the revised ESIA Guidelines developed by the EPA and will ensure full compliance therewith.

#### **5.3.1.7 GFC's Log Export Policy, 2020 (GFC, 2020)**

The general purpose of GFC's Log export policy is to encourage local or Guyana based timber merchants to develop value adding timber businesses to generate more value from local timber resources.

The current policy builds upon the improved sector performance of the forestry over period 2000 to 2019; specifically sector earnings increased and 'new ventures in added value manufacturing enterprises came on stream (GFC, 2020).

This recently approved Policy is characterised by the following:

- a) Uses progressively increasing rates of export levy on specific log species
- b) There are specific provisions for squares and for LUS
- c) Will help to limit the export of the premium species in log form Will provide an opportunity to export more of the LUS in log form
- d) Will encourage the increased production of logs by all types of concessionaires since the range of exporters is now expanded.

RTI believes that the export of value-added timber products is vital to the viability of the company. RTI supports the log export policy and is particularly pleased with the provisions for squares and for LUS, given the considerable number of LUS on the concession area.

### **5.3.2 Forestry Legislation**

#### **5.3.2.1 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 conduct 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; and
- (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.

RTI contributes to discussions on forest policy and forest legislation as often as the opportunities to do so present themselves.

RTI notes that the Act provides for the protection and conservation of forests, and include measures to conserve biological diversity, protect specific trees and plants, conserve soil and water resources, and protect forests against degradation, fires, pests, and diseases. The EPA may declare specially protected areas, prohibiting any disturbance of the soil, vegetation, rivers, or creeks in any specially protected area(s). The Act also provides for the prevention of fires, the protection of trees and plants, forest conservation on private lands and provides rules for forestry operations. Therefore, one objective of RTI's GIS/RS geospatial database is to ensure that the Company complies with the requirements of the Forests Act and Forest Regulations, respectively.

#### **5.3.2.2 Forests Regulations 2018**

The Forest Regulations No. 2 of 2018 made under the Forest Act was developed to guide the management of State Lands inclusive of the State Forests, protected areas, and research areas. The regulations address the requirements and stipulations for a State Forest Authorisation inclusive of exploratory permits, forest concession agreements, use permits, community forest management agreements, transfers, and registrations.

The regulations also outline requirements for forest conservation, establishment of primary conversion plant, movement of forest products, the resale, export and import of forest products. Additionally, the regulations provide a framework for the fees, charges & levies imposed and any offences & penalties which occur.

RTI has noted that the key requirement of the forest Regulations is to promote sustainable forestry through participation with local communities. The Regulations also provide forest conservation by formulating fire protection plans, the management of programs for protected species and the management plans for specifically protected areas with a particular focus on biodiversity.

Moreover, regarding forest management, communities are permitted to use forest resources to meet local needs in terms of income generation and economic development on a sustainable basis and with consideration to the enhancement of environmental stability.

RTI will ensure adherence to the forest regulations so that all activities are conducted in keeping with the legal requirements of the Country. Thus, full compliance with GFC's SFM guidelines will ensure de facto compliance with the Forest Regulations, 2018.

#### **5.3.2.3 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 conduct 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

#### **5.4 Other Relevant/Applicable Laws**

##### **5.4.1 The 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. RTI's conservation practices will have to be aligned with the objectives of this Act.

RTI will establish a network of biodiversity reserves throughout the concession in keeping with GFC's COP. This will ensure compliance with GFC SFM guidelines and systems.

RTI intends to manage the biodiversity reserves and other freshwater ecosystems and important watersheds in a prudent manner so that they may be added to the NPAS as a means of combatting climate change.

##### **5.4.2 The Wildlife Conservation and Management Act 2016**

This 'ACT' provides for the protection, conservation, management, sustainable use, and internal and external trade of Guyana's wildlife.

RTI will do its utmost to conserve Guyana's wildlife; the company's employees and contractors will not be allowed to hunt or fish on the concession area. RTI intends to create a supportive mechanism cognisant of the national goals for wildlife protection whereby local indigenous villages may participate in the effective, protection, conservation, management, and sustainable use of wildlife on their titled lands. Thus, any observed cases of illegal wildlife trade will be reported to the relevant authority in keeping with the Wildlife Conservation and Management Act 2016. RTI will use UAV technology to monitor its forest concession and will document and report any suspicious activities to the relevant authorities.

##### **5.4.3 National Insurance and Social Security Act 1969**

The Act establishes the national insurance and social security system, which covers and protects workers. The individuals to be insured under this act by payment of contributions are sixteen (16) years to under sixty (60) years of age; both self-employed and gainfully employed. The national and social security system provides benefits for old age, invalidity, survivors' benefits, sickness, maternity, funeral, and industrial benefits.

RTI will ensure compliance with NIS to maintain workers contributions.

RTI will establish a register to ensure that records of contributions and annual compliance reports will be provided to employees on an annual basis. Such records will be available for scrutiny by Labour Department (Ministry of Social Protection), the GFC and other stakeholders upon request. Records of accidents or diseases in the course of legal employment will be kept.

#### **5.4.4 Labour Act 1942**

The Labour Act provides for the establishment of the department of labour, for the regulation of the relationship between the employer and the employees. The act stipulates and establishes procedures regulating wages paid; minimum rate wages payable; hours of work; the rights and obligation of the employees; and provides for settlement of differences between employees and employers.

RTI is committed to ensure that all workers are paid within the confines of the law.

RTI will collaborate with the MOL in data collection on labour and skill availability in order to recruit workers and persons who are seeking employment.

#### **5.4.5 The termination of employment and Severance Pay Act (No. 19 of 1997)**

This Act regulates termination of employment practices in the public and private sectors of Guyana. During its operations, RTI will ensure due compliance with the provisions of this legislation.

#### **5.4.6 Occupational Safety and Health Act 1997**

This act provides for the registration and regulation of industrial establishments/ operation ensure the occupational safety and health of workers. The act requires the safety of machinery and plants; provision of enough sanitary facilities and access to potable drinking water; identification of hazardous chemicals and regulation of its use and storage.

RTI notes the requirements of an employee under the OSH Act requires employers and employees to ensure a safe work environment and for the appointment of safety committees in workplaces. RTI will work closely with the GFC and MOL to ensure that workers' rights are protected through the establishment of OSHA committee. The company will collaborate with the inspector of Labour and medical inspector in any OSHA matters through safety and health representatives and joint workplace and health committees with defined functions and powers.

The company also notes the requirements of the Trade Union Act, 1921 which sets out the basis for the establishment and registration of trade unions in Guyana. The company intends to honour the requirements as set out under the law for employees to freely join a trade union.

In relation to hazardous chemicals, physical and biological agents, the Act requires their identification hazardous nature with appropriate inventories, and regulates their use, storage, instruction, and training. Notification of accidents and occupational diseases, in case of death by accident or occupational disease are further requirements of the Act. RTI is fully committed to complying with the law to protect and safeguard the welfare of employees.

#### **5.4.7 Amerindian Act, Cap 29:01**

The Amerindian Act provides for 'the good Government of the Amerindian Communities of Guyana. RTI is particularly concerned with Section 3 that includes provisions for 'Amerindian Villages' and how these are defined, Sections 18 and 23 which set out the modalities for communicating with Amerindian Villages and Section 33 which deals with the employment of Amerindians.

RTI values the natural abilities and intellectual capital of Amerindians particularly in tree identification and 'bush craft' and will offer employment to any Amerindian who has attained the age of eighteen years and who has voluntarily expressed interest in working for the company and on the concession area.

RTI also notes the recent commitment by GOG to revise and update the Amerindian Act through consultation and utilize every opportunity to contribute to the revision of the Act<sup>11</sup>.

#### **5.4.8 Combating of Trafficking in Persons Act 2005**

This Act is intended to 'provide comprehensive measures to combat trafficking in persons. RTI will not engage in any unethical behaviour in the recruitment of employees. RTI will only employ persons who are not less than 18 years of age and who express an interest in working for RTI via a written application, accompanied by an acceptable form of identification. For foreigners, the applicant must present evidence of a work permit issued by Ministry of Home Affairs.

RTI will also ensure that its contractors have employees who are collaborating voluntarily with them and who have proper enumeration packages and job descriptions. RTI will establish a database and register to gather data on any reported cases. Any such cases will be reported to the relevant authorities as mandated by the Act.

#### **5.4.9 Employment of Young Persons and Children Act, Cap. 99:01**

This Act relates to certain Conventions relating to the employment of young persons and children. RTI will employ persons who are not less than 18 years of age. RTI will insist that its contractors do not employ anyone whose age is less than 18 years. RTI will maintain a register of all employees and this register will be available for stakeholders' scrutiny as prescribed by the Act. RTI will at all times comply with the requirements of the Act and take any necessary steps to avoid human rights and environmental violations in the course of conducting its business.

#### **5.4.10 Prevention of Discrimination Act, Cap 99:09**

This Act provides for the elimination of discrimination in employment, training, recruitment and membership of professional bodies and the promotion or equal remuneration to people in employment who perform work of equal value, and for matters connected therewith.

RTI is an equal opportunity employer. RTI will employ women at its Base Camp as soon as adequate facilities are available for them. Given the hazardous nature of logging, RTI will not employ more than 20% of its field operatives as women. From January 2022, more women will be employed mostly for record keeping, timber grading and forest monitoring tasks.

The Company will adhere to the provisions of the Act and instruments which provides for the promotion of equal remuneration for work of equal value and prohibits discrimination in employment, and protection against discrimination in other areas.

### **5.5 Regulatory Agencies/Departments**

#### **5.5.1 Ministry of the Presidency**

##### **5.5.1.1 Office of Climate Change (OCC)**

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, and UN-REDD.

RTI's forest monitoring officer will scan the OCC's website regularly.

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<sup>11</sup> <https://guyanachronicle.com/2020/12/13/revision-of-amerindian-act-2006-is-of-highest-priority/>

The Office of Climate Change and the Department of Environment has been merged to form a Department of Environment and Climate Change.

#### **5.5.1.2 Environmental Protection Agency (EPA)**

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 sectoral 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...”

The EPA has been aggressive in fostering awareness on environmental management through its newsletters and other extension exercises. Apart from environmental clubs countrywide, the agency produces a weekly article published in the national newspaper highlighting critical aspects of environmental management. In addition, it publishes a biannual magazine and a monthly news bulletin.

The EPA has recently been collaborating with holders of SFAs-small concessions to alert them about the requirement of environmental authorizations for timber harvesting practices and the process towards achieving such authorizations.

Of course, the EPA does extension works outside the natural resources sector. The EPA’s Monthly bulletin for June-July 2019 proudly proclaimed that the agency had trained 33 additional police officers in noise management.

#### **5.5.1.3 The Protected Areas Commission**

This Commission enforces the Protected Areas Act, 2011.

#### **5.5.1.4 The Guyana Wildlife Conservation and Management Commission**

This agency inter alia is the designated CITES management authority for Guyana. RTI looks forward to liaising the Commission in any of its work on the concession area.

#### **5.5.1.5 Guyana Lands and Surveys Commission (GL&SC)**

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. GL& SC is the authority for the determination of boundaries of the `Amerindian Villages. RTI looks forward to working with GL&SC and MOAA to ensure the proper demarcation of the extended *Kurutuku Amerindian village* and will explore opportunities for collaboration with GFC’s community MRV program.



## **5.5.2 Ministry of Natural Resources (MNR)**

### **5.5.2.1 Overview**

The Ministry manages the overarching initiatives to coordinate policy development for the following agencies in the natural resources sector: the GFC, the GGMC and the GGB. The MNR is expected to oversee the multiple use approach to natural resources generally and the resolution of emerging conflicts. The MNR also helps determine priorities for hinterland road construction and toll structures; for example, the MNR, is responsible for the toll on the Buckhall Road. RTI will provide MNR (via GFC) with biannual maps of its primary and access road network. The company will also share spatial data and information from its GIS/RS data base with MNR and other stakeholders.

### **5.5.2.2 Guyana Forestry Commission (GFC)**

Of the 214,970 km<sup>2</sup> of which seventy-five percent is covered with natural vegetation, approximately four fifths are classified as State Forests under the authority 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 works with FAO (Caribbean), UNDP, ITTO and ACTO to develop the local forestry sector, including the provision of technical assistance to loggers' associations and community-based organizations.

The GFC has been partnering with the EPA to create awareness within the forestry sector on the need for environmental management generally, the need for an Environmental Authorisation for timber harvesting practices and the process for achieving an Environmental Permit. The GFC has been partnering with its Associate Body-the FPDMC –to create awareness of the FLEGT-VPA and its implications for the sector. Finally, the GFC has been partnering with another Associate Body to provide training in RIL and other ancillary forestry practices.

RTI keeps track of all developments at the GFC to inform its own operations.

### **5.5.2.3 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 Department, Guyana Department.

Objectives of the GGMC, include:

*Reduce the occurrences of identified pollution violation levels associated with mines and production processing facilities from year end 2014 levels by identifying and correcting existing environmental threats and by working with and using the financial and other resources of the property owners, the government and GGMC.*

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.

GGMC, in association with the GMSTCI and partners (WWF and CI, see Section 5.8) are engaged in initiatives to manage mining practices. These are expected to bear fruit countrywide in another two to five years. The mining community is well established within the same area in which RTI intends to conduct its logging operations. To the maximum extent possible, RTI will support 'greener mining'<sup>12</sup> piloted by the GGMC and the GMSTCI.

RTI will work closely with MNR, GGMC and GFC in developing a mining and logging plan for the forest concession area. The Company will plan its logging operation within blocks that are targeted for mining to extract all commercial species from those blocks before the commencement of mining. The Company recognizes that ad hoc arrangements may result in conflicts and as such will work closely with MNR, GGMC and GFC to identify suitable alternatives to avoid the destruction of prime commercial species found within pre-harvest blocks in the concession area.

### **5.5.3 Other Relevant Agencies**

#### **5.5.3.1 Ministry of Labour**

The Ministry regulates the relationship between the employers and employees. Specifically, the Ministry deals inter alia with wage agreements, industrial relations, industrial training and occupational health and safety.

RTI's field operations depend on the quality of its field staff, especially in sharing responsibility for environmental management even as the company pursues sustainable production levels. RTI will therefore build up and maintain adequate corporate discipline to promote the overall welfare of its employees.

#### **5.5.3.2 National Insurance Scheme (NIS)**

NIS is a social security organization which maintains a system of social security by securing contributions from both employees and employers to generate benefits during sickness/ accidents. NIS also provides other benefits including those for old age and invalidity, respectively.

RTI will ensure that its obligations in respect of NIS matters are addressed in a timely manner.

### **5.6 Treaties & Conventions**

Guyana has signed on to international and regional treaties and conventions (see Table 8) to ensure that forest-based developments in Guyana are consistent with global and regional approaches to such development.

### **5.7 Environmental NGOs & International Agencies**

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<sup>12</sup> <http://dpi.gov.gy/small-and-artisanal-miners-are-learning-how-to-mine-greener/>

WWF-Guyana and Conservation International (Guyana) Inc. are two very initiative-taking environmental NGOs<sup>13</sup> in the natural resources sector. For example, since 2013, a grant agreement was signed between WWF and GGMC which provides financial and technical support for national capacity building through education and awareness activities, baseline studies and training of stakeholders within the gold mining sector. Also, CI in partnership with the GGDMA and GGMC, is implementing a programme to advance green development of the mining sector by enhancing efficiency, reducing pressure on the environment, and improving livelihoods. There is evidence that GGMC staffs have been sharing pamphlets at camps within the concession area with a view to promoting responsible behaviour during mining operations.

RTI will be sharing an extensive forest area with miners in the long term and will endeavour to develop partnerships with the miners and so that everyone shares responsibility for proper environmental management.

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<sup>13</sup> <https://www.nre.gov.gy/environmental-management-in-the-mining-sector-wwf/>

Table 7: List of treaties/international conventions and agreements to which Guyana is a party.

No.	Conventions	Ratification/Accession
<b>Biodiversity</b>		
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</b>		
9	+United Nations Framework Convention on Climate Change +Montreal Protocol	+Signatory in 1992, ratified in 1994. +Acceded to in 1993.
9	+Kyoto Protocol +Paris Agreement	+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 +International Plant protection Convention (IPPC), 1951	+Acceded to in 2007 +Adherence 1970
16	+Minamata Convention on Mercury	+Signatory in 2013
<b>Other relevant items</b>		
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

## 6.0 RTI'S PROJECTS

### 6.1 Overview

RTI will be involved in two projects. RTI's primary business is the logging/sawmilling project; a secondary project will be the construction of an airfield (subject to approval from CAD, MOPW).

### 6.2 RTI's logging & sawmilling project

#### 6.2.1 Overview

RTI will invest US\$ 2.8 million to set up and implement its integrated logging and sawmilling operations. The operations will be geared to produce 17,500m<sup>3</sup> of logs from an area of 2,100ha each year, in line with GFC's forest management prescriptions, and in full compliance with the provisions of RTI's *Environmental Authorization*.

RTI will run a two-phased operation, producing both logs and lumber, in line with marketing requirements. For example, timber species for plywood production will be extracted as logs. The determination of RTI's product mix *over the next two years* will depend on the upgrade of the barge plying the Puruni Crossing or the availability of a bridge at that location. All logs and lumber produced at the concession area will be brought to Iteballi for transshipment by barge to Georgetown or other point of sale or processing. RTI will of course consider the feasibility of transporting *lumber* by road directly from Iteballi to Georgetown.

In pursuing timber harvests, RTI is guided by its principles, including:

- a) **Optimum production.** RTI will harvest the forest at an optimum, but sustainable level in line with criteria agreed with GFC and set out in the company's FMP.
- b) **Optimal use of technology.** RTI will optimize the use of available technology to enhance the efficiency of its fieldwork and the quality of its timber output.
- c) **Multiple use of forest resources.** RTI recognizes the rights of Indigenous peoples, miners, and other persons to the use of the forest resources on the concession area. RTI will protect any assets with Indigenous and archaeological significance. RTI will also foster a shared responsibility for RTI's logging roads.

#### 6.2.2 Core Forest management parameters

The parameters that guide RTI's operations area as follows:

- |                              |  |
|------------------------------|--|
| a) Concession area           | 107, 670.54 ha   |
| b) Felling cycle             | 25 years   |
| c) Sustained yield           | 8.33m <sup>3</sup> /ha   |
| d) Biodiversity reserve      | ≥3105.45 ha ( <i>actually, RTI has set aside a provisional area of 3,931.72 ha</i> ) |
| e) Available productive area | 52,723.56 ha   |
| f) Total stock available     | 439,188.05 m <sup>3</sup>  |
| g) Annual allowable area     | 2,108.95ha   |
| h) Annual Allowable Cut      | 17,567.52m <sup>3</sup> .  |

#### 6.2.3 Preparatory work

RTI's first actions on receipt of a large concession would be to:

- a) Develop a temporary field camp and transfer core logging and equipment at hand (see Tables 8 and 9) to the concession area.

Table 8: List of RTI's Core Logging Equipment at hand

Item No.	Type/Unit	Model
1	Bulldozer (2)	D6D/H Caterpillar
2	Skidder (3)	CAT 528 /C
3	Chain Saw (6)	2@070 AV STIHL, 4@066 Stihl
4	Wheel Loader (2)	966F Caterpillar
5	Pickup (2)	4x4 Toyota Twin Cab
6	Log Trucks (2)	6x6 Mack Truck
7	Lumber Trucks (3)	6 x 6 Mack Trucks

Table 9: List of RTI's Core Sawmilling equipment at hand

Category	Remarks
Brand	Wood Mizer
Model	LT70HDD62-RX sawmill
Motor	Caterpillar 62 hp Turbo Charged Diesel (4 cylinder, water-cooled)
Log capacity	36" diameter x 20'
Log Handling	Hydraulic Load, Level Clamp, Chain Turner
Feed System	12V Electric (3/4 hp)
Capacity	800 Board feet per hour
Operator Location	Walk, ride or movable remote station

- b) Recruit core staffs (see Annex VII) and organize appropriate training courses for them. The resources for the training will include standard operational procedures and policies being developed by the company, GFC's Code of Practice for Field Operations, and manuals for equipment at hand.
- c) Demarcate the boundaries of the concession and post sign boards at appropriate locations to assert ownership of the concession area.
- d) Organise and demarcate the four compartments already determined and the biodiversity reserve (See annexes XIV and XV,) and start/continue the block demarcation process (Figure 17).
- e) Start 100% inventory for blocks already demarcated.
- f) Conduct a detailed assessment of the current road network (based in part on topography, mining sites, and merchantable stocking).
- g) Develop RTI's base camp (after expensive surveys on flooding regime and considerations for potable water). (See Figure 18, Annex XXI)

- h) Identify points for permanent monitoring stations
- i) Conduct detailed surveys for the airstrip (see Figure 18)
- j) Prepare a forest management plan for a five-year period and an annual plan of operations.

#### **6.2.4 Base Camp, Forward Camp**

The base camp and the forward camps to be established at various points within the concession area represent major considerations for RTI due to their environmental footprint. Generic diagrams for the RTI's base camp, sawmill and the forward camp(s) are set out in Annexes XX, XXI and XXII).

#### **6.2.5 Field Operations**

Logging operations will be cyclic events (see Figure 19), merely occurring at different geographic locations.

The basic, routine activities will involve:

- g) Briefing sessions to help staff share responsibility for environmental management, overall compliance with forest management prescriptions and approved OSH practices. Frequent briefing sessions will also ensure that field operatives stay on top of emergency response measures.
- h) Putting in many survey lines (at least 20km/100 hectares) and conducting forest inventories (see species targeted at Table 10).
- i) Major earthworks: site preparation, road building, skid trail construction, laying out culverts and bridges and log/lumber depot construction.
- j) Stock map preparation, selection of harvesting stock, and tree marking.
- k) Selective and directional felling of trees, skidding logs to log markets, and conveying the logs to log markets or portable mill sites.
- l) Processing logs into lumber and sorting the lumber by species, dimensions, or product type.
- m) Hauling logs and/or lumber to timber/lumber depots to Iteballi and beyond.

#### **6.2.6 Forest Research**

RTI has a particular interest in surface water quality. RTI will make every effort to avoid polluting waterways and to drain any *shallow* ponds arising from mining activity. However, RTI will be willing to support research work targeting conservation of fresh surface water resources, providing such research is approved by the EPA and the GFC.

#### **6.2.7 Forest Monitoring**

Forest monitoring is at the heart of RTI's field operations (see Figure 19). Forest monitoring is critical for remediation works necessary after logging. RTI will hire a Forest Monitoring Manager and purchase state of the art equipment to aid the forest monitoring effort.

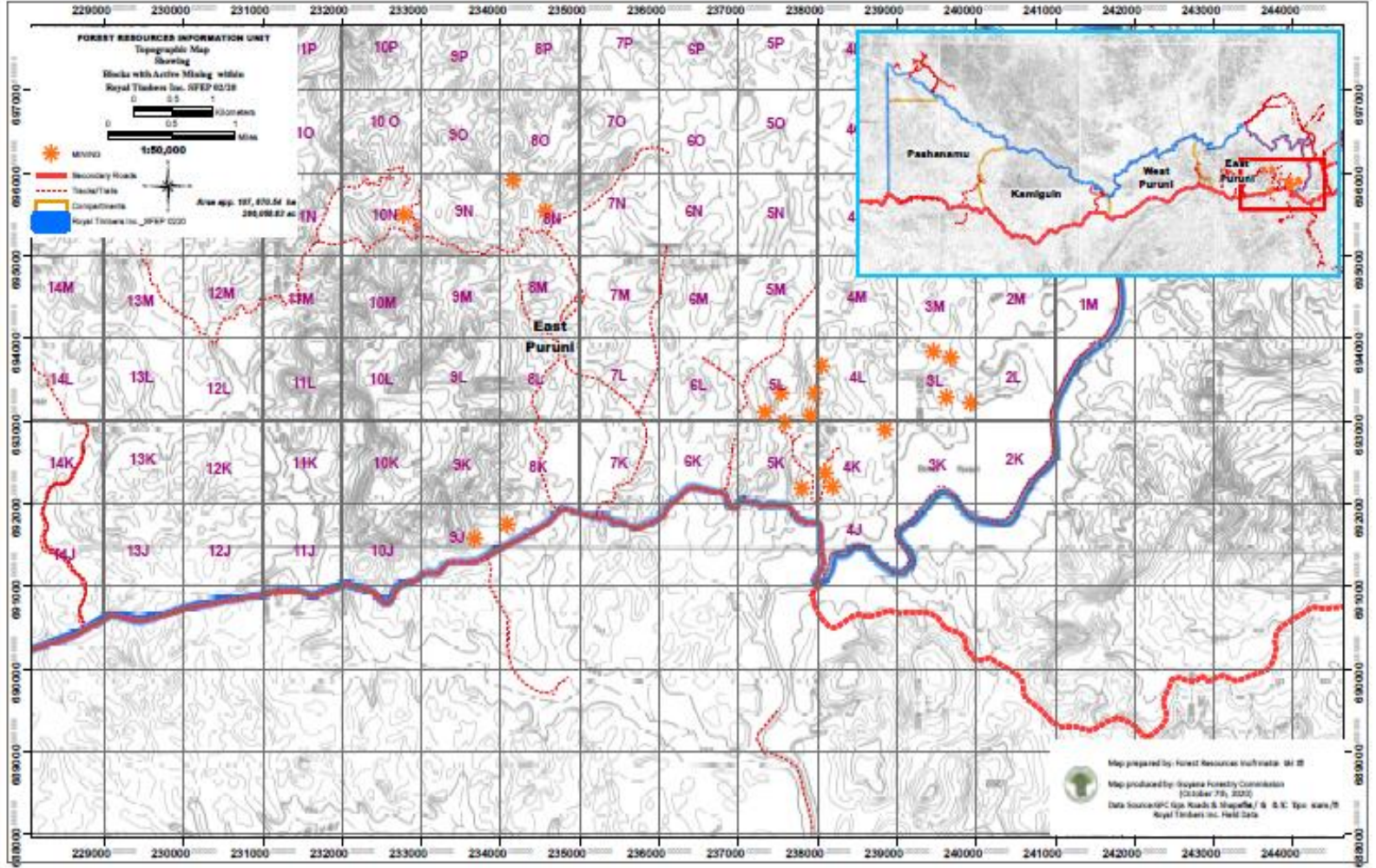


Figure 17: Illustrations of layout of 100m x 100m (10ha) blocks with alpha-numerical codes



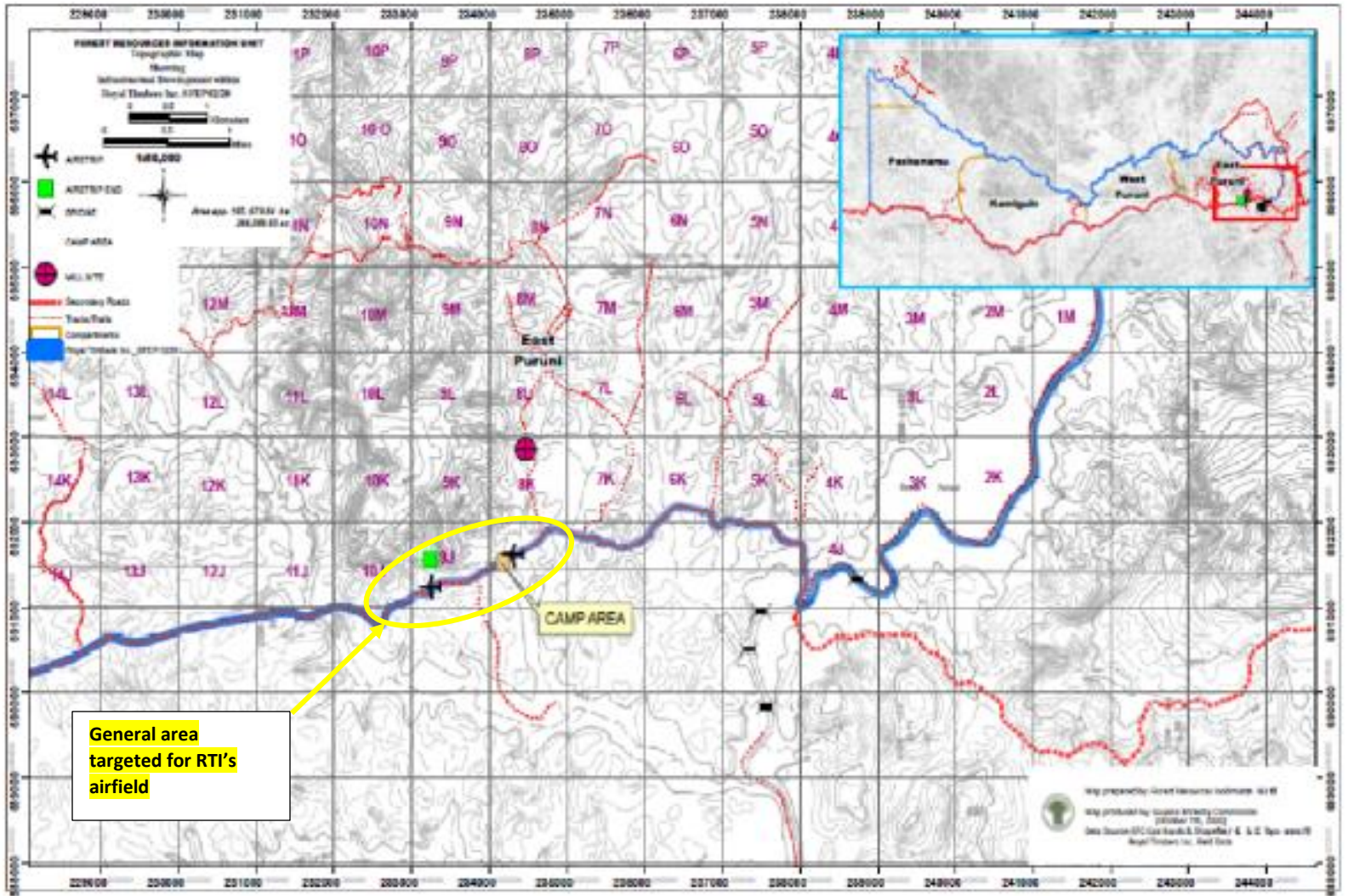


Figure 18: Map showing the proposed location of RTI's Base Camp & Airfield zone

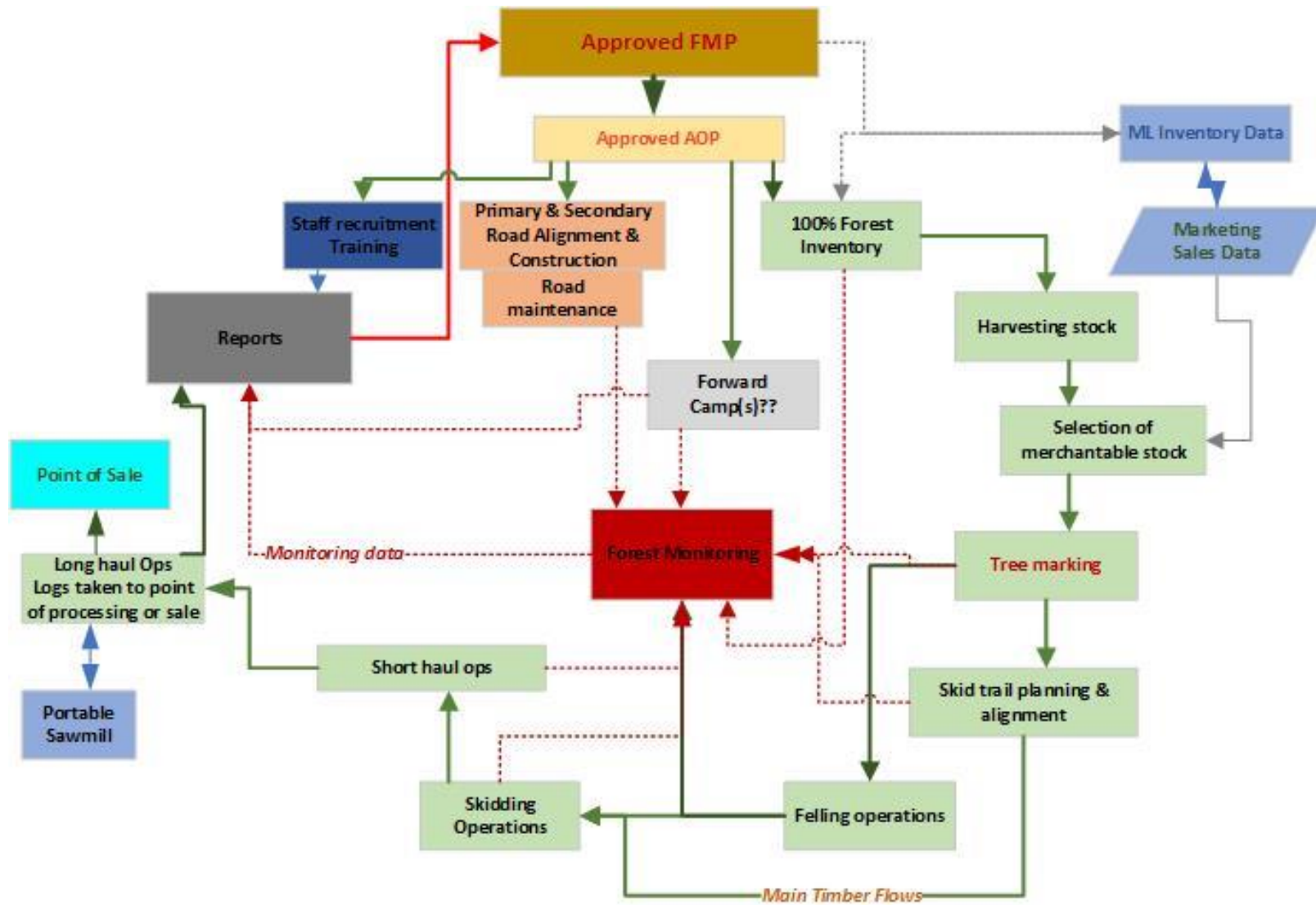


Figure 19: Chart illustrating the cyclic flow of RTI's annual field operations

Table 10: List of 32 species targeted by RTI

No.	Local Name	Scientific Name
<b>Lumber</b>		
1	Crabwood	<i>Carapa guianensis</i>
2	Huruasa	<i>Pithecellobium jupunba</i>
3	Purpleheart	<i>Peltogyne spp.</i>
4	Kabukalli	<i>Goupia glabra</i>
5	Locust	<i>Hymenea spp.</i>
6	Shibadan	<i>Aspidosperma spp.</i>
7	Tatabu	<i>Diploptropis purpurea</i>
8	Mora	<i>Mora excelsa</i>
9	Manni	<i>Symphonia globulifera</i>
10	Monkey Pot	<i>Lecythis davisii</i>
11	Greenheart	<i>Chlorocardium rodiei</i>
12	Washiba	<i>Tabebuia sp.</i>
13	Limonaballi	<i>Chrysophyllum pomiferum</i>
14	Tonka-bean	<i>Dipteryx odorata</i>
15	Silverballi	<i>Aniba ovalifolia</i>
16	Wamara	<i>Swartzia leiocalycina</i>
17	Morabukea	<i>Mora gonggrijpii</i>
18	Tauroniro	<i>Humiria balsamifera</i>
19	Bulletwood	<i>Manilkara bidentata</i>
<b>Plywood</b>		
1	Baromalli	<i>Catostemma spp.</i>
2	Maho	<i>Sterculia spp.</i>
3	Simarupa	<i>Simaruba amara</i>
4	Cedar	<i>Cedrela odorata</i>
5	Dalli	<i>Virola surinamensis</i>
6	Haiawa	<i>Protium spp.</i>
7	Karahoro	<i>Didymopanax morototoni</i>
8	Kurokai	<i>Protium decandrum</i>
9	Moraballi	<i>Pouteria minutiflora</i>
10	Barakairo	<i>Ormosia spp.</i>
11	Soap wood	<i>Pithecellobium spp.</i>
12	Cow-wood	<i>Bagassa tilifolia</i>
13	Futui	<i>Jacaranda copaia</i>

### 6.3 Establishment of an Airfield

#### 6.3.1 Overview

RTI plans to construct an airstrip on or adjacent to the concession area. The airstrip is a special project as it requires that any subterranean gold resources be locked down. (There are local cases where mining activity has approximated airstrips, jeopardizing their integrity; also, there are instances where logging roads have been shifted when gold was 'discovered' near to or under them). Therefore, consultations with the mining community and a suitable MOU or Agreement are a prerequisite for securing the 20ha required.

The reasons for the airstrip may be summarized as follows:

- a) To allow directors to visit the main camp: a trip by road takes about 8 hours under normal road conditions, in the rainy season this can easily extend to 10hours. Further a trip by road from Georgetown currently requires the use of three barges (across the Essequibo, Mazaruni and Puruni Rivers) in addition to the bridge across the Demerara River: all these crossings are very time-consuming events.
- b) To allow for the rapid conveyance of critical supplies, such as spare parts to RTI's operation centers.
- c) To allow for rapid evacuation of ill persons to medical facilities at Bartica or Georgetown.

RTI hopes that it can eventually extend its services to the wider community

### **6.3.2 Basic specifications for the Airfield**

All modalities and licences for operating airfields will require the approval of the Civil Aviation Department, Ministry of Public Works.

RTI intends to construct and maintain, an airfield non-towered airstrip in the vicinity of its main camp x) to support its logging operations. RTI proposes to start with an airfield, and then move on to an airstrip (with passenger accommodation and other amenities).

The runway will be 800 meters to accommodate Cessna 206, Britten-Norman BN2 Aircraft, Cessna 208 Caravan Aircraft, and SKYVAN aircraft all immensely popular in Guyana for use on unpaved surfaces. The airfield will require turning nodes of 25m x 25m at each end. Normally, the longitudinal grade for the airstrip will be about 2%

The total area for the airfield will be 1000m x 200m (20ha). This implies that the airstrip will occupy an area of a clearing of about 1000 m x 200 m (20ha).

Facilities for passengers will depend on stakeholders' interest in the facility.

### **6.3.3 Airstrip management**

RTI would take a decision about the way it would manage the airstrip and accommodate stakeholders' interest in the facility. Two immediate scenarios are normally used in rural areas or mining zones. Firstly, RTI can have scheduled passenger trips or cargo trips, allowing enough seats or space for other parties. The other option is to allow other parties to do their own independent charters and to pay a 'landing fee' every time the airstrip is used. In any event, RTI will have to add the management and maintenance of the airstrip to its administrative load. Initially, the Administrative Manager will be responsible for the airstrip.

### **6.3.4 Environmental considerations**

RTI considers the runway as a special road surface, duly compacted to accommodate the weight of loaded aircraft in a safe manner. Exceptional care will be taken to ensure that the runway has sufficient drainage features (grades and side drains) so that it remains dry at all times.

As far as possible, RTI will apply asphaltic to the runway itself, to improve its functionality; for example, it would be easy to add 'centre-line markings' or 'touch down zone markings.' Solar powered edge lights may be added if approved by the CAD.

## 7.0 WATER RESOURCES

### 7.1 Introduction

The availability of 'much water' is one of the defining attributes of the Guiana Shield (Hammond D. , 2005); and Guyana is defined by an abundance of water resources and wetlands, including rivers, streams, lakes, marshes and swamps (WWF-GUIANAS, 2012). While the low lying coastal plain of *Guyana* is characterised by special drainage structures and sluices to drain surface water and avoid flooding, inland conditions on the higher terrain south of the coastal plain are different.

The concession area is within the national *Physiographic Region Zone II, Interior Plains* which is characterised by 'enormous quantities of fresh water from April through August, and from November through January'; large quantities of fresh water are available for the remainder of the year **Invalid source specified..**

The primary natural surface drainage network, within the concession area, is shown in Figure 20: there are streams that flow directly in a general southerly direction to the left bank Mazaruni River, while others run in a northerly direction into the Puruni River-itself a major tributary of the (left bank) Mazaruni River.

### 7.2 Definitions and scope.

Water is important ecologically, for it is the medium in which many organisms live (Boyd, 2015). Forests are an integral part of the hydrological cycle: rain forest canopies *redistributes* rainfall: '*Interception*' refers to that fraction of rainfall reaching a forest canopy which is intercepted and evaporated; '*throughfall*' refers to rainfall that goes through the canopy and falls onto the forest floor; and '*stemflow*' refers to the fraction of rainfall that reaches the forest floor by flowing down the trunks of trees or the stems of other plants **Invalid source specified. .**

The following definitions are also useful:

(a) **Quantitative terms** (GL&SC, 2013).

Enormous quantities of water refer to discharge rates of >400,000 litres /min.

Very large quantities refer to discharge rates of 40,000 to 400,000 l/m.

Large quantities: refer to rates of 10,000-40,000 l/m.

(b) **Qualitative terms** (GL&SC, 2013).

*Fresh water*: maximum of dissolved solids <1,000 mg/l.

*Brackish water*: maximum >1,000mg/l but less than 15,000mg/l.

*Saline water*: TDS>15,000 mg/l

(c) **Water hardness** (GL&SC, 2013).

*Soft water*: 0-60mg/l

*Moderately hard water*: 61-120mg/l

*Hard water*: 121-180mg/l

*Very hard water*: >180mg/l C

(e) '**Soil Water balance**' refers to *the amount of water available at any given time in the soil: it is a function of primarily of precipitation, evapotranspiration, soil water storage and water surplus* (Strahler & Strahler, 1997)

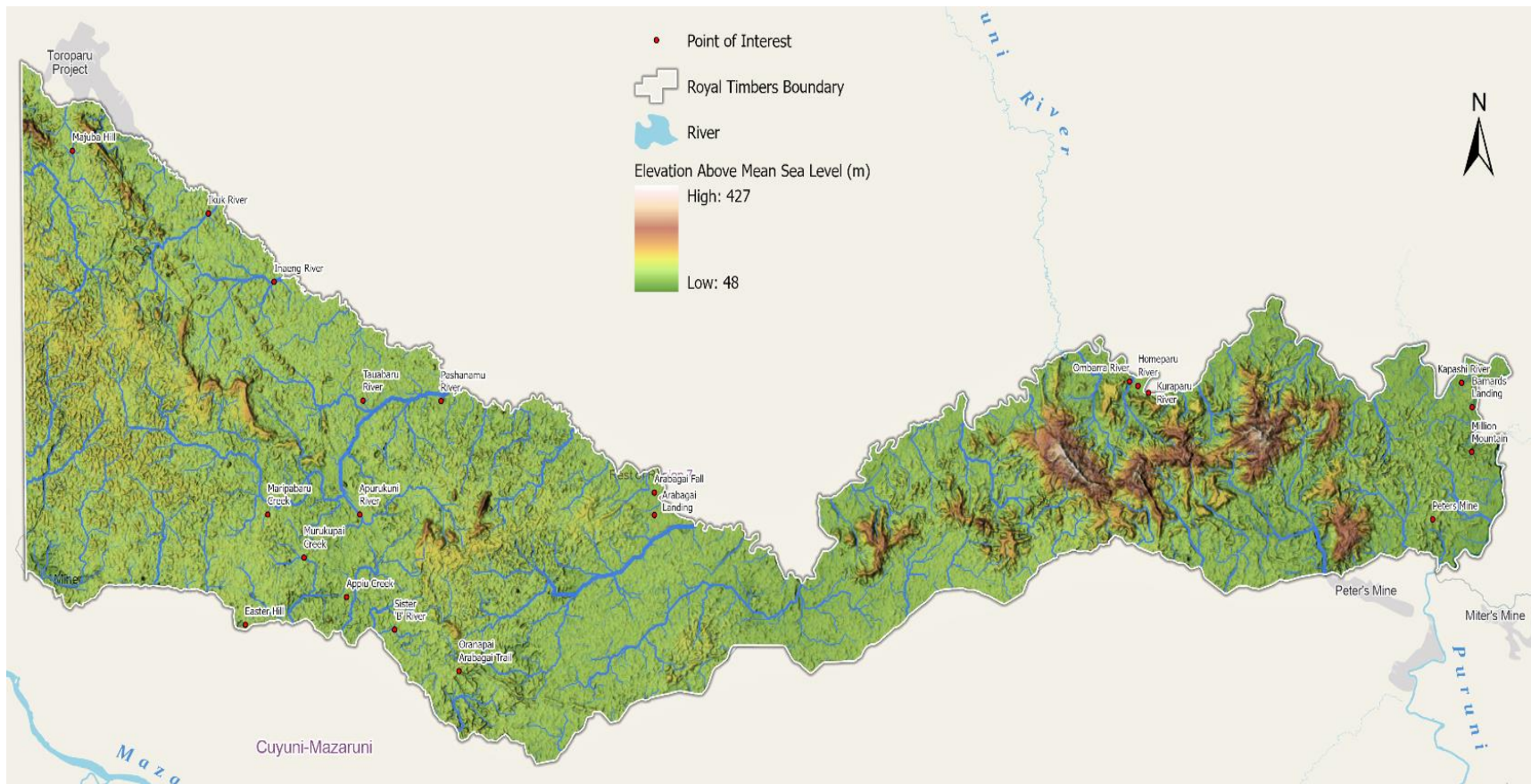


Figure 20: Map showing surface water drainage pattern for SFEP 2/2020

(f) **Water Quality Standards.** *‘Water quality standards are the quantitative values for acceptable ranges of physical, chemical, biological, and aesthetic characteristics of water (or criteria in stream classification standards, and other water quality standards’* (Boyd, 2015).

### 7.3 Legislation

**The Water and Sewerage Act, 2002** provides the following definitions:

a) *‘Surface water systems’* includes creeks and rivers.

b) *‘Water resources’* mean water systems, conservancies, canals, and all other water arising from rainfall or run off from the land that has been stored or captured within Guyana.

**The Water and Sewerage Act, 2002** provides for the setting up of the **Hydro Meteorological Department** whose functions include *‘to establish, manage, and operate national systems to monitor the availability, quality and use of surface water and ground water’*.

**The Environmental Protection (Water Quality) Regulations (Reg.6/2000)** (see Section 5.2.9.1) made under the provisions of the EPA Act 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.

### 7.4 Methodology for base line studies undertaken by RTI.

#### 7.4.1 Challenges

The consultants developed a sampling plan that targeted surface water sampling across the entire concession area. Also, the intention was that the sampling would be done in two phases: it emerged however that access to the upper right bank Puruni River was extremely challenging.

For the Puruni River, access along the river beyond Paiyuka Falls was unsafe, and not attempted. There is road access to Kumung-Kumung Landing, well above Paiyuka Falls, it is possible to rent a boat and traverse the river for about ten kilometres to Tumble Down Falls.

There are very few inland roads to access the western parts of the concession area and a couple of these ‘mining roads’ carry road barriers. (Naturally, the consultants were always on the quest to find anyone who knew of any road, trail, or path in the concession area).

Ground conditions did not allow for samples to be taken at the same location during successive visits, due to the erratic weather conditions, road conditions or flooding at sites (see Figure 21).

Prior to April 2022, when the consultants used an ATV, all prior sampling trips were aborted -due to poor road conditions or vehicular problems, and as a consequence the desired number of samples were not achieved. (In April 2022, eight sets of samples were recorded). In addition, the consultants imposed a 5-7-day on field trips, in order to ensure that water samples be delivered to Kaizen Laboratory in Georgetown not more than 4-5 days after their collection in the field.

#### 7.4.2 Water sample collection

This section refers to the single data set collected in **April 2022**; *this data set is unique in terms of the geographic range of the data, and the fact that data on mercury was collected for the first time. For parameters such as pH and water temperature, comparative data based on smaller data sets collected at the concession area and other points near to the concession area are presented.*

Most of the waterways sampled were in marsh forests: the typical tree species present were Trysil (*Pentaclethra maculosa*), Crabwood (*Carapa guianensis*), Dalli (*Virola surinamensis*), Manni (*Symphonia globulifera*), Ite palm (*Mauritia flexuosa*) and Manicole palm (*Euterpe edulis*). (Soil

samples-(see Section 8.0) and air quality samples (see Section 9.0) were also taken with a 10m radius of the points at which the samples were taken.

Samples of creek water were collected using **new**, wide mouth polypropylene bottles<sup>14</sup> (see Figure 22). Bottles are discarded after use; they are never reused or recycled. Once the proper notation was placed on the bottles, they were stored in a cooler with ice for the trip to Georgetown. Trips were organized in such a way that water samples were not stored for more than four days, and special arrangements were put in place to deliver the water samples to Kaizen Laboratory within a few hours of the consultants' arrival in Georgetown. The EES group has the capacity to undertake several tests *in situ*.



Figure 21: Sediments on a leaf indicating the height of flood waters, Kumung-Kumung River



Figure 22: Photo showing sampling operations for surface water

<sup>14</sup> These were sourced from either Kaizen Laboratory or Gaffons Industries Ltd; in the rare case that the bottles were not available, ordinary new water bottles-based on advice from Kaizen Laboratory - were sourced from Weiting & Richter Ltd.



Ideally, samples should be collected in the dry season and the wet season, however access options-based on road conditions, are the main factors that determine the time for sample collection.

Two sets of water samples were taken at each of the eight sampling points reported. One set was used for in situ analysis of parameters such as temperature, pH, and turbidity. The values for the respected parameters as recorded by Jamal Lewis are reported in Table 11. The other set of samples for each location were taken to KAIZEN Environmental Services (Guyana) Inc.'s for analysis of parameters such as pH, Chemical Oxygen, Total Suspended Solids; the values for each parameter are reported in Annex XXIV. The locations of the samples are shown in Annex XII.

EES follows the manufacturer's instructions to the letter in order to calibrate the instruments that they use.

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, Temperature, Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Oil and Grease, Turbidity, Electrical Conductivity, Total Nitrogen, Nitrate and Phosphate Ions were taken to assess the spatial changes of the quality of water.

In the absence of a specific national standard on surface water quality, comparison was made with the Guyana National Bureau of Standards (GNBS) for Industrial Effluent Discharge (see Table 12) as well as internationally acceptable limits from the US-EPA, 1986 standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife, the World Bank Group International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines for Wastewater and Ambient Water Quality, and European Union (EU) 1998 Drinking Water Standards (see Table 13).

Table 11: Water Quality Data Report (EES)

Page 1 of 3

<b>Distribution of copies:</b> EES Office File Records		<b>Sheet No.</b>
<b>1. General</b>		
<b>Location (Site):</b> Royal Timbers	<b>Samplers:</b> Company Staff	
<b>Sample Date:</b> April 11-15, 2022	<b>Observer:</b> Company Staff	
<b>Measurement Duration:</b> 5 days	<b>Sample Type:</b> Surface water	
<b>2. Field Observations</b>		
<b>Current Weather</b>	Sunny Weather Conditions.	
<b>Relative Humidity</b>	Relative Humidity average of 68.97 %.	
<b>Ambient Temperature</b>	The Ambient Temperature Reading was between <b>19.3 °C to 27.5 °C.</b>	
<b>Description of Location</b>	<u>Description of area where Samples were taken/read:</u> The samples were taken around and within the boundaries of the concessions to investigate the environmental conditions. The test results represent the effluent or discharge points that may have pollution. The test results are shows in the following table.	

Water Parameters/ Data Results																	
Sample ID	Date	Location UTM 20N/21N	Time	BOD mg/L	COD mg/L	DO mg/L	O & G mg/L	Temp °C	pH	Cndtv. µS/cm 0-2000	Tbdty FAU	TSS	TDS ppm	Total N mg/L	NH <sub>3</sub> mg/L	Total Mercury	F/RATE m/s
RT1	12-04-22	0831829, 0689631	3:28	12.1	20.4	3.7	0.40	25.1	8.69	82	26.3	38	18	22	3.2	<0.0005	0.002
RT2	12-04-22	0177378, 0688284	4:27	10.6	18.3	5.0	0.20	19.3	8.54	48	28.2	36	10	20	1.6	<0.0005	0.005
RT3	13-04-22	0228183, 0691839	2:33	11.5	10.16	6.65	0.40	24.3	6.81	86	27.5	10.4	19	36	2.8	<0.0005	0.007
RT4	13-04-22	0228190, 0691834	5:31	10.3	12.13	5.0	0.40	23.4	6.13	68	22.5	8.6	14	42	1.6	<0.0005	0.004
RT5	14-04-22	0201471, 0689761	9:01	11.2	14.28	5.3	0.40	23.2	5.72	52	25.0	18	11	32	3.9	<0.0005	0.006
RT6	14-04-22	0198180, 0691917	10:09	4.76	12.9	6.23	0.20	27.5	6.2	70	27.2	26	16	26	4.0	<0.00090 1	0.356
RT7	14-04-22	0215370, 0691184	3:22	6.54	16.7	6.6	0.20	24.3	7.32	69	24.8	22	16	22	1.8	<0.0005	0.26
RT8	14-04-22	0219645, 0694211	4:16	14.2	18.0	6.4	0.40	23.6	6.4	48	26.8	34	11	33	2.4	<0.0005	0.031

**1. Standards and Guidelines: Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.**

Parameter	Guideline	Guideline Colour Identification
Temperature (T)	<40°C	Below Guideline Value
pH	6.0-9.0	
Total Suspended Solids (TSS)	<50 mg/L	Boundary Guideline Value
Chemical Oxygen Demand (COD)	<250 mg/L	
Biological Oxygen Demand (BOD)	<50 mg/L	
Ammonia (NH <sub>3</sub> )	< 5 mg/L	Above Guideline Value
Total Nitrogen (TN)	< 50 mg/L	
Oil and Grease	< 10 mg/L	

**Test Methods**

**Biological Oxygen Demand (BOD):** SMEWW 5210 B

**Chemical Oxygen Demand**

**Oil & Grease:** USEPA 1664

**Total Suspend Solid (TSS):** Photometric

**Total Nitrogen:** Persulfate Digestion Method


**Ammonia:** Chromotropic Acid

**pH, Conductivity, Turbidity, Temperature, TDS:** Optical Sensor

**Comments and Recommendations**

- No constrains during the survey.
- The values represent the current state of water quality within Royal Timbers. When compare with the Standards (Guidelines), the result shows values below Guyana National Bureau of Standards Interim Guidelines.

**Report Authorized by:**  
**Isidro Espinosa (Director)**



**Date:** May 23, 2022

Table 12: GNBS: Standards for Industrial Effluent Discharge

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 NH3	Total N	P	CN (Tol.)	P04	C1	Surfactant	Phenols	Coliform	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 and 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 and 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 and 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; Cl: 300; NH4 as N:1.0

Sector	pH	Temp	BOD5	COD	DO	TSS	N as NH3	Total N	P	CN (Tot.)	P04	C1	Surfactant	Phenols	Coliform	O & G	Other and/or Comments
Petroleum bulk terminal	5.0-9.0	<40	<50	,250		<100										TPH:<40	Pb: 0.1, Cr GT 0,.1 Cr (+A) 05
Printers and 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										
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 detergents	<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.

Table 13: US EPA Standards for Recreation, propagation, and maintenance of a healthy, Well-balanced population of fish and wildlife.

*(a) Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife*

<b>Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife</b>		
<b>Parameter</b>	<b>Fresh</b>	<b>Marine</b>
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

***(b) World Bank Group International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines for Wastewater and Ambient Water Quality***

<b>Pollutants</b>	<b>Units</b>	<b>Guideline Value</b>
pH	pH	6 - 9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and Grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform Bacteria	MPN / 100 ml	400

***(c): European Union (EU) 1998 Water Standards***

<b>Pollutants</b>	<b>Units</b>	<b>Guideline Value</b>
Electrical Conductivity	μS/cm	2500

## 7.5 Results and Discussion

### 7.5.1 Overview

For the results of the surface water quality analysis conducted for RTI's forest concession, the parameters analysed were within the acceptable range in comparison with the standards and guidelines mentioned above (Tables 12, 13).

### 7.5.2 Significance of values

- **PH** - The pH analysis of the surface water samples collected within and around the RTI' concession during the dry season ranged from 5.72 to 8.69 (see Table 11). However, the pH parameters were within the limits (5.0 - 9.0 pH) GNBS Guidelines for Industrial effluent into the Environment as well as the US-EPA and World Bank Group IFC EHS Guidelines.

*For comparative purposes, a review of values for this parameter, for 14 other samples, taken in the Puruni Watershed taken September 2020 and September 2021 respectively indicated a pH range of between 6.2 and 9.81, and a mean pH value of 7.26. For the subset taken in September 2021 within RTI's concession, the range was 6.2 to 6.51, with a mean pH value of 6.33.*

- **Water Temperature**– The surface water temperature reading ranged from 19.3 to 27.5°C. All values are within the GNBS accepted range of <40 °C, which is considered healthy for living organisms.

*For comparative purposes, a review of 14 other values taken within and near to the concession area showed a temperature range of 23.5°C to 34.3°C. For the subset values taken with RTI's concession in September 2021, the range was 25.0°C to 26.7°C.*

- **BOD (Biochemical Oxygen Demand)** – BOD levels of the surface ranged from 4.762mg/l to 14.2mg/l and were all within the GNBS accepted range of <50 mg/l as well as the World Bank Group IFC EHS Guidelines of 30 mg/l. (Please see Annex XXIV).
- **Total Suspended Solids** - TSS results of the surface water samples ranged from 8.6 to 38.0 mg/l. (average 24.125 mg/l) Indicating that the water samples were below the GNBS (<50 mg/l) Guidelines as well as the World Bank Group IFC EHS Guidelines of 50 mg/l, indicating high content of suspended particles as natural condition of water within the concession. *The suspended particles are likely to be related with organic matter decomposition and high content of sediment driven by the water flow.*
- **COD (Chemical Oxygen Demand)** COD levels of the water samples ranged from 10.16 mg/l – 20.4 mg/l (average 15.35875 and were all within the GNBS accepted range of <250 mg/l and the World Bank Group IFC EHS Guidelines of 125 mg/l.
- **Oil and Grease (OG)** - OG levels of the water samples ranged from 0.20 mg/l – 0.40 mg/l (average 0.325 mg/l) and were within the GNBS and World Bank Group IFC EHS limits of <10 mg/l. Monitoring indicated that OG concentration present in the surface waters of the RTI concession were within the accepted limits. Figure 23 indicates practices that may lead to elevated values for this parameter. (Please see Annex XXIV).





Figure 23: Current practices contributing to oil and grease in waterways in the concession area

- **Turbidity**- The turbidity level of the water samples ranged from 22.5 to 28.2 ntu (average 23.0675 ntu). Therefore, the turbidity levels of the water samples were all above the accepted 10 ntu GNBS standards, due to the soil being rich in organic matter-the normal forest conditions, as well as the particulate matter in streams near to mining operations. *High turbidity levels were expected because of heavy rainfall in April 2022. The heavy rain led to accelerated erosion of the roadway.* Also, frequent boat movement in shallow water keeps agitating the water and sediments on the stream bed.
- **Electrical Conductivity**- Electrical Conductivity of the surface water samples within the RTI area ranged from 48 - 86  $\mu\text{S}/\text{cm}$  average 65.375 and were all within the European Union (EU) standards for drinking water i.e., 0 - 2500  $\mu\text{S}/\text{cm}$ . Most streams range between 50 to 1500  $\mu\text{S}/\text{cm}$ . Freshwater streams ideally should have electrical conductivity ranging from 150 - 500  $\mu\text{S}/\text{cm}$  to support aquatic life.
- **Total Nitrogen**- Total Nitrogen highest concentration ranged from 20-42 mg/l; average 29.175 mg/l; concluding that all values were all below the World Bank Group IFC EHS Guidelines of 10 mg/l.
- **Nitrates**- Nitrate levels of surface water samples ranged from 1.6-4.0 mg/l; average 2.6625 mg/l and therefore were all within the accepted range of 10 mg/l.
- **Total Dissolved Solids (TDS)** - All sources of natural water contain minerals. These minerals characterise the total dissolved solids in inorganic form or salts like potassium, calcium, magnesium, chlorides, bicarbonates, and sulphates. Heavy metals may be present too but normally in low concentration from natural sources. During the surveys, the values found ranged from 10-19 ppm, average 14.375.
- **Mercury**  
*The values for total mercury ranged from 0.0005-0.0009 mg/l (please see Annex XXIV).*

## **7.6 Impact prediction and assessment**

### **7.6.1 Overview**

From a logging perspective, most impacts on water resources are likely to emerge from three situations: erosion due to earthworks necessary for road construction and road maintenance, skidding logs, and the (accidental) release of pollutants such as oil and grease on the forest floor.

### **7.6.2 Impacts from earthworks.**

Earthworks include grubbing roadways-felling trees then bulldozing stumps, and excavation works for side drains, culverts, bridges and borrow pits.

The hydrological balance in watersheds depend on the nature of the vegetative cover and capacity of the soil to retain water. According to ter Steege et al (1996) the removal of trees during road construction disrupts both the interception of rainfall and the opportunity for plant debris on the soil surface to trap moisture; further grading soil removes root masses and soil fauna which are responsible for soil porosity. Ter Steege et al argue that in respect of changes to the hydrological balance, both interception and uptake are reduced to zero. Soil porosity is further reduced by compaction which in turn is due to deforestation (D'Almeida et al, 2006; ter Steege et al 1996).

### **7.6.3 Impacts from Skidding**

Skidding is responsible for residual stand damage which impacts forest degradation, soil scouring and soil compaction and therefore the hydrological cycle; less skidding will lead to less compaction (Ter Steege, 1996); (van der Hout, 1999).

### **7.6.4 Impacts from oil spills, other pollutants**

In the use of heavy-duty machines in logging, it is possible to inadvertently spill oils, fuel, and grease. During logging, the accumulation of small spills during routine operations, may seriously contaminate soils and drainage water; all oils, especially diesel migrate quickly through the soil.

## **7.7 Mitigation and monitoring**

RTI is committed to conserving water resources within the concession area, and conservation measures will be mentioned at every briefing session for field operatives. The Forest Monitoring Officer will be tasked to provide briefing sessions to all employees to instil in them the need to think about conservation of the environment generally and the conservation of water resources.

The company plans five key initiatives to translate its concerns into action (please also see Table 14).

- a) **Adherence to the COP:** Guidelines of the COP will be followed to the letter: specifically, Sections 4.4.1-4.4.4 which refers to prescribed buffer zones along waterways; Section 5- '*Construction of road network, drainage structures, and water course crossings*', Section 8- '*Operational Hygiene*', and Section 9 '*Camp Hygiene*' will be followed to the letter. At no time whatsoever will any vehicle be washed in natural waterways.
- b) **Planning versus weather sensitive events:** All earthworks and skidding operations will be planned with great care to reduce the deployment of machines. RTI will avoid road construction and road maintenance works during the rainy season.

- c) **Side drains:** RTI will take measures to avoid water running from roadside drains directly into streams; the more customary practice is to channel storm water into pits ('dead sumps') at roadside to allow the storm water to infiltrate into the soil rather than flow over land. Another option is to lead the run-off to masses of vegetation, leaf litter or rocks which would help filter out the sediment.
- d) **Permanent Monitoring Stations:** Initial plans targeted sites close to the mouth of the main rivers. The eight sites sampled in April 2022 will for now, represent the initial locations for PMS. Water samples will be taken quarterly, guaranteeing samples during dry spells and during the rainy season.

The forest monitoring manager will be responsible for water conservation practices. Technical inputs will be sought from a duly qualified consultant to retrieve and interpret water quality data.

Table 14: Water quality monitoring plan for RTI

ACTIVITY	INSTITUTION (S) RESPONSIBLE	FREQUENCY OF MONITORING	LOCATION OF MONITORING
Conduct 'Environmental Awareness sessions' for all field operatives using GFC's Cop.	RTI (Forest Monitoring Officer)	Quarterly	Base Camp
Avoid earthworks during the rainy season.	RTI (Forest Monitoring Officer)	(Several times during the rainy season)	Roadways
Surface water drainage off roads, log markets and other clearings;	RTI (Forest Monitoring Officer)	Wet season	Roads, skid trails & log markets
Cleaning of drainage structures (bridges, culverts) along roads and skid trails;	RTI (Forest Monitoring Officer)	Quarterly	Roads, skid trails & log markets
Observance of the integrity of buffer zones along water ways	RTI (Forest Monitoring Officer)	Quarterly	Current work areas re (AOP)
Data Collection at Permanent Monitoring Stations	RTI (Forest Monitoring Officer)	Quarterly	Permanent Monitoring Stations
<b>Requirements</b> Transportation (ATV), GPS Device, Water bottles, Laboratory Services BUDGET G\$2,000,000.00 per annum (including costs for laboratory analysis).			

## 8.0 SOILS, LAND & GEOLOGY

### 8.1 Overview

The prevailing geology, soil type and landform are critical considerations in planning logging activities. There is substantial correlation between soil type, the natural floristic composition, and the occurrence of timber species for any given area: for example, root depth and morphological plant features such as buttresses and stilt roots indicate special adaptations to soil and landform. As edaphic characteristics of the soil vary, so do the forest features **Invalid source specified..** Variations in forest formations are linked to geology which manifests itself in several ways relating to topography and to the chemical and physical properties of the soil **Invalid source specified..**

‘Soils are a key reservoir of global biodiversity which ranges from microorganisms to flora and fauna. This biodiversity has a fundamental role in supporting soil functions and therefore ecosystems goods and services associated with soil. Therefore, it is necessary to safeguard soil biodiversity to safeguard these functions’ **Invalid source specified..**

The earthworks necessary to construct forest roads for timber harvesting operations coupled with log skidding operations produce considerable impacts on soil, the major impact being **soil compaction**. Soil compaction decreases the volume of macropores and consequently alters soil structure, penetration resistance, soil pore distribution and bulk density **Invalid source specified..** John Hendrison on researching problems with soil compaction on a logging concession in Suriname, reported that after four passes of a skidder on a particular parcel of soil, its bulk density changed from  $1.25 \text{ g m}^{-3}$  to  $1.60 \text{ g m}^{-3}$  (Ter Steege, 1996)

Soil conservation practices inform many of the prescriptions in GFC’s COP: for example, Section 5.4 Road Construction and Section 9.3 Water ponding. Similarly measures such as those prescribed in Section 8.0: ‘Operational Hygiene’ of the GFFO, speak to the conservation of water resources through proper soil protection and soil conservation practices.

### 8.2 Definitions and scope

Geology refers to the science of the solid earth, including the earth’s origin and history, materials comprising the earth, and the processes acting within the earth and upon its surface (Strahler & Strahler, 1997).

Soil is the natural terrestrial surface layer containing living matter and supporting or capable of supporting plants (Strahler & Strahler, 1997).

### 8.3 Baseline information

The entire concession area is part of the local, natural physiographic region designated as *Crystalline Shield Uplands* characterised by highlands, mountains, and plateaus (GL&SC, 2013).

From a lithological perspective, GL&SC (2013) categorizes the geology of the concession area as partly Lower Proterzoic Supracrystals, characterised further by the *Barama-Mazaruni super group* comprising Greenstone Belts-metasedimentary and metavolconic lithology together with younger granites of the Trans Amazonia Tectonic-Thermal event. The Greenstone belts are a major resource for gold mining operations.

Turning to soil types, detailed thematic soil maps (see Annex XI) available at the GFC indicate that Kanhapludults constitute 96.0 % of the soil types on the concession area (see Table 15). Kanhapludults are deep, well drained soils with slight to high erosion hazards.

Table 15: Soil types, etc., based on GFC's soil maps for SFEP 2/2020.

#	DESCRIPTION	AREA (HA)	%	REMARKS
2	Kanhapludults	103,744.71	96.0	Very deep, well drained soils, slight to high erosion hazard
4	Ustochrepts	3,928.99	4.0	Very deep, well drained soils, slight erosion hazard
<b>TOTAL</b>		<b>107,673.70</b>	<b>100.0</b>	

#### 8.4 Methodology

The consultants collected and analysed eight soil samples during the last visits to the concession area in April 2022. The area selected for each sample was first cleared of litter and then the samples were collected at a depth of about 15cm. Samples were stored in Ziploc bags pending analysis.

#### 8.5 Results

The basic results for the initial data for period September 24-29, 2020, are summarized in Table 27. Soil samples were collected in the vicinity of waterways and those reflected darker hues and higher levels of organic content, than soils at other altitudes that were characterised by a yellow or red colour at other locations (see Figure 24).









Figure 24: Typical colour of soils in the concession area.



#### 8.6 Impact Statement and Assessment

Logging produces physical damage and erosion hazards due to the passage of heavy-duty vehicles that compact topsoil during the skidding of logs and earth works linked to road construction. **Invalid source specified..**

Table 16: Table Soil type classification report (EES).

<b>Distribution of copies:</b>		Isidro Espinosa EES Office Files	<b>Sheet No. 807</b>
<b>1. <u>General</u></b>			
<b>Location (Site):</b> Royal Timbers		<b>Sampler:</b> Jamal Lewis	
<b>Sample Date:</b> April 11-15, 2022		<b>Observer:</b> Biodiversity and Forestry Team	
<b>Measurement Duration:</b> 5 days		Sample Type: Outdoor/ Soil	
<b>2. <u>Field Observations</u></b>			
<b>Current weather:</b>	<input type="checkbox"/> Rainy	<input type="checkbox"/> Stormy	<input checked="" type="checkbox"/> Sunny
	<input checked="" type="checkbox"/> Hot	<input type="checkbox"/> Cold	<input type="checkbox"/> Dry
			<input type="checkbox"/> Cloudy
			<input type="checkbox"/> Wet
<b>Relative Humidity:</b>	Average Relative Humidity during the survey was 68.97 %.		
<b>Ambient Temperature:</b>	The Ambient Temperature Reading was between 68.97		
<b>Description of Location:</b>	Description of area where Samples were Taken/Read: Samples of soil and measurement of moisture content were taken within the <b>Royal Timbers</b> logging concession.		
<b>1. <u>Measurements (Data)</u></b>			
<i>Initial Soil Type Classification</i>			

Sample ID	Collection Date	Location UTM 20N/21N	Time 24hrs.)	SOIL Description				Photo of soil samples
				M/C %	Texture	Consistence	Colour	
RT-01	12/04/2022	0831829, 0689631	15:28	14.8	Loamy/soft	Soft/loose	Dark brown: organic soil	
RT-02	12/04/2022	0177378, 0688284	16:27	11.7	Organic material/Sandy	Friable/firm	Black: contains some organic	
RT-03	13/04/2022	0228183, 0691839	14:33	14.6	Loamy/soft	Soft/loose	Dark brown: organic soil	
RT-04	13/04/2022	0228190, 0691834	17:31	10.9	Organic material/Sandy	Loose/weak	Dark brown: organic soil/sandy	
RT-05	14/04/2022	0201471, 0689761	9:01	12.6	Soft	Soft/loose	Dark brown: organic soil	
RT-06	14/04/2022	0198180, 0691917	10:09	18.5	Loamy/soft	Soft/loose	Dark brown: organic soil	

Sample ID	Collection Date	Location UTM 21N	Time 24hrs.)	M/C %	Texture	Consistence	Colour	Photo of soil samples
RT-07	14/04/2022	0215370, 0691184	15:22	16.6	Soft	Soft/loose	Deep brown: organic soil	
RT-08	14/04/2022	0219645, 0694211	16:16	18.9	Organic material/Sandy	Friable/firm	Black: contains some organic	

### 2. Comments

- Soil moisture content can be determined by the 'feel' of the soil in the hand. It will vary over time depending on rainfall or irrigation frequency and proximity to the water table.
- Soil texture is determined by the proportions of organic material, sand, silt, and clay in a soil. If a soil is dominated by decomposed plant fibers, then it is called an organic soil (commonly known as peat). Mineral soils generally have a small amount or no organic material, and are composed of sand, silt, and clay.
- Soil consistence describes the strength and coherence of a soil.
- Soil colour is an easily observed characteristic for determining distinct types of soil materials. Usually, Munsell colour charts are used to place a soil into a colour grouping. For the purposes of this Soil Identification Key a few broad groups were used. Source: Field Manual for Soil Type Identification (2018).

### 3. Personnel

Sampled by Jamal Lewis. Checked By: Isidro Espinosa

Date: May 23, 2022





## 8.7 Mitigation measures

The **forest monitoring manager** will be responsible for overall soil conservation practices.

RTI's efforts to manage water and waterways are also linked to soil conservation and the two activities will be done at the same time.

Other specific actions will be as follows:

- a. All interventions will be planned so that heavy-duty machines will impact the minimal distance possible and for the minimal time possible; major road works will be limited to the dry season. (*Only emergency interventions will be scheduled during the rainy season*).
- b. Soil samples will be taken and analysed at the same time as the water samples from the PMS.
- c. Staff will be briefed quarterly on the need for proper soil and water conservation practices.
- d. RTI will post signs (see Figure 25) at workplaces to remind staffs about environmental conservation.



Figure 25 Typical aids for nurturing employees' behaviour in relation to soil conservation.

## 9.0 AIR QUALITY

### 9.1 Introduction-Air quality

Air pollution is the single largest health risk in Europe with around 400,000 premature deaths attributable to air pollution in Europe in 2018 ( (European Environmental Agency, 2020).

In the pursuit of its general logging operations RTI's vehicles will be emitting exhaust fumes and creating dust clouds while traversing roads within and beyond the concession area. Air quality is a major concern for RTI as it addresses air pollution hazards confronted by its employees and other persons and fauna in the vicinity of its operations.

### 9.2 Definition and scope

**Air pollution** may be defined as the contamination of the atmosphere by gas-phase and particulate phase substances that results in adverse or undesirable environmental effects (Godish, Davis, & Fu, 2015).

'Air pollution may be divided into *natural air pollution* and *anthropogenic air pollution*. Natural air pollution may arise from wildfires, plant and animal decomposition, pollen, and spores and even soil erosion. Anthropogenic air pollution arises from human activity such as burning wood, gaseous pollutants from internal combustion engines and waste disposal, and noise' **Invalid source specified.**, (Godish, Davis, & Fu, 2015).

**Particulate Matter (PM)** – refers to a broad class diverse substances or particles suspended in air, also called aerosols, that are capable of entering and being deposited in the human respiratory system, and chronic studies have shown that long term exposure to particulate matter is associated with various cardiac and pulmonary health effects (Godish, Davis, & Fu, 2015). Particulate pollution may come from logging activities, mining operations, unpaved roads, and wind erosion.

Particles may constitute a wide range of chemicals; construction sites and unpaved logging roads are major sources of particulate matter in the atmosphere.

**Total Suspended Particulates (TSP)** - This refers to all particles in the atmosphere that are less than 100 micrometres per cubic meter. Smaller aerosols travel farther into the respiratory system and generally cause more health effects than larger particles: for this reason, the US EPA has divided airborne particles into two size particles, PM<sub>2.5</sub> which refers to particles  $\leq 2.5\mu\text{m}$  in diameter and PM<sub>10</sub> which refers to particles  $\leq 10\mu\text{m}$ **Invalid source specified.** PM<sub>2.5</sub> can absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs.

Particulate Matter guidelines and standards are instituted due to short term and long-term health effects. These health effects are especially associated with PM<sub>10</sub> and PM<sub>2.5</sub>. and therefore, PM<sub>10</sub> and PM<sub>2.5</sub>. are critical parameters used to assess air quality.

### 9.3 Air Quality Standards/Guidelines

The purpose of the ambient *air quality standards* is to establish maximum limits for air quality parameters considered desirable for public health. Air quality standards/guidelines are set by each country to protect the public health of their citizens and as such are a critical 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.

The parameters of primary focus for this assessment are that of Total Suspended Particulate (TSP), Particulate Matter (PM<sub>2.5</sub> and PM<sub>10</sub>), Formaldehyde (HCHO) and Total Volatile Organic Compounds (TVOC). High occurrences and changes in these parameters will aid in providing a good indication or assessment of air pollution that can affect the atmosphere and human health. Consequently, the

parameter measurements recorded were assessed in comparison with the USA National Ambient Air Quality Standards (NAAQS) (Table 17), the World Health Organization and EAS Inc. Indoor Air Quality Guidelines (Table 18).

Prior to the air quality assessment tasks in April 2022, there was no historical air quality data for SFEP 2/2020, save for a preliminary assessment of air quality in September 2021.

#### 9.4 Methodology/Monitoring Procedure

The Total Suspended Particulate (TSP) measurements were taken using the Thermo pDR-1000AN personalDataRAMTM Particulate Monitor (Figure 26).

TSP measurements, recorded in milligram per cubic meter (mg/m<sup>3</sup>), were taken at nine sample sites after a log interval of 5 minutes. 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/m<sup>3</sup>) 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/m<sup>3</sup>) to micrograms per cubic meter (µg/m<sup>3</sup>) were done by taking the milligrams per cubic meter (mg/m<sup>3</sup>) measurements x 1000 (Hedges 2004, p.23).

Micrograms per cubic meter (µg/m<sup>3</sup>) results were then compared to the United States Environmental Protection Agency (USEPA) 1971 National Ambient Air Quality Standards (NAAQS) for Particulate Matter, as a current TSP limit permissible utilized (See Table 18).

Quality assurance and quality control (QA/QC) was practiced, as well as routine parts of the air quality monitoring during the calibration, operation, and maintenance of the monitoring equipment.



Figure 26: Photograph of the Thermo pDR-1000AN personal DataRAMTM Particulate monitor used by EES.

Table 17: National ambient air quality standards (US EPA, 2016).

Parameter	Type	Averaging Time	Level	Form
<b>PM<sub>2.5</sub></b>	Primary	Annual	12.0 µg/m <sup>3</sup>	Annual arithmetic mean, averaged over 3 years.
	Secondary	Annual	15.0 µg/m <sup>3</sup>	Annual arithmetic mean, averaged over 3 years.
	Primary and Secondary	24-hour	35 µg/m <sup>3</sup>	98 <sup>th</sup> percentile, averaged over 3 years.
<b>PM<sub>10</sub></b>	Primary and Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over a 3-year period.
<b>Total Suspended Particles (TSP)</b>	Primary	24-hour	260 µg/m <sup>3</sup>	Not to be exceeded more than once per year.
		Annual	75 µg/m <sup>3</sup>	Annual geometric mean.
	Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year.
		Annual	60 µg/m <sup>3</sup>	Annual geometric mean.

Table 18: Indoor air guidelines for TVOC and HCHO (EAS Inc., 2015; WHO, 2010).

Parameter	Guideline		Notes
<b>TVOC</b>	0.3 mg/m <sup>3</sup>	300 µg/m <sup>3</sup>	Low Level of Concern
	0.5 mg/m <sup>3</sup>	500 µg/m <sup>3</sup>	Acceptable Level
<b>HCHO</b>	0.1 mg/m <sup>3</sup>	100 µg/m <sup>3</sup>	Short-term (30 min)

## 9.5 Results and Discussion

### 9.5.1 Overview

The Table 19 shows the results of Total Suspended Particulates (TSP) concentration, PM<sub>2.5</sub>, PM<sub>10</sub>, TVOC and HCHO taken within and around SFEP 2/2020. Table 26 below contains the Average Concentration, Time Weighted Average (TWA) and Maximum Concentration of the air quality during the monitoring period.

### 9.5.2 Total Suspended Particles

Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.). TWA of the monitored area ranged from 0.045 to 0.082 µg/m<sup>3</sup>, while maximum concentration ranged from 0.053 to 0.101 µg/m<sup>3</sup> respectively, during the monitoring period (Table 19, page 2).

In comparison with the USEPA 1971 National Ambient Air Quality Standard (NAAQS) 150 µg/m<sup>3</sup> 24-hours average, the values recorded were all below the TSP Air Quality Standard during the monitoring period.

Based on 14 samples taken elsewhere in the Puruni Basin (TPTTI-6; RLSS -4 and RTI -4) between September 2020 and September 2021, values for TWA ranged from 0.0  $\mu\text{g}/\text{m}^3$  to 0.02  $\mu\text{g}/\text{m}^3$ , with the mean for 4 values within SFEP being 0.0075  $\mu\text{g}/\text{m}^3$ .

The highest Maximum Concentration was 0.101  $\mu\text{g}/\text{m}^3$ ). 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 USEPA 1971 NAAQS 150  $\mu\text{g}/\text{m}^3$  24-hours average, measurements showed that the maximum value was below the USEPA 1971 NAAQS - TSP AQS during the time of monitoring.

Based on 14 samples taken elsewhere in the Puruni Basin, values for Max Conc. ranged from 0.0  $\mu\text{g}/\text{m}^3$  to 0.049  $\mu\text{g}/\text{m}^3$ , while the mean of the 4 values within SFEP 2/2020 was 0.0375  $\mu\text{g}/\text{m}^3$ .

The *Average Concentration* values recorded at the RTI Forest Concession ranged from 0.042  $\mu\text{g}/\text{m}^3$  to 0.073  $\mu\text{g}/\text{m}^3$ : these values were all below the USEPA 1971 National Ambient Air Quality Standards (NAAQS) 150  $\mu\text{g}/\text{m}^3$  24-hours average.

Based on 14 samples taken elsewhere in the Puruni Basin, values for Ave Conc. Ranged from 0.0  $\mu\text{g}/\text{m}^3$  to 0.02  $\mu\text{g}/\text{m}^3$ , while the mean for the 4 values within SFEP 2/2020 was 0.0075  $\mu\text{g}/\text{m}^3$ .

Most of the TWA, Average and Maximum concentration readings were below the USEPA 1971 National Ambient Air Quality Standards (NAAQS) 150  $\mu\text{g}/\text{m}^3$  24-hours. The highest concentration values were expected due to human activity i.e., heavy trucks traffic during the time of monitoring. It is important to note that TWA (Time Weighted Average) values are used for the representation and reliability of data where pollution is concern, since TWA values represent the average values during continuous monitoring, which implies that the equipment is always 'ON' to capture any increased that can be harmful at that time.

TSP levels were under the Standards, it should also be noted that not all of TSP consist of particulate matter harmful to human health then an analysis of PM<sub>2.5</sub> and PM<sub>10</sub> will describe the air quality and the risk during working conditions.

### 9.5.3 PM<sub>2.5</sub> and PM<sub>10</sub>

The material particulate in the air with a nominal diameter of 10 micrometres (PM<sub>10</sub>) and a nominal diameter of 2.5 micrometres (PM<sub>2.5</sub>) were monitored through the survey exercise. Tables 19 shows the values obtained and the comparison with the guidelines and standards on the Table 24 give us a description of the air ambient conditions within the RTI forest concession.

PM<sub>2.5</sub> values were found within the range 13.6 to 18.9  $\mu\text{g}/\text{m}^3$ : all values being over the standard of 12.0  $\mu\text{g}/\text{m}^3$  as a primary exposure during an annual arithmetic mean, averaged over 3 years. These high values are expected due of the high intensity of mining on either side of the KPR, west of Puruni Landing. The PM<sub>2.5</sub> suspended in the air was due to fumes from myriad pumps and generators

Based on a total of 14 samples taken elsewhere in the Puruni Basin, values for PM<sub>2.5</sub> ranged from 6.2  $\mu\text{g}/\text{m}^3$  to 22.1  $\mu\text{g}/\text{m}^3$ , while the mean for the 4 samples within SFEP 2/2020 was 11.7  $\mu\text{g}/\text{m}^3$ .

Particulate material concentrations with a nominal diameter of 10 micrometres found during the survey at RTI concession are shown in Tables 19: values for PM<sub>10</sub> range from 14.3 to 28.2  $\mu\text{g}/\text{m}^3$  in comparison with the standard of 24 hours exposure that is 150  $\mu\text{g}/\text{m}^3$ , the study indicate that the air is safe and healthy for life within the concession. PM<sub>10</sub> density can be higher in comparison with PM<sub>2.5</sub> this make them safer to the environment because are more susceptible to settle on the ground in less time, avoiding or reducing the exposure time.

Based on a total of 14 samples taken elsewhere in the Puruni Basin, values for PM<sub>10</sub> ranged from 8.6  $\mu\text{g}/\text{m}^3$  to 30.9  $\mu\text{g}/\text{m}^3$ , while the mean for the 4 samples taken with SFEP 2 /2020 was 16.7  $\mu\text{g}/\text{m}^3$ .

#### 9.5.4 Formaldehyde (HCHO)

The concentration of the HCHO hydrocarbon at the sample points were all 0.

Based on a total of 14 samples taken elsewhere in the Puruni Basin, values for HCHO ranged from 0.0  $\mu\text{g}/\text{m}^3$  to 0.05  $\mu\text{g}/\text{m}^3$ , while the mean for the 4 samples taken with SFEP 2 /2020 was 0.0  $\mu\text{g}/\text{m}^3$ .

#### 9.5.5 Total Volatile Organic Compounds (TVOC)

Concentration of TVOC at the sample points ranged from 0.176  $\mu\text{g}/\text{m}^3$  to 0.851  $\mu\text{g}/\text{m}^3$ , during the monitoring period. Based on the results obtained, it was observed that TVOC readings were below the Guideline of 300  $\mu\text{g}/\text{m}^3$  which is the ideal target for a low level of human health impact.

Based on a total of 14 samples taken elsewhere in the Puruni Basin, values for TVOC ranged from 0.096  $\mu\text{g}/\text{m}^3$  to 3.203  $\mu\text{g}/\text{m}^3$ , while the mean for the 4 samples taken with SFEP 2 /2020 was 0.4565  $\mu\text{g}/\text{m}^3$ .

In virgin forest or monitoring in forest concession before the logging operations, the VOCs come from three main sources, these source indicators by source type are anthropogenic, biogenic, or forest wildfire. The anthropogenic activity is low, no forest wildfires were found during the survey, then the data obtained for VOCs came from biogenic source type, meaning produced or brought about by living organisms the forest system.

#### 9.5.6 Noise

Noise may be defined as any unwanted sound capable of causing hearing impairment, speech interference, and annoyance (Godish, Davis, & Fu, 2015). Noise pollution is the regular exposure to elevated sound levels that can lead to adverse effects in humans or other living organisms.

Measurement Site: The measurement site must be located at least 3.5m from an acoustically reflective surface other than the ground. If conditions limit the available measurement location to positions within 3.5m of such a surface, then the measurement location should be positioned 1 meter from the surface.

Calibration. Collection of data and calibration protocols respectively were conducted according to the Instruction Manual<sup>15</sup>. Calibration exercises are recommended at least once per year. The calibration of a sound level meter is checked at about 94dB (A) using a 1000Hz acoustic calibrator. Any variation from the calibration method should be noted. Environmental noise levels are often significantly lower than 94 dB (A).

Noise Level readings. The meter must be set to fast time response and A-weighted frequency response. The results are read directly from the meter's display screen. All measurements should be accompanied by a written record of the measurement conditions.

Time measurements. The time of day of any measurement must be noted to an accuracy of  $\pm 5$  minutes. The duration of any measurement periods for statistical and/or integration measurements must be measured and noted to an accuracy of  $\pm 5\%$  of the duration.

The noise levels found during the survey range from 38.6 dB to 58dB; and are within the standards for industrial activities (80 dB night-time and 100 dB daytime).

Based on a total of 14 samples taken elsewhere in the Puruni Basin, values for Noise ranged from 31.3 dB to 52.6dB, while the mean for the 4 samples taken with SFEP 2 /2020 was 45.15 dB.

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<sup>15</sup> The Manual can be found online

Table 19: Air Quality-Noise Sampling Field Data Report  
 Page 1 of 3

<b>Distribution of copies:</b> Isidro Espinosa EES Office Files		<b>Sheet No.</b>		
<b>1. General</b>				
<b>Location (Site): ROYAL TIMBERS INC</b>		<b>Sampler:</b> Company Staff		
<b>Sample Date:</b> April 11-15, 2022		<b>Observer:</b> Company Staff		
<b>Measurement Duration:</b> 5 days		<b>Sample Type:</b> Outdoor		
<b>2. Field Observations</b>				
<b>Current weather:</b>	<input checked="" type="checkbox"/> Rainy	<input type="checkbox"/> Stormy	<input type="checkbox"/> Sunny	<input type="checkbox"/> Cloudy
	<input type="checkbox"/> Hot	<input type="checkbox"/> Cold	<input type="checkbox"/> Dry	<input type="checkbox"/> Wet
<b>Relative Humidity:</b>	Average Relative Humidity during the survey was <b>78.5%</b>			
<b>Ambient Temperature:</b>	The Ambient Temperature Reading was between <b>29.7 °C to 35.70 °C.</b>			
<b>Description of Location:</b>	Description of area where Samples were Taken/Read: The measurements of air quality were taken around and within the concession boundaries to investigate the environmental baseline conditions. The test results represent the initial environmental examination related to Air Quality. The test results are shows in the following table.			

### Air Quality-Noise Sampling Field Data Report

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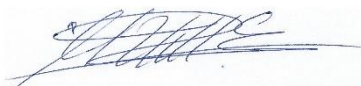

3. <u>Measurements (Data)</u>																
<i>Air Quality and Total Suspended Particulate (TSP) <math>\mu\text{g}/\text{m}^3</math></i>																
Sample ID	Collection Date	Coordinates 20N/21N UTM	Time Start	%RH	Data RAM $\text{mg}/\text{m}^3$ TEMPO							Wind		Noise	Temp.	Elev.
					TWA	Max. Con	Ave. Con	PM <sub>2.5</sub>	PM <sub>10</sub>	HCHO	TVOC	Direction	Speed (m/s)	dB Low	Celsius	meter
RT1	12-04-22	0831829, 0689631	15:28	44.2	0.072	0.101	0.069	14.7	21.2	0.000	0.626	W	0.04	43.2	26.2	89
RT2	12-04-22	0177378, 0688284	16:27	65.3	0.082	0.090	0.058	14.0	14.3	0.000	0.176	W	0.4	48.3	27.2	91
TR3	13-04-22	0228183, 0691839	14:33	80.6	0.078	0.096	0.064	18.9	28.2	0.000	0.642	SW	0.4	48.5	25.6	57
RT4	13-04-22	0228190, 0691834	17:31	84.2	0.052	0.084	0.073	18.5	25.9	0.000	0.253	SW	0.02	54.8	24.2	58
TR5	14-04-22	0201471, 0689761	9:01	89.1	0.045	0.053	0.042	14.8	20.7	0.000	0.851	W	0.3	48.7	28.6	28
TR6	14-04-22	0198180, 0691917	10:09	75.6	0.051	0.060	0.045	13.6	16.9	0.000	0.369	W	0.00	46.2	23.2	33
RT7	14-04-22	0215370, 0691184	15:22	85.8	0.068	0.168	0.055	16.6	19.7	0.000	0.534	W	0.06	44.2	27.5	70
RT8	14-04-22	0219645, 0694211	16:16	86.2	0.059	0.078	0.072	15.8	21.7	0.000	0.743	W	0.3	48.2	25	112
RT9	14-04-22	0219525, 0694622	16:30	84.3	0.068	0.069	0.068	14.0	19.2	0.000	0.549	W	0.04	38.6	25	112



## Air Quality-Noise Sampling Field Data Report

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### 4. Standards and Guidelines

Parameter	Type	Averaging Time	Level	Form	References/ Colour Code
PM <sub>2.5</sub>	Primary	Annual	12.0 µg/m <sup>3</sup>	Annual arithmetic mean, averaged over 3 years.	USA EPA, 2016 GNBS, 2002
	Secondary	Annual	15.0 µg/m <sup>3</sup>	Annual arithmetic mean, averaged over 3 years.	
	Primary and Secondary	24-hour	35 µg/m <sup>3</sup>	98 <sup>th</sup> percentile, averaged over 3 years.	<b>Below Guideline Value</b>
PM <sub>10</sub>	Primary and Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over a 3-year period.	<b>Boundary Guideline Value</b>
Total Suspended Particles (TSP)	Primary	24-hour	260 µg/m <sup>3</sup>	Not to be exceeded more than once per year.	<b>Above Guideline Value</b>
		Annual	75 µg/m <sup>3</sup>	Annual geometric mean.	
	Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year.	
		Annual	60 µg/m <sup>3</sup>	Annual geometric mean.	
Noise	Categories		<b>Daytime Limits in dB</b> (06:00 – 18:00h)	<b>Night-time Limits in dB</b> (18:00 – 06:00h)	<b>Above Guideline Value</b>
	Industrial		100	80	
	Construction		90	75	
<b>5. Comments and Recommendations</b>					
<p>The Samples of Air were taken along <b>Royal Timbers</b> concession to have an initial environmental examination of the weather conditions and the quality of Air. The data presented in this survey reflect the quality of the air present conditions. The data assessment reflects an overall decent quality of Air for both PM 2.5 and PM 10 at Royal Timbers. In addition, the values for noise were below the standard guidelines in all the zones. Safety Gear such as dust mask, earmuffs for noise attenuation and safety boots are compulsory so that the health impacts on employees may be reduce and the environment will be deemed as a no risk one.</p>					
<b>6. Personnel</b>			Checked By: Isidro Espinosa	Date: May 13, 2022	
					

## 9.6 Mitigation measures

### 9.6.1 Overview

The forest monitoring officer will be responsible for mitigation measures targeting air quality. RTI is committed to taking whatever measures are feasible to ensure that air quality remains at tolerable levels, and always within the established ranges.

### 9.6.2 Concession area

The forest monitoring officer will be responsible for air quality management including addressing complaints from stakeholders and for preparing reports in this regard to the EPA and GFC. Technical inputs will be sought from a duly qualified consultant to take and interpret air quality data. At the concession level, dust may not be much of a problem because trucks will make one trip per day and will not travel more than 50km/hr. Every effort will be made to maintain vehicles in a fully functional state so that exhaust emissions are within the projected parameters for the machine.

### 9.6.3 Permanent Monitoring Stations

Air quality will be monitored initially at the permanent monitoring stations to be implemented by RTI while water quality and soil quality parameters are taken.

### 9.6.4 The KPR

On the KPR, the following measures will apply (see also Table 20):

- a) Trucks will always travel < 65km/hr. by day only and will always be using rotating orange beacons on the top of the cab or travel with its main headlights in the on position.
- b) Trucks will always slow down to 25 km/hr. near communities, camps, or other human dwelling, unless there are humps on the road when trucks will come to a stop before crossing the hump.

Table 20: Summary of mitigation measures for air quality monitoring, SFEP 2/2020

ACTIVITY	PARTY RESPONSIBLE	FREQUENCY OF MONITORING	LOCATION
Data Collection at PMS	RTI	Quarterly	PMS
Ensure all vehicles are in a fully functional state	RTI	Quarterly	RTI's B/Camp
Engagement with the mining community, other stakeholders	RTI	Quarterly	Buckhall
Requirements <ul style="list-style-type: none"> <li>• Transportation (ATV)</li> <li>• GPS Device</li> <li>• Thermo pDR-1000AN personalDataRAMTM Particulate Monitor</li> <li>• Laboratory Services</li> </ul>			
BUDGET G\$1,000,000.00 per annum (including costs for laboratory analysis)			

## 10.0 CLIMATE AND CLIMATE CHANGE

### 10.1 Overview-definitions, concepts

**Climate** may be defined as ‘a generalized statement of the prevailing weather conditions at a given place based on statistics of a long period of record and including mean values, departure from those means, and the probabilities associated with those departures’ (Strahler & Strahler, 1997).

**Basics of Climate Change.** Greenhouse gases emitted by human activities alter Earth’s energy balance and thus its climate. Humans also affect climate by changing the nature of the land surfaces (for example by clearing forests for farming) and through the emission of pollutants that affect the type and relative proportion of certain particles in the atmosphere. Scientists have determined that, when all human and natural factors are considered, Earth’s climate balance has been altered towards warming, with the biggest contributor being increases in CO<sub>2</sub>. (National Academy of Sciences & The Royal Society, 2014).

**Greenhouse gases** in the atmosphere, including water vapour, carbon dioxide, methane, and nitrous oxide, absorb heat energy and emit it in all directions (including downwards), keeping Earth’s surface and lower atmosphere warm. Adding more greenhouse gases to the atmosphere enhances the effect, making Earth’s surface and lower atmosphere even warmer (National Academy of Sciences & The Royal Society, 2014).

The term **global warming** is used to describe the rising temperatures resulting from human activities while the term climate change refers to the complete suite events that will change, including patterns of temperature, wind, and rainfall (Primack & Corlett, 2005).

Forests contain a substantial part of the Earth’s **carbon**, current rates of forest loss contribute 20% of total emissions of CO<sub>2</sub> (Van Bodegom, AJ; Savenijie, H; Wit, M., 2009). In addition, forests maintain climatic equilibrium through its impacts on microclimates based on damping effects on wind movement, humidity in the forest environment, temperatures in the forest environment, transpiration, evapotranspiration, and hydrological influences (Richards, 1998).

### 10.2 Introduction-Guyana’s climate

Guyana lies on the north-eastern part of South America, between 56°20’W and 61°23’W and 1°10’N and 8°35’N. The climate of Guyana is strongly influenced by the movement of the Intertropical Convergence Zone, and therefore most climatic variables show a bi modality through the year; there are two wet and two dry seasons per year (Ter Steege, 1996).

On the coastal plain there is precipitation for 200 days per year: 50% of the annual rainfall occurs from mid-April to mid-August, and there is a second wet season December through February (GL&SC, 2013); (ter Steege, 1996). Annual rainfall varies from about 2,200 mm on the coastal plain to 2800mm inland, although it rises to over 4000mm in the upper Mazaruni/Pakaraima Mountains Area; October is the driest month of the year (ter Steege, 1996). In the *drier* savannahs there is only one wet season from April to August when annual rainfall ranges from 1400 to 1800mm, most of it occurring from April to May (GL&SC, 2013)

Mean air temperature ranges from 25°C through 27°C throughout the year in most regions except the upland regions on the western edge of the country where mean temperatures range from 20°C through 23°C.

**Georgetown's** climate is classified as tropical. There is a great deal of rainfall in Georgetown, even in the driest month. This climate is Af according to the Köppen-Geiger climate classification. The average annual temperature is 26.8 °C in Georgetown. About 2363 mm of precipitation falls annually. Precipitation is the lowest in September, with an average of 84 mm. The greatest amount of precipitation occurs in June, with an average of 330 mm. At an average temperature of 27.6 °C, September is the hottest month of the year. The lowest average temperatures in the year occur in January, when it is around 26.1 °C. Between the driest and wettest months, the difference in precipitation is 246 mm. The variation in temperatures throughout the year is 1.5 °C.

Climate data dictate operational activities: there is a reduction of most field operations such as tree felling, and road construction and maintenance during the rainy season. The trucking of logs may also be reduced in the rainy season due to visibility hazards during rainfall or due to slippery road surfaces.

### **10.3 Key relevant policy, legislation, guidelines, standards etc.**

Section 24 (h) of the Protected Areas Act, 2011 sets out that Objectives of the National protected Areas System includes '*assist in combatting climate change by*

- a) *Ensuring that Guyana's existing forests are maintained, and protected degradation and their ecosystem functions are safeguarded.*
- b) *Promoting the restoration and expansion of Guyana's natural forest cover*
- c) *Protecting marine ecosystems*
- d) *Protecting freshwater ecosystems and important watersheds.*

The Water and Sewerage Act, 2002 provides for the setting up of the Hydro-Meteorological Department whose functions include 'to establish, manage, and operate national systems to monitor atmospheric conditions, climate change and water resources'.

An Office of Climate Change (OCC), within the OOTP was established in 2017 to drive the Government's *Green Development Agenda*. The OCC uses the motto 'building the Government's climate resilience.' (Please see section 5.6.1.1).

### **10.4 Global Initiatives to safeguard forests.**

Over the years the international community have developed initiatives to help countries with major forest resources to safeguard them on the one hand and on the other to encourage countries with massive industrial bases to put limits on their gas emissions.

According to Ghazoul & Sheil (2010) the major international and bilateral initiatives to conserve forests are:

- a) **Emphasis on conservation areas:** protected area systems, Indigenous and extractive reserves, conservation concessions and debt for nature swaps.
- b) **Forest conservation and livelihoods:** sustainable forest management, reduced impact logging, forest certification, ecotourism, payment for environmental services (PES), bioprospecting, wildlife management, ecotourism and enterprises based on NTFPS.  
*Certification is widely advocated as a strategy to conserve the world's forests and the biodiversity which they contain* (Shiel, Putz, & Zagt, 2010).
- c) **Governance:** combat on corruption, the Kyoto Protocol and REDD+

The UNFCCC was established at the Earth Summit in Rio-de-Janeiro in 1992, followed in 1997 by the more powerful and legally binding Kyoto Protocol (see Table 7).

### **10.5 Initiatives in Guyana**

In Guyana, the Office of Climate Change (OCC), situate within OOTP, works across the Government of Guyana to support work on climate adaptation, mitigation, and forest conservation; it drives the development of the GSDS the advancement of the Government's green agenda; it also and coordinates the Government of Guyana's engagement with international forestry programmes such as the Forest Carbon Partnership Facility, the Forestry Investment Programme and UN-REDD.

A major initiative of the OCC is its engagement with UNDP-which has pledge support for Guyana's 'green' endeavours-to finalize official guidelines for the reduction of Green House Gases (GHG) of municipalities across Guyana. The guidelines were defined in the final draft of the Nationally Appropriate Mitigation Actions (NAMA): greening of Towns in Guyana.

Guyana, in collaboration with international agencies and environmental NGOs, has been taking measures to contribute to climate mitigation initiatives.

Initiatives include:

- a) The establishment of the Iwokrama International Centre, 1996.
- b) The establishment of the Environmental Protection Agency ,1997.
- c) The requirement for ESIA's and/or Environmental Management Plans for large land based or industrial projects.
- d) The development of a protected areas system.
- e) The development of Codes of Practices for the forestry sectors and the mining sectors, respectively.
- f) The adoption of *reduced impact logging* as the basic standard for commercial timber operations.
- g) The establishment of a Faculty of Earth and Environmental Sciences, University of Guyana, 2017.
- h) The establishment of a PES project with Norway.
- i) The development of a VPA with the EU ,2018.
- j) Revised forest policy and forestry legislation that address broader forest values (rather than timber production), 2018.
- k) The signing onto international agreements and conventions (see Table 7).
- l) The development of a Low Carbon Development Strategy.

### **10.6 Initiatives by RTI**

Climate change mitigation requires a shared understanding of the issues and a collective approach to generating solutions for problems as they emerge. A major issue is the availability of data to guide decision makers in adopting prescribed practices.

RTI will take five approaches to local initiatives to manage climate change:

- a) Keep abreast of national policy positions and discussions initiated by the DOE-OOTP:
- b) Follow the guidelines, standards and practices recommended by the GFC and the EPA: RTI will engage directly with the GFC in development of its logging operations and engage with the EPA in reporting on environmental matters.
- c) Participate in discussions on sectoral initiatives on issues of sustainable forest management climate such as those embodied in formal initiatives like the VPA between GOG and the EU; and
- d) Participate in initiatives on waste management, noise abatement or dust nuisances.

RTI's **forest monitoring officer** will be responsible for managing the company's efforts at climate change mitigation. RTI's climate change-based initiatives will be linked to data collected on water quality and air quality, respectively.

## 11.0 BIOLOGICAL RESOURCES

### 11.1 Overview

A 107, 650.54 ha parcel of forest resources harbours ecological processes that ensure the resilience of the resources themselves. It is critical that the impacts of logging interventions do not unduly perturb those processes. For example, soil microbial activity and biomass are affected by soil compaction; because changes in soil bulk density due to compaction affect the burrowing action of macrofauna such as earthworms **Invalid source specified**.

RTI acquired the forest resources for the purpose of extracting merchantable timber on a sustainable basis. It is critical that interventions made to retrieve merchantable timber do not unduly foster forest degradation or forest fragmentation and ensure conservation of ecological processes that sustain the flora and fauna that together constitute the biological component of the forest resources. Ecological processes include flower pollination, seed dispersal and animal-animal predation.

### 11.2 Flora

#### 11.2.1 Desk review-the forest resources

The forests of the concession area are described as *Central Wet Forests* (Ter Steege, 1996) and they cover about 90% of the concession area. Additional information is available at the GFC (see Table 21). Even more details on the vegetation were garnered from ML inventories conducted by RTI itself (see Section 11.2.4).

Table 21: Table vegetation types recorded for SFEP 02/2020 (source GFC, 2020)

Forest Type	Area (ha)	% Of area	Remarks
1: Mixed Forest on undulating to hilly terrain	61,870.65	57.5	Productive forests:
1b: Mixed Forest on flat to undulating terrain	23,289.95	21.6	Productive forests: Typical species:
1c: Mixed Forest on deeply dissected terrain	2,206.39	2.0	Non-productive ( <i>subject to verification</i> )
1h: Mixed Forest on high hills	18,986.40	17.6	Non-productive ( <i>subject to verification</i> )
3: Low swamp forests	1,308.07	1.2	Non-productive ( <i>subject to verification</i> )
<i>No data</i>	<i>9.08</i>	<i>0.0</i>	
<b>Total</b>	<b>107,670.54</b>		

#### 11.2.3 Field work

Major interventions have been made along right bank Puruni River where most mining activities are concentrated. Miners, road engineers and truckers have removed timber from the KPR corridor to provide materials for buildings, bridges, culverts, and corduroy works.

Small volumes of timber have been harvested by miners for onsite works (see Figure 27).

RTI conducted reconnaissance (management level) inventory data using 491 x 0.1ha plots distributed across 33 transect lines. the methodology used was based on GFC's recommendations. For trees of dbh>10cm, seventy-four (74) potentially commercial species occur with the concession area.



Figure 27: Illustration of miners' use of timber on SFEP 2/2020

#### 11.2.4 Main observations

The data set generated from RTI' pre-harvest inventory data validates the data published by Ter Steege (ter Steege, Hans, 2000).

For trees of dbh>10cm, seventy-four (74) potentially commercial species occur with the concession area.

Black Kakaralli and Mora occur throughout the concession area, while Greenheart, for example, does not occur throughout the concession area. For prime commercial species, Greenheart represents 10.4% of total volume, with Wamaradan (4.1%), Purpleheart at 2.6% and Locust (0.1%). Previous work by PWPI estimated mean volume for prime commercial species across the concession area is 32.2m<sup>3</sup> (which is well above the 8.33m<sup>3</sup>/ha that RTI will be authorized to harvest, based on the felling cycle (25 yrs.) the company adopted).

There is evidence of extensive overtopping of riverbanks in the rainy season. *Mora excelsa* is the dominant swamp species in the upper Puruni River; there it is associated with Kamarakata (*Acosium nitens*).

Forest gaps and road edges are quickly dominated by light demanding pioneers such as *Cecropia spp.*, *Goupia glabra*, and *Vismia spp.* Other species typical of road edges include *Inga spp.* and *Passiflora spp.*

As is typical of forests on rolling terrain, where lianas proliferate due to higher canopy exposure to sunlight, the understory is quite dark. All the popular lianas are in evidence including Monkey ladder (*Bauhinia guianensis*), Kufa (*Clusia sp.*), Kapadulla (*Tetracera volubris*), and Nibbi (*Heteropsis jenmanni*).

Palms are also very noticeable: the more popular ones are *Astrocaryum spp.*, *Bactris acanthocarpa*, *Euterpe edulis*, *Jessenia bataua*, and *Mauritia flexuosa*.

There is a robust understory vegetation, comprising primarily juvenile trees of the species in the canopy layer. However, juvenile trees of the species Mora (*Mora gonggrijpii*), Aromata (*Clathrotropis brachypetala*), Yariyari (*Dugetia spp*) Crabwood (*Carapa guianensis*) and Maho (*Sterculia spp.*) were widespread in understory of most forest types.



### 11.2.5 Conclusion

RTI has been able to validate the data published by Ter Steege, 2000. RTI is delighted with the species spread and the opportunity to diversify its operations by engaging in the production of furniture or veneer.

There was no evidence of *commercial* scale logging. Most mining camps are made from spars (and tarpaulin), but many are also built with chainsaw milled lumber.

Current indications point to an expansion of the gold mining industry and gold output, particularly as the current price of gold is attractive and there is strong policy support for the industry.

RTI has already chosen an area of 3,931 ha at the western border area of the concession for a biodiversity reserve (see Figures 28). The reserve contains all forest types in the concession area; and the presence of creeks and altitudinal gradients ensure a diversity of plant species and fauna. No mining activities were detected in the area.

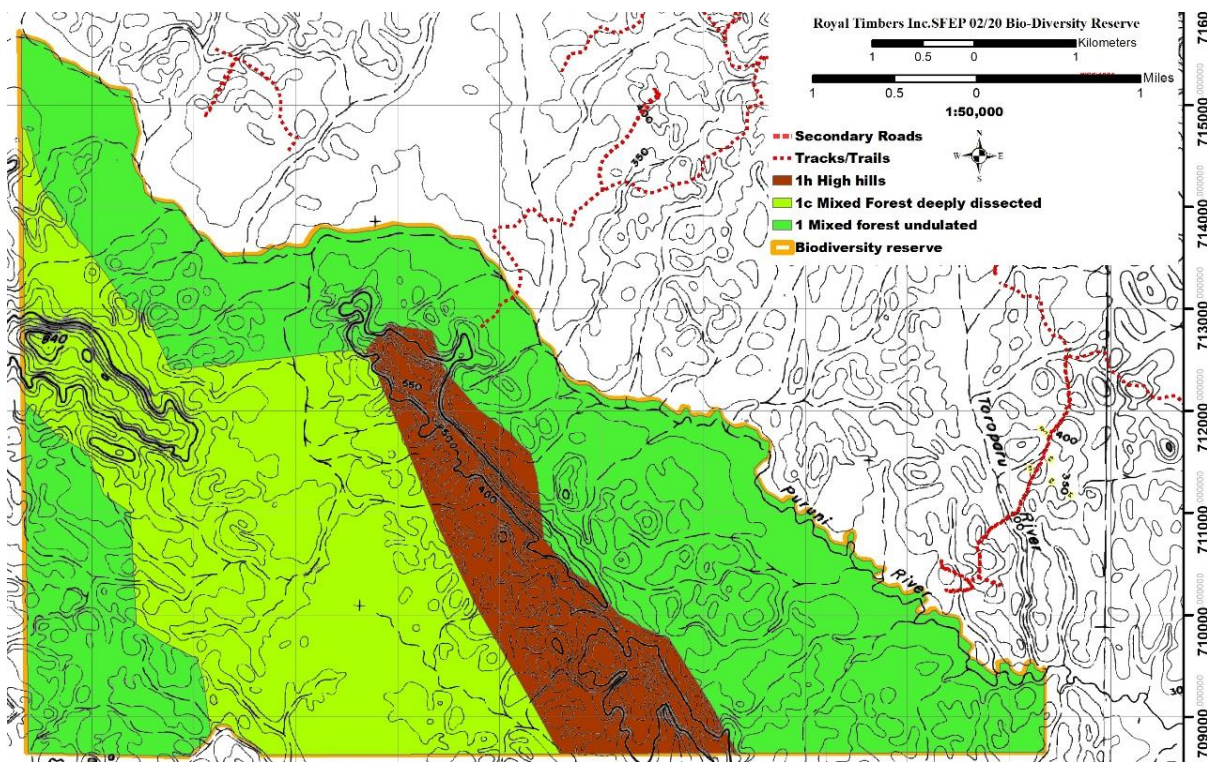


Figure 28: Chart of RTI's Biodiversity reserve showing vegetation types and surface drainage patterns

## 11.3 Fauna

### 11.3.1 Overview

Guyana is a rich country in terms of faunal assets (see Tables 22, 23). Frequent sightings of a variety of fauna have been recorded for the concession area. Meanwhile, no hunters, or evidence of hunters (such as a 'wabini') were observed at any point within the concession area. Also, at no point did the consultants encounter anyone selling wild meat. Residents of Kumung-Kumung do fishing for their own needs.

Table 22: Number of vertebrates in Guianan countries (Hammond D. , 2005).

Class	Guyana	Suriname	French Guiana	Guianas
Mammals	221	180	191	234
Birds	752	672	699	812
Fish, skates, and eels*	420	318	334	440
Amphibians	81	94	72	118
Reptiles	140	143	162	206
Total <sup>16</sup>	1,426	1,365	1,416	1765

\*Fresh water only.

Table 23: Number of described mammals, Guianan countries (Hammond D. , 2005).

ORDER	Guyana	Suriname	French Guiana
Marsupialis	15	11	12
Xenarthra	10	10	10
Chiroptera	126	105	109 <sup>a</sup>
Primates	8	8	8
Carnivores	16	15	15
Perissodactyla	1	1	1
Artiodactyla	5	5	5
Rodentia	40	25	31
Total	221	180	191

<sup>a</sup> Including a new species and name revisions in Simmon and Voss (1998) and Voss et al (2001).

### 11.3.2 Methodology

The consultants travelled frequently in and around the concession area and were able to observe numerous species of fauna. In addition, boat captains, miners and RTI field operatives were consulted about wildlife in the area. Other casual means used to identify fauna were animal tracks and scat.

**Formal** wildlife surveys were done during period September 11-17, 2021, and April 11-15, 2022. For terrestrial surveys one camera was deployed for three days<sup>17</sup> at the mouth of Kumung-Kumung River and another was placed for another three-day period along the Kumung-Kumung access road.

Nets were used for birds and bats: these were set up for 30-minute periods in shaded areas in the early morning and in the late afternoon. Seines and rods were used for capturing fishes: and the consultants released them as soon as they were extricated from the hook or seine.

<sup>16</sup> The computation of the values for totals are not quite clear to the consultants.

<sup>17</sup> People steal the memory card from the cameras.



Figure 29: Typical aids used to detect the presence of fauna: Tracks (Deer, Tapir), Scat (Capybara).



Figure 30: Photographs illustrating aids use to detect the presence of fauna left-seine; right-trail camera.

Several publications were used to support this baseline study for example mammals (Eisenberg, 1989); birds (Restall, Rodner, & & Lentino, 2006); (Braun, Robbins, & Schmidt, 2007) and insects (Gallo, 1988).

### 11.3.3 Results

An example of a reptile recorded in the concession area is shown at Figure 31. Detailed lists are presented in and Tables 24 (Mammals), 25 (Reptiles), 26 (Birds), 27 (Fishes), 28 (Insects) and 29 (Amphibians).



Figure 31: Example of a reptile on SFEP 2/2020: *Chironius sp.* (Colubridae) seen at SFEP 2/2020

Table 24: List of mammals recorded in SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
<b>1.0 MARSUPIALIA/Opossums</b>								
1.1	DIDEPHIDAE/Didelphinae: Opossums							
1.1.1	Philander opossum	Gray four-eyed opossum				+		
1.1.2	Marmosa murina	Murine mouse Opossum				+		
<b>2.0 CHIRPOTERA/BATS</b>								
2.1 PHYLLOSTOMIDAE								
2.1.1	Carollia perspicillata	Common short-tailed bat	+					
2.1.2	Rhinophylla pumilio	Little fruit bat	+					
2.2 MOLOSSIDAE								
2.2.1	Molossus molussus	Free tailed bat	+					
2.3 EMBALLONURIDAE								
2.3.1	Saccopteryx bilineata	White lined sac winged bat				+		
2.3.2	Saccopteryx leptura	Brown Sac-winged bat				+		
<b>3.0 PRIMATES</b>								
3.1 CEBIDAE								
3.1.1	ALOUATTINAE: Alouatta seniculus	Howler monkey	+				II	
3.1.2	CEBINAE: Cebus olivaceus	Wedge-capped Capuchin				+	II	
3.1.3	CEBINAE: Saimiri sciuricus	Squirrel Monkey				+	II	
<b>4.0 CARNIVORA/Carnivores</b>								
4.1 PROCYONIDAE								
4.1.1	PROCYONIDAE: Nasua nasua	South American Coati	+					
4.2 FELIDAE								
4.2.1	PANTHERINAE: Panthera onca	Jaguar		+	+		I CR	
4.2.2	FELINAE Leopardus pardalis	Ocelot				+	I	
4.2.3	FELINAE Puma concolor	Puma					II	
4.2.4	FELINAE Herpailurus yagouaroundi	Jaguarondi				+	II	
5.0 PERISSODACTYLA								
<b>5.1 TAPIRIDAE/Tapirs</b>								
5.1.1	Tapirus terrestris	Tapir			+		II CR	
6.0 ARTIODACTYLA								
<b>6.1 TAYASSUIDAE/Peccaries</b>								
6.1.1	Pecari tajacu	White-lipped peccary				+	II	
6.1.1	Tayassu tajacu	Collared peccary				+	II	
6.2 CERVIDAE/Deer								
6.2.1	Mazama americana	Red brocket deer	+					
6.2.2	Mazama gouazoubira	Gray brocket deer						

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
7.0	<b>RODENTIA</b>							
7.1	<b>HYDROCHAERIDAE</b>							
7.1.1	Hydrochaeris hydrochaeris	Capybara	+		+			
7.2	<b>DASYPROCTIDAE</b>							
7.2.1	Dasyprocta agouti	Red-rumped agouti	+					
7.3	<b>AGOUTIDAE</b>							
7.3.1	Agouti paca	Paca				+		
7.4	<b>SCIURIDAE</b>							
7.4.1	Sciurus spp.	Guianan squirrel				+		
8.0	<b>XENARTHRA</b>							
8.1	<b>DASIPODIDAE</b>							
8.1.1	Dasypus septemcinctus	Armadillo	+					

Method of detection: S-seen; Heard T-Track/Sign; R-reported.

Table 25: List of reptiles recorded in SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R	I	II
1.0	LEPTODACTYLIDAE							
1.1	Eleutherodactylus sp.							
1.2	Leptodactylus knudseni							
1.3	Leptodactylus sp.							
2.0	TEIIDAE							
2.1	Ameiva ameiva	Lubo lizard	+					
2.2	Kentropyx calcaratus	Forest lizard	+					
3.0	GEKKONIDAE							
3.1	Hemidactylus mabouia	Skink lizard				+		
4.0	TROPIDURIDAE/Lizards							
4.1	Tropidurus hispidus					+		
4.2	Plica plica	Forest lizard	+					
4.3	Plica umbra	Forest lizard	+					
5.0	Amphisbaenidae							
5.1	Amphisbaenidae alba					+		
6.0	DENDROBATIDAE							
6.1	Epipedobatus femoralis		+					
7.0	COLUBRIDAE/Serpents							
7.1	Chironus carinatus	Black racer	+					
7.2	Leptophis ahaetulla	Vine snake	+					
8.0	BOIDAE							
8.1	Corallus caninus	Emerald tree boa				+		
8.2	Boa constrictor	Land Camoudi				+		
8.3	Epicrates cenchria	Rainbow boa				+		
9.0	VIPERIDAE/							
9.1	Laches muta	Bushmaster				+		
9.2	Bothrops atrox	Labaria	+					
10.0	ALLIGATORIDAE							
10.1	Melanosuchus niger	Black caiman				+		
11.0	TESTUDINIDAE							
11.1	Geochelone denticulata	Yellow foot turtle	+					
14.0	IGUANIDAE							
14.1	Iguana iguana	Iguana	+					LC

Table 26: List of avian fauna encountered in SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
<b>1.0 ACCIPITRIDAE: Hawks, Eagles</b>								
1.1	<i>Ictina plumbea</i>	Plumbeous kite	+					
1.2	<i>Leucoternis albicollis</i>	White hawk	+					
1.3	<i>Elanoides forticatus</i>	Swallow tailed kites	+					
1.4	<i>Spizaetus tyrannus</i>	Black hawk eagle	+					
<b>2.0 AOPDIDAE: Swifts</b>								
2.1	<i>Chaetura spinicaudus</i>	Band rumped swift	+					
<b>3.0 BUCCONIDAE: Puffbirds</b>								
3.1	<i>Nonarchus tectus</i>	Pied puffbird	+					
3.2	<i>Bucco capensis</i>	Collared puffbird	+					
<b>4.0 CRAPRIMULGIDAE: Nighthawks, Nightjars</b>								
4.1	<i>Caprimulgus nigricans</i>	Blackish nightjar	+					
<b>5.0 CARDINALIDAE: Grosbeaks, Saltators</b>								
5.1	<i>Saltator grossus</i>	Slate coloured grosbeak	+					
5.2	<i>Cyanocompsa cyanooides</i>	Blue-black grosbeak	+					
5.3	<i>Caryothraustes canadensis</i>	Yellow-green grosbeak	+					
<b>6.0 CATHARTIDAE: Vultures</b>								
6.1	<i>Cathartes melambrotus</i>	Greater yellow head vulture	+					
6.2	<i>Sarcoramphus papa</i>	King Vulture	+					
<b>7.0 COLUMBIDAE: Pigeons, Doves</b>								
7.1	<i>Patagioenas plumbea</i>	Plumbeous pigeon	+					
7.2	<i>Leptotila rufaxilla</i>	Gray fronted Dove	+					
7.3	<i>Patagioenas subvinacea</i>	Ruddy pigeon	+					
<b>8.0 COTINGIDAE: Cotingas</b>								
8.1	<i>Querula purpurata</i>	Purple throated fruit crow	+					
8.2	<i>Lipaugus vociferans</i>	Screaming pia		+				
<b>9.0 CRACIDAE: Curassows, guans</b>								
9.1	<i>Penelope sp.</i>	Spix's guan	+					
9.2	<i>Crax alector</i>	Black Curassow	+					
<b>10.0 CUCULIDAE: Cuckoos</b>								
10.1	<i>Piaya melanogaster</i>	Black bellied cuckoo	+					
<b>11.0 EMBERIZIDAE: Emberizine Finches</b>								
11.1	<i>Oryzoborus angolensis</i>	Chestnut bellied seed eater		+				
<b>12.0 FALCONIDAE: Falcons, Caracaras</b>								
12.1	<i>Falco ruficularis</i>	Bat falcon		+				
12.2	<i>Ibycter americanus</i>	Red throated caracara	+					

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
12.3	<i>Herpetotheres cachinnans</i>	Laughing falcons		+				
<b>13.0 FORMICARIDAE: Ground Antbirds</b>								
13.1	<i>Formicarius analis</i>	Black face ant thrush	+					
13.2	<i>Hylopezus macularis</i>	Spotted Antpitta	+					
<b>14.0 FRINGILLIDAE: Cardueline finches</b>								
14.1	<i>Euphonia cayennensis</i>	Golden sided euphonia	+					
14.2	<i>Euphonia plumbea</i>	Plumbeous euphonia	+					
<b>15.0 FURNARIIDAE: Ovenbirds</b>								
15.1	<i>Dendrocolaptes certhia</i>	Amazon barred wood creeper	+					
15.2	<i>Xiphorhynchus pardalotus</i>	Chestnut rumped wood creeper	+					
<b>16.0 GALBULIDAE: Jacamars</b>								
16.1	<i>Galbula dea</i>	Paradise Jacamar	+					
16.2	<i>Jacamerops aureus</i>	Great Jacamar	+					
<b>17.0 ICTERIDAE: New World Black birds</b>								
17.1	<i>Psarocolius viridis</i>	Green Oropendola	+					
<b>18.0 PARULIDAE: Wood warblers</b>								
18.1	<i>Phaethlypis rivularis</i>	Riverbank warbler	+					
<b>19.0 PICIDAE: Woodpeckers</b>								
19.1	<i>Melanerpes cruentatus</i>	Yellow tufted woodpecker	+					
19.2	<i>Dryocopus lineatus</i>	Lineated woodpecker	+					
19.3	<i>Celeus undatus</i>	Waved woodpecker	+					
19.4	<i>Picus flavigula</i>	Yellow throated woodpecker	+					
19.5	<i>Picus chrysochloros</i>	Golden green woodpecker	+					
19.6	<i>Campephilus rubricollis</i>	Red necked woodpecker	+					
<b>20. PSITTACIDAE: Parrots</b>								
20.1	<i>Touit batavicus</i>	Lilac tailed parakeet	+					
20.2	<i>Brotogeris chrysoptera</i>	Golden winged parakeet	+					
20.3	<i>Gypopsitta caica</i>	Caica parrot	+					
20.4	<i>Amazona dufresniana</i>	Blue cheeked parrot	+					
20.5	<i>Pionus menstrus</i>	Blue headed parrot	+					
20.6	<i>Amazona farinosa</i>	Mealy parrot	+					
20.7	<i>Ara chloropterus</i>	Red and green macaw	+					
20.8	<i>Pionus fuscus</i>	Dusky Parrot	+					
20.9	<i>Pionites melanocephalus</i>	Black headed parrot	+					
<b>21.0 PSOPHIIDAE: Trumpeters</b>								
21.1	<i>Psophia crepitans</i>	Gray winged trumpeter	+					
<b>22.0 RAMPHASTIDAE: Toucans</b>								



#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
22.1	<i>Pteroglossus viridis</i>	Green aracari	+					
22.2	<i>Ramphastos vitellinus</i>	Chanel billed toucan	+					
22.3	<i>Pteroglossus aracari</i>	Black necked aracari	+					
22.4	<i>Selenidera culik</i>	Guianan toucanet	+					
22.5	<i>Ramphastos tucanus</i>	White throated toucan	+					
<b>23.0 THAMNOPHILIDAE: Typical antbird</b>								
23.1	<i>Cymbilaimus lineatus</i>	Fasciated antstrike	+					
23.2	<i>Thamnophilus murinus</i>	Mouse coloured antstrike	+					
23.3	<i>Thamnophilus doliatus</i>	Barred antstrike	+					
23.4	<i>Ceromacra tyrannina</i>	Dusky antbird	+					
23.5	<i>Myrmeciza ferruginea</i>	Ferruginous backed antbird	+					
23.6	<i>Herpsilochmus stictocephalus</i>	Todd's antwren	+					
23.7	<i>Myrmotherula menetriesii</i>	Gray antwren	+					
<b>24.0 THRAUPIDAE: Tanagers</b>								
24.1	<i>Ramphocelus carbo</i>	Silver beaked tanager	+					
24.2	<i>Tangara punctata</i>	Spotted tanager	+					
24.3	<i>Coereba flaveola</i>	Bananaquit	+					
24.4	<i>Tangara velia</i>	Oral rumped tanager	+					
<b>25.0 TINAMIDAE: Tinamous</b>								
25.1	<i>Crypturellus variegatus</i>	Variegated Tinamou	+					
<b>26.0 TROCHILIDAE: Hummingbirds</b>								
26.1	<i>PHAethornis superciliosus</i>	Long tailed hermit	+					
26.2	<i>PHAethornis ruber</i>	Reddish hermit	+					
26.3	<i>Topaza pella</i>	Crimson topaz	+					
<b>27.0 TROGLODYTIDAE: Wrens</b>								
27.1	<i>Henicorhina leucosticta</i>	White breasted wood wren	+					
<b>28.0 TROGONIDAE: Trogons</b>								
28.1	<i>Trogon viridis</i>	Green backed trogon	+					
<b>29.0 TYRANNIDAE: Flycatchers</b>								
29.1	<i>Tomomyias poliocephalus</i>	Gray crowned flycatcher	+					
29.2	<i>Myiopagis gaimardii</i>	Forest Elaenia	+					
29.3	<i>Colonia colonus</i>	Long tailed tyrant	+					
29.4	<i>Tyrannus melancholicus</i>	Tropical king bird	+					
29.5	<i>Zimmerius gracilipes</i>	Slender footed tyrannulet	+					
29.6	<i>PHilohydor lictor</i>	Lesser kiskadee	+					
<b>30.0 VIREONIDAE: Vireos</b>								
30.1	<i>Hylophilus thoracicus</i>	Lemon chested greenlet	+					

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
30.2	<i>Vireolanius leucotis</i>	Slaty-capped shrike vireo	+					
30.3	<i>Hylophilus musicicapinus</i>	Buff-cheeked greenlet	+					

Table 27: List of Fishes recorded within SFEP 1/2017.

#	SCIENTIFIC NAME	COMMON NAME	IDENTIFICATION			CITES	IUCN
			S	R	O		
1	SERRASALMIDAE						
1.1	Serrasalmus nattereri		+				
1.2	Metynnis hypsauchen						
2	LORICARIIDAE		+				
2.1	Ancistrus spp						
3	ERYTHRINIDAE						
3.1	Erythinus erythrinus	Yarrow	+				
3.2	Hoplias malabaricus	Huri	+				
3.3	Hoplias marcphthalmus	Haimara	+				
4	CYNODONTIDAE						
4.1	Hydrolicus scomperoides	Biara	+				
4.2	Leporinus falcatus		+				
5	CICHLIDAE						
5.1	Cichlasoma festivum	Patwa	+				
5.2	Crenicichla alta	Sunfish	+				

Table 28: List of insects recorded within SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	IDENTIFICATION				CITES	IUCN
			S	H				
1.0	COLEOPTERA/ Beetles							
1.1	1.1 CERAMBYCIDAE							
1.1.1	1.1.1 Long horned beetles		+					
1.2	1.2 CURCULIONOIDEAE							
1.2.1	1.2.1 Snout beetles		+					
2.0	LEPIDOPTERA/Butterflies		+					
3.0	HEMIPTERA/Cicadas, etc		+					
4.0	ORTHOPTERA/Grasshoppers		+					
5.0	MANTODEA/Praying Mantis		+					
6.0	ODONATA/Dragonflies		+					
7.0	HYMENOPTERA/Ants, bees, etc		+					
8.0	DIPTERA/Flies		+					
9.0	BLATTODEA /Roaches, Termites		+					

Table 29: List of amphibians recorded at SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R	I	II
1.0	BUFONIDAE/Toads							
1.1	<i>Bufo marinus</i>	Common Toad	+					
1.2	<i>Bufo guttratus</i>	Land toad	+					
2.0	HYLIDAE/Frogs							
2.1	<i>Hyla granosa</i>	Tree frog	+					
2.2	<i>Hyla boans</i>	Barking frog		+				

## 11.4 Impact Assessment

### 11.4.1 Flora

A major impact of the selection system of timber harvesting based on diameter limits for merchantable trees, the selection of merchantable species, and the selection of trees of good form, is the *high grading* or *creaming* of the logged forest ( Fimbel, Grajal, & Robinson, 2001). Logging robs the forest of the best (quality) trees. To attempt to counter act such creaming in Guyana, a maximum yield per hectare, felling cycles and site restrictions are prescribed (GFC, 2018 ); for example, in Guyana, a maximum of 20m<sup>3</sup>/hectare for a felling cycle of 60 years is applied. Logging also removes trees from the forest at a faster rate of than natural mortality.

Logging disrupts ecological relationships between plant species by brutally altering understorey conditions- light, humidity, and temperature, within a brief time. Over the over the period of 18-20 days it takes to harvest a 100ha, major perturbations in habitats and plant niches occur.

Road building operations and timber harvesting leads to forest degradation and the alteration of microclimate (in terms of wind, humidity temperature and light conditions in the understorey. The sudden shock in the understorey influences seed germination and seedling development. The combination of gaps and disrupted soil surface facilitate the establishment of pioneer species (for example *Goupia glabra*<sup>18</sup>, *Renialmia spp*, *Miconia spp*, and *Trema spp*) which eventually influence the floristic composition of the forest in the long term (Ter Steege, 1996).

The removal of logs during timber harvesting tasks represents a loss of nutrients for the soil as well as plant genetic material; trees of good form are normally harvested so perhaps the best genetic material may be exported.

Poorly executed logging and skidding damages residual trees and may unwittingly produce forest gaps and forest fragmentation which creates a modified, mostly unfavourable environment for seedlings of merchantable species that thrive in shade.

The short term and long-term effects of RIL based, sustainable logging is a function of the forest type, the patchiness of species distribution, soil type, slope position, and care taken with directional felling and skidding operations, respectively. Forest fragmentation represents the worst scenario wherever sustainable logging is practiced. (Forest fragmentation due to logging in Guyana is rare).

<sup>18</sup> This is a commercial species, but the mass of seedlings does not always translate into well stocked stands of the species.

### 11.4.2 Fauna

The species composition of gaps is an indicator of animal activity: for example, the seeds of Burburu (*Solanum stramonifolium*) are dispersed by bats, birds, and monkeys (van Andel, 2000)

One reason that fauna thrives in tropical forests is that forests provide innumerable habitats and niches: for example, many animals dwell only at the ground level (tapir, deer, agouti), others dwell at mid-storey /understorey (squirrels, monkeys) and others dwell in the canopy itself (eagles, sloths) (Whitmore, 2012). Animals, depending on their foraging habits are active only by day, only by night and or are active by day and by night (tapir, jaguars, peccaries) (Whitmore, 2012).

Logging directly impacts forest dependent wildlife through the destruction or degradation of habitats, disruption of faunal movements, and interruption of ecological interactions between organisms. The intensity of impact of these 'disruptions' depend a great deal on the species of animals and their capacity to adapt quickly to changes (Fimbel, Grajal, & Robinson, 2001).

The consultants think that old campgrounds and old farms or kitchen gardens are frequented by various animals. Deer and tapir have been encountered frequently on RTI' access roads as they forage on juvenile roadside vegetation such as *Cecropia* spp.

### 11.5 Mitigation and Monitoring Measures

For flora, RTI will follow strict RIL practices, **planning all interventions** in the forest resources and paying special attention to *directional tree felling* and *skid trail planning*. RTI will make every effort to avoid water ponding in any form which restricts tree growth.

RTI will take measures, for example 'no hunting policies,' to protect all fauna-animals, including bats- that aid in seed dispersal and foster the regeneration of trees.

RTI's employees will be forbidden from lighting fires on the forest floor.

Based on RIL, forest degradation may be regarded as 'commercial degradation' because the residual forests continue to conduct all forest functions; and while some ecological relationships are destroyed, new ones emerge.

For fauna, RTI's field operatives would *avoid* confrontation with fauna; vehicles will always stop and allow animals crossing the road to do so safely; this applies particularly to snakes, sloths, anteaters, and ground dwelling birds. **Strict no hunting and no fishing policies will be enforced by RTI.** Signage to this effect will be posted along the primary roads. (RTI and its consultants will rely on camera traps for all future work related to wildlife censuses at the monitoring stations or elsewhere).

Forest gaps stymy the movement of fauna that will not use open spaces (Fimbel, Grajal, & Robinson, 2001). Every effort will be made to avoid gaps and fragmented forests. Prescriptions of the COP regarding logging operations (Chapter 6) operational hygiene (Chapter 8) and Camp Hygiene (Chapter 9) will be followed. Field operatives will be encouraged to take an interest in fauna. Registers will be kept at the base camp where field operatives can record sightings of mammals.

## 12.0 ECOSYSTEM SERVICES

### 12.1 Introduction

Ecosystem services are the multitude of benefits that nature provides to society (FAO, ITPS, GSBI, & EC, 2020). These services are the products of natural ecosystems, their cycles, and interactions, which develop and evolve over lengthy (Artiola, Pepper, & Brusseau, 2004).

RTI recognizes the benefits of ecosystems services, and the forest environment particular, on human livelihoods. RTI supports all local initiatives that the various public agencies and NGOs have been taking to conserve local forest resources and as such, RTI ensures that it keeps abreast of the national and international discussion on biodiversity, the conservation of natural landscapes and issues of climate change.

### 12.2 Definitions and scope

The Protected Areas Act, Act 14 of 2011, defines an ecosystem as *'the dynamic complex of animal, plant and microorganism communities and their non-living environment interacting as a functional unit'*.

An ecosystem may be defined as *'all plants, animals and micro-organisms in an area together with their physical environment, interacting as a functional system'* (ITTO/IUCN, 2009). An ecosystem may also be defined as a *'group of organisms and the environment with which the organisms interact'* (Strahler & Strahler, 1997). The livelihoods human societies are highly dependent on biodiversity and the ecosystem services it provides (FAO, ITPS, GSBI, & EC, 2020).

Three terms are also worth looking at: **'Ecosystem approach'** is 'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (ITTO/IUCN, 2009); **'Ecosystem management'** refers to the integrated management of an ecosystem (ITTO/IUCN, 2009); and **'Ecosystem services'** refer to the direct and indirect contributions of ecosystems to human well-being; the concept *'economic goods and services'* is synonymous with ecosystem services (TEEB, 2010).

An ecosystem refers to a set of biotic and abiotic components woven together in such a way that the system sustains itself. The biotic components refer to animals, plants, and micro-organisms while the abiotic components refer to edaphic and atmospheric parameters, respectively.

The coexistence of plants and animals in the forest environment lead to the following:

- (a) *plant-plant* interactions (such as epiphytic plants or parasitic plants on a host tree),
- (b) *animal-plant* interactions (such as animals feeding on plants or their fruits, bees pollinating flowers or birds disseminating seeds); and
- (c) *animal-animal* interactions (such as predation, for example carnivores feeding on herbivores)

For local tropical forests, abiotic components include:

- a) **Soil**-which provide mechanical support to plants, facilitate their growth through nutrient cycling processes from the weathering of primary rock, the decomposition of organic material and the leaching of solutes (Richards, 1998). Soil ph., soil temperature, soil moisture, soil texture and

water retention capacity are also major factors influencing plant growth and soil biology. Edaphic properties are frequently linked to landform; for example, the classification of montane and sub-montane forests is based on altitude. Certain edaphic properties (soil texture, ph., extremely free drainage, or impeded drainage due to hardpans) in association with landform may severely restrict the nature of the vegetation present. Hammond (2005) refers to the Guiana Shield as a vast expanse of low-land forests, mountains, wetlands, and savannah. The diversity of forest types in Guyana (see Figure 67) is aligned to terrain.

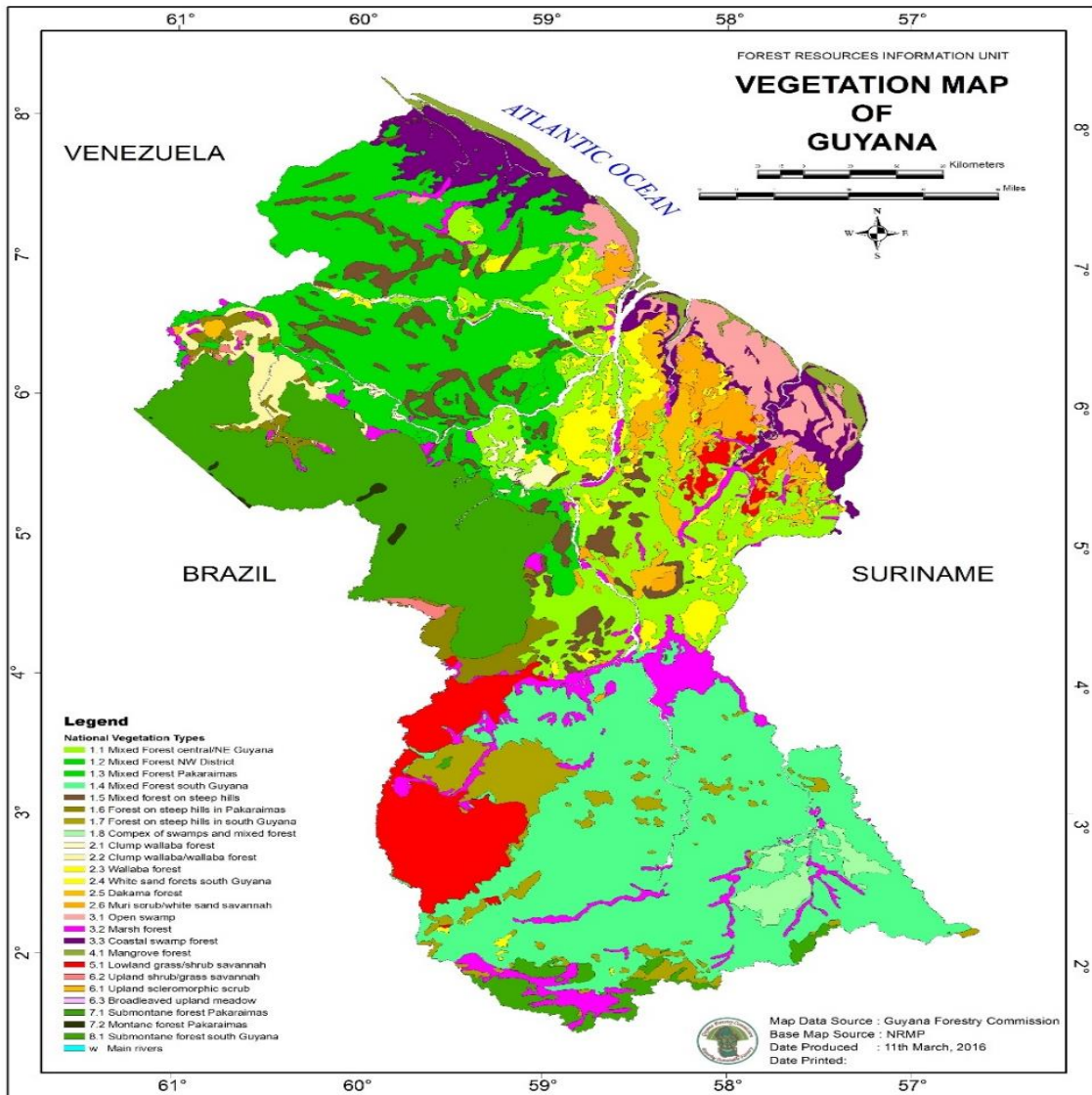


Figure 32: Vegetation map of Guyana ( GL&SC, 2013).

b) **Environmental phenomena:** rainfall, wind, sunlight, relative humidity.

The interaction of biotic and abiotic components of ecosystems creates what are commonly referred to geo-chemical cycles: for example, the carbon cycle or the hydrological cycle.

### 12.3 Key relevant policy, legislation, guidelines, standards etc.

Section 5(a) of the Guyana Forestry Commission Act No. 20 of 2007, mandates the GFC to prepare plans, codes of practice and guidelines for the *conservation and management of forests*; this by implication includes the *conservation of ecosystems*.

Section 5(b) of the same Act, mandates the GFC to research, collate, analyse, prepare, and disseminate data, statistics and other information about forests and all aspects of forestry including forest ecology and the use of forest produce. The GFC prescribes that a minimum of 4.5% of the *productive forests* within State Forest authorizations  $\geq 8,000$ ha must be preserved (and managed as biodiversity reserves). RTI has already earmarked an area of **19,779 ha for a biodiversity reserve (see Annex XIX).**

The *Protected Areas Act 2011* has the following preamble: an Act to provide for the protection of Guyana's natural heritage and natural capital, the creation, management and financing of a national system of protected areas; *the maintenance of ecosystem services of national and global importance* including climate regulation; the establishment and management of a protected areas trust fund; the fulfilment of Guyana's international environmental responsibilities; public participation in protected areas and conservation; and related purposes.

Section 24 of the protected areas Act 2011 specifies that the objectives of a national protected areas system, includes:

- a) Conserving Guyana's biological diversity.
- b) Protecting ecologically viable areas representative of all ecosystems and habitats naturally occurring in Guyana, and its natural landscapes and seascapes.
- c) Protecting ecologically significant areas which are vulnerable; and
- d) Safeguarding and maintaining ecosystem services

### 12.4 Existing information, Surveys and Baseline studies

The protected areas network (see Figure 33), the forests managed by the Iwokrama International Centre and forest reserves managed directly by the GFC are all part of the attempts at the national level to conserve ecosystems. The total current protected areas comprise those areas that *formally* constitute the NPAS, in addition to an area of 3716.81km<sup>2</sup> managed by IIC and an area of 6,250 km<sup>2</sup> of *private property* managed by the *Konashen Indigenous Community*. In addition, within the '*productive forests*' category on *active forest concessionaires*, forest concessionaires *and* the GFC together co-manage a total of 866.6 km<sup>2</sup> of biodiversity reserves<sup>19</sup>.

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<sup>19</sup> Holders of forest concession agreements/ State Forest authorizations for areas  $>8000$  ha must establish a biodiversity on an area equivalent to 4.5% of the area designated as *productive forests* of the concession. The location of the reserve must be agreed with the GFC.



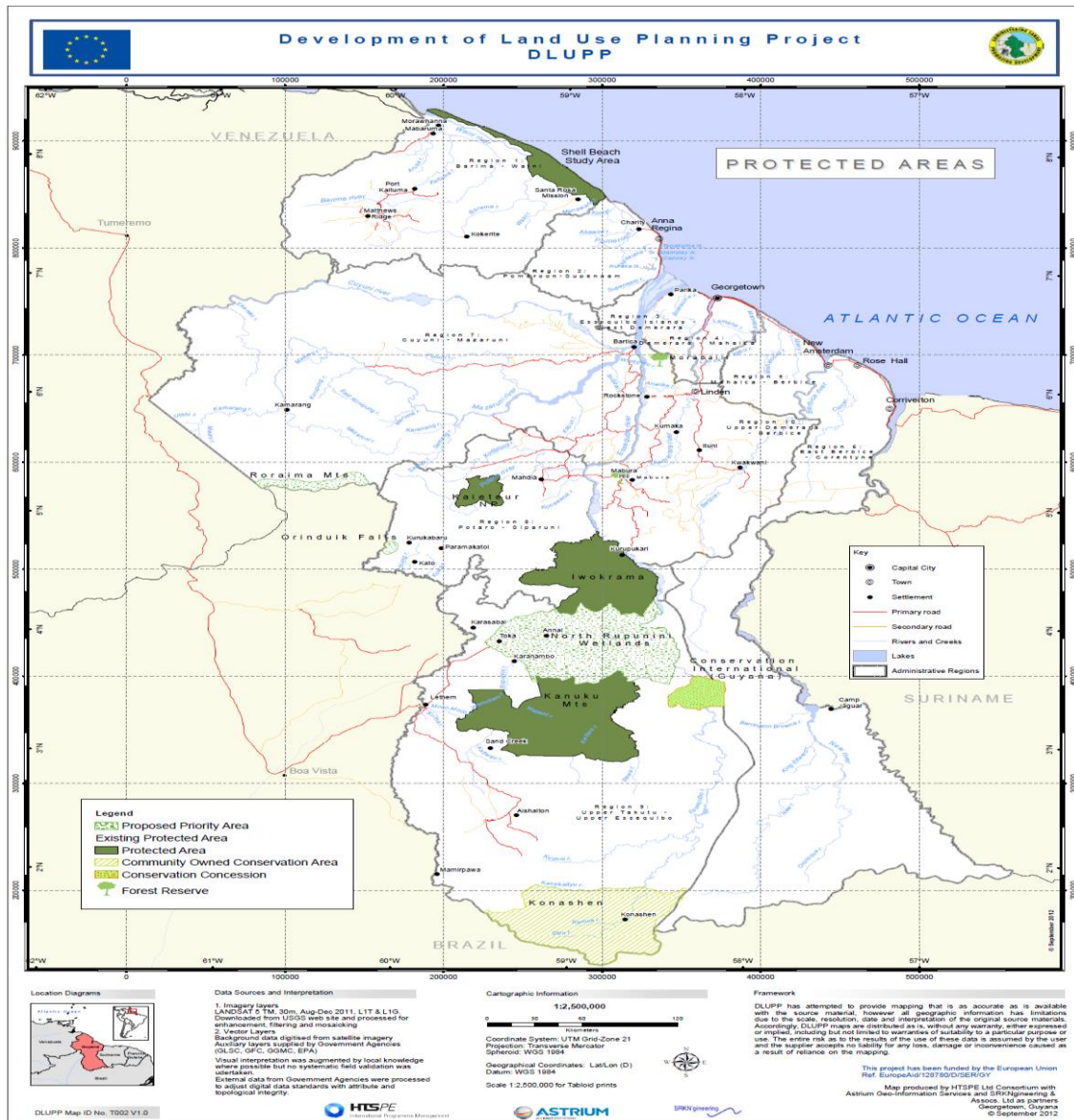


Figure 33: Map of protected areas at (December 2012) (GL&SC, 2013)

Ecosystems are critical because they provide humans with *four categories* of services (TEEB, 2010) (see also Table 30):

- Provisioning services*-ecosystem services that describe the material or energy outputs from ecosystems, including food and fresh water.
- Regulating services*: these are services that ecosystems provide by acting as regulators, for example in regulating the quality of air and soil.
- Habitat or supporting services*: for example, habitats provide the means for survival; and
- Cultural services*: experiences with aesthetic phenomena.

Table 30: Typical ecosystem services garnered from forest resources (TEEB, 2010).

THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES <a href="http://www.teebweb.org/resources/ecosystem-services/">(http://www.teebweb.org/resources/ecosystem-services/)</a>
<p><b>1.0 Provisioning Services:</b> Provisioning Services are ecosystem services that describe the material or energy outputs from ecosystems. They include food, water, and other resources.</p>
<p><b>1.1 Food:</b> Ecosystems provide the conditions for growing food. Food comes principally from managed agro ecosystems, but marine and freshwater systems or forests also provide food for human consumption. Wild foods from forests are often underestimated.</p>
<p><b>1.2 Raw materials:</b> Ecosystems provide a great diversity of materials for construction and fuel including wood, biofuels and plant oils that are directly derived from wild and cultivated plant species.</p>
<p><b>1.3 Fresh water:</b> Ecosystems play a vital role in the global hydrological cycle, as they regulate the flow and purification of water. Vegetation and forests influence the quantity of water available locally.</p>
<p><b>1.4 Medicinal resources:</b> Ecosystems and biodiversity provide many plants used as traditional medicines as well as providing the raw materials for the pharmaceutical industry. All ecosystems are a potential source of medicinal resources.</p>
<p><b>2.0 Regulating Services:</b> Regulating Services are the services that ecosystems provide by acting as regulators, for example, regulating the quality of air and soil or by providing flood and disease control.</p>
<p><b>2.1 Local climate and air quality:</b> Trees provide shade whilst forests influence rainfall and water availability both locally and regionally. Trees or other plants also play a significant role in regulating air quality by removing pollutants from the atmosphere.</p>
<p><b>2.2 Carbon sequestration and storage:</b> Ecosystems regulate the global climate by storing and sequestering greenhouse gases. As trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues. In this way forest ecosystems are carbon stores. Biodiversity also plays a significant role by improving the capacity of ecosystems to adapt to the effects of climate change.</p>
<p><b>2.3 Moderation of extreme events:</b> Extreme weather events or natural hazards include floods, storms, tsunamis, avalanches, and landslides. Ecosystems and living organisms create buffers against natural disasters, thereby preventing damage. For example, wetlands can soak up flood water whilst trees can stabilize slopes. Coral reefs and mangroves help protect coastlines from storm damage</p>
<p><b>2.4 Waste-water treatment:</b> Ecosystems such as wetlands filter both human and animal waste and function as a natural buffer to the surrounding environment. Through the biological activity of microorganisms in the soil, most waste is broken down. Thereby pathogens (disease causing microbes) are eliminated, and the level of nutrients and pollution is reduced</p>
<p><b>2.5 Erosion prevention and maintenance of soil fertility:</b> Soil erosion is a key factor in the process of land degradation and desertification. Vegetation cover provides a vital regulating service by preventing soil erosion. Soil fertility is essential for plant growth and agriculture and well-functioning ecosystems supply the soil with nutrients required to support plant growth</p>
<p><b>2.6 Pollination:</b> Insects and wind pollinate plants and trees which is essential for the development of fruits, vegetables, and seeds. Animal pollination is an ecosystem service provided by insects but also by some birds and bats. Some 87 out of the 115 leading global food crops depend upon animal pollination including important cash crops such as cocoa and coffee (Klein et al. 2007)</p>

THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES  
(<http://www.teebweb.org/resources/ecosystem-services/> )

**2.7 Biological control:** Ecosystems are important for regulating pests and vector borne diseases that attack plants, animals, and people. Ecosystems regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs, and fungi all function as natural controls.

3.0 Habitat or Supporting Services

**Habitats for species:** Habitats provide everything that an individual plant or animal needs to survive food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species' lifecycle. Migratory species including birds, fish, mammals, and insects all depend upon different ecosystems during their movements.

**Maintenance of genetic diversity:** Genetic diversity is the variety of genes between and within species populations. Genetic diversity distinguishes different breeds or races from each other thus providing the basis for locally well-adapted cultivars and a gene pool for further developing commercial crops and livestock. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others and are known as 'biodiversity hotspots.

4.0 CULTURAL SERVICES

**4.1 Recreation and mental and physical health:** Walking and playing sports in green space is not only a good form of physical exercise but also lets people relax. The role that green space plays in maintaining mental and physical health is increasingly being recognized, despite difficulties of measurement.

**4.2 Tourism:** Ecosystems and biodiversity play a significant role for many kinds of tourism which in turn provides considerable economic benefits and is a vital source of income for many countries. In 2008 global earnings from tourism summed up to US\$ 944 billion. Cultural and eco-tourism can also educate people about the importance of biological diversity.

## 12.5 Impact prediction and assessment.

The key issues of interest for loggers are the functional aspects of forests and the need to ensure that these processes are conserved because they form the basis of forest sustainability.

The core processes include:

- a) **Soil conservation:** everything should be done to avoid soil degradation and to avoid soil pollution given the critical role of soil biodiversity in the vigour of ecosystems.
- b) **Pollination:** this refers to the transfer of pollen between flowers: birds and insects are the main agents
- c) **Seed dispersal:** seed dispersal and seed predation affect the regeneration potential of forest stands; the higher the quantity of viable seeds, the more robust the regeneration. Most animals that feed on fruit facilitate seed dispersal. Seed predation may have negative effects on forest regeneration; insects that feed on seed and seedlings have the potential to kill their host (Basset, 1999).
- d) **Nutrient cycling:** nutrient cycling depends on soil moisture, soil ph., soil texture and the nature of the soil itself-whether shallow or deep or whether freely draining or waterlogged, etc.

- e) **Infiltration of water into the soil:** forest floor conditions such as the presence of a litter layer, soil organisms, soil texture and site conditions help determine the degree to which water infiltrates into the soil and percolate in the subsurface.

## **12.6 Mitigation and monitoring - Environmental and Social Management Plan**

Ecosystem conservation considerations have been built into the forestry legislation, the COP and forest management guidelines.

The legislation grants power to the GFC to set conditions for timber harvesting, restrictions on felling trees, and restrictions on felling species.

The Forest management guidelines include prescribing fell cycles, forest organization-compartments and blocks, annual allowable area, annual allowable cut, maximum yield per hectare.

RTI will be using RIL principles and practices in association with the COP and GFFO. Other measures to be taken to conserve water resources, soil and air quality will also contribute to ecosystem conservation. These measures will be articulated in FMPs, AOPs and annual reports to the EPA.

Temporary modifications to the forest resources within the area held by SFEP 2/2020 are inevitable. For example, mining leads to the removal of entire habitats and modification of the geological features underlying them ( TEEB, 2010). Miners within the concession area will be encouraged to support RTI's conservation efforts; for example, the draining of residual ponds from mining activity are areas where miners and RTI can collaborate.

## 13.0 NOISE AND VIBRATION

### 13.1 Introduction

On forest concessions, heavy duty equipment is used for the construction of forest roads and skid trails, for skidding logs and organizing these at log markets, and for conveying logs from log market to any log depot. These heavy-duty vehicles produce noise and vibration. Also, at base camps, generators and other mechanical equipment in workshops generate noise and vibration. Chainsaws in use are noisy machines.

The proximity to noise is a major hazard for humans *as well as animals*. Common effects of prolonged exposure to noise causes various effects including hearing impairment and sleep disturbance. RTI is committed to mitigating noise and vibration in every case where this is achievable. Careful planning of the use of machines and employee sensitization about the issues of noise and vibration and their respective mitigation will be RTI' main thrust in its noise and vibration *mitigation* practices.

### 13.2 Definitions and scope

Noise may be defined as any unwanted sound that may cause hearing impairment, speech interference, annoyance, and any other effects (Godish, Davis, & Fu, 2015).

The term 'vibration' covers any vibration which is transmitted to the human body through solid structures and is harmful to health or otherwise dangerous.

For forestry activities, chainsaw operators, operators of skidders, bulldozers excavators and front-end loaders and mechanics are particularly exposed to noise for many hours at a time on a regular basis. Manufacturers of heavy-duty machines go to great lengths to prevent reduce the noise and vibration emanating from their machines.

### 13.3 Legislation

The Environmental Protection (Noise Management) Regulations 2000 (see Section 5.4.3) is the primary noise management legislation in Guyana. The EPA and the GNBS have published standards (see Tables 7, 31) to guide developers. Noise decibel levels are not to be greater than the established permissible noise levels/limits of the Guyana National Bureau of Standards (GNBS) Guideline values for noise in specific environment which has been adopted by the Environmental Protection Agency (EPA).

Table 31: Table GNBS' Guidelines for Noise Emission into the Environment (GNBS: GYS263:2010 First Revision)

Categories	Daytime Limits (dB) (06:00-18:00)	Night-time Limits (dB)
Residential	75	60
Institutional	75	60
Educational	75	60
Industrial	100	80
Commercial	100	80
Construction	90	75
Transportation	100	80
Recreation	100	70

### 13.4 Baseline information

Clusters of noise measurements were taken in at various locations within and around the concession during April 2022 using a Sound Level Meter (ExTech 407730) (Figure 34).

Noise decibel levels are not to be greater than the established permissible noise levels/limits of the Guyana National Bureau of Standards (GNBS) Guideline values for Noise in specific environment which has been adopted by the Environmental Protection Agency (EPA).

RTI's SFEP is characterised by itinerant mining and the SFEP area is considered an 'industrial zone.'



Figure 34: Illustration of Noise Recording device used at SFEP 2/2020

### 13.5 Results and Discussion

Noise levels within RTI's forest concession ranged from 38.6 dB to 54.8 dB (see Table 32). Noises emanated primarily from motor driven water pumps and generators used by miners.

### 13.6 Impact Assessment

Employees of RTI will be exposed to noise and vibration across the whole gamut of the company's field operations daily because they are in the frontline of operations.

Mining operatives or persons transiting the forest concession may be affected temporarily if they happen to be in the vicinity-less than 300m - of logging operations. (RTII will not conduct felling operations in the vicinity (<1000m) of logging camps.

Logging practices impact wildlife by perturbing habitats and dispersing populations but there is reason to believe that different faunal groups react differently to these practices (Fimbel, Grajal, & Robinson, 2001). For noise emanating from tree felling and skidding operations, nuisances will normally be very temporary, a maximum of about three weeks duration per 100ha block. However, noise and vibration impacts will persist along the main primary roads that are used a regular basis.

Table 32: Noise data recorded at SFEP 2/2020 (EES)

<b>1. Measurements (Data)</b>																
<i>Air Quality and Total Suspended Particulate (TSP) <math>\mu\text{g}/\text{m}^3</math></i>																
Sample ID	Collection Date	Coordinates 21N UTM	Time		Data RAM $\text{mg}/\text{m}^3$			TEMPO		HCHO	TVOC	Direct ion	Speed (m/s)	Noise dB Low	Temp. Celsius	Elev. meter
			Start	%RH	TWA	Max. Con	Ave. Con	PM2. 5	PM10							
RT1	12/04/2022	0831829, 0689631	15:28	44.2	0.072	0.101	0.069	14.7	21.2	0.000	0.626	W	0.04	43.2	26.2	89
RT2	12/04/2022	0177378, 0688284	16:27	65.3	0.082	0.090	0.058	14.0	14.3	0.000	0.176	W	0.4	48.3	27.2	91
TR3	13/04/2022	0228183, 0691839	14:33	80.6	0.078	0.096	0.064	18.9	28.2	0.000	0.642	SW	0.4	48.5	25.6	57
RT4	13/04/2022	0228190, 0691834	17:31	84.2	0.052	0.084	0.073	18.5	25.9	0.000	0.253	SW	0.02	54.8	24.2	58
TR5	14/04/2022	0201471, 0689761	9:01	89.1	0.045	0.053	0.042	14.8	20.7	0.000	0.851	W	0.3	48.7	28.6	28
TR6	14/04/2022	0198180, 0691917	10:09	75.6	0.051	0.060	0.045	13.6	16.9	0.000	0.369	W	0.00	46.2	23.2	33
RT7	14/04/2022	0215370, 0691184	15:22	85.8	0.068	0.168	0.055	16.6	19.7	0.000	0.534	W	0.06	44.2	27.5	70
RT8	14/04/2022	0219645, 0694211	16:16	86.2	0.059	0.078	0.072	15.8	21.7	0.000	0.743	W	0.3	48.2	25	112
RT9	14/04/2022	0219525, 0694622	16:30	84.3	0.068	0.069	0.068	14.0	19.2	0.000	0.549	W	0.04	38.6	25	112

### **13.7 Mitigations Measures**

RTI will apply the following basic measures:

- a) All employees will be sensitized about the dangers of exposure to noise and vibration.
- b) Employees will be provided with ear plugs or other appropriate hearing protection apparatus to restrict noise and vibration entering their ear.
- c) The use of all machinery will be planned. Machines will be serviced and maintained in a state where they emit only noise in line with their optimum performance. Care will be taken that all machines will carry fully functional exhaust systems.
- d) Timber harvesting and sawmilling operations will be restricted to periods between 7:00hrs and 18:00hrs. However, when the haul distance between the concession area and Iteballi exceeds 200km, trucks will start hauling timber at 4:00hrs.



## 14.0 LAND SCAPE AND VISUAL RESOURCE

### 14.1 Introduction

Large scale forest and landscape restoration has emerged as an important global priority (Cassels, Luo, & Chen, 2020)

Landscapes in the concession area are a function of the prevailing natural topographic conditions and land use. The general land scape is pock marked by mining activity and ancillary activities (see Figure 35. In line with seasonal rainfall cycles and corresponding plant growth patterns, specifically flush of leaves or flowers, there are mild changes in the general aspect of the vegetation during the year. Major landscape aesthetic modification of landscape in the concession area is due to anthropogenic activity.

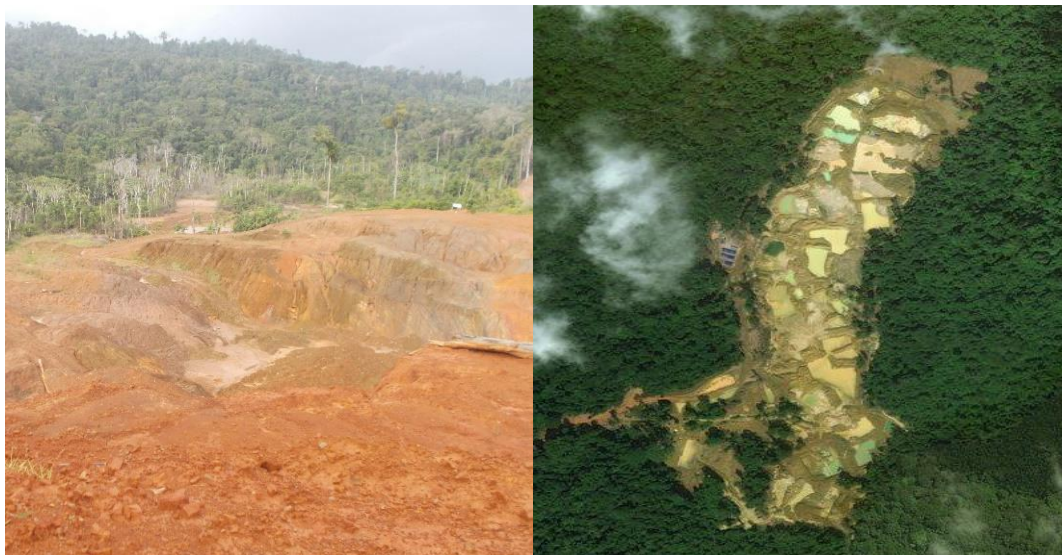


Figure 35: Modification of the landscape due to mining at SFEP 2/2020

*Conventional* logging leads to degraded landscapes due to erosion, the creation of gaps, forest fragmentation, and forest gap colonization by grasses, lianas, and shrubs. On the other hand, the use of RIL, characterised by planned interventions in the forest resources do not normally lead to significant landscape modification.

Forest fires, which are capable of major changes in the aesthetic quality of landscapes, are not common in the Puruni district. Further no commercial scale farms or pasture occur within the concession area.

### 14.2 Definitions and Scope

Landscapes are more than just physical spaces: they are contexts in which species and communities interact and function. Rainforest landscapes are influenced by variables such as weather, drainage, and soil **Invalid source specified.**

Some authors use the term **landscape ecology**-the study of spatial patterns, processes and change across biological and cultural structures within areas encompassing multiple ecosystems **Invalid source specified.**

At a regional scale, Hammond (Hammond D. , 2005) describes ‘a massive landscape designated the *Guiana Shield* simply as a land of old rock, poor soils, much water, extensive forests and few people’.

Several swamps in the concession area (see Figure 36) may *for convenience* be treated as wetlands (WWF-GUIANAS, 2012).



Figure 36: Example of a swamp (wetland) within SFEP 2/2020

#### **14.3 Key relevant policy, legislation, guidelines, and standards.**

RIL practices, selective logging, felling site restrictions (linked to gap control and terrain) and buffer zones, all mandated by GFC's forest management standards, are the primary practices leading to the conservation of forest resources and landscapes. For example, Sections 4.3.1 and 4.3.2 of the (mandatory) COP contain prescriptions on the need for pre-harvest data for more 'economical forest harvesting' and Section 5.1 seeks to 'limit the area cleared' for road networks, restricting the formation of forest gaps, the emergence of forest fragments, and forest degradation.

#### **14.4 Impact prediction and assessment**

Logging alters forest structure through the felling of, and the removal of large merchantable trees from the forest stock and the consequent need for roads and skid trails to extract timber. Felling trees alter landscapes by altering the distribution of diameter classes and height classes respectively and by changing the proportion of each species per unit area and eventually the forest architecture (van der Hout, 1999) (Shiel, Putz, & Zagt, 2010). Where rainfall occurs during or shortly after major earthworks for roads, excessive sediment loads due to accelerated erosion may modify the aesthetic values of the waterways and consequently, the landscape.

#### **14.5 Mitigation and monitoring**

Lessons from China indicate that the main drivers for successful landscape 'management' are *sustained political and budgetary support, mass mobilization and participation of 'stakeholders', coordinated governance and management, development of partnerships, and a focus on livelihoods and ecosystem services* (Cassels, Luo, & Chen, 2020).

At the *regional level*, RTI's FMO will study outcomes of initiatives such as WRI's Initiative 20 x 20 involving Latin American and Caribbean Governments<sup>20</sup> and stakeholders that rehabilitated 20 million hectares of degraded lands<sup>21</sup> across eight Latin American Countries. The combination of a national

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<sup>20</sup> Not including Guyana.

<sup>21</sup> [Initiative 20x20: A Landscape Restoration Movement Rises in Latin America and the Caribbean | World Resources Institute \(wri.org\)](https://www.wri.org/initiative-20x20)

framework and legislation as well as international commitments will help strengthen the country's (wetland conservation and) management efforts (WWF-GUIANAS, 2012)

RTI will research initiatives at the *national level*. RTI's Forest Monitoring Officer will consult with agencies such as the PAC, IIC, UG, GFC and GGMC to monitor management or restoration efforts in Guyana

At the concession level, RTI anticipates that its embrace of RIL practices will support forest resources conservation and conservation of landscapes. Every effort will be made to avoid forest based open fires, stream pollution, deforestation, and any other form of forest degradation.

RTI will ensure that all employees share responsibility conserving forest resources: specifically, they will at all costs avoid any pollution of the environment. RTI's quarterly briefing sessions with employees will include discussion on problems associated with issues such as forest fires and stream pollution. The relevant sections of GFC's COP, 2018, specifically:

- a) Chapter 5: sections 5.5 (*drainage*) & 5.7 (*water course crossings*),
- b) Chapter 8
- c) Chapter 9
- d) Chapter 10: section 10.4 (*fire prevention and suppression*) and section 10.11 (*water operations*).

RAI's employees and contractors will be prohibited from lighting any open fire on the forest floor. Smokers will be asked to carry a small bottle or tin to store cigarette butts until these can be disposed of in pits near the camp.

There will be three main measures to avoid stream pollution, as follows:

- a) Spillage of any petroleum products will be avoided at all costs.
- b) No major road works will be conducted in the rainy season, and no activity requiring earthworks will be done during a rainstorm
- c) No water from side drains or ditches will be allowed to enter directly into water courses: preferably such water will be led into special pits (*'dead sumps'*) where it will lodge and allowed to infiltrate into the soil. Alternatively, the water will be channelled through any suitable structure or debris deliberately put in place to trap most of the sediments suspended in the drainage water before it reaches the watercourse.

RAI will post signs at workspaces (see Figure 37) to reinforce information passed on during briefing sessions.



Figure 37: Illustration of pre-emptive measures for conserving the quality of surface water.

## **15.0 CULTURAL HERITAGE**

### **15.1 Introduction**

RTI will isolate and conserve any evidence- -related to historical occupation of the concession area, because such items may have huge archaeological significance. To date the consultants did not observe any evidence of ancient historical human occupation of any part of the concession area, during their reconnaissance activities.

### **15.2 Baseline information**

There is no historical information on any indigenous village or 'nations' within the Puruni Watershed (Bulkan J. , 2013), see Figure 38 where SFEP 2/2020 is situate. However, villages in the *upper Mazaruni* such as Kako, Kamarang and Philipai have been around since time immemorial (APA et al, 2019).

Apart from Kartabo, established in the early 1900, other communities in the Kartabo Triangle were established fairly recently; for example, Karrau, 1940 and Batavia, 1970 (APA et al, 2019).

In the course of its field operations, RTI' field operatives will seek out any archaeological materials including products made from pottery, ancient tools, old cemeteries, rock, and paintings and collaborate with the relevant authorities to protect the articles.

### **15.3 Impact predictions**

In the pursuit of its logging operations, RTI will develop the concession area in a general east west orientation. Unless field operatives are vigilant, assets of Indigenous or archaeological importance may be destroyed.

### **15.4 RTI' policies**

RTI will adopt the following policies in the development of the concession:

- a) RTIS will not operate near communities; specifically, RTI will not operate less than 500m from the right bank of the Puruni River.
- b) RTI will be vigilant in isolating and protecting any asset of archaeological interest on the concession area and then bringing the relative facts to the authorities.

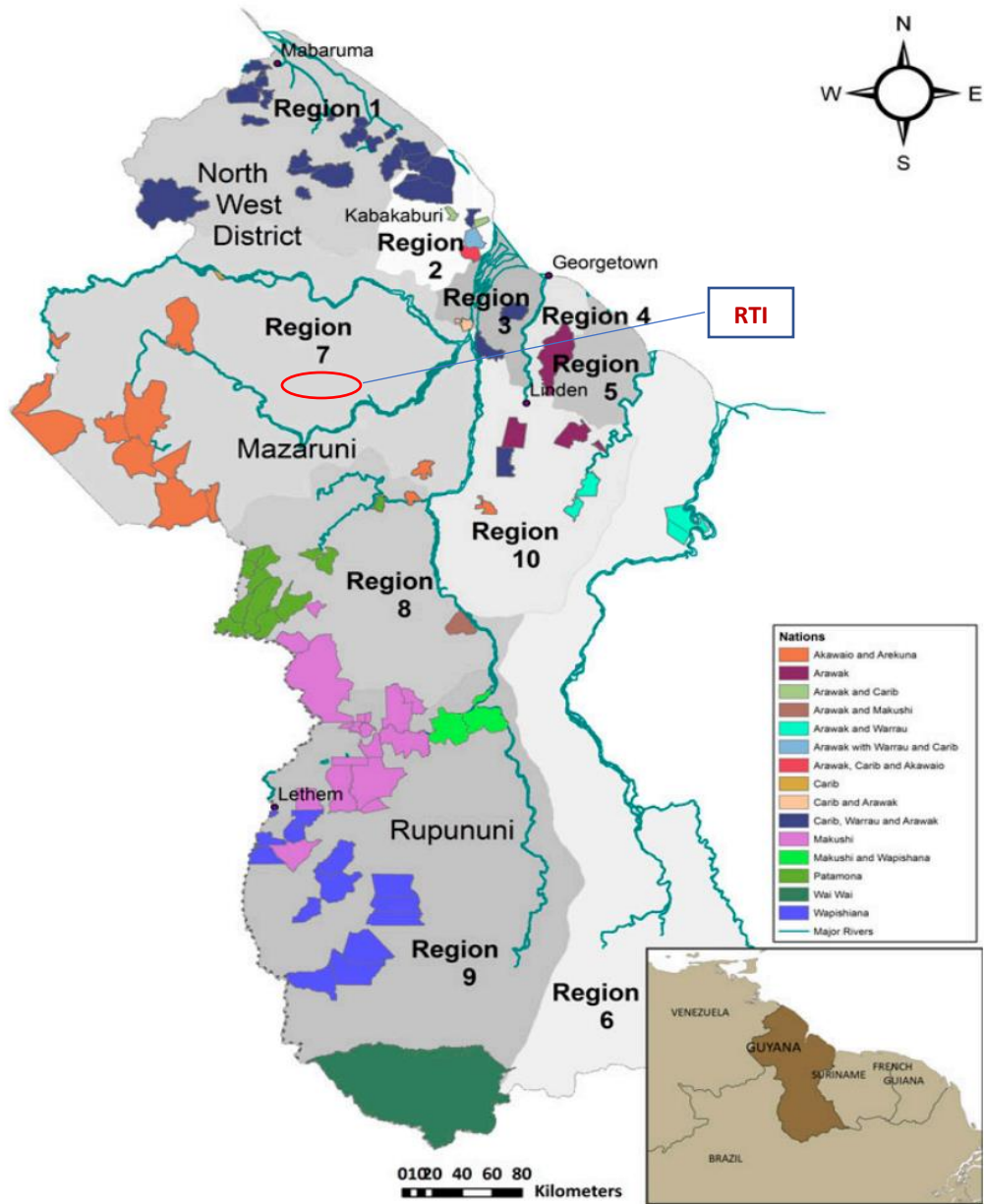


Figure 38: Map of Guyana showing inter alia formally titled indigenous areas and names of Indigenous nations ( (Bulkan J. , 2013) page 376

## 16.0 SOCIO-ECONOMIC AND CULTURAL IMPACTS (DIRECT AND INDIRECT)

### 16.1 Introduction

Residents of the Kartabo-Triangle openly welcome any development and believe that RTI's logging operations will add incremental economic benefits to the Kartabo-Triangle, and the Puruni District in particular.

FTCI has had the opportunity to note the direct impacts of expanded economic activity on the development of *Puruni Landing* over the period 2007 to 2022, in respect of the following:

- a) The development of a taxi service between Iteballi & Puruni Landing, also a marked increase in vehicles traversing the Kartabu Puruni Road on a daily basis
- b) A 300% increase in the volume of business community. Apart from the traditional businesses<sup>22</sup> vending rations, fuel, mining equipment, and fresh vegetables; there are now about four hotels, hair salons, vulcanizing shops, vehicle wash bays, mechanical workshops, and a host of roadside vendors.
- c) The expansion in the number of hotels and bars at Puruni Landing
- d) An increase in the population, and also an increase in the number of females at Puruni Landing
- e) At least three public agencies-GGMC, MOH, and GPF are now based at Puruni Landing. (Note that GGMC has been present at Puruni Landing for many years, while there have been police patrols and extension services by Ministry of Health).
- f) The erection of mobile phone towers and mobile phone services.



Figure 39: Illustration of the expansion of Puruni Landing: the hotel at right was constructed in 2017

A higher volume of economic development will generate *more revenue* for the national coffers and therefore at the regional level, more public agencies will be inclined to maintain a presence in the area and therefore offer more services to residents. These services also attract the *business community* and then the services available to residents are enhanced considerably. The enhancement of services also allows residents to stay at their community and not migrate (to coastal locations).

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<sup>22</sup> The business community at Puruni Landing comprises Guyanese, Brazilian and Chinese businesses.

It is anticipated that RTI’s sawmilling facilities will provide a ready source of timber for housing construction and road works respectively at Puruni and environs.

Only one logger, *Jettoo Lumber Yard & Sawmills*, has been active in areas west of Puruni River; other large concessionaires have been stymied by challenges arising from using the barge plying the Puruni Crossing for hauling logs using trucks with pole trailers<sup>23</sup>.

The core impacts are summarized in Table 33 and prioritized in Table 34.

Table 33: Core impacts socio-economic impacts of RTI’s proposed project.

#	Issue	Nature of Impact
1	Public services & public spending	<ul style="list-style-type: none"> <li>• More public services (health, security) available to enhance citizens’ welfare</li> <li>• Public expenditure for bridges and road works makes more sense where there is (the opportunity to expand economic activity</li> </ul>
2	Employment	<ul style="list-style-type: none"> <li>• Creation of opportunities for employment and training</li> <li>• Expanded businesses</li> </ul>
3	Concession road network	<ul style="list-style-type: none"> <li>• Expanded gold mining operations.</li> <li>• Restrictions on road use leading to conflict.</li> <li>• Opportunities for expanded services by public agencies</li> <li>• Increased opportunity for disagreeable activities</li> </ul>
4	Road hazards	<ul style="list-style-type: none"> <li>• Dust hazards</li> <li>• More congestion, more risk of accidents</li> </ul>

## 16.2 Definitions and scope

SFEP 2/2020 has a gross area of 107 ha of mostly intact forests and stakeholders’ interest covers several concerns, including the integrity of watersheds and the conservation of fauna. The National Forest Policy Statement 2018 ( GFC, 2018) deliberately includes not only provisions for the sustainable harvesting of timber but also the whole gamut of services generated by forests; these have been categorized as -provisioning services, regulating services, habitat or supporting services, and cultural services ( TEEB, 2010).

## 16.3 Baseline studies

RTI’ consultants engaged in extensive formal and informal consultations with stakeholders, including residents of Batavia Amerindian Village, Kartabu Village, Iteballi, and Puruni Landing. These yielded information on the perspectives of stakeholders in the face of the projected logging operations within SFEP 2/2020 and ancillary benefits for stakeholders, particularly in terms of employment opportunities, increased trade in goods, new access options for areas in the upper Puruni District, and more attention from Central Government and the Regional development Council, Region 7.

## 16.4 Impact prediction and assessment

### 16.4.1 Positive Direct Impacts

- Employment opportunities

RTI requires field operatives, auto-mechanics, auto-electricians, heavy-duty machine operators, and timber graders. As far as possible RTI will recruit employees from the Kartabu Triangle.

- Skills training for employees

<sup>23</sup> These are used for logs with lengths exceeding 10 meters.

RTI will create a cadre of skilled technicians in the Kartabu Triangle within one year. RTI will expend huge sums of money to train new employees to function within the enterprise whose timber harvesting systems will be built up on RIL principles and practices. RTI will also ensure that its employees share responsibility for compliance with GFC standards and with the provisions of its *Environmental Authorization*.

- Road network development

RTI will support maintenance of the Puruni -Pappy Show segment of Kartabu Puruni Road. In addition, RTI will develop and share road networks within its concession area. (If necessary, RTI will accept contracts with MOPW/MNR/GGMC for the scheduled maintenance of selected or agreed road segments).

Public officials -including GGMC, GPF and MOH-will take advantage of improved road networks developed by RTI for outreach exercises for monitoring or managing matters of public interest, including matters of public health and security.

- Economic expansion-Kartabu Triangle

RTI expects it will expend G\$20 million annually within the Kartabu Triangle on remuneration packages, and the purchase of goods from merchants or farmers at Iteballi and Puruni Landing.

- Revenue for Government

The imminent logging operations will lead to a significant increase in revenue for the GFC. The Government will benefit directly from taxes linked to remuneration packages and taxes on the expanded trade in the volume of goods and services. Agencies such as the NIS and GEA will garner additional revenue.

#### **16.4.2 Positive indirect impacts**

Positive indirect impacts include the following:

- Enhanced interest by public agencies and private developers

The consequent increase in the workforce within the Kartabu Triangle as well as the higher proportion of employed workers within communities caused by RTI' operations and the corresponding increase in the volume of cash flows will lead to the expansion of existing businesses as well as create opportunities for new businesses to the area. More businesses will attract more political attention and more political attention will in turn lead to better social services that allow communities to develop.

There are no known eco-tourism ventures in the Kartabu Triangle itself. However, there are many beautiful landscapes with amazing aesthetic characteristics worthy of a tourism venture. There are hotels of reasonable quality at Bartica, at Aruwai, White Water near Iteballi and at Puruni Landing. There are opportunities for many more.

- Community development

Regular paid employment is key to the youth remaining and building their communities. Many residents of Kartabu Village and Batavia Amerindian Village prefer to live at those locations. (Any villager can easily do a return trip to Bartica or Georgetown on any business day). *A major concern for most residents however is the point at which students attend secondary school, at Bartica or a coastal location; parents need a regular source of cash to sustain their children and they are happier if they can stay at home and do so.*



Similarly, young people who have left school, and young women in particular will stay in their villages if they can get jobs there. The advent of mobile phones, internet and solar technology and more security at home have stymied the urge to migrate to urban centres.

RTI's operations will afford both jobs and training for people willing to work on its forest concession. Further the proposed use of Information Technology and UAVs for forest monitoring purposes will ensure adequate challenges for young people.

- **Regional Development**

RTI's proposed logging operations will lead to the structured exploration of the area embodied under SFEP 2/2020. RTI is committed to sharing responsibility for the maintenance of the Kartabu-Puruni Road; a fully functional road will lead to an increase in the flow of goods, expanded economic activities, and provide more justification for bridges at Teperu-Iteballi and at Puruni Landing, respectively.

The concession-based road network will facilitate faster flow of goods to mining sites in the upper left bank Puruni District with the real possibility that annual gold output for the district will increase. Increased mining activity generates more employment for citizens.

All communities in the Kartabu Triangle (see Annex XXIII) will benefit in some way from additional economic activity.

#### **16.4.3 Negative Direct Impacts**

RTI anticipates the following negative direct impacts:

- **Conflicts due to restrictions on the use of RTI's concession-based road network**

RTI will need to manage the use of its roads within the concession area for its own security and for ensuring compliance with its FMP and its Environmental Authorization. Such management includes putting restrictions on hunting, fishing, and littering through the use of barriers and this may not go down well with persons trying to access the concession area. Any restrictions could be a cause for conflict. Also, a few miners have placed locked barriers across their roads, a situation that requires some negotiation for their use.

No commercial scale hunting or fishing has been observed in the Puruni area to date. However, RTI's road network could open the gates for commercial hunting in intact areas.

Another source of conflict is the tendency for small businesspeople to set up shops along new roadways vending an array of goods, including alcoholic beverages. The presence of these shops is an administrative burden because they create the need for cash, which in turn leads employees or idlers associated with such shops to steal goods such as fuel and machine parts from loggers and miners, generating uncomfortable, time-wasting situations, or forcing loggers to invest excessively in security measures.

- **Contribution to hazards on KPR**

RTI' vehicles transiting the KPR will add to the volume of impacts from dust (see typical example at Figure 40), noise, and vibration associated with the use of the road. Dust clouds due to the passage of heavy-duty vehicles are particularly common in the dry season. Only the communities at Takutu Village and a few camps along the road will be affected. However, for small utility vehicles such as ATVs and motorcycles, dust clouds are particularly hazardous.

- **Accelerated degradation of the KPR**

RTI's logging trucks, with a mean laden weight of about 40 tons will contribute to the degrade of the segment of the KPR it uses. RTI expects to deploy a minimum of two (2) trucks per week, doing round trips between its Base Camp and Iteballi. Trucks will carry pole trailers and full-size logs: therefore, the mean total length of a laden truck is projected at 18.5m. Unlike typical cargo trips along the KPR, RTI's trucks (and those of other loggers are laden on the 'outward-east bound- trip'<sup>24</sup>. RTI's use of the KPR will result in more costs for the maintenance of the road.



Figure 40: Photos showing potential hazards on the KPR

#### 16.4.4 Negative indirect impacts

RTI anticipates the following negative indirect impacts:

- Potential scarcity of mechanics, technicians

RTI will start logging operations in an area already occupied by other loggers and miners who require the same skills sets that RTI will recruit. RTI will have to spend more time and costs on efforts to retain its employees, preventing them from transferring to other enterprises. Similarly, some enterprises in the area will be affected by the competition for highly skilled workers.

- Expansion of public agencies' budgetary provisions

Expanded activity in the upper Puruni District will force public agencies expand the scope of their field operations by posting staffs in those areas, forcing them to procure bigger budgets, more workforce, or to transfer resources from other geographic areas. For example, just recently at Puruni Landing, the GPF has moved from *random patrols* at Puruni Landing to the creation of a police outpost there; the outpost is likely to develop and become a fully functional police station within a few years.

#### 16.5 Mitigation measures

The following measures will form the basis of RTI' response:

- a) RTI will follow the provisions of the COP, forest management guidelines and prescribed tasks set out in its Environmental Authorization.
- b) RTI's Forest Monitoring Manager will be proactive in engaging stakeholders so that any issues of concern will be addressed in a timely and amiable manner.
- c) All logging trucks and heavy-duty vehicles will carry rotating beacons and trucks will also travel with their headlights in the **turned-on** position.

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<sup>24</sup> Typically, trucks associated with miners are loaded on the west bound trip, and empty on the east bound (outward trip).

Table 34: Matrix of potential social impacts expected to emerge from RTI' operations

Predicted Impacts	PROJECT ACTIVITIES								
	Planning Phase				Operations Phase				
	Const. of forward camps	Const. of primary access roads	100% Pre-harvest Inventories	Tree marking operations	Construction of secondary roads	Constr. of Skid trails, Log markets	Felling trees & skidding logs	Log market operations	Log haul to Iteballi by trucks
Employment	Lo: Rv: St: Av: Im: In: Lp	Ex: Rv: St: Un: M: Sig: Hp	Lo: Rev: St: Un: M: In: Lp	Lo: Rev: St: Un: M: In: Lp	Ex: Rev: St: Un: M: Sig: Hp	Ex: Rev: St: Un: M: Sig: Hp	Ex: Rev: Lt: Un: Im: Sig: Hp	Lo: Rev: St: Av: M: Sig: Hp	Ex: Ir: Lt: Un: Im: Sig: Hp
Concession based conflicts	Lo Rev Lt Un M In Hp	Ex Rev Lt Un M In Hp	Ex Rv Lt Av M In Hp	Lo Rv St AV M In Lp	Ex Hp Ir. Lt Un Sg	Ex Hp Ir. Lt Un Sg	Ex Hp Ir. Lt Un Sg	Lo Rv St Un M In Lp	Lo Ir. Lt, Un M Sg Lp
Other Conflicts	Lo Rev St Av M In Lp	Ex Rv St Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv St Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv St Un M In Lp	Ex Rv St Un M In Lp	Lo Rv Lt Un In LP	Lo Ir Lt Un M In Lp
Road Hazards	Lo Rv St Un M In Lp	Ex Rv Lt Un M Sg Hp	Ex Rv Lt Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv Lt Un M Sg Hp	Ex Rv Lt Un M Sg Hp	Ex Ir Lt Un M Sg Lp	Lo Rv Lt Un M In Lp	Ex Rv Lt Un M Sg Hp

Impact Significance (parameters)

Lo-localised, Ex-Extensive/ Rv-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

Note: All Extensive, Mitigable, Long term, and significant impacts will have to be prioritized.

## 17.0 RISKS AND RISK ASSESSMENT

### 17.1 Introduction/Overview

RTI has conducted several reconnaissance trips to the Kartabu Triangle, in the process studying the variables that will impact on production. Mining activity is not considered as a formidable a threat, however vague responsibility for road maintenance is a grave issue. The road degrades to bad state before any repairs is attempted (see Figure 41). Further the variety of vehicles using the road and their varying wheelbases and weight aggravates the situation when the road is in a bad state.



Figure 41: Illustration of sections of the KPR in a bad condition.

### 17.2 Access

RTI will rely on about 115km of the Kartabu-Puruni Road to access the forest concession and to extract timber to Iteballi. There are two concerns: firstly, extraction of timber is not possible when the road is in a poor state (see Figure 42).



Figure 42: State of the KPR, west of Puruni Crossing in April 2022

Secondly, there is the issue of the Puruni Crossing (see Figure 43), a situation that has so far prevented the development of the forest concessions west of Puruni Crossing, because of limitations on the

vehicle length. There is also severe congestion on the left bank of the river, with a few buildings so close the river, that trucks carrying logs with length >9m will not be able to turn there.



Figure 43: Photo showing current modalities at the Puruni Crossing

Current efforts to address the road repairs and to construct a bridge across the Puruni River are unlikely to yield meaningful results before the end of 2023.

### 17.3 Forest Resources

RTI is satisfied with the following parameters for the forest resources:

- a) The quality of the merchantable stock, both in terms of the species composition and the distribution of diameter classes.
- b) Terrain that is manageable for road construction and RIL based timber harvesting operations.
- c) Opportunities for value added wood processing in the plywood sub-sector.
- d) Opportunities to develop wood products based on the considerable number of lesser used species in the concession.

### 17.4 Choice of technology

RTI' timber harvesting operations will be based on RIL principles and practices which require that every aspect of the forest interventions be **planned** to reduce environmental impacts and achieve cost savings.

Consequently, RTI will deploy the appropriate machine for every intervention including but not limited to:

- a) Chainsaws designed for directional tree felling and with the proper safety features for the protection of the chainsaw operator.

- b) Bulldozers, motor graders, compactors for main road clearance and surfacing works.
- c) excavators for mining burrow pits, roadside draining design, and bridge and culvert construction.
- d) Front-end loaders (with fork and bucket) for loading earths into trucks and for loading logging trucks.
- e) Skidders for transferring logs from stump to log market.
- f) Heavy-duty logging trucks with a proven performance under local forest conditions.

RTI is confident that spare parts and the proper maintenance services are available to keep all equipment in their proper functional state. RTI is confident that the use of RIL practices associated with a maximum yield of 20 m<sup>3</sup> /ha and prescriptions on felling trees set out in the COP will neither lead to accelerated forest degradation or forest fragmentation and further, will create minimal impact on fauna.

The feasibility of establishing a second portable mill on the concession area is still under review.

### **17.5 Constraints-stakeholder engagements**

RTI is committed to engaging with stakeholders to minimize conflict and create conditions for continuous operations. One staff will be assigned specific responsibility for engaging stakeholders and for managing their concerns.

RTI anticipates simple conflicts with stakeholders and hopes that these will be resolved easily by dialogue.

RTI will push for large scale loggers in the vicinity of Puruni River to organize themselves so that they as a body can make a stronger impact on matters affecting loggers.

### **17.6 Constraints-shared Road use**

For RTI, shared road use at the **concession level** is manageable: the enterprise will erect barriers to control access. In addition, wherever access is granted, the company will post signs requiring other users to give way to RTI' vehicles. RTI will engage with other road users to ensure that all concerns are managed properly and not escalate into conflict.

RTI has concerns over the KPR, a public road without any specific road maintenance programme. The MOPW, MNR, and GGMC do occasional maintenance of the road, but it is not clear which agency is responsible for road maintenance.

The KPR is critical for RTI' operations: however, the enterprise does not exercise any control over its use, and cannot, for example, post road signs to regulate its proper use. When using the road, RTI will simply apply basic 'care, consideration, caution, courtesy and common sense' practices in the face of other road users. RTI is also committed to supporting road maintenance efforts, by placing some of its equipment at the service of the authorities or simply proactively undertaking maintenance efforts at its own initiative and cost.

RTI is concerned about the time and effort traditionally required to address conflicts with stakeholders, in an environment dominated by miners.

### **17.7 Security Issues**

RTI believes that currently security considerations are unlikely to stymie its operations. However, in a couple of years when its road system is developed, restrictions on hunting and fishing, the proximity of itinerant mining operations, and a diversity of 'bush businesses' traversing the concession area are

all potential sources of security concerns. RTI will rely on its stakeholder engagement protocols to identify and manage stakeholder issues.

### **17.8 Labour challenges**

To maintain a viable operation fully compliant with the legal framework for logging as well as forest management standards, RTI needs a critical number of skilled field operatives. RTI will compete with other regional enterprises for such field operatives and will confront the so called 'quit rate' that typically plague forest enterprises (Conway, 1982). Specifically, RTI will take reasonable measures, *including competitive remuneration packages and the provision of Wi-Fi services*, to prevent the loss of trained field operatives to other employers.

RTI values its employees and their respective training for the tasks required of them. RTI will ensure that it optimises the use of available technology to bolster the management of field data and records, and to achieve efficiency in the conduct timber harvesting and forest monitoring functions, respectively.

The enterprise has developed a human resources policy for consistency in managing employees. The peculiarities of logging require flexible working hours to address time sensitive (production) targets to ensure the enterprise remains competitive and profitable.

### **17.9 Markets**

RTI' intends to garner a minimum of 2% of the volume of Guyana's timber exports, banking on its existing relationships with 'overseas' customers and the intention to invest in technology to bolster its value adding capability.

Local contractors are currently utilizing large volumes of imported (Pine) lumber as they respond to the existing building boom and the rapid expansion of housing schemes, country wide. In addition, steel beams are the choice for buildings with more than three stories. However, RTI predicts that the local as well as the regional demand for flooring, wooden doors, and indoor and outdoor furniture from local species will continue to create demand for local timbers.

RTI is confident that the minimum price achievable for value added timber products from local species will be reach US\$1,800.00 per cubic meter by 2023.

### **17.10 Main cost centres**

RTI has computed its primary cost centres (*totalling about 98% of expenditure*) for period 2022-2026 as follows:

- a) Capital purchases of equipment.
- b) 100% pre-harvest forest inventory.
- c) Road construction and road maintenance respectively.
- d) Timber harvesting and extraction (including hauling logs to Iteballi).
- e) Preventive maintenance of equipment.
- f) Labour costs and employee welfare, including training of field operatives.
- g) Concession administrative costs, including costs linked to the ESIA study and report as well as forest concession charges-acreage fees, royalties, and taxes.

- h) Corporate taxes.
- i) Administrative costs linked to Ekabago Base Camp and forward camps.
- j) Forest monitoring tasks.
- k) International marketing practices; and
- l) Corporate social responsibilities.

### 17.11 Analysis and conclusion

The twelve (12) items identified at 17.10 will be responsible for 98% of the operational costs and will be expressed eventually in cost/m<sup>3</sup>. RLLS is convinced the company will recover its investments comfortably within ten (10) years.

Table 35 shows a simple SWOT Analysis for RAI, Table 36 shows a simple risk assessment template for the enterprise and Table 37 shows that staffs with a score ≥9 require special attention.

Table 35: SWOT Analysis for RTI prior to start of field operations.

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>• <b>Location:</b> RTI's concession boundaries are well defined, virtually no problems with neighbours, and there are no (Amerindian) Communities <u>within</u> the concession area.</li> <li>• <b>Large stocks of merchantable timber</b> are available.</li> <li>• <b>Wide ranging experience:</b> RTI has a strong and experienced, management team.</li> <li>• <b>Markets:</b> RTI has access to markets based on current operations.</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>• <b>Itinerant nature of mining:</b> this refers to miners starting operations in blocks targeted for harvesting, extensive use of RTI' logging roads and skid trails, etc.: these situation can complicate RTI's strategic planning.</li> <li>• <b>Unfamiliarity with the mining community <i>in situ</i>:</b> it will take considerable time and effort for RTI to get to know the owners of mining concessions so that the enterprise can begin positive collaboration with them.</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>• <b>Modern technologies:</b> RTI can capitalise on new emerging technologies for tree harvesting, wood processing, and forest monitoring</li> <li>• <b>New product lines:</b> RTI can capitalise on the considerable number of merchantable species to generate new wood products, including outdoor furniture.</li> <li>• <b>New market opportunities:</b> RTI can adapt to new market conditions and customer behaviour.</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>• <b>Competing land use-the need to share road use:</b> RTI will share its concession road network with many people who use a wide assortment of vehicles: conformity with RTI's road use protocols can lead to time consuming conflicts.</li> <li>• <b>Strong national policy support for miners,</b> whose activity drive economic activity in Administrative Region 7.</li> <li>• <b>Challenges to match remuneration packages for heavy-duty operators in the mining sector.</b></li> </ul>



Table 36: RTI's general assessment of risks.

ID	Risk	Consequence	Probability	Rating	Risk score	Assessment
1	Workers consider their welfare packages inadequate:	High staff turnover	0.4	5	2	Extreme
2	Worker indiscipline	RTI's inability for compliance with national standards	0.3	4	1.2	High
3	Conflict arising from shared road use	Administrative burden, reduced efficiency	0.4	4	1.6	High
4	New mining activity in blocks targeted for harvesting	High administrative burden; reduced production	0.3	4	1.2	High
5	Onerous legal framework	High administrative burden	0.3	4	1.2	High
6	Security issues with third parties, conflict	Reduces efficiency	0.3	3	0.9	Low
7	Unpredictable markets	Planning production becomes challenging	0.2	4	0.8	Low

Table 37: RTI's assessment of risks for various categories of field operatives.

#	EMPLOYEE/CATEGORY	WORKSPACE												Total
		OFFICE	Mechanical Workshop (Base Camp) (Wood processing complex-Manaka)				Field Camps/Field Operations					BHR		
		Electric Shock	Inhalation of toxic fumes	Bruises, burns, cuts	Fractures, punctures	Electric Shock	Snakebites/ Insect bites	Bruises, burns, Cuts	Fractures, punctures	Fatal injury (falling trees)	Lost in the forest	Minor Accidents	Fatal Accidents	
1	FOREST MANAGER	0	0	0	1	0	1	0	1	1	1	1	1	7
2	SUPERINTENDENT -ROAD SURVEYS	0	0	0	0	0	1	1	1	1	2	2	1	9
3	SUPERINTENDENT-LOG PRODUCTION	0	0	0	0	0	0	0	0	1	1	1	1	4
4	SUPERINTENDENT -WORKSHOP	0	1	1	1	1	0	0	0	0	0	1	1	6
5	BLOCK INSPECTORS	0	0	0	0	0	2	2	2	1	1	2	2	12
6	HVY -DTY MACHINE OPERATORS	0	1	1	0	0	1	1	1	0	0	2	2	9
7	CHOKER-MEN FOR HVY-DTY MACHINES	0	1	1	1	1	1	1	1	1	0	2	2	12
8	LORRY DRIVERS & CHOKERMEN	0	1	1	1	0	0	1	0	0	0	1	2	7
9	CHAINSAW OPERATORS & CHOKERMEN	0	1	0	0	0	2	2	1	2	1	2	2	13
10	FOREST TECHNICIANS	0	0	0	0	0	2	2	2	2	2	2	2	14
11	MECHANICS	0	1	1	1	1	1	1	1	0	0	2	1	10
12	SAWMILL TECHNICIANS	0	1	2	2	1	0	0	0	0	0	0	0	6
13	CLERICAL STAFF	0	0	0	0	0	0	0	0	0	0	1	0	1
14	SECURITY	0	1	0	0	0	1	0	0	0	0	0	0	2
15	MEDEX	0	1	0	0	0	0	0	0	0	0	0	0	1
16	COOKS	0	1	0	0	0	1	1	0	0	0	0	0	3
17	STORE KEEPERS	1	0	0	0	0	0	0	0	0	0	0	0	1
	UNLIKELY, VERY LOW PROBABILITY													
	LIKELY, REAL CHANCE OF OCCURRENCE													
	VERY LIKELY, REAL CHANCE OF OCCURRENCE AT ALL TIMES													

## 18.0 CUMULATIVE IMPACTS

### 18.1 Introduction

RTI expects to produce around 17, 500 m<sup>3</sup> of round logs annually. Also, RTI's projections are that a minimum of six kilometres of roads and 10km of skid trails will be required per year.

The introduction of logging operations elsewhere in Regions 1, 7, and 10 led to a corresponding increase in the scale of mining activity, because miners take full advantage of logging roads to access their mineral licences. A comparable situation is expected to prevail in the area and the entire gold trade will be impacted by additional gold production.

The Kartabu-Puruni Road is the primary access road in the Kartabu Triangle, and RTI' will deploy at least two (2) 40-ton trucks on a 115 km segment of the road at least two days per week. The more developers using the road, the easier it is for MNR, MOPW and GGMC to justify higher budgetary allocations to maintain the road.

The increased road traffic due to RTI' vehicles would encourage mechanics and persons offering vulcanizing services to increase the scope of their businesses.

### 18.2 Definitions and scope

Cumulative Effects/Impacts for this study may be defined as the impact on the environment which results from the incremental effects of the timber harvesting when added to mining activities, past, present, and near future actions. Cumulative effects result from individually minor, but collectively significant, actions taking place over a period.

Cumulative impacts related to socio-economic impacts (including those linked to jewellery businesses) in administrative regions 2, 3, 4, 6 and 7 are more difficult to quantify).

The nature of the project, particularly the projections for employment and the planned interventions into the resources along with existing land use are the elements used to determine cumulative impacts.

### 18.3 Cumulative Impacts

#### 18.3.1 Positive impacts

Residents of communities in the area are willing to stay and live within their villages providing they can get **regular and constant** employment. Regular and constant employment are essential for parents of children attending secondary school at Bartica or other coastal locations. Able bodied men (and women) in the Kartabu Triangle, who are not comfortable with either the hazards of gold mining or the need to spend a great deal of time away from home, will be able to find employment with RTI. In addition, RTI will provide many of its new employees with regular training that will improve their skills and position them to earn better remuneration packages.

RTI's operations will attract more people to the Kartabu Triangle who will stay for extended periods. Regional farmers at Kartabu Point, Batavia and Iteballi stand to benefit from the higher demand for foodstuffs while merchants trading in clothes, beverages and fuel may extend the scope of their business. Banks DIH, Demerara Distilleries Limited and Massy Stores (Guyana) Inc. have been scaling up their operations at Bartica: a direct of increased economic activity at Bartica **and its satellite communities**, including Batavia, Kartabu, and Iteballi. GPL installed a new power plant at Bartica, MOPW is constructing a new THD Bartica Stelling, and MOH has initiated major expansion of the health services, including upgrading the Bartica Regional Hospital.

RTI' operations will install a fully functional road network within the concession area and its highly likely that new mineral licenses will be developed, leading to the expansion of gold mining activity and

increases in gold output. Gold mining is a major driver of regional and national level economic activity. *“The sector is both labour and capital intensive, the high degree of mechanization requiring a considerable range of support services, including metal fabrication, machine construction and repair, transportation, carpentry, plumbing, welding, pipefitting, and blasting”*Invalid source specified.. Therefore, RTI’s operations will lead to many ancillary benefits for the economy.

### **18.3.2 Negative Cumulative Impacts**

- Stress on families

RTI will not cater for accommodation for the families of all workers deployed on the concession area. Therefore, field operatives based at the concession will be away from their families for extended periods, and unless managed well, this could lead to undesirable tension within families. In addition, employees’ children will also not benefit from the coaching and counselling of their fathers on a regular basis, and this can only be to their disadvantage in the longer term.

- Expanded road network.

Stakeholders, including miners, are sure to take advantage of the expanded road network that RTI will construct. Unlike typical mining roads, these roads will be well constructed and maintained to accommodate heavy-duty timber trucks. An expanded road network could prove to be a challenge for the security forces trying to track down people engaged in undesirable activities.

- Intensity of interventions on the concession area

The concession area is already impacted by mining operations, and it is straightforward at this time to assign responsibility for current environmental issues to mining activities. The interventions necessary to undertake logging will increase the intensity of environmental impacts on the concession area. Over time it will be tedious to determine the responsibility for the source of major environmental problems such as forest degradation or poor water quality in streams; the perception could very well be that RTI is responsible, and this has implications for RTI’s overseas marketing strategy.

- Conflicts with national policy

Until mining practices improve dramatically (in a few years) based on current initiatives by the GGMC and the GMSTCI, the expansion of negative environmental impacts in the short term based on mining and logging on the same area could produce data that are not compatible with national level commitments for a green economy or with international obligations set out in various treaties and conventions to which Guyana is a party.

### **18.4 Mitigation and monitoring - Environmental and Social Management Plan**

RTI is committed to running a successful logging operation in line with the terms of its State Forest Authorization and its Environmental Authorization.

## 19.0 EMERGENCY RESPONSE PLAN (ERP)

### 19.1 Overview

In the course of its operations, there is the risk that emergencies in the form of mishaps would occur from time to time. It follows then that RTI must prepare itself to address any such occurrence **urgently** and the consequences of any unplanned event by preparing and publishing practices for preventing and managing mishaps.

This ERP sets out RTI's framework basis for dealing with hazards that are likely to arise in the course of its routine operations. The Administrative Manager will prepare and distribute briefing notes and reporting templates for all eventualities. The Forest Monitoring Manager and the Workshop Superintendent will collaborate to make sure that each employee is familiar with all documentation and the related practices.

### 19.2 Purpose

The purposes of the ERP include:

- (a) To sensitise employees about the gravity and environmental consequences of mishaps.
- (b) To prescribe procedures to be followed in case of emergencies.
- (c) To establish a command chain in responding to emergencies

### 19.3 Policies

All personnel must exercise **vigilance** in recognizing and share responsibility for responding to mishaps in their workspaces. However, even though all personnel are obligated to raise alarms in the prescribed manner, as far as possible only duly trained personnel are expected to respond to some events, for example fire. Therefore, *Emergency Response Teams (ERT)* and *Fire Response Teams (FRT)* respectively will be organized and trained to respond to fire, oil spills, chemical spills, and medical emergencies. These teams will comprise persons drawn from the various sections based on the nature of the potential hazards associated with each section.

### 19.4 Responsibilities/ chain of command

- (a) Workshop Superintendent<sup>25</sup>.

The Workshop Superintendent will

- a. Ensure implementation and maintenance of this plan.
- b. Report to relevant authorities in case of an emergency
- c. Review event analysis reports with relevant line managers/ supervisors and the Administrative Manager.
- d. Get as much information as possible about the nature of the emergency from the person making the initial report.
- e. Ensure that the Administrative Manager and members of the relevant ERT are immediately alerted and given the information obtained on the emergency.
- f. Ensure the Operations Manager is informed of the emergency.

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<sup>25</sup> The WS will be based at the base camp, whereas the forest monitoring manager will be travelling often.

(b) Line Managers or Supervisors

Line managers and supervisors will ensure that field operatives are aware of the potential hazards of their workplace and take the necessary precautions.

Specifically, line managers will:

- a. Ensure staffs under their supervision are familiar with and trained in emergency response procedures.
- b. Ensure personnel are provided with and **use** the prescribed safety equipment to perform their duties safely.
- c. Ensure an inspection of electrical wiring (pipes, and hoses) in each section/ department on a yearly basis. Conduct regular visual checks to ensure wiring is safe and in good condition.
- d. Ensure that oil and other petroleum products used by staff are labelled, safely stored, and managed in accordance with this ERP and any other guidelines provided by the Company.
- e. 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 the respective workspaces.

(c) Personnel Staffs

The personnel staffs will ensure the following:

- a. Provide on-going safety training and briefing sessions for staff related to operational hazards.
- b. Oversee and conduct regular inspections of all emergency response/ clean up equipment to ensure they are in working order.
- c. Ensure that the ERTs receive appropriate training to respond to fire, oil, or chemical spills.
- d. Assist line managers/ supervisors with the completion of the spill reports and incident investigations after any spill or fire.

(d) Emergency Response Teams (ERTs)

ERT teams comprise: A *Fire Response Team* whose main objective is to respond promptly to fires or threats of fires; and a *Medical Response Team* whose priority is to respond to medical emergencies as trained and as set out in this plan. (In actual fact, **all field operatives, including those in the mechanical workshop**, will be trained in first aid and basic firefighting practices. However, the ERTs will be responsible for ensuring that the appropriate materials are available for fighting forest fires and controlling and eliminating oil spills).

ERTs must:

- a. Be aware of the potential occupational hazards at workspaces and be prepared to take preventative measures and manage mishaps.
- b. Ensure briefing notes and appropriate signage are prepared and placed at workspaces and ensure good housekeeping practices to prevent accidents, fires, and other emergencies are reviewed at briefing sessions or for suitable drills.

- c. Monitor fire hazards and storage spaces for petroleum products and any other chemical on site.
- d. Ensure alarm systems are functional and contact #s for managers are easily available.
- e. Continually review the emergency response measures elaborated in this ERP.

## 19.5 Fire prevention and response

### (a) Potential Fire Hazards

Fires can be prevented once potential hazards are identified and monitored. Good housekeeping is a major factor in prevention of fires; for example, combustible materials should be discarded within non-combustible waste or rubbish receptacles. Use of flammable cleaning solvents to clean floors, walls, furniture, or sanitise open spaces and equipment should be managed in accordance with their manufacturers' prescriptions or avoided altogether.

Some potential fire hazards to be avoided are listed below:

- a. Overloaded electrical circuits, unsafe wiring, extensive use of extension cords, and defective extension cords.
- b. Improper disposal of cigarette butts.
- c. Mishandling or improper storage of flammable material e.g., gasoline, waste oil, paint.
- d. Improper housekeeping (or poor hygiene) resulting in the accumulation of flammable material e.g., paper, cardboard boxes, oil-soaked rags, flammable liquids; and
- e. Improper or careless use of welding torches and wet cell batteries.

### (b) Types of Fires and Fire Extinguishers

There are four distinct types of fires and that may occur on the concession area, and these determine the type of extinguisher to be used in an emergency.

Four kinds of fires may occur

*Class A Fire:* involves ordinary combustible material such as wood, paper, rags, rubbish, and other solids. These may occur at any work site: typical red coloured water fire extinguishers will be posted at all work sites, including forward camps. For buildings, the extinguishers will be placed near the exits for the building.

*Class B Fire:* involves flammable or combustible liquids such as gasoline, fuel oil, paint, and hydraulic fluids. Such fires may occur around workshops, fuel storage areas and parking areas for vehicles. Foam fire extinguishers will be deployed in those areas.

*Class C Fire:* fires due to flammable gases such as natural gas and propane. RTI anticipates that only in the mechanical workshop will there be a need for such an extinguisher and at least one of these will be stored near to bottles of flammable gases.

*Class E Fires:* these relate to fires of electrical origin and RTI anticipates that such may only occur in the workshop. At least one CO<sub>2</sub> extinguisher will be used in the workshop near to the generator room.

(c) Fire Response Procedures:

Any field operative or security personnel who discovers a fire shall:

- a. Activate the fire alarm (gong)
- b. Call security<sup>26</sup> (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.)
- c. Ask for help if someone needs rescuing...
- d. Confine the fire by closing doors, windows, and other openings if time permits and if possible.
- e. Evacuate the area and wait in the nearest designated waiting and meeting area.
- f. Provide as much information as you can to emergency response personnel.

### 19.6 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 from improper storage or disposal. It is vital that RTI adopts measures to ensure that petroleum products are carefully stored.

The following practices would apply:

- a. 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."**
- b. 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,"** and "No Smoking" (see Figure 44) The storage area must also be protected from the weather by a shed.
- c. The drums will be stored off the ground on pallets to facilitate the detection of any leakage.
- d. The workshop superintendent will organize monthly inspection of the waste oil storage area 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.



Figure 44: Warning signs to be posted at all workspaces.

(b) Oil Spill Response Procedures

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<sup>26</sup> Normally, all supervisors will carry a short-wave radio for easy 24-7 communication.



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

- a. Evacuate the area and warn others, as necessary.
- b. Contact security immediately.
- c. Ask for help if anyone is injured and/ or needs rescuing...
- d. The security staff responding to the call will notify the Administrative Manager, the Emergency Response Team/Oil Spill Response Team, and the Workshop Superintendent.
- e. If possible, stop the release e.g., by turning off any valve left open.
- f. Visually inspect the site of the oil spill to obtain enough information to describe the situation to security and response personnel (see Table 36)
- g. Be careful, be alert and keep clear if any hazardous chemical is involved.
- h. 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, etc....
- i. Help to direct response personnel to the location of the spill.
- j. Response personnel must ensure the release is stopped-special putties may be used- and mop up the released oil using rags, sand, earth, or sawdust, and manage the resultant contaminated material.
- k. On the same day of the spill submit event information to the Workshop Superintendent, and the Administrative Manager. This will assist them in completion of the **Oil Spill Report Form**.
- l. Line management with assistance from the Administrative Manager and relevant Department Personnel will perform an Event Analysis.

### **19.7 Plant maintenance**

Regular drills would be conducted to ensure the functional aspects of the ERP. This initial draft plan will be refined within six months of start-up of operations. After this, the plan would be reviewed on a yearly basis and updated, as necessary.

### **19.8 Other protocols**

RTI developed an Emergency Response Chart for widespread application (see Figure 45), a simple reporting format in case of emergencies (see Table 38) and a list of contact numbers in the event of an emergency (see Table 39) to guide the effective management of emergencies.

The Forest Monitoring Officer will review the whole emergency response process to guide its development and make sure everyone understands and internalize the process.

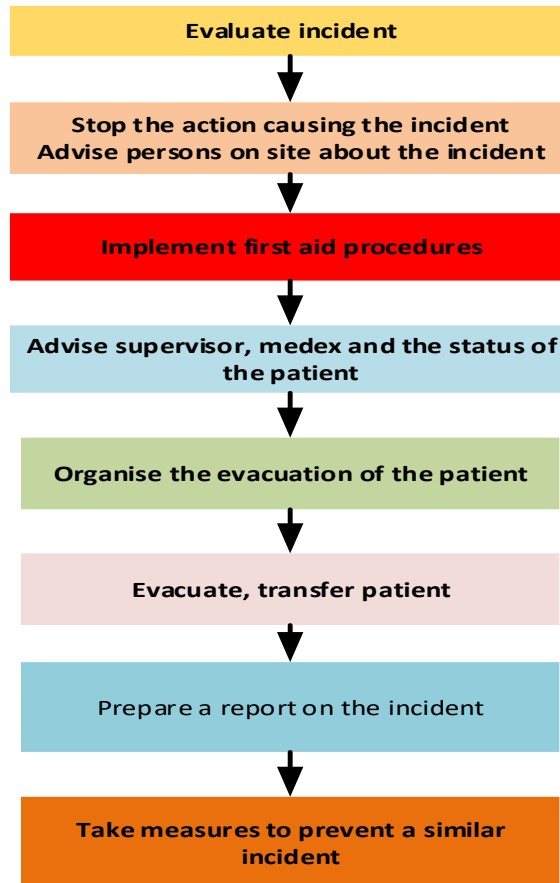


Figure 45: Outline of RTI' provisional emergency procedures.

Table 38: Outline of RTI' protocols for addressing emergencies.

#	EVENT	REMARKS
<b>A</b>	<b>EMERGENCY:</b>	
1	Time discovered	
2	Date discovered	
3	Name of responder	
4	First reported by	
<b>B</b>	<b>Reported Injuries</b>	
5	If so, was the medical response team dispatched	
<b>C</b>	<b>FIRE HAZARD</b>	
6	If so, was the fire response team dispatched?	
<b>D</b>	<b>OIL /FUELSPILL</b>	
7	Type of Oil or Fuel discharged or spilled:	
8	Estimated Quantity Spilled	
9	Exact Location of Spill	
10	Is it flowing/contained?	
11	Weather Conditions:	
12	Ground Conditions	
13	Action Taken: (A, B or C)	

Table 39: Contact phone numbers for emergencies.

#	Agency	Phone No(s).
1	RTI Head Office, Georgetown	592-231-2993; 592-231-3920
3	Bartica Hospital	592 455-2339
3	Speed Boat Services	To be registered
4	Georgetown Hospital	592 227-8210/2
5	Air Services Limited/Helicopter	222-4537, 222-4368, 222-2993
6	Bartica Police Station	592 455 2222
8	GFC-Bartica Office	592 455 2332
10	Commissioner of Forests, GFC	592 226-7271/4
11	Environmental Protection Agency	225-4679, 225-5469, 225-4173

## **20.0 CONCEPTUAL CLOSURE PLAN**

### **20.1 Factors that may lead to the closure of RTI Operations.**

RTI's business projections are based on a 25-year tenure for the concession area, and its renewal for a second 25-year period. (Of course, RTI will abide by decisions of the GFC with respect to tenures).

In line with the TOR agreed with EPA, RTI has prepared a Closure Plan for implementation under the following conditions:

- a) If the GFC does not grant an extension of the large concession after its expiry.
- b) If expanded mining activities lead to inoperable field conditions (for example conflict over internal road use) or severe degradation of merchantable timber stocks rendering logging uneconomical.
- c) If, for any reason there is a heightened threat to the safety and security of field crews.

### **20.2 Objective of Closure Actions**

The primary 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.
- e) Provide for the redeployment of employees, where practicable

### **20.3 Closure Actions:**

The core closure actions will be as follows:

In event of the Company's closure, the GFC, the employees, the designated trade union, RDC and relevant Government authorities, institutions and organizations would be notified. The authorities would be given adequate notice prior to the closure of the field operations (see Table 40).

All applicable provisions of the Labour Act and the Termination and severance Payment Act, 1997 will be followed. Specifically, RTI will ensure that registers regarding NIS and PAYE are updated, and the respective sums paid up fully to the NIS and GRA, respectively. In addition, RTI will ensure full payment of remuneration packages.

The disposal of buildings and other major assets will be done in consultation with the GFC. Save for buildings that might be useful to 'other agencies' A comprehensive site clean-up activity will be undertaken at all workplaces to remove all foreign debris from the forest environment.

RTI will duly inform the FPA regarding the availability of trained technicians. RTI, in consultation with the workers themselves will also explore other ways of assisting them, for example, giving them priority in the sale tools, vehicles, and buildings.

Table 40: SOP for closure of RTI's field operations

#	Action	Responsible Party	Consultations	Schedule
1	Prepare a checklist of all activities to be undertaken toward the closure of operations.	General Manager	Forest manager	-180 days
2	Formally, advise the GFC, GRA and NIS about the impending closure' and address any concerns they have	General Manager	Personnel Clerk	-90 days
3	Prepare a list of all redundant staffs and their CVs or profiles with a view to sharing the lists with other companies.	General Manager	Forest manager	-90 days
4	Brief employees about the reasons for closure.	General Manager	Forest manager	-90 days
5	Prepare redundancy packages & Letters of Reference	General Manager	Forest manager	-90 days
6	Ensure records related to remuneration packages are up to date	General Manager	Chief Clerk	-90 days
7	Take care to secure company assets, especially records	Forest Monitoring Manager	Chief Clerk	-45 days
8	Plan to clean up the base camp in the forest area and dispose of all items that could injure animals	Forest Monitoring Officer	Chief Clerk	-45
9	Give employees preference in the sale of disposable assets	Forest Monitoring Officer	Chief Clerk	-30

## 21.0 THE ENVIRONMENTAL MANAGEMENT PLAN -SUMMARY

### 21.1 Overview

RTI has developed this environmental management plan (EMP) to ensure that all filed operations at SFEP 2/2020 are conducted in an environmentally responsible manner and in line with local standards. The EMP serves several purposes: it ensures transparency in addressing the requirements of the EPA, GFC, and other stakeholders; ensures consistency in RTI's approach to environmental management because all RTI's staffs operate from the same framework; and helps identify the (budgetary) resources necessary for implementing RTI's environmental management programme.

The nature and extent of RTI's EMP are set out in this chapter. The Forest Monitoring Manager will be personally responsible for implementing the EMP.

This EMP comprises the following five subplans:

- a) Waste Management
- b) Mitigation measures/Mitigation Plan
- c) Basic road management plan
- d) Wildlife management plan
- e) Capacity building and training plans
- f) Monitoring Plan

The development of the (sub)plans is based on several considerations:

- a) Corporate discipline: RTI's management is fully committed to forest resources conservation and responsible environmental management.
- b) The value of technology: RTI will employ the latest technology to support its forest monitoring operations.
- c) The value of trained employees. Trained employees are vital for RTI's environmental management programme as well as the need for them to share responsibility for compliance with national guidelines.
- d) Customer base: RTI's marketing thrust depends a great deal on customers' confidence that the company is a *responsible* forest operator.
- e) Therapeutic values: The management of RTI believes that the forest could be exploited for financial benefits and at the same time continue to offer a range of aesthetic and therapeutic values.

### 21.2 Waste Management Plan

#### 21.2.1 Overview and definitions

**Waste** is a by-product of all human activity and is therefore found temporarily at every workspace. Waste refers to liquid or solid matter, no longer usable or required by its owner, and which must be discarded. At SFEP 2/2020, waste will be generated from domestic sources (kitchen waste, sewage-including human excreta, and garbage (wrappers, boxes, plastic bags, and articles such as bottles,

empty cans); industrial waste from the mechanical workshop (used oil, batteries, old tyres, old cans) and from wood processing (bark, sawdust, strips, and wood ends).

**Waste management** comprises the totality of actions of collecting, transporting, and safe disposal of waste. The issue of **waste management** requires further elaboration, even though RTI will follow prescriptions of the COP.

### 21.2.2 Domestic waste management

Solid kitchen waste including leftovers, unusable vegetable parts, and empty cans will be collected daily in covered bins for periods not exceeding three days, then dumped into earthen pits or natural depressions, lined with wood waste. Cans or tins will be squashed before being disposed of. Broken bottles will be put in another container to avoid exposing edges. Cans and bottles will be covered with earth or sawdust to prevent injury to animals foraging in waste pits.

RTI will employ both septic tanks and pit latrines for the disposal of human excreta. The effluent from septic tanks will be channelled to pits lined with wood waste to facilitate its infiltration into the soil. Pit latrines and septic tanks will be put at least 300m from natural water courses.

Liquid waste generated from kitchens and bathrooms at base camps and forward camps respectively, will be channelled to special pits dug to a depth of about 9m and lined with tree debris where some filtration will occur and where the filtered wastewater will infiltrate into the soil. Such pits will be put at least 500m from camps and 300m from waterways.

### 21.2.3 Industrial waste

Tree debris, comprising tree crowns and log ends due to the bucking of logs at stump will be left in the forest (at stump). Log ends arising from trimming logs at log markets and bark will be collected and deposited in natural depressions on the forest floor or special pits constructed to receive effluents from camps. Wood ends will also be used in conjunction with roadside ditches to restrict sediments from entering natural waterways.

Wood waste will also be generated at the wood processing site. Such wood waste will be taken into the forest and dumped in natural depressions. A limited quantity of strips generated by the mills will be utilized by employees engaged in the cultivation of vine crops such as bora (*Vigna unguiculata*) Karela (*Momordica charantia*), squash (*Cucurbita spp.*) or passion fruit (*Passiflora edulis*).

RTI will sell used lead acid batteries to dealers in this type of product, including those who engage in battery neutralization services such as YISRAEL at Providence East Bank Demerara, Guyana. Likewise, RTI will explore selling metallic waste- including old chainsaw chassis, bars, and chains- to metal recycling agents.

Empty 5-gal containers of paint, grease, and oil, once cleaned, are commonly used by field operatives and miners for laundry purposes or for the storage of various field equipment-very useful for field technicians who are always on the move, or for cultivating plants. These options will be explored to the fullest.

RTI' chainsaw operators will re-use waste oil in their chainsaws. Chemical waste such as paint and grease will be put into drums and buried at pre-determined, duly designated and marked points on the forest floor.

### **21.3 Mitigation measures/Mitigation Plan**

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 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, and road use.
- d) safety, waste management

These matters are presented in Tables 41, 42 in terms of the following:

- a) Predicted impact and proposed mitigation measure and the period for implementation (Table 41).
- b) Projected situation after implementation of mitigation measures (Table 42).



Table 41: Potential negative impacts and corresponding mitigation measures.

Predicted impact.	Proposed mitigation measures	Lead agency	Period for implementation
<b>1.0 Physical Environment</b>			
1.1 Earthworks will lead to, scarification of soil surface, sub-soil exposure, erosion, soil compaction, and water logging	<ul style="list-style-type: none"> <li>Plan roads, bridges and culverts paying attention to topography and the use of stock maps.</li> <li>Use appropriate machines for all earth works to reduce the time taken to complete each activity.</li> <li>Consider the weather pattern before initiating major earthworks.</li> <li>Follow the recommendations of the CoP (Sections 4.5-4.7, Section 5)</li> </ul>	RTI	During the entire period for the project.
1.2 Air quality: Dust and smoke (especially along roads) minor changes in micro-climate	<ul style="list-style-type: none"> <li>Vehicles will travel slowly &lt;25 km/hr whenever they pass homesteads or communities.</li> <li>All machines must be fully functional to maintain emissions within manufacturers' parameters.</li> </ul>	RTI	During the entire period for the project.
1.3 Water resources: negligible increases in turbidity, temperature, ph.; oil spills	<ul style="list-style-type: none"> <li>Strict adherence to RIL principles and prescriptions of the CoP, especially regarding buffer zones along waterways.</li> <li>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.</li> <li>EPA's Brochure on Water conservation to be placed at all public points around the concession.</li> <li>Regular briefing sessions for field staff would be formalised.</li> <li>Care taken to avoid excessive spillage of borax solutions whenever used to treat (some species of) timber.</li> </ul>	RTI, GFC	During the entire period for the project.
<b>2.0 Biological/ecological environment</b>			
2.1 Timber harvesting: destruction of juvenile trees, genetic erosion of species, decline in soil fertility, spillage of oil, increased potential for blow downs	<ul style="list-style-type: none"> <li>Implement a system for conducting pre-harvest inventories and preparing stock maps.</li> <li>Use directional felling techniques for felling trees.</li> <li>Plan skid trails based on stock maps.</li> <li>Use winching techniques.</li> <li>Use heavy duty machines that are fully functional.</li> <li>Train all field operatives in RIL practices</li> </ul>	RTI	During the entire period for the project.
2.2 Wildlife: modification, destruction of habitats, population changes	<ul style="list-style-type: none"> <li>Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on, so that no further disturbances occur.</li> <li>Prohibit employees from hunting and fishing.</li> <li>Unique ecosystems, habitats and species will be conserved, by restricting logging in areas where they occur.</li> </ul>	RTI	During the entire period for the project.
2.3 Ecological relationships; Modifications of ecological relationships.	<ul style="list-style-type: none"> <li>Implement proper RIL practices and prescriptions of the CoP (Sections 8, 9 &amp; 10)</li> <li>Prohibit the use of fires on the forest floor.</li> </ul>	RTI, GFC	During the entire period for the project.

Predicted impact.	Proposed mitigation measures	Lead agency	Period for implementation
<b>3.0 Socio-economic environment</b>			
3.1 Conflicts: restrictions of access, alienation of rights	<ul style="list-style-type: none"> <li>Engage residents in discussion and consultations to address mutual concerns: ensure the company is positioned to receive and address complaints.</li> </ul>	RTI	As required
3.2 Social problems: crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	<ul style="list-style-type: none"> <li>Work with public agencies (Police, staff of the Ministry of Health, and staff of the Ministry of Regional Development) in Regions 7, to address emerging issues.</li> <li>Keep proper records of emerging problems and pass these on to the appropriate agencies.</li> </ul>	RTI	As required
3.3 Road safety: high probability of road accidents.	<ul style="list-style-type: none"> <li>Work with MOPW, the GPF, the mining community and other stakeholders to ensure adherence to proper road use practices and to identify road locations requiring special attention.</li> <li>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.</li> <li>Place appropriate cautionary signs at sharp turns, steep grades, and bridges and near populated areas.</li> <li>Promote proper skills set among drivers through Training.</li> </ul>	RTI	During the entire period for the project.
3.4 Waste management: illnesses resulting from a polluted environment	<ul style="list-style-type: none"> <li>Observe prescriptions of the Code of Practice for forest operators. 3rd Ed. Sections 8.0, 9.1, 9.2.</li> <li>Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management.</li> <li>Distribute and put-up EPA's brochure on waste management at all camps.</li> </ul>	RTI	Monthly
3.5 Indigenous, archaeological assets: loss, destruction modification of habitats, landscapes	<ul style="list-style-type: none"> <li><b>Identify and isolate any assets encountered and post appropriate advisory signs and notices; ensure such sites are recorded on all stock maps.</b></li> <li><b>Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered.</b></li> <li><b>Collaborate with communities to address the conservation of existing and emerging assets.</b></li> <li><b>Offer Training &amp; incentives where appropriate</b></li> </ul>	RTI	As required

Table 42: Projected situation following mitigation measures.

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
<b>Physical Environment (Land/Soil)</b>	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Operations	<ul style="list-style-type: none"> <li>Removal of specific site vegetation to facilitate the construction of project facilities has the potential to expose the soil to erosion,</li> <li>Scarification of soil surface and sub-soil, soil compaction.</li> </ul>	<ul style="list-style-type: none"> <li>Minimize removal of vegetation and encourages the re-vegetation of site impacted by clearance.</li> <li>Installation of drainage system to accommodate surge in storm water.</li> </ul>	Ex: Ir: Lt: Un: M: In: Lp
	Operation of Machineries	Operations	<ul style="list-style-type: none"> <li>Soil compaction from multiple passes of heavy vehicles over soil surface.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid the use of heavy vehicles during periods of heavy rainfall.</li> <li>Design specific routes for heavy vehicles and equipment to use.</li> </ul>	Ex: Ir: Lt: Un: M: Sig: Lo
	Waste Disposal (solid and liquid waste)	Operations	<ul style="list-style-type: none"> <li>May result in soil contamination from indiscriminate disposal of liquid, solid and hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of a sound waste management system at the location of operation</li> </ul>	Lo: Rv: St: Av: M: In: Hp
	Fuel and Oil transportation, handling, and storage	Operations	<ul style="list-style-type: none"> <li>Pollution from fuel and oil because of a spill during transportation, handling, or storage.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that fuel, oils, and hazardous liquids are stored in a bunded area that has an impervious surface.</li> <li>Due care will be applied to prevent spillage whilst handling fuel, oils, and potential hazardous liquids.</li> </ul>	Lo: Ir: Lt: Av: Im: In: Lp.  Lo: Ir: St: Av: Im: In: Lp
	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction/ Operations	<ul style="list-style-type: none"> <li>Potential increase in sediment loads and turbid streams due to surface run off and erosion. Removal of vegetation</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of erosion control measures.</li> <li>Channel storm water to a settling/forested area before discharge into creeks.</li> <li>Create buffer zone around streams and creeks.</li> </ul>	Lo: Ir: St: Un: M: Sig: Hp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Physical Environment (Water Resources)	Construction of bridges and the installation of culverts	Construction/Operations	<ul style="list-style-type: none"> <li>Reduction of stream flow from the installation of bridges and culverts</li> </ul>	<ul style="list-style-type: none"> <li>Construct bridges and culverts in accordance with the GFC 's Code of Practice for Timber Harvesting Operations</li> <li>Temporary water-crossings to be decommissioned after usage to ensure that they do not collapse and block stream flow.</li> <li>Design bridges to allow for the free flow of water, taking into consideration water flow during period of extremely high intensity rainfall.</li> <li>Road culverts should be aligned perpendicular to the road and horizontal to the flow of water</li> </ul>	Lo: Ir: Lt: St: Un: Im: Sig: Hp: Av: Lp
	Waste Disposal (solid and liquid waste)	Construction/Operation	<ul style="list-style-type: none"> <li>Contamination of water in proximity to disposal, modifications in water temperature, turbidity, pH.</li> <li>Pollution with oil</li> </ul>	<ul style="list-style-type: none"> <li>Avoid the dumping of waste in creeks and streams.</li> <li>Development and implementation of a waste management plan.</li> </ul>	Lo: Ir: St: Un: M: In: Lp
	Fuel and Oil transportation, handling, and storage	Construction/Operation	<ul style="list-style-type: none"> <li>Contamination of water in proximity to disposal, modifications in water temperature, turbidity, pH.</li> <li>Pollution with oil</li> </ul>	<ul style="list-style-type: none"> <li>All fuel, oils and hazardous liquids will be stored away from streams and creeks.</li> <li>Ensure that all fuel, oils, and hazardous liquids that will be used by the operation is stored and used in a bunded area.</li> </ul>	lo: Ir: Lt: Un: M: In: Lp
Physical Environment (Air)	Operation of chainsaws	Construction/Operation	<ul style="list-style-type: none"> <li>Noise, dust, and smoke generated from the operation of the various equipment.</li> <li>Changes in microclimate.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that all operative working in proximity to mills and saws be provided with personal protective gear.</li> </ul>	Lo: Ex: Ir: Lt: Un: M: Sig: Hp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
	Operation of heavy-duty vehicles and equipment	Construction/Operation	<ul style="list-style-type: none"> <li>Noise generated for the operation of the various pieces of equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that all operative working on and in proximity to are provided with personal protective gear</li> </ul>	Lo: Ex: Ir: Lt: Un: M: Sig: Hp
	Clearing of lands and of logs and other materials	Construction/Operation	<ul style="list-style-type: none"> <li>Excessive exposure of soil and constant traversing of heavy-duty vehicles over exposed soil</li> </ul>	<ul style="list-style-type: none"> <li>All employees working in dusty environs will be provided with dust masks.</li> <li>Speed limits will be instituted for vehicles using dusty areas.</li> <li>During extensive dry periods dusty areas will be soaked on a regular basis.</li> </ul>	Lo: R: St: Av: M: In: Lp
	Operation of heavy-duty vehicles and equipment.	Operation	<ul style="list-style-type: none"> <li>Dust and particulate matter resulting from the operations of chainsaws and movement of vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>All employees working in dusty environs will be provided with dust masks.</li> </ul>	Lo: Ex: Ir: Lt: Un: M: Sig: Hp
	Disposal of wood Waste	Operation	<ul style="list-style-type: none"> <li>Improper disposal of waste generated wood processing activities at Base Camp</li> </ul>	<ul style="list-style-type: none"> <li>All dust generate from chainsaws and mills will be spread on the forest floor.</li> </ul>	Lo: Ex: Ir: St: Un: M: Sig: Hp
<b>Biological &amp; Ecological Environment (Flora)</b>	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction	<ul style="list-style-type: none"> <li>Destruction of trees and from the clearing of lands for construction purposes.</li> </ul>	<ul style="list-style-type: none"> <li>Clearing of vegetative areas will be restricted to areas where construction activities will occur.</li> </ul>	Ex: Rv: St: Un: Im: In: Hp:
	Harvesting of Logs (Logging and extraction)	Operation	<ul style="list-style-type: none"> <li>Reduction in tree species specific to the areas of logging.</li> <li>Genetic erosion of species</li> <li>Decline in soil fertility due to removal of biomass from poor soils,</li> <li>Increased potential for blow downs of residual trees due to freer flow of air though the canopy/under-storey.</li> </ul>	Use of the GFC COP2018	Lo: Ex: Ir: Rv: Lt: St: Un: M: Sig: Hp: Lp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
<b>Biological &amp; Ecological Environment (Fauna)</b>	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction	<ul style="list-style-type: none"> <li>Modification, fragmentation, and destruction of habitats (especially in terms of cover and food sources); depletion in number, /variety of some species.</li> </ul>	<ul style="list-style-type: none"> <li>Use of the GFC's COP related to the harvesting of logs and all other guidelines that protect biodiversity.</li> </ul>	Ex: Rv: St: Un: Im: In: Hp:
	Presence of humans	Construction and Operation	<ul style="list-style-type: none"> <li>Increase in the level of predation, modifications of prevailing ecological relationships: plant-plant, plant-animal, animal-animal</li> </ul>	<ul style="list-style-type: none"> <li>All employees will be educated on the conservation and protection of wildlife.</li> </ul>	Lo: R: St: Av: M: In: Lp
<b>Socio-economic Environment (Occupational Health &amp; Safety)</b>	All construction and Operation activities	Construction/Operation	<ul style="list-style-type: none"> <li>Risk of accidents from the used of the various equipment onsite</li> </ul>	<ul style="list-style-type: none"> <li>All employees will be educated about the Company's OSH practices.</li> <li>All working environments will be presented with First Aid kits.</li> <li>Appropriate signage will be posted around all working areas.</li> <li>Relevant and appropriate safe gear will be provided to all employees.</li> </ul>	Lo: R: St: Av: M: In: Lp
	Operation of machineries and equipment	Construction /Operation	<ul style="list-style-type: none"> <li>Continuous exposure to excessive noise and vibration from the operation of equipment.</li> </ul>	<ul style="list-style-type: none"> <li>All employees working in environs that cause them to be exposed to occupational hazards will be provided with protective gear.</li> </ul>	Lo: Rev: St: Av: M: Sig: Hp
	Conflict results from the Change in Land Use activities	Construction /Operation	<ul style="list-style-type: none"> <li>Restriction of access, alienation of rights, unplanned changes in lifestyle, restrictions on hunting.</li> </ul>	<ul style="list-style-type: none"> <li>All employees will be educated on how to defuse conflicts.</li> <li>Regular monitoring will be conducted to ensure that no illegal activity occurring within concession and if such is</li> </ul>	Lo: Rev: St: Av: M: In: Lp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
				observed it will be reported to the relevant authority.	
<b>Socio-economic Environment (Employment)</b>	Increase in workforce	Construction /Operation	<ul style="list-style-type: none"> <li>Increase in the incidences of crime, increase in the use of illicit drugs and alcohol, socially unacceptable behaviour and inappropriate with members of close-by communities.</li> </ul>	<ul style="list-style-type: none"> <li>Illicit drugs and alcohol will not be allowed at camps.</li> <li>All employees will be trained at a minimal level on how to engage with members of close-by communities.</li> </ul>	Lo: Rev: St: Av: M: Sig: Hp
	Hiring of Workforce	Construction /Operation	<ul style="list-style-type: none"> <li>Skills transfer, Training opportunities job creation, increase incomes and cash flows</li> </ul>	<ul style="list-style-type: none"> <li>Members of close-by communities will be sought after.</li> </ul>	Lo: Rev: St: Av: M: Sig: Hp
	Regional Development	Construction /Operation	<ul style="list-style-type: none"> <li>Improvement of infrastructure.</li> <li>Crime; use of alcohol; health risks, disagreeable behaviour</li> </ul>	<ul style="list-style-type: none"> <li>All staff will be trained in-house on OSH and security</li> </ul>	
<b>Socio-economic Environment (Archaeological Resources)</b>	Construction and operational activities	Construction /Operation	Loss, destruction, or modification of the assets	<ul style="list-style-type: none"> <li>If evidence is found, all activities in the vicinity of findings will be suspended.</li> <li>The relevant authorities will be notified.</li> </ul>	

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

## 21.4 Basic Road Management Plan

### 21.4.1 Overview

RTI's road corridor plan has two main components (see also Table 43):

- a) Maintaining its concession-based roads in a fully function state through proper road maintenance procedures, and adequate road signs.
- b) Monitoring road use by other parties.

Table 43: Core elements of RTI's plan for road corridor management.

Action	Responsibility	Objective	Intervals
1. Monitor the road for tree fall, erosion. Also check bridges and culverts to establish their state.	Forest Manager	Maintain the road in a proper state always for maintaining production and safety.	Daily & weekly depending on which specific road segments are used
2. Post signs at junctions, turns, steep grades and bridges.		Safety issues	As required
3. Monitoring the use of the road by third parties	Forest Manager	Find out and maintain a data base of who is co-using the concession area.	Daily, as often as the opportunity presents itself or via random visits to areas not being logged

### 21.4.2 Partnerships

In the pursuit of this plan, RTI will seek support from the EPA, the GFC, the GGMC, GGMDA and the Police

## 21.5 Wildlife Management Plan

RTI's management has an interest in the conservation of wildlife and RTI is prepared to collaborate with the authorities to manage wildlife, not only to check on illegal hunting, but also to support concession-based research. The key activities for RTI are set out in Table 44.



Table 44: Core elements of RTI' Wildlife Management Plan

Action	Responsibility	Objective	Intervals
1. Maintain a register of sightings of mammals within the concession area. (The register will state Date/Time of sighting/Common name of species observed).	Field Operatives	A data base would be critical to track the number, variety, and habits of large fauna	On sight
1. Train field operatives to recognize the various fauna in the concession area. RTI will also source posters from WWF and other agencies for the benefit of its field operatives	Field Operatives	Workers should be able to describe accurately the type of animal observed.	Quarterly
2. Post and maintain no hunting and no fishing signs along the concession roads	Field Operatives	This is an attempt to enforce RTI's no hunting policy.	Not applicable. (All major road junctions, and bridges)
3. All heavy-duty vehicles to be equipped with ' <i>rotating beacons</i> ' to warn animals using the road. (Horns may unduly scare the animals).	Drivers/ Mechanics	The objective is to avoid hitting animals using the roadways	Whenever the vehicle is traversing the road.
4. Be on guard for nesting animals during tree felling operations	Fellers	RTI does not wish to kill wildlife or unduly put them at risk	During operations
5. Monitor whether any third party is extracting wildlife from the concession area.	Drivers, technicians	<ul style="list-style-type: none"> <li>To check on hunting activities.</li> <li>To ensure that RTI's technicians are not blamed unnecessarily for harvesting wildlife</li> </ul>	During operations
6. RTI's employees will avoid all unnecessary noise, open fires and littering and ensure that waste is properly disposed of	All employees	These activities will help conserve fauna.	During operations

## 21.6 Capacity Building and Training Plans

### 21.6.1 Overview

RTI intends to build capacity to address obligations emerging from this EIA Report and to better implement approved forest management prescriptions. The objectives are:

- a) To ensure that each worker at the company takes responsibility for good environmental conduct generally and good forest management practices.
- b) To address the requirements of lead agencies and to better comply with national standards.

### 21.6.2 Training content

Training for selected staff will be as set out in Table 45. RTI will conduct a Training needs analysis to inform its general capacity building strategy.

RTI will participate any training course with environmental management content organized by the EPA, or GFC or GGMC. RTI will source and use any publications or extension materials put out by the EPA.

Table 45: Training options prioritized for RTI's capacity building project.

#	Target group	Subject areas	Agencies
1	Senior staff	<ul style="list-style-type: none"><li>Reduced Impact Logging (Decision Makers' Course)</li></ul>	FTCI
2	<ul style="list-style-type: none"><li>Forest Manager</li><li>Forest Monitoring Manager</li></ul>	<ul style="list-style-type: none"><li>Environmental management Code of Practice</li></ul>	FTCI/GFC/EPA
3	<ul style="list-style-type: none"><li>Forest Managers,</li><li>Block Inspectors,</li><li>Forest Monitoring Manager</li></ul>	<ul style="list-style-type: none"><li>Code of Practice</li><li>RIL Foundation Course</li><li>OSH</li></ul>	FTCI Consultant
4	<ul style="list-style-type: none"><li>Forest Monitoring Manager</li></ul>	<ul style="list-style-type: none"><li>Conflict management</li><li>Introduction to sustainable mining</li></ul>	Consultant GMC/GGMDC

### 21.6.3 Methodology

The mechanisms to be used to build capacity, include:

- 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' courses
- d) Training materials: manuals brochures, etc.
- e) Briefing sessions

## 21.7 Monitoring Plan

### 21.7.1 Overview

This monitoring plan is intended to address the mitigation measures in a timely and consistent manner. Monitoring will occur at PMSs, at Base Camps, and at random points along the concession logging road. It is important to note that RTI, as part of its routine operations, will be maintaining appropriate records.

RTI needs to collaborate with several agencies to ensure that the mitigation measures are addressed in a meaningful and realistic manner. Table 46 lists the agencies and the collaboration anticipated. Table 47 provides details of monitoring activities; Table 48 provides a checklist for monitoring activities and Table 49 provides a budget for monitoring the environment management plan.

Table 46: List of agencies targeted for collaboration.

#	Agency	Nature of collaboration
1	EPA	Collection/monitoring of environmental data;
2	GFC	Consultations, Training, forest management
3	NDC, Iteballi	Working relationship at Iteballi
4	CAD	Aviation issues
5	MARAD	Routine shipping of logs by barge from Iteballi
6	FTCI	Training
7	MOH	Consultations on health issues
8	TPTTI	Collaboration
9	RTI	Collaboration
10	JLYS	Collaboration
11	GGMC	Consultations (mining)
12	GGMDA	Consultations: shared road use
13	MPOW	Ministry of Public Works: roads, aviation issues

Table 47: RTI's plan for monitoring operations at the concession area.

Parameter	Responsible Party	Frequency	Location of monitoring
<b>Physical Environment</b>			
<b>Earthworks:</b> <ul style="list-style-type: none"> <li>Field operatives have stock maps.</li> <li>Field operatives have copy of the Code of Practice.</li> <li>All roads, skid trails, sawmill sites, log markets and borrow pits are marked.</li> <li>Machines are in a proper functional state</li> </ul>	RTI, GFC	Quarterly	<ul style="list-style-type: none"> <li>Sites where earthworks are occurring.</li> <li>Field camps</li> </ul>
<b>Water Quality:</b> <ul style="list-style-type: none"> <li>Surface water drainage off roads, log markets and other clearings.</li> <li>Cleaning of drainage structures (bridges, culverts) along roads and skid trails.</li> <li>Observance of the integrity of buffer zones along water ways</li> </ul>	RTI, GFC	<ul style="list-style-type: none"> <li>Biannually (PMS)</li> <li>Routine checks, especially in the wet season</li> </ul>	<ul style="list-style-type: none"> <li>PMS</li> <li>Areas being logged.</li> <li>logged over areas.</li> <li>Primary roads and associated drainage structures.</li> </ul>
<b>Air Quality:</b> <ul style="list-style-type: none"> <li>Number of illnesses among field operatives related to smoke or dust</li> <li>Base camp</li> <li>Logging roads</li> </ul>	RTI RTI RTI	Biannually Quarterly Random measurements (dry season)	Camp site: sick leave register. Base Camp Random points
<b>Biological/Ecological Environment</b>			
<b>Timber harvesting.</b> <ul style="list-style-type: none"> <li>canopy openings,</li> <li>retention of seed trees,</li> <li>Integrity of Biodiversity Reserves.</li> <li>quality of stock maps</li> </ul>	RTI	Quarterly	Active logging areas, permanent sample plots and Biodiversity reserves
<b>Wildlife Trapping /hunting</b> <ul style="list-style-type: none"> <li>Movement of live animals away from the concession area</li> <li>Trade in wild meat</li> <li>Traps, firearms, shells</li> </ul>	RTI/GFC	Random checks Random checks Random checks	70 km check point

Parameter	Responsible Party	Frequency	Location of monitoring
<b>Ecological Relationships</b> <ul style="list-style-type: none"> <li>Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes, or other fauna</li> </ul>	RTI, GFC	On observance	Concession area
<b>Socioeconomic Environment</b>			
<b>Conflicts</b> <ul style="list-style-type: none"> <li>No. of mining camps, type of mining, vehicle movements,</li> <li>Complaints lodged with the company.</li> <li>Complaints lodged with the RDC or another public agency</li> </ul>	RTI, GFC, RDC #7 GGMC,	Quarterly	Concession area,
<b>Social &amp; Employment issues</b> <ul style="list-style-type: none"> <li>Number of persons recruited from the Kartabu Triangle</li> <li>Number of persons trained.</li> <li>Rate of absence from work</li> <li>Disciplinary measures taken</li> </ul>	RTI	Biannually	Concession area
<b>Road safety</b> <ul style="list-style-type: none"> <li>Number of accidents/records</li> <li>Number of fatal accidents/records</li> <li>Number, type, and position of advisory road signs/records</li> </ul>	RTI	Quarterly	Bartica Police Station,
<b>Health and Safety</b> <ul style="list-style-type: none"> <li>Emergency Response Plans,</li> <li>Health and safety committees,</li> <li>Status of first aid kits, fire hydrants,</li> <li>Implementation of OHS practices &amp; the regular use of safety gear</li> </ul>	RTI, GFC	Biannually	Sawmill site, field locations, housing quarters
<b>Waste Management</b> <ul style="list-style-type: none"> <li>Waste accumulation &amp; waste disposal procedures</li> <li>Apparent increase in vectors (rats, roaches &amp; flies)</li> </ul>	RTI	Monthly	Sawmill complex, field camps
<b>Indigenous/Archaeological assets</b> <ul style="list-style-type: none"> <li>Auditing of archaeological and anthropological resources</li> </ul>	RTI	On observance (Quarterly if observed)	Logging operations [blocks] and sawmill complex

Table 48: Table RTI's general checklist for monitoring its operations.

ITEM	STATUS (Y-OK/ R-REQ. ATTN.)		
	OK	Requires attention	Responsible Party
<b>Office Area/Field Camp</b> <ul style="list-style-type: none"> <li>Emergency Response Plan posted and visible.</li> <li>First Aid box complete and clean</li> <li>Litter bins are available</li> </ul>			
<b>Personnel:</b> <ul style="list-style-type: none"> <li>Records of issue of safety gears</li> <li>All personnel have and are using safety equipment</li> </ul>			
<b>Fuel Storage Tanks and Fill Point – Transit Log Yard and Camp</b> <ul style="list-style-type: none"> <li>Fire extinguishers and other firefighting aids available nearby</li> <li>Physical condition of storage tanks, hoses, valves (evidence of leaks)</li> </ul>			
<b>Communication Equipment</b> <ul style="list-style-type: none"> <li>Check base station radio set is in working order and signal strength is good with base and with handset for field personnel.</li> <li>Check all field handsets are in working order and fully charged</li> </ul>			
<b>Fire Fighting Equipment and Emergency Equipment</b> <ul style="list-style-type: none"> <li>Check that all fire extinguishers are present, fully charged and the correct number are present with no sign of damage.</li> <li>Check sand buckets are full of dry sand.</li> <li>Check contents of First Aid box are all present and correct</li> </ul>			
<b>Warning/Advice Notices</b> <ul style="list-style-type: none"> <li>Check all notices and signs are posted as required, are undamaged, clean, and legible at Transit Log Yard and Camp and on secondary roads</li> </ul>			
<b>Soak away/Filter at Transit Log Yard and Camp</b> <ul style="list-style-type: none"> <li>Soak away filter is clear of all solid particles.</li> <li>Check drains are not blocked or full</li> </ul>			
<b>Stock maps</b> <ul style="list-style-type: none"> <li>Updated stock maps are available for use by all field crews</li> </ul>			
<b>Basic equipment</b> <ul style="list-style-type: none"> <li>Compass, clinometers, flagging tapes and GPS are available for use by staffs.</li> <li>Equipment tailored for the needs of specific departments (fire extinguishers-workshop; flasks for water collection-forest management division; etc.)</li> </ul>			

ITEM	STATUS (Y-OK/ R-REQ. ATTN.)		
	OK	Requires attention	Responsible Party
<b>Vehicles</b> <ul style="list-style-type: none"> <li>All vehicles equipped with horns, lights and rotating amber lights.</li> <li>All vehicles are equipped with appropriate tools, first aid kits.</li> <li>All trucks/lorries are equipped with basic communication equipment.</li> <li>All vehicles have chains, rope, or straps as appropriate.</li> <li>Maintenance schedules for vehicles are in force.</li> </ul>			
<b>Security</b> <ul style="list-style-type: none"> <li>All employees have a security badge, carry, and display them on their uniforms</li> </ul>			
<b>Camp Hygiene</b> <ul style="list-style-type: none"> <li>All camps are provided with potable water.</li> <li>All camps are cleaned regularly, equipped with fires extinguishers, lights and pesticides, other supplies.</li> <li>Waste disposal practices/mechanisms are monitored</li> </ul>			
COMPLETED BY: (signature and date)			

Table 49: Breakdown of annual budget for monitoring field operations

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 (ATV)	3 days every three months	600,000
2. Air quality <sup>27</sup>	Review of medical records of field operatives; consult medical personnel	N/A	2 days every three months	
	Analysis of air quality at PMS			2,500,000
3. Water quality <sup>28</sup>	<ul style="list-style-type: none"> <li>Review of medical records of field operatives consult medical personnel.</li> <li>Quarterly monitoring of water quality (PMS)</li> </ul>	Clean bottles, ice, cooler to store water earmarked for a laboratory (Kaizen) (Laboratory services)	1 day per PMS, every three months	2,500,000
4. Timber Harvesting	Visits to field crews to verify the use of stock maps, CoP, etc.1	Vehicle	3 days every three months	500,000
5. Wildlife	Recruitment of wildlife expert; physical check of traps and shells along frequently used concession roads	Vehicle, trail cameras	Biannually	500,000
6. Eco-relationships	Recruitment of a consultant; field tour across logged over sites within the concession area	Vehicle, camera	Annually	500,000
7. Conflicts	Discussions with community leaders, representatives of miners, public officials (RDC)	Vehicle, camera	Biannually (one-day session)	400,000
8. Employment	Review of company records		Minimum: 2 days every six months	150,000

<sup>27</sup> RTI will seek further legal advice on the issue of medical records.

<sup>28</sup> RTI will seek further legal advice on the issue of medical records.



Impact/Event	Actions	Equipment/tools	Duration	Annual cost (G\$)
9. Social problems	Discussions with public officials (Police, RDC) and community leaders	Vehicle, camera	2 days every three months	800,000
10. Occupational Health & safety	Verify the use safety gear, SOPs; check on the frequency of briefing sessions	Vehicle, camera	2 days every six months	200,000
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 KPR and Puruni River Corridors, respectively	Joint patrols, faunal surveys, other consultations	Boat & o/b engine; digital camera; radio/phone	4 trips per year	1,000,000
15. Contingencies				500,000
<b>TOTAL</b>				<b>8,100,000</b>

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

### **21.7.2 Core approach to stakeholder issues**

On receipt of a large forest concession from the RTI's forest manager and forest monitoring manager will visit each mining camp and business place on the concession area

RTI 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.

A copy of its environmental reports will also be placed at:

- a) GFC Divisional Forest Station, Bartica.
- b) GFC Forest Station, Iteballi
- c) RTI's Base Camp.

## 22.0 CONSULTANTS' OPINION & RECOMMENDATIONS

The consultants believe that RTI will be a catalyst for the organised development of the upper Puruni District. Unlike the itinerant mining prevalent in the area, RTI will expend significant sums building a base camp, a road network, an airstrip and at least six forward camps over a period of at least 25 years. Further RTI's forest management plan setting out the scope and extent of its operations in the area will be available for review by stakeholders. In addition, its environmental management plan will also be available for annual review by stakeholders.

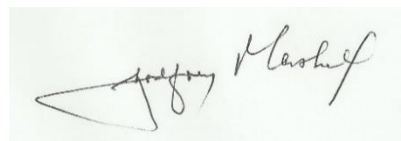
The mining community entrenched in the upper Puruni District have shared concerns about the ongoing destruction of merchantable timber due to (legal) forest clearing operations preceding mining. It should be possible for collaboration between RTI and the mining community with a view of harvesting merchantable timber prior to extensive mining operations. All the merchantable timber in the area therefore **contribute** to national and regional development. Indeed, RTI anticipates a 3% increase in national timber output once its operations get fully on stream by April 2023.

Sustainable forestry practices, particularly based on an approved yield of just 8.33m<sup>3</sup>/ha and selective felling of trees are **compatible** with every other type of forest resource use. **Intensive** forestry activity will occur over just 2% of the concession area per annum, and even within that 2%, there will be areas set aside for buffer zones alongside waterways, and the avoidance *-no tree felling-*of areas with inoperable ground conditions such as swamps, marshes, or rock outcrops. RTI will follow up its best timber practices with a robust **forest monitoring system**, ensuring due attention to emerging issues that need urgent remediation.

RTI's operations will be a critical driver of economic development within the Kartabu Triangle. Its investments in the area that will see the injection of millions of dollars into the economy of the Kartabu Triangle. There will be major benefits for miners in terms of improved, free access to their resources, which could lead to expanded gold output and all the ancillary benefits that that will generate, including an expanded revenue base for the relevant public agencies and expansion of the jewellery sector. All consultations indicate that the mining community is disposed to collaborate with the logger.

The consultants believe that the company is sincere in its commitment to regular engagements with stakeholders, and that the company will abide by all local laws and environmental management standards, in line with its environmental authorization.

The consultants recommend that an **Environmental Authorization** be granted to RTI.

A handwritten signature in black ink on a light green background. The signature is written in a cursive style and appears to read 'Godfrey Marshall'.

Godfrey Marshall  
Team Leader  
Consulting Team

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## 24.0 ANNEXES



## Annex I: Extract of the TOR for the ESIA Study for SFEP 2/2020

### EXTRACTS OF THE TERMS OF REFERENCE FOR ENVIRONMENTAL IMPACT ASSESSMENT

#### ROYAL TIMBERS INC

#### SFEP 02/2020 – RIGHT BANK PURUNI RIVER REGION NO.7

### 4. REQUIREMENTS FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND ENVIRONMENTAL IMPACT STATEMENT

#### 4.1 ORGANIZATION OF THE REPORT (ENVIRONMENTAL IMPACT STATEMENT)

The EIA Report shall focus on significant environmental issues and must provide all the relevant information needed by the EPA to consider fully any adverse or beneficial impacts of the proposal.

The introduction to the EIA shall provide an explanation of the scope of the proposal and the issues and decisions which led to the proposal at this time and in this context, including a history of events leading up to project formulation, envisaged time scale for implementation and project life, anticipated establishment costs and actions already taken at the project site.

#### **Suggested table of contents:**

Glossary

Executive (non-technical) Summary

Chapter 1: Introduction and Background, ESIA Team (Detail cv in appendices)

Chapter 2: Approach and Methodology, Significance Criteria, Area of Influence (AOI)

Chapter 3: Project Alternatives

Chapter 4: Stakeholder identification and consultation (records/minutes etc. in appendices)

Chapter 5: Legislative and Regulatory Framework

Chapter 6: Description of Proposed Project (location, design etc.)

Chapter 7: Water Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 8: Soils, Land and Geology

- *Introduction*
- *Definitions and scope*
- *Key relevant policy and legislation*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 9: Air Quality

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 10: Climate and Climate Change

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 11: Biological Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Surveys and Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 12: Ecosystem Services

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Surveys and Baseline studies*
- *Impact prediction and assessment.*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 13: Noise and Vibrations

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring- Environmental and Social Management Plan*

Chapter 14: Landscape and Visual Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 15: Cultural Heritage

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline studies*

- *Impact prediction and assessment*
- *Interactions*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 16: Socio-Economic and Cultural Impacts (direct and indirect)

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Social Management Plan*

Chapter 17: Risks and Risk Assessment

- *Introduction*
- *Definitions and concepts*
- *Key relevant legislation*
- *Prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 18: Cumulative Impacts

- *Introduction*
- *Definitions and scope*
- *Key relevant legislation, guidelines*
- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

## Appendices

- All relevant documentation from the ESIA including records of consultations, data collection/survey forms etc.
- Emergency Response Plan
- Conceptual Rehabilitation and Closure Plan

## **Annex II: CVs of the Consultants**

### **External Consultants**

1. Environmental Engineering solutions: Expertise in the collection and analysis of environmental parameters for soil, air quality and surface water quality
2. Philip Odwin: wildlife census, identification

### **FTCI staffs**

3. Robert Skeete: Expertise in Forestry
4. Luann Nero: Environmental Science, Community forestry
5. Mariea Suegrim: Business administration, social forestry

### **Resource Persons:**

6. Jagdesh Singh: Expertise in Forestry, Environmental Policy & Law
7. Godfrey Marshall: Forester, Team Coordinator

## 1. ENVIRONMENTAL ENGINEERING SOLUTIONS

### ENVIRONMENTAL ENGINEERING SOLUTIONS

Page 1 of 7



### ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

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#### GENERAL INFORMATION

<b>Business Name :</b>	ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)
<b>Address (main office) :</b>	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
<b>Business No.:</b>	Certificate 130433
<b>Management Staff:</b>	M. Sc. & Eng. Isidro Ubaldo Espinosa (Director) M. Sc. Env. Osbert Ellis (Project Manager)
<b>Services Offered:</b>	Environmental Engineering (Design and Supervision): <ul style="list-style-type: none"><li>• Air Pollution Control</li><li>• Solid Waste Management</li><li>• Wastewater Treatment</li><li>• Contaminated sites: prevention, control and restoration</li></ul> Environmental Studies: <ul style="list-style-type: none"><li>• Environmental Impact Assessment</li><li>• Environmental Management Plan</li><li>• Environmental Annual Report</li><li>• Environmental Planning</li><li>• Project Development</li><li>• Research /Training</li><li>• Site Inspections</li></ul>

#### Fields of activity and services provided

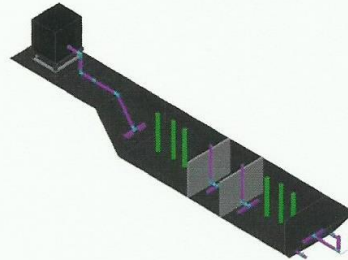
EES was founded in 2011. EES is the first consultant company in Guyana that offers environmental engineering based on demands in the engineering field. EES is rapidly gaining recognition as a technical qualified company by the Government of Guyana and the Private Sector. Projects developed for the private 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.

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.

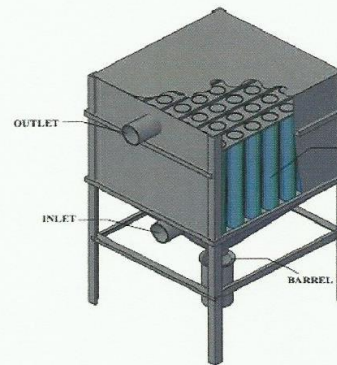
Project beneficiary: Beharry Company Limited.



**Dust Collector System Design (2011).**

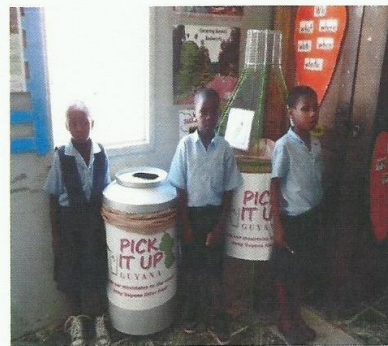
The project implied a conceptual design and supervision of a dust collector system, for the air pollution control.

Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters

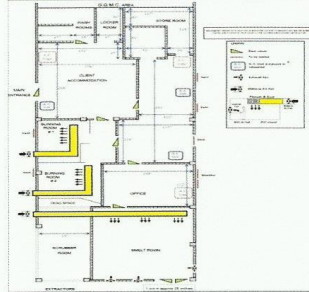


**Integrated Solid Waste Management Initiatives (2011).**

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.



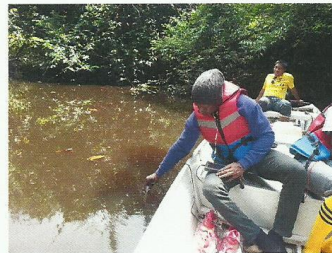
**Preliminary Design, Fabrication and Installation of a Dilution Ventilation System to Remove Hot Air from Room Spaces and to Dilute Toxic Gases at the Guyana Gold Board Lab Facilities (2011).**  
Project beneficiary: The Geology and Mines Commission from Guyana.



**“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).



**Environmental and Social Impact Assessment (ESIA) Update for Sherwood Forrest Inc. Logging Concession (March, 2015).**

Project beneficiary: Baishanlin International Forest Development Inc.



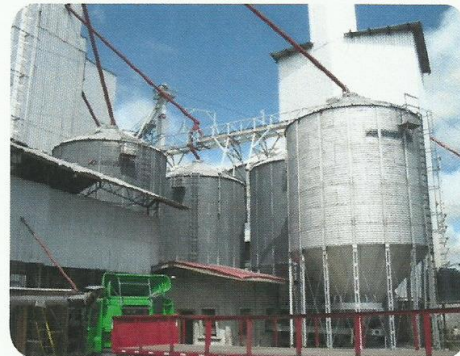
**Environmental and Social Management Plan (ESMP) for Sanitary Landfill Operation in Bartica (April, 2015).**

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





**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)



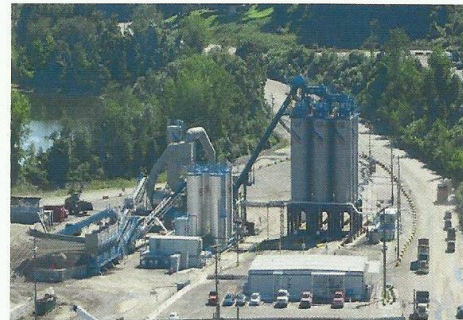
**Consolidated Annual Report for Service Station (Bartica) (July, 2015).**

Project beneficiary: David Coates Service Station



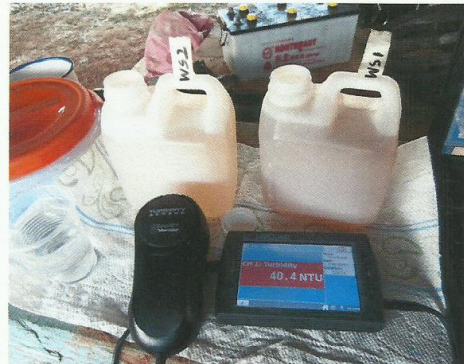
**Environmental Report for the Asphalt (Bitumen) Plant Project, Upper Demerara-Berbice (August 2015).**

1. Project beneficiary: Region 10, Environmental Impact Assessment.



**Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter Forest Concession (August 2015).**

Project beneficiary: Rong-An Inc.



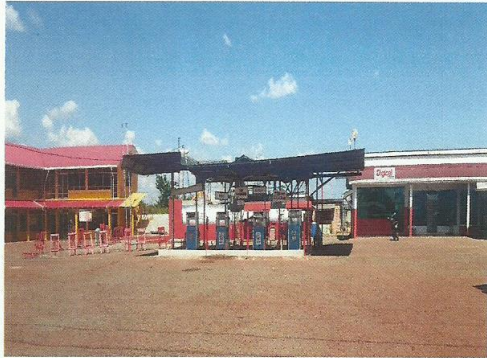
**Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter for Forest Concession (August 2015).**

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.

## 2. PHILIP ODWIN: CURRICULUM VITAE

### 1. Personal Details

Name: Philip Sylvester Odwin  
Date of Birth: October 31, 1989  
Place of Birth: Bartica, Guyana  
Address: 34 Fort Street, Kingston, Georgetown  
Email: odwinphillip@gmail.com  
Telephone: 592-227-1500, 592-671-8050

### 2. Education

2000-2004: Kingston Community High School  
2005-2007: Adult Education Remedial School  
Acquired: Junior High certificate in English Language, Mathematics, and Social Studies

### 3. Skills: Trapping animals

- Fishing (rod, seine, cast net)
- Bird identification, colouration, call, flight pattern
- Bush craft

### 4. Work Experience:

- 2008-2010: Employer: Total Logistics:  
Position held: Port Agent.  
Job Description: Clerical task, record keeping.
- 2010-2014: **Wildlife surveys** with various professionals including Michael Braun.
- 2015-2016: **Forestry Training Centre Incorporation:**  
Forest Technician (18 days), Kaburi, West Mazaruni  
  
Job Description: measuring, assessing trees, and creating circular plots for a 2% ML inventory; identifying and recording fauna encountered at or near sample plots.
- Wildlife technician (2016-January-February 2016), **Forestry Training Centre Incorporation**  
  
Job Description: **Trapping animals**, photographing, and identifying the various species of animals encountered UNAMCO Road, Kwakwani Ituni, Bissaruni and Haimorakabra.
- 2016-2017:
  - *Wildlife surveys* (2 weeks-2016) with **Eustace Alexander, Region 1** (Barama, Barima & Waini) and Region 3 (Fort Island); Region 7 (Bartica to Sherima; Kartabo-Marshalls Falls, Kartabo-Kamaira falls)
  - **Aurora Goldmines** Wildlife surveys (20 days-March 2016, 20 days September 2016, and 20 days January 2017) supporting **Leon Moore**, bird expert.

- 2017:
  - September 24-30, 2017: **Forestry Training Centre Inc.:** Wildlife surveys-Rong-An Inc Forest concession, right bank upper Berbice River.
  - October 6-8, 2017: **Forestry Training Centre Inc.:** Wildlife surveys-Toolsie Persaud Timber Traders Inc. Forest concession, Puruni District
  - October 13-18, 2017: **Forestry Training Centre Inc.:** Wildlife surveys-Toolsie Persaud Timber Traders Inc. Forest concession, Puruni District
  - October 26-November 2, 2017: **Forestry Training Centre Inc.:** Wildlife surveys-TTPTI forest concession (SFEP 2/2013), Puruni District
- 2018:
  - February 19-March 1, 2018: **Aurora Gold Mines.** Wildlife Studies: Bird Surveys
  - March 26-April 5, 2018: **Aurora Gold Mines.** Wildlife Studies: Bird Surveys
  - April 22-27, 2018: **Forestry Training Centre Inc. / Toolsie Persaud Timber Traders Inc.** (Waiamu, right bank Cuyuni River, Kartabo Triangle). Wildlife surveys.
  - May 22-28, 2018: **Forestry Training Centre Inc. / Toolsie Persaud Timber Traders Inc.** (Waiamu, right bank Cuyuni River, Kartabo Triangle). Wildlife surveys
  - September 24: Tour guide duties, **Wilderness Explorers**, Mahaica River
  - September 30 – October 4, 2018: Bird surveys: Accompanying **Waldyke Prince** on a shore bird survey, Essequibo Islands (Region 3).
  - October 6, 2018 (Botanical Gardens); October 13, 2018, Botanical Gardens), November 2, 2018 (Abari River): Bird Surveys, **Wilderness Explorers.**
  - November 20-25, 2018: **Forestry Training Centre Inc /Faunal surveys: TPTTI, Puruni District**
- 2019
  - January 17-21, 2019: **Forestry Training Centre In.** Faunal surveys: Aranka District-Ianna District, NWD, Region 1
  - January 23-Feb 2, 2019: **Environmental Resources Management ([www.erm.com/en/service](http://www.erm.com/en/service)):** Coastal bird surveys: -Guyana’s Coastland, from 63 Beach, Corentyne to Essequibo Islands & Dartmouth, Essequibo Coast. Accompanied Waldyke Prince.

## 5. References:

- a) Leon Moore-Bird specialist, wildlife photography
- b) Waldyke Prince-Wildlife Specialist

### 3. ROBERT SKEETE

## Curriculum Vitae Robert Skeete

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### Personal Information



**Name:** Robert Dellon Skeete

**Address:** Lot 26 & 27 Windsor Castle, Essequibo Coast, Guyana, South America.

**Date of Birth:** 24<sup>th</sup> July, 1989.

**Nationality:** Guyanese

**Marital Status:** Single

### Contact Information:

Phone #: 592-679-6686, 592-695-2343, 592-651-1748

E-mail: [rskeete724@gmail.com](mailto:rskeete724@gmail.com)

### Education

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**2013:** University of Guyana: BSc. Degree in Forestry.

**2010:** University of Guyana: Diploma in Forestry.

**2005-2006:** Guyana School of Agriculture: Certificate in Forestry.

**2001-2005:** Anna Regina Multilateral School.

### Experience

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2016- Present – Forestry Training Centre Inc; Forester

2013- 2015 – Guyana Forestry Commission; as a Monitoring Inspector.

2009: Sand Springs Mining Company: Field Technician for ESIA's

2008: Amaila Falls Hydro Project; Field Technician for Rapid Assessments

### Training Courses Attended

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2016: Dale Carnegie: Skills for Success. Supervisory Management Course

2015: FTCI; Chainsaw Operation and Maintenance

2009: University of Guyana; Anthropology Summer School

2008: FTCI: Reduce Impact Logging

2006: FTCI: Reduce Impact Logging

## 4. LUANN NERO

### Curriculum Vitae

#### Personal Information

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Name: Luann Aderita Nero  
Date of Birth: January 25, 1986  
Nationality: Guyanese  
Current Address: Lot 3 Tain Public Road, Corentyne, Berbice, Guyana  
Marital Status: Single  
Mobile: 615 – 0602  
Telephone: 337 – 2898  
Email: [aderita252003@hotmail.com](mailto:aderita252003@hotmail.com) or [luannnero28@gmail.com](mailto:luannnero28@gmail.com)

#### 1. Key Competencies

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**Forest Management:** Over six years of knowledge and experience in the field of forest audits and management, with emphasis on forest monitoring and compliance.

**Middle Management and Planning:** Over five years of experience in supervising staff, planning, and developing conflict resolution skills.

**Communication and Capacity-building:** skilful writing and communication skills, with experience in planning and organizing Capacity Building Workshops for Guyana Forestry Commission (GFC), Independent Forest Monitoring (IFM) and European Union Forest Law Enforcement Governance and Trade (EU FLEGT).

#### 2. Educational Background

INSTITUTION	DATE	QUALIFICATIO
Technische Universität Dresden <i>(Centre for International Postgraduate Studies of Environmental Management (CIPSEM)</i>	January – July, 2013	Post Graduate Diploma – Environmental Management
University of Guyana	2005 – 2010	Bachelor of Science - Agriculture (General)

### 3. Experience

Organization	Designation	Period	Brief Overview of Duties and Responsibilities
FTCI	Course coordinator	2018+	Plan projects and coordination for training programmes, executed by FTCI training staffs
GFC	Environmental Auditing Officer	2011 - 2018	Mainly, ensuring that stakeholders comply with the requirements of the Forests Act Chapter 67:01 of 2009 of the Laws of Guyana (the Forest Act).
	Management Trainee	2010-2011	Conducted audits at lumberyards and sawmills as well as 100% audits at concessions for compliance.

### 4. Additional Qualifications and Skills

- 1) Mastering English Language for Report Writing - February – May 2012
- 2) Geographic Information System Fundamentals – November 2011 – February 2012
- 3) Women in Forestry in the Caribbean Symposium – October 23 -25, 2011



## 5. MARIEA SUEGRIM

### Mariea Alessa Suegrim

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102, First Street, Craig Village, East Bank Demerara, Georgetown / Tel: (592) 690-9757 /  
[Mariciasuegrim@rocketmail.com](mailto:Mariciasuegrim@rocketmail.com)

#### PERSONAL INFORMATION

**Date of Birth:** 20/10/1992  
**Age:** 25  
**Nationality:** Guyanese  
**Marital Status:** Single

#### PROFILE

I am an Aspired Career Oriented Individual and I am hoping to become a mature in the near future with my interest specifically in Public Sector. I have great writing and statistical analysis skills that were acquired and developed throughout my academic exposures. I am courteous, dedicated and a very hardworking individual who takes pride in completing any task that is assigned to me. I am very organized, logical and reliable and have great interpersonal skills. As such, I have the capacity to work in a team or individually with minimal guidance. Moreover, honesty and trustworthiness are the two pillars for which I am known for.

#### EDUCATION

Craig Nursery School	1997-1999
Craig Primary School	1999-2005
Friendship Secondary School	2005-2009
University of Guyana	2012-2016

## QUALIFICATIONS

**2014-2016**    **BSc. Public Management:** (Grade Point Average {GPA} 2.9) University of Guyana, Turkeyen Campus, Georgetown, Guyana.

**2012-2014**    **Diploma in Public Management:** University of Guyana, Turkeyen Campus, Georgetown, Guyana.

**2011**            Basic Foundation: Benschop Foundation, Grade A.

**2010-2012**    Microsoft Word: Benschop Foundation, Grade A

<b>2009</b>	<b>CXC General Proficiency</b>	<b>Grade</b>
	Mathematics	Three
	English A	Three
	Office Administration	Two
	Electronic Document Preparation and Management	Three
	Principles of Business	Two
	Principles of Accounts	Three
	Integrated Science	Three
	Social Studies	One
	Visual Arts	Three

## WORK EXPERIENCES

**Human Rights Commission:** General Clerk 2 – Administrative Assistant (Acting)

Responsibilities included:

Preparing and Assembling daily Reports to Administrative Officer, Answering telephone, scheduling Appointments, Composing of Correspondence, composing necessary Notices and Memorandum. In addition, arrangement of Monthly Statutory Meeting, Attend various meetings and preparing minute, reports, review invoices and prepare cheques for payment, Maintains files and prepare documentation, Manage Asset Inventory, Procure request for Quotation, Manage Ledgers, Make purchases of all Janitorial, Stationery and Refreshment, Maintain Call Logs, Timesheets Update, Store and File all relevant Document, Photocopying and Printing of Documents, experience in Government Accounting (IFMAS), schedule Bookings for Travelling, Prepare Agenda for Meetings, Assist with Preparation for Outreaches and Activity of the Commission.etc

**Nand Persaud International Communication:** Call Agent [2010]

Responsibilities included:

Converting Voice to Text Conversation –Typing at 30-40 words per minute -- Making daily reports to management – Devising new means of attracting potential clients .

## EXTRA CURRICULAR ACTIVITIES

**Assistant Counselor at Church Camp (Brethren Assembly)**

2008-Present: **Brethren Assembly**

Main responsibilities include assisting Senior Counselor with preparation of Camp Activities Typing, Printing of Documents, Camp Registration and Assisting with Finance of Tuc Shop.etc

## PROFESSIONAL SKILLS

I am computer literate and proficient in Microsoft Word, Excel and PowerPoint.

## INTERESTS

I like to keep up-to-date with current news and events taking place both locally and internationally, travelling, meeting and interacting with persons of different background, culture and race, participating in cultural activities, writing and I also have good time management.

## ACCOMPLISHMENTS

**Best Graduating Social Studies Student at Friendship Secondary School and Best Camper for Three (3) Consecutive Years (2009-2011).**

## OTHER

- Holder of US Visa
- Long term goal – to obtain Master's Degree in Project Management and possibly PHD thereafter

## REFEREES

**Ms. Sharon Nelson**

Human Resources Manager

Banks D.I.H Limited

Thirst Park

Tel: (592) 225-0910 ext 2216/680-7407

Email: [snelson@banksdih.com](mailto:snelson@banksdih.com)

**Mr. Deoraj Gyandat**

Superintendent of Prison

Timehri Prison

Timehri

Tel: (592)604-7305

## 6. JAGDESH SINGH

164 Section A, Block Y Grove,  
East Bank Demerara, Guyana.

Date of Birth: 28-12-78  
Marital Status: Married  
Nationality: Guyanese  
Language: English

Tele: (592) 641-1451  
E-mail: [jagdes\\_h\\_singh@hotmail.com](mailto:jagdes_h_singh@hotmail.com)  
[jagdes\\_h.singh@gmail.com](mailto:jagdes_h.singh@gmail.com)

# Jagdes\_h Singh

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<b>Background Summary</b>	Natural Resources Management professional with strong skills in project development and management, Geographic Information Systems/Remote Sensing design, management and analysis, Sustainable Forest Management, Forest Law, Policy and Governance, Environmental Law and Policy, Sustainable Development and Climate Change.
<b>Qualifications</b>	<ol style="list-style-type: none"><li>1. September 2020 – LLB (Bachelor of Laws), University of Guyana.</li><li>2. October 2003 – September 2004. Chevening Scholar (2003). MSc in Geographical Information Science/Remote Sensing (GIS/RS), Department of Geography, University of Edinburgh.</li><li>3. October 2000. BSc Forestry, Department of Forestry, University of Guyana</li><li>4. October 1998. Dipl. Forestry, Department of Forestry, University of Guyana</li><li>5. December 2001. Certificate Professional Development Program, Institute of Business, University of the West Indies.</li></ol>
<b>Specialist Skills</b>	<ul style="list-style-type: none"><li>• Natural Resources Management and Sustainable Development planning and implementation</li><li>• Environmental Law, Climate Change, Sustainable Forest Management (SFM) planning and implementation</li><li>• Forest Law, Policy, and Governance</li><li>• Planning and project management</li><li>• Monitoring, Reporting and Verification Systems (MRVS) design and implementation</li><li>• National Forest Monitoring System (NFMS) design and implementation</li><li>• Communication, team building and training.</li></ul>

<p><b>Experience</b></p>	<ol style="list-style-type: none"> <li>1. 2018 – Present - Technical Officer, Guyana Forestry Commission.</li> <li>2. 2014 – 2018 - National Technical Coordinator (NTC) for the implementation of the Project “Forest Cover Monitoring in the Amazon Region”, GFC</li> <li>3. 2008 – 2014 - Deputy Commissioner of Forests – Forest Resources Management Division (FRMD), GFC.</li> <li>4. June – December 2007 - Head, Forest Resources Information Unit, GFC</li> <li>5. 2004 – 2007 - Head, Geographical Information Systems Unit, EPA.</li> <li>6. 2004 – 2007 - Lecturer, Department of Forestry, University of Guyana.</li> <li>7. 2001 – 2003 - Assistant Commissioner of Forests – Forest Resources Management Division (FRMD), GFC.</li> <li>8. 2000 – 2001 - Environmental Monitoring Officer – Forest Monitoring Division (FMD), GFC.</li> </ol>
<p><b>Interests</b></p>	<ul style="list-style-type: none"> <li>➤ Environmental Law, Sustainable Development, Climate Change, Natural Resources Management, Sustainable Forest Management.</li> <li>➤ Use of GIS/Remote Sensing in Natural Resources Management and Environmental Applications</li> <li>➤ Developing methods for mapping and managing tropical forest stands and species using satellite/radar imagery</li> </ul>
<p><b>Other Information</b></p>	<ol style="list-style-type: none"> <li>1. Chevening Scholar, 2003.</li> <li>2. Special Award. Awarded the Vice-Chancellor Special Award for Best Graduating Student in the Faculty of Agriculture, University of Guyana.</li> <li>3. Member of the Board of Directors of the Guyana Lands and Surveys Commission (GL&amp;SC) and the Environmental Protection Agency (EPA), 2010 – 2014.</li> </ol>

## 7. GODFREY MARSHALL

### CURRICULUM VITAE: GODFREY EMERSON MARSHALL: FORESTER

46+ 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\\_fm@outlook.com](mailto:gemar_fm@outlook.com)  
Phone: 592-216-4602(H); 592-642-1910(C).

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#### 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.

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#### C. PROFESSIONAL EXPERIENCE:

Appointed a Forest Officer, Guyana Forestry Commission on December 7, 1972, 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. However, I was re-employed as Technical Adviser with effect from January 1, 2015.

Key positions held at the GFC were as follows:

2015+: *Technical Adviser/Consultant* with the GFC/FTCI; provide technical support to the GFC and Forestry Training Centre Incorporated. (I also engage *informally* in extension services, advising concessionaires, sawmillers and loggers' associations on their projects).

2005 to 2014: *Director, Forestry Training Centre Incorporated*: Co-managed two ITTO projects, PD 68/01 Rev.2(I) and PD 333/05 Rev.2(I), 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.*

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D. Field Tours

I have been exposed to field tours in various countries, including Malaysia, Sweden, Brazil, and the United Kingdom.

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E. Languages

I am fluent in English and Portuguese.

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F. Recent Publication

Marshall, G. & Kerrett, R. 2010. The Chainsaw milling subsector in Guyana. ETFRN NEWS Issue No. 52, December 2010. Pages: 91-97.

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G. Projects/Consultancies

I have successfully written project proposals for support from ACTO, FAO, ITTO, and WWF. On a personal basis, I have done consultancies for FAO, ACTO and ITTO projects, respectively. Also, I have written many Forest Management Plans and Annual Plans of Operations for logging companies in Guyana. I am currently engaged in the preparations of ESIA's for local developers.

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H. Other

- Served for one year as a member of the Board of Directors, Guyana Mining School, and Training Centre (January -December 2014).
  - Received a *national award: Medal of Service*: November 2015.
-



Annex III: Copy of Face Page of RTI's Certificate of Incorporation



Company No. 8612

**COMPANIES ACT OF GUYANA  
CERTIFICATE OF INCORPORATION**

**ROYAL TIMBERS INC.**

I hereby certify that the above-mentioned Company, Articles of Incorporation of which are attached, was incorporated under the Companies Act of Guyana on the 23<sup>rd</sup> day of November, 2016.

A handwritten signature in blue ink, consisting of a large loop and several vertical strokes.

Registrar of Companies (Ag)

Dated this 25<sup>th</sup> day of November, 2016



  
**Certificate of Registration**  
Taxpayer Identification Number (TIN)

<b>Taxpayer Name:</b>	ROYAL TIMBERS INC.
<b>Business Name:</b>	ROYAL TIMBERS INC. COMPANY
<b>Taxpayer Type:</b>	COMPANY
<b>Address:</b>	LOT 15 GARNETT STREET CAMPBELLVILLE
<b>Date Issued:</b>	December 05, 2016
<b>Tax Office:</b>	HEAD OFFICE
<b>TIN: <u>016235733</u></b>	

This Taxpayer has been registered under the provisions of the Income Tax (Amendment) (No. 2) Act # 15 of 2006

  
**Commissioner General**  
Guyana Revenue Authority

GRA10291277



GUYANA FORESTRY COMMISSION

*STATE FOREST EXPLORATORY  
PERMIT*

*SFA-SFEP: 02/2020*

ROYAL TIMBERS INC.

MARCH 2020

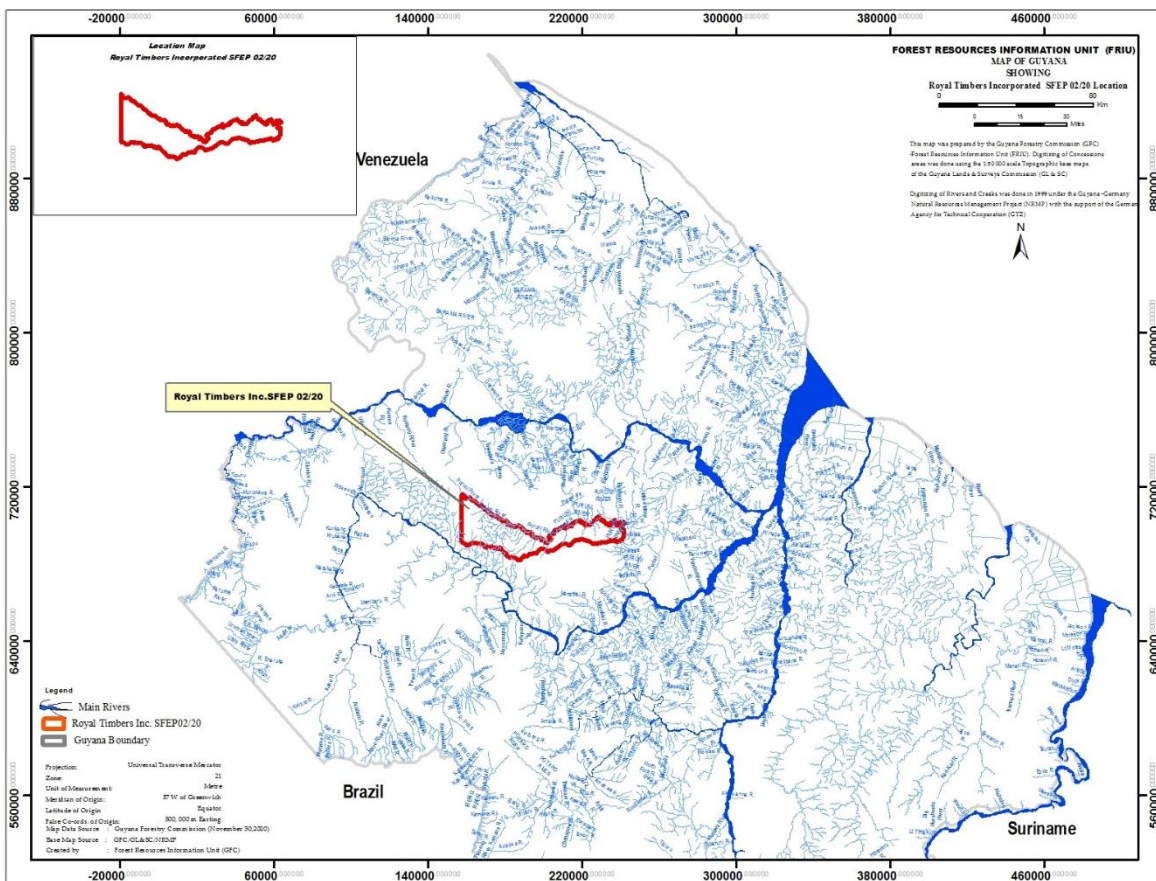
## Annex VI: Description of Concession Area

-Commencing at a point on the right bank of the Puruni River where it intersects the Kartabu-Puruni Road, having approximate UTM geographic coordinates of 02 37 902 E and 06 91 027 N.

-thence along this road in a westerly direction for approximately 99.8 kilometres to a point having approximate UTM geographic coordinates of 01 57 714E and 06 90 690 N.

-thence by a cut line in a northerly direction for 25.42 kilometres to a point on the right bank of the Puruni River, having approximate UTM geographic coordinates of 01 57 465 E and 07 16 074 N.

-thence down the right bank of the Puruni River for approximately 175 Kilometres to the first mentioned point, this being the point of commencement; --Save and except all lands lawfully held.



Map showing the location of SFEP 2/2020

## **Annex VII: Description of RTI's Core staffing structure (see also Annex VIII)**

**Chairperson/Chief Executive Officer (CEO):** The Chairman of the Board of Directors and CEO of the Company, with overall responsibility for strategic planning, financial control, human resources management, and marketing matters.

**General Manager (GM):** The GM has direct responsibility for day-to-day administration for concession-based operations. He is supported by a Forest Manager, an Administrative Manager, and a Utilization Officer. He reports directly to the Chairman/CEO.

**Forest Manager (FM):** The FM is personally responsible for forest management (including the preparation of FMPs and AOPs) environmental management-including environmental management plans, forest monitoring, and community relations. He is supported by a Surveys and Planning Superintendent, a *Log Production Coordinator*, and a *Forest Monitoring Officer*. The *Forest Monitoring Officer* will consult with GFC, EPA and other relevant stakeholders to ensure RTI's logging operations proceed smoothly. The Forest Manager reports directly to the General Manager.

**Administrative Manager (AM):** The AM is responsible for mechanical/electrical workshop and ancillary utility services for the base camp, accounting matters including remuneration packages, procurement of goods and materials, and staff recruitment and training matters. He is supported by a workshop superintendent, accounting staffs and personnel staffs. The administrative manager, in consultation with workshop superintendent and forest monitoring manager will develop policy documents (environmental policy, energy policy, human resources policy, etc. ad reporting templates for mishaps at workspaces. He/she reports directly to the General Manager.

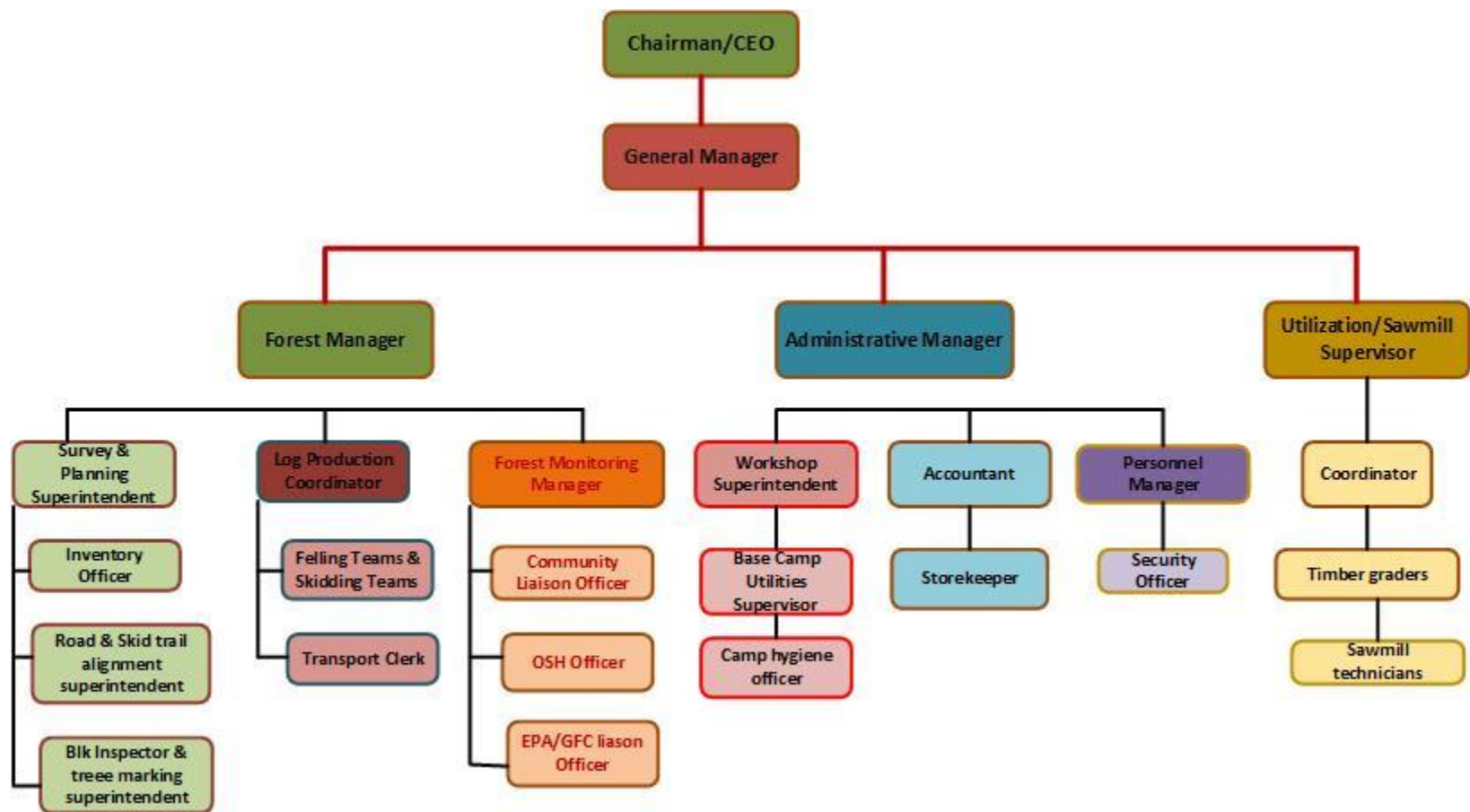
**Utilization Officer (UTO).** The UTO, in consultation with the GM and in line with RTI's marketing objectives and goals, will ensure that log and lumber production meet customers' requirements. The UTO will consult with the Marketing Unit of the GFC. He/she will report directly to the General Manager.

**Forest Monitoring Manager (FMO).** The FMO will be personally responsible for consulting with stakeholders and ensuring the implementation of RTI's environmental management plan.

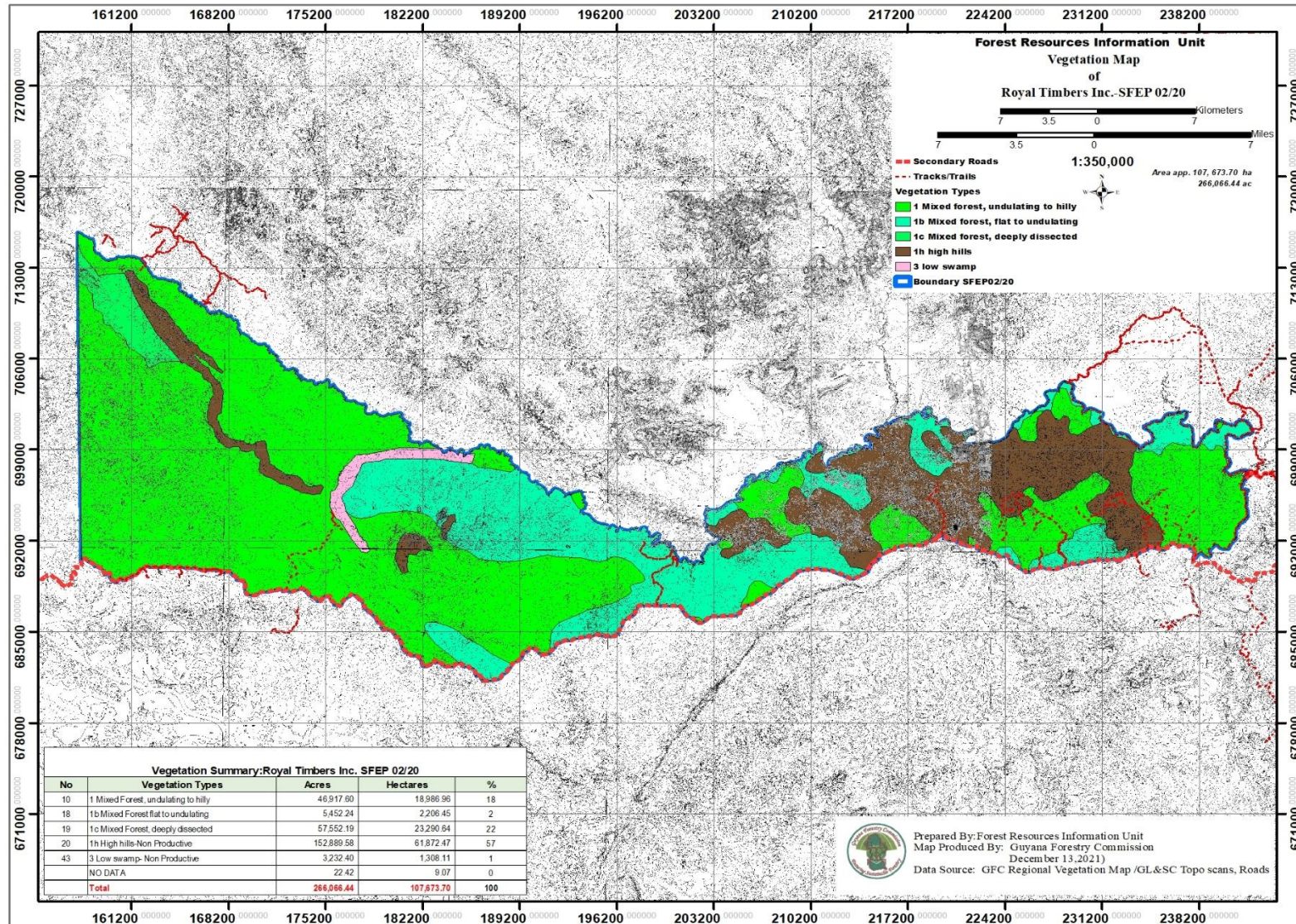
The company will employ about 75 workers for the logging operations including:

- a) technicians, tally clerks & machine operators and for its timber harvesting operations.
- b) technicians, timber graders and tally clerks for its sawmilling and timber grading operations on the concession area.
- c) technicians for its timber depot and wharf at Kartabu Point.
- d) forest monitoring staffs; and
- e) security staffs.

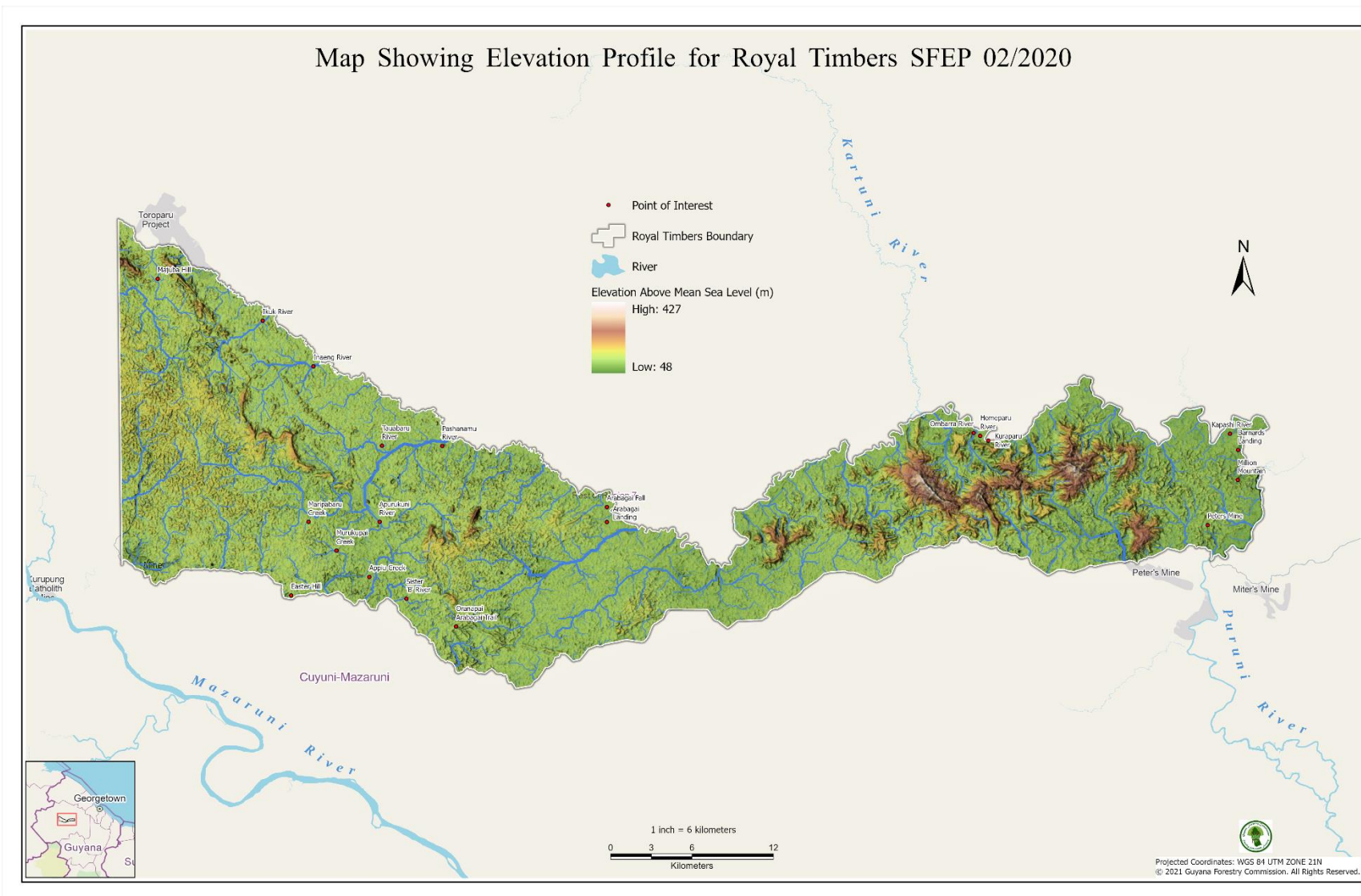
Annex VIII: RTI's Organizational Chart



Annex IX: Indicative vegetation map of SFEP 2/2020

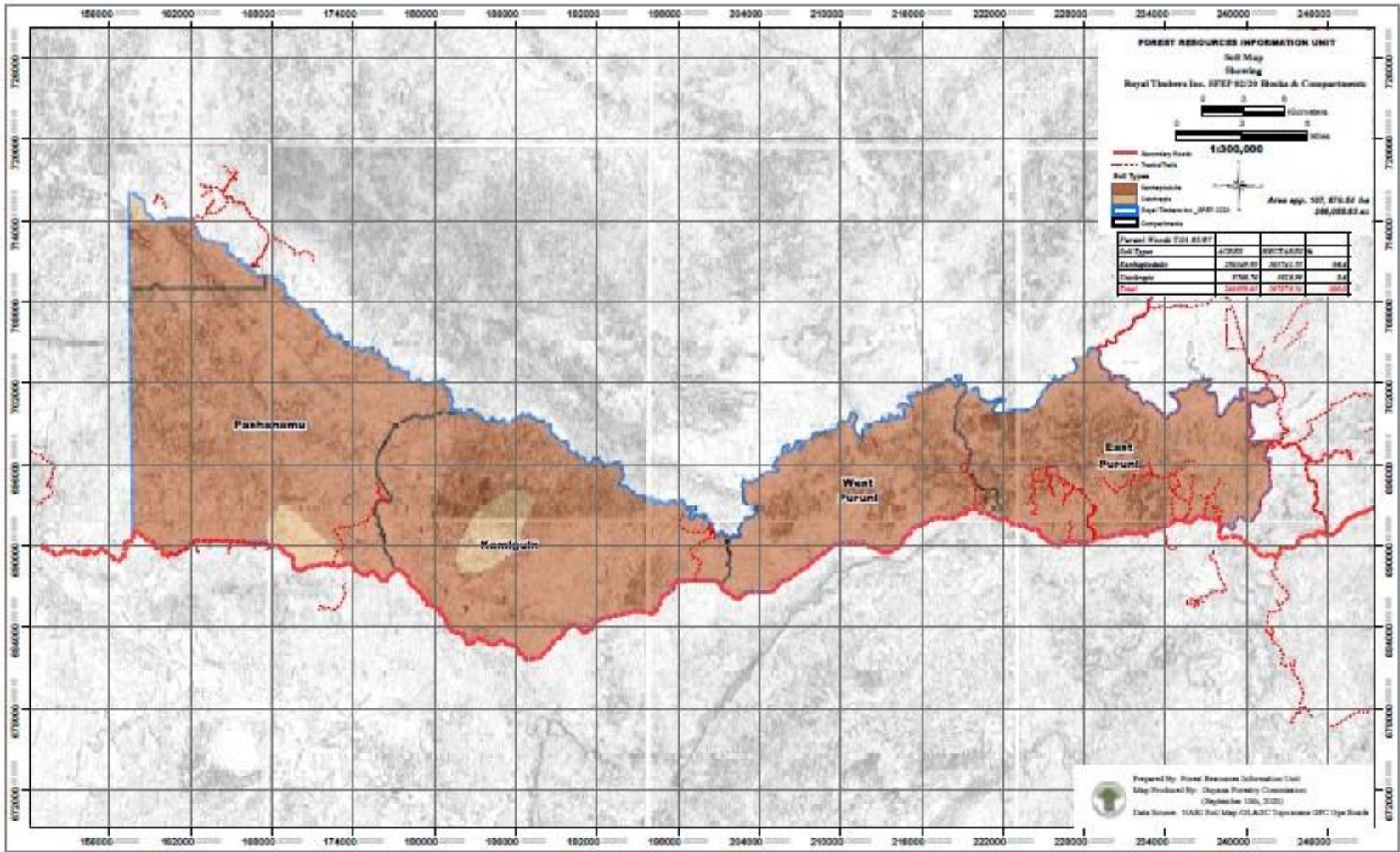


Annex X: Map Showing the Elevation Profile of SFEP 2/2020



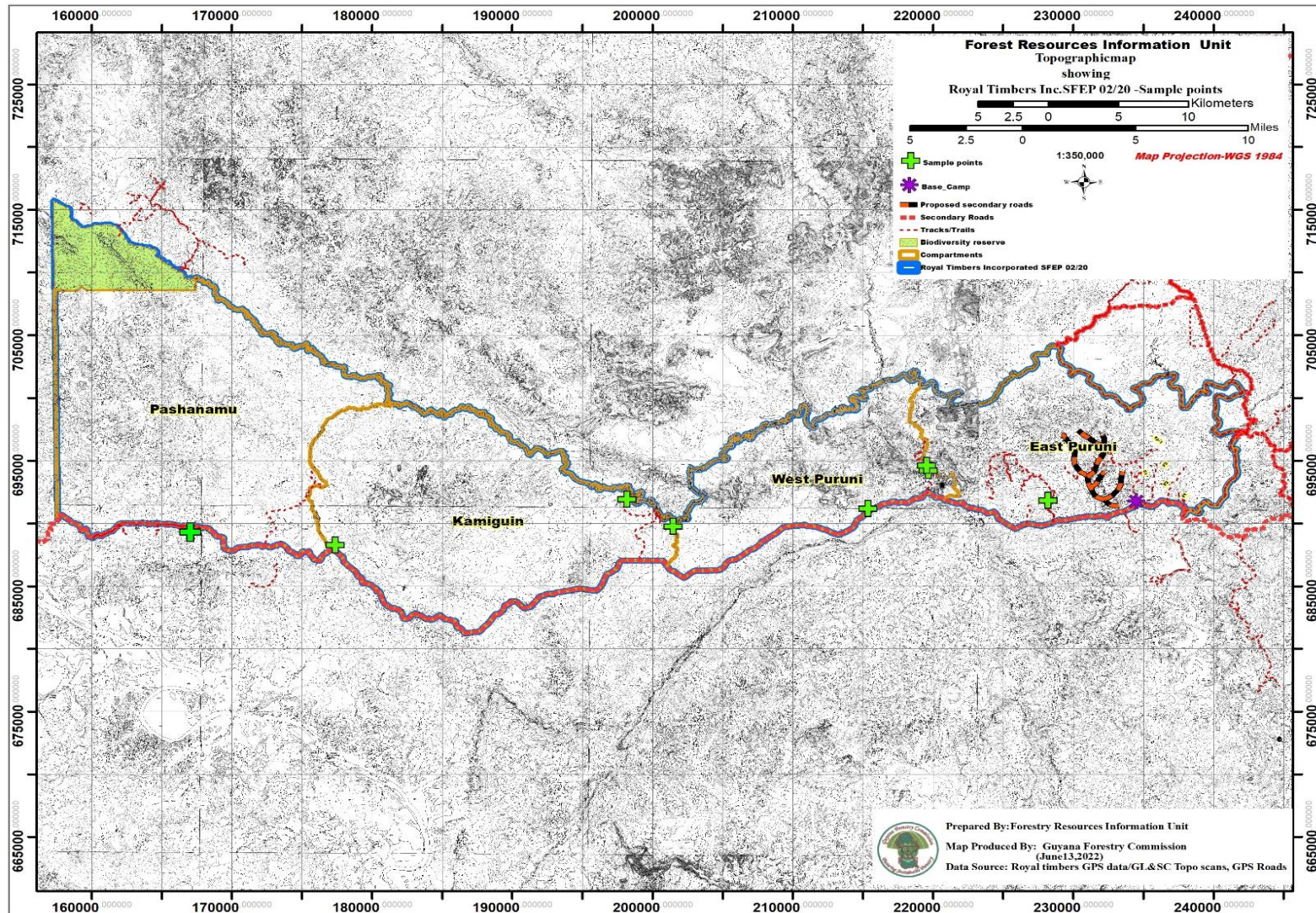


Annex XI: Indicative soil map of SFEP 2/2020

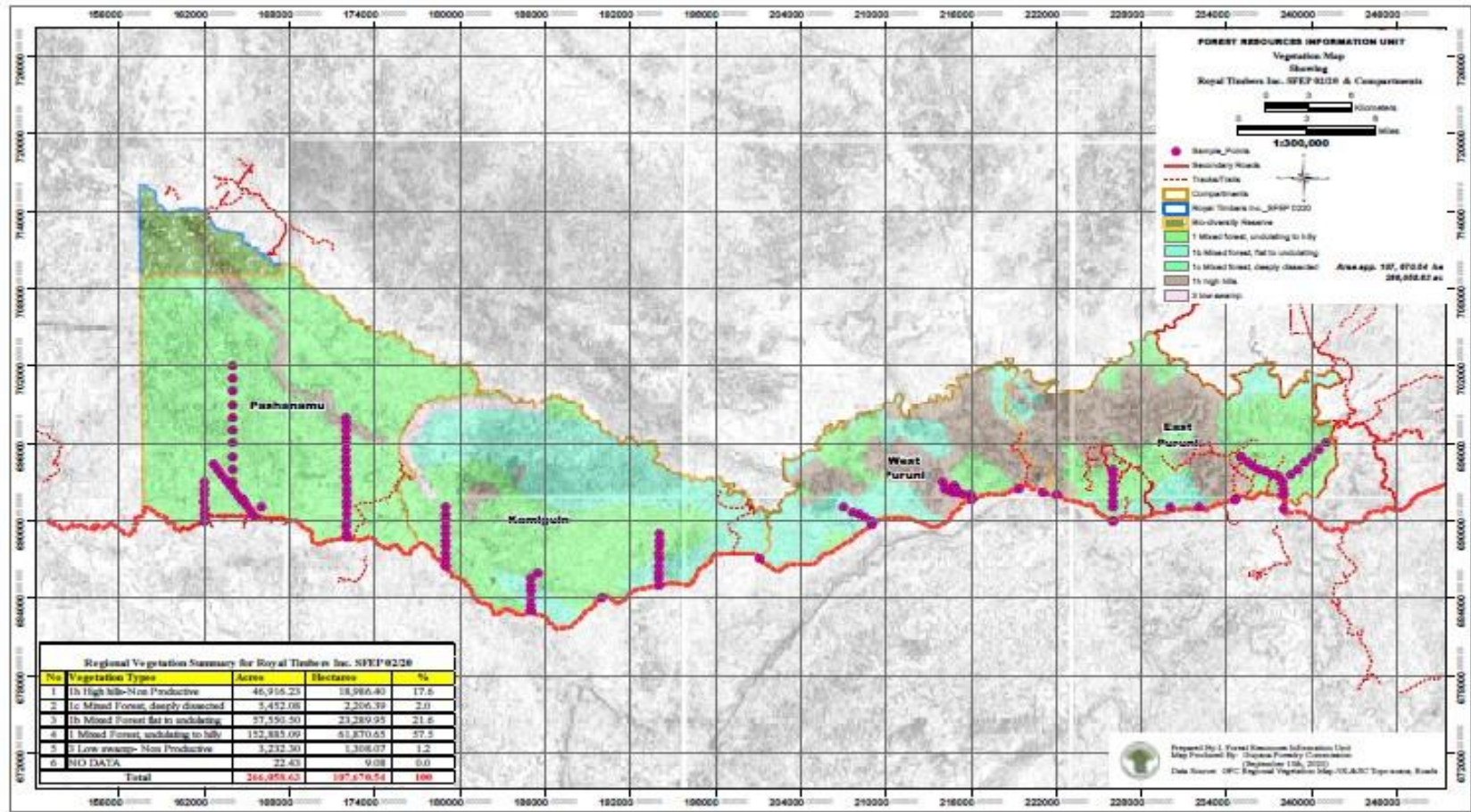


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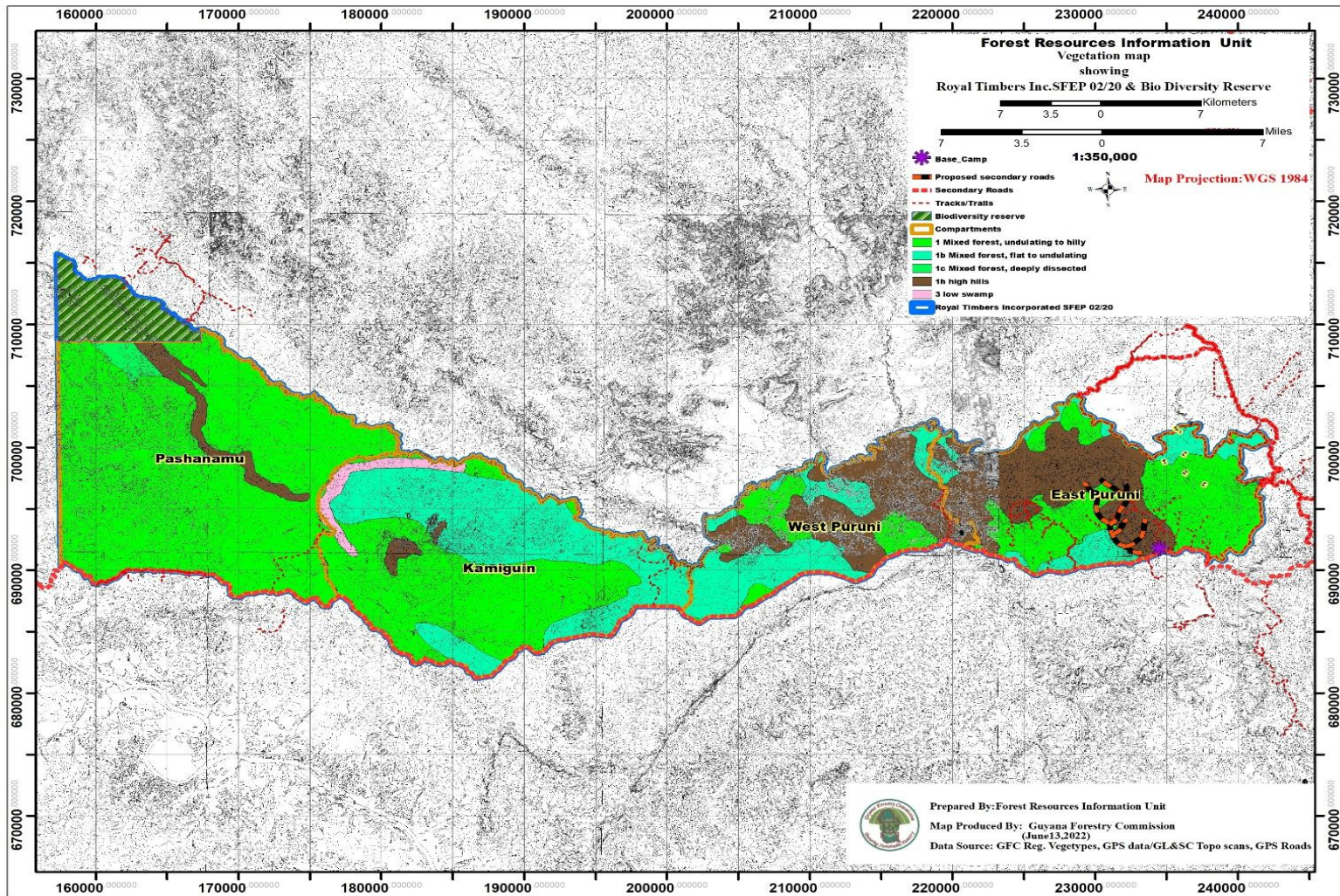
Annex XII: Map showing the location of eight sample points



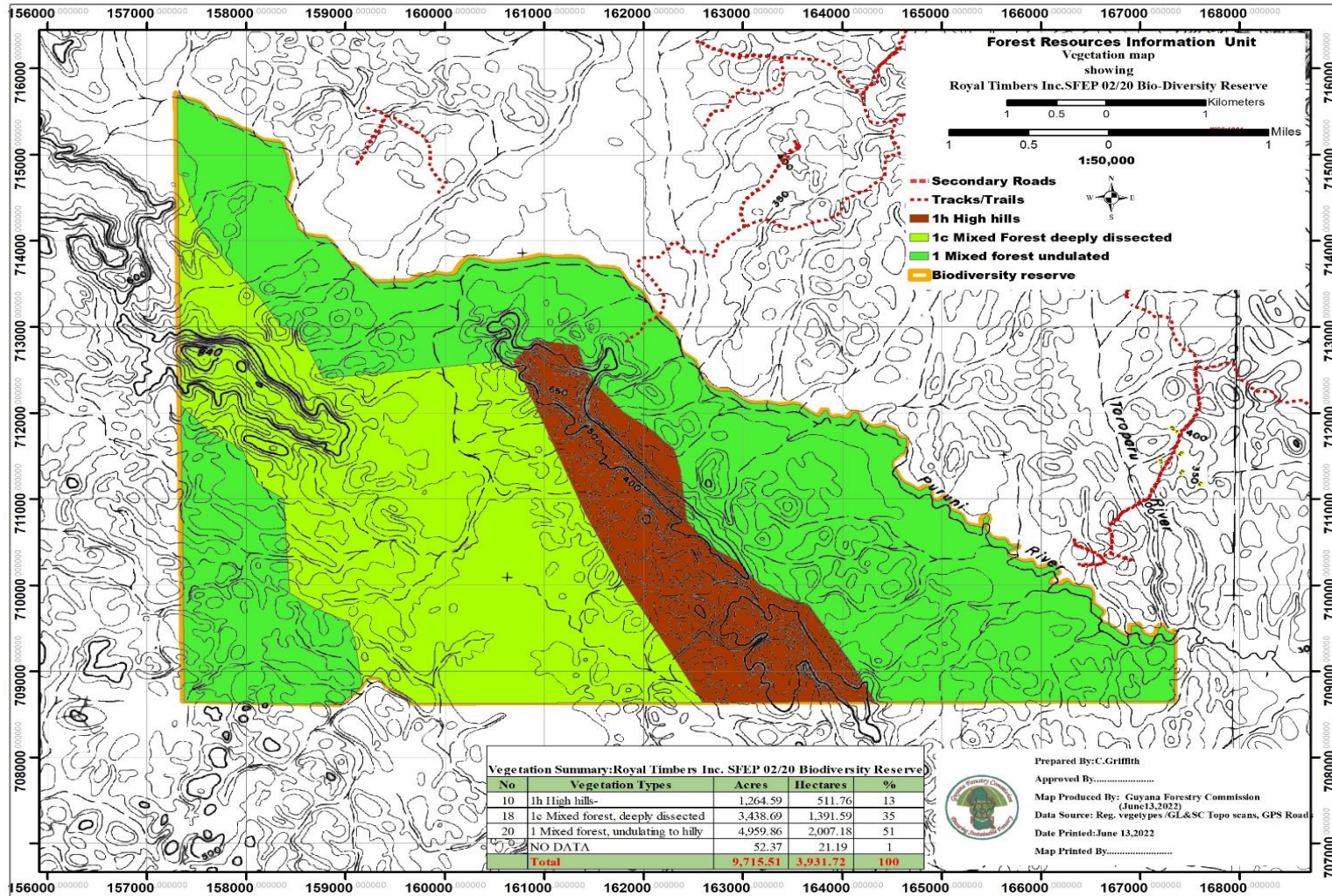
Annex XIII: Map showing the sample points during RTI's ML Inventory



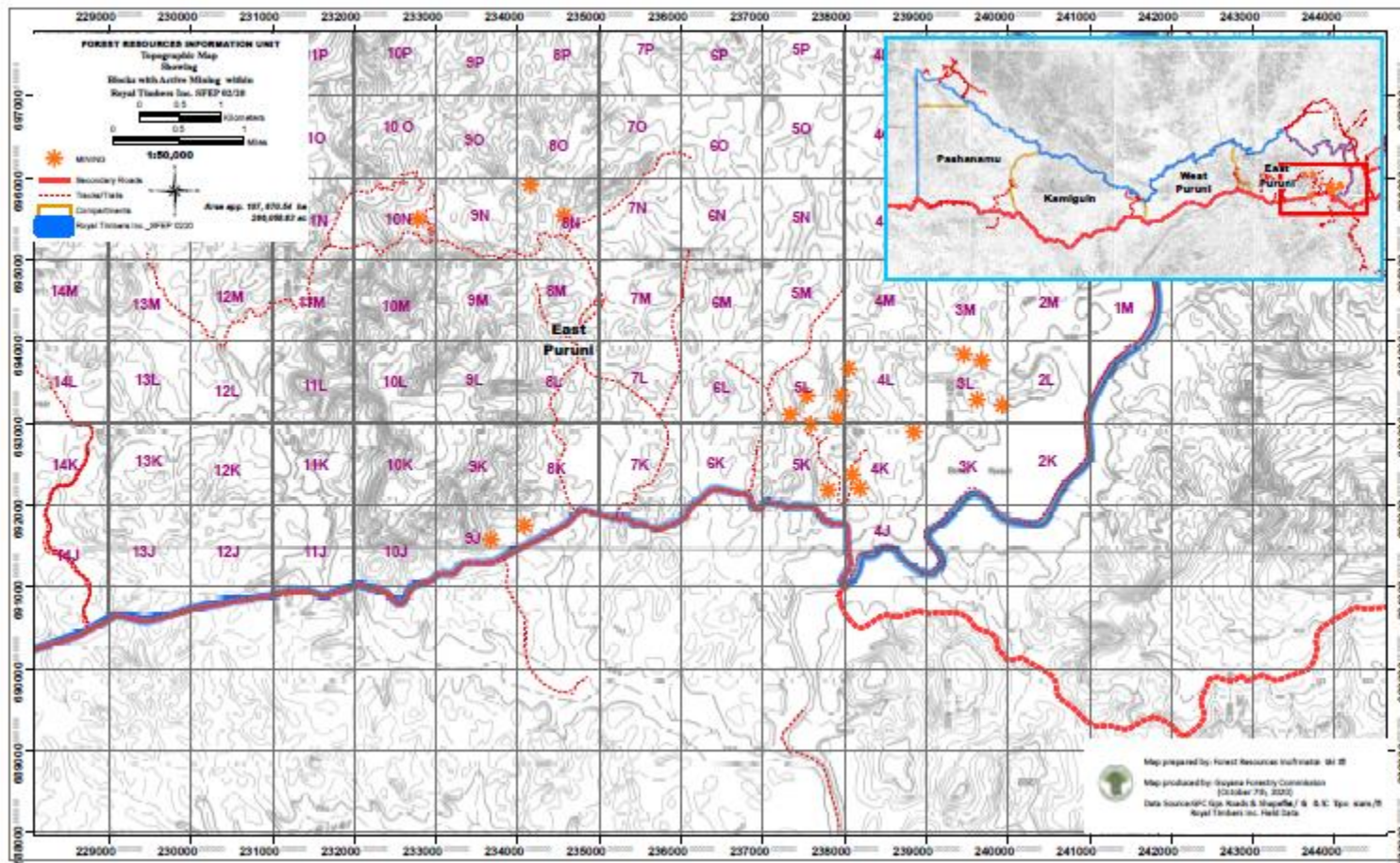
XIV: Map showing location of the compartments within SFE 2/2020



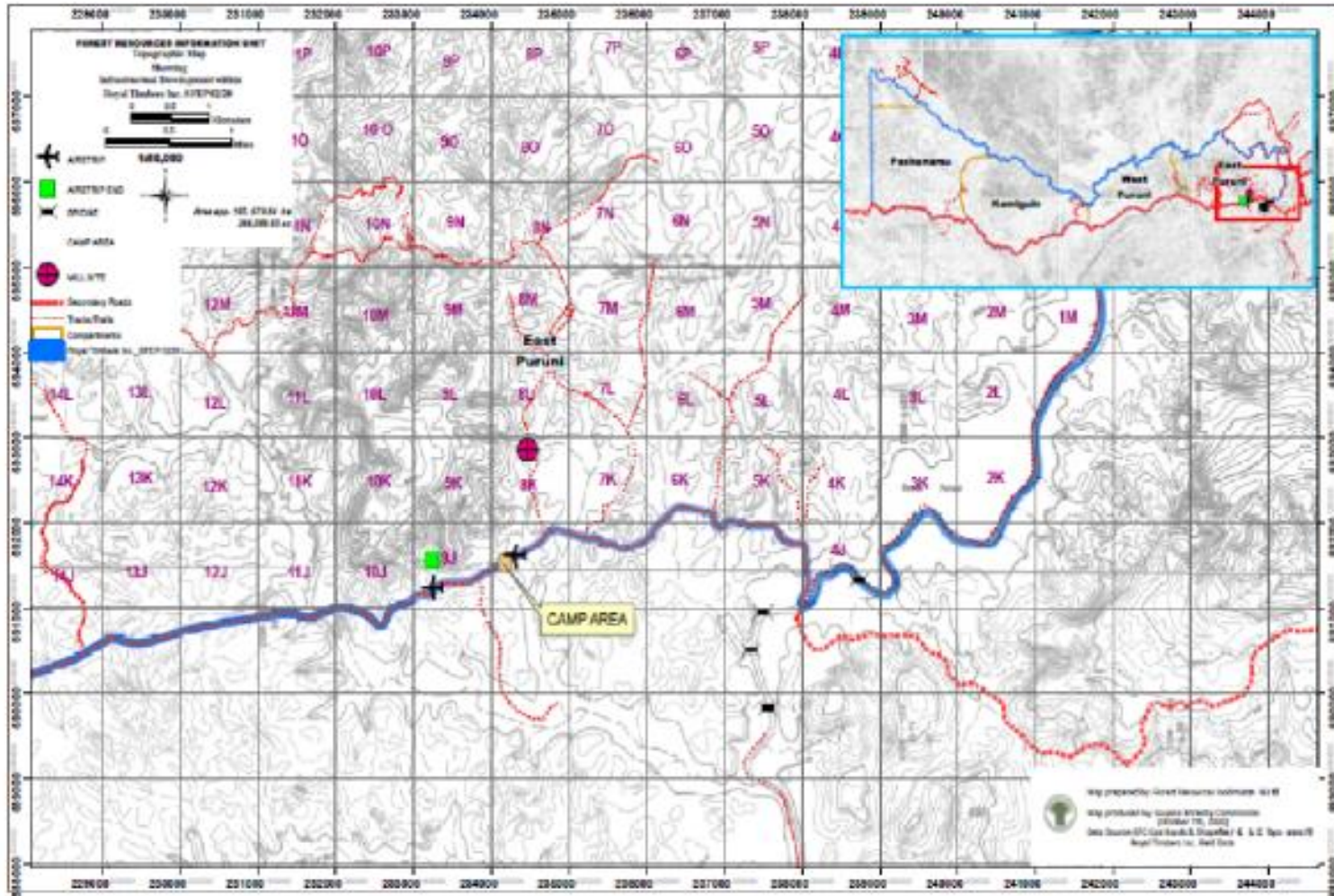
Annex XV: Map of Biodiversity Reserve, SFEP 2/2020



Annex XVI: Map illustrating the organization of SFEP 2/2020 in blocks (with an alpha numerical code)



Annex XVII: Map showing the location options for RTI's base camp and airstrip



## **ANNEX XVIII: Summary Results for Social Surveys Conducted MARCH 1-4, 2021.**

### **FORESTRY TRAINING CENTRE INCORPORATED**

#### **A. Introduction**

FTCI conducted a social survey within the Kartabu Triangle during period March 1-4, 2021. The activity was delayed for more than one year due primarily to restrictions linked to the COVID-19. Pandemic. The communities targeted will not be impacted directly by RTI' concession-based operations, situated more than 120km away; however, RTI' log flows between the concession area and its log depot at Pine Tree Landing will include major segments of the KPR. Also, both Kartabu and Batavia are near RTI' proposed log transshipment facility at Pine Tree Landing.

Barama Company Ltd. ran a similar log depot and wharf facilities at Pine Tree Landing and residents of Batavia and of Kartabu did not register any complaint with the GFC or regional officials.

During the survey, considerable care was taken to minimize interpersonal contact with interviewees to the maximum extent possible; consequently, hand sanitization and the use of masks were standard practices.

#### **B. Methodology**

To reach as many people as practicable in the shortest possible time, a five-person team visited the area during period March 1-4, 2021. The team was based in Bartica and used a boat to visit the three riverine communities, targeting one of the three communities each day, March 2-4, 2021 (see Annex I).

The first order of business on March 1, 2021, was to make as many appointments as possible, especially for Batavia Amerindian Village and Kartabu Village. Appointments were also made with Regional Officials at Bartica.

Interviews were done via one-to-one meetings with residents; a few regional officials in Bartica were interviewed by phone following earlier appointments.

For one-to-one meetings, FTCl used a general questionnaire (see Annex II). The consultants briefly explained the nature of RTI project and the reasons for soliciting feedback from residents. Specifically, the interviewees were advised that RTI' concession area is about 120km west of the villages in the Kartabu Triangle and that RTI will not be sending its vehicles to Iteballi, as is the case with the other large loggers in the Kartabu Triangle.

Although forms were used for a consistency in the respective interviews, residents were encouraged to provide their own views about the general impact of logging on their livelihoods. on their perception of the proposed logging operation and its impacts, and particularly the team also provided each interviewee with their contact numbers if they wanted to contribute additional information at a later post-interview date.

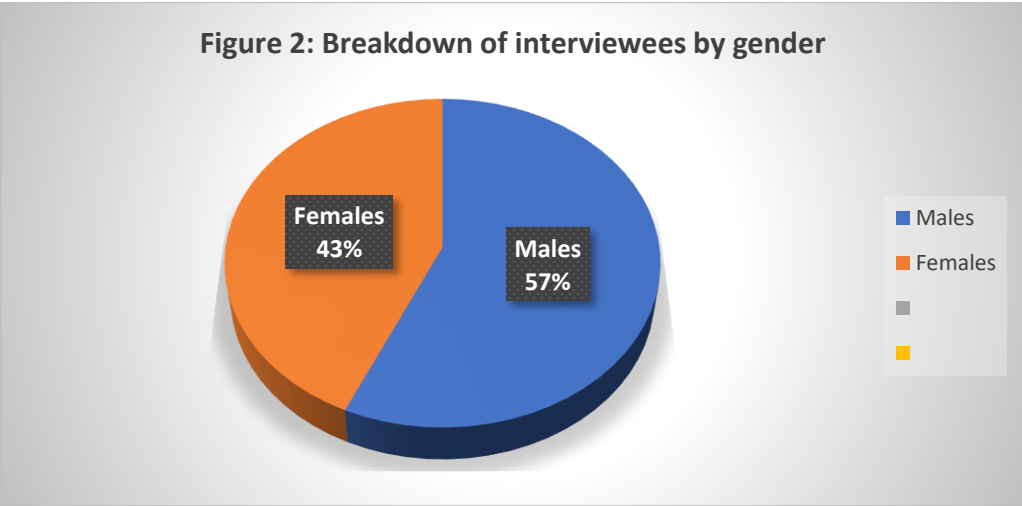
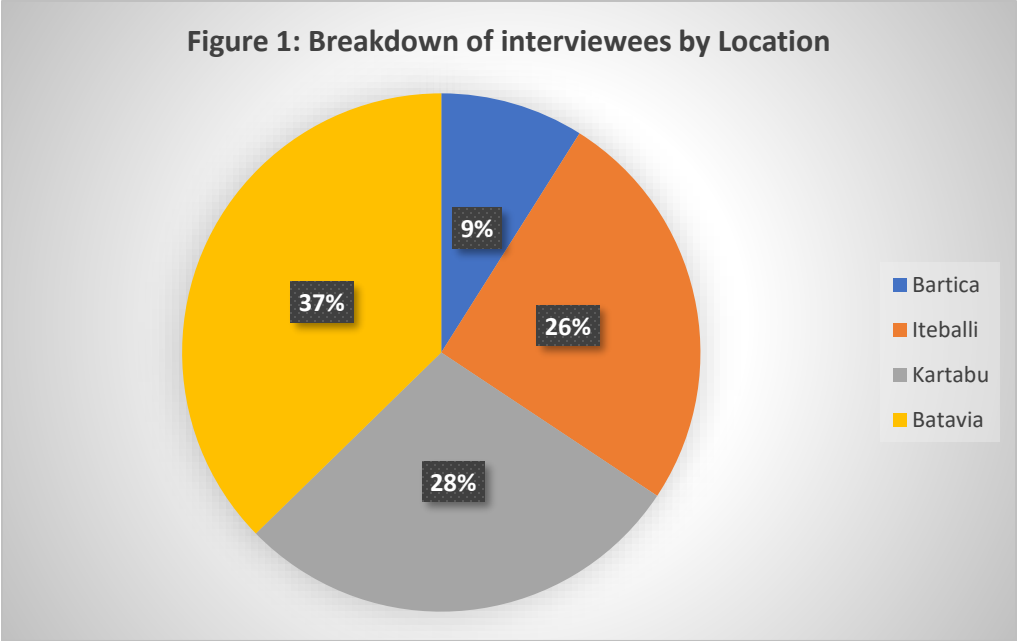
#### **C. Core Results**

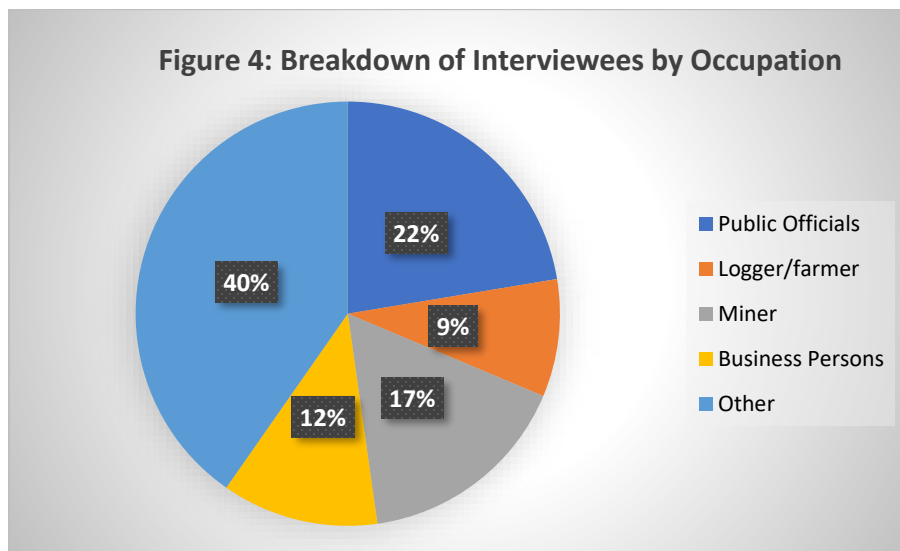
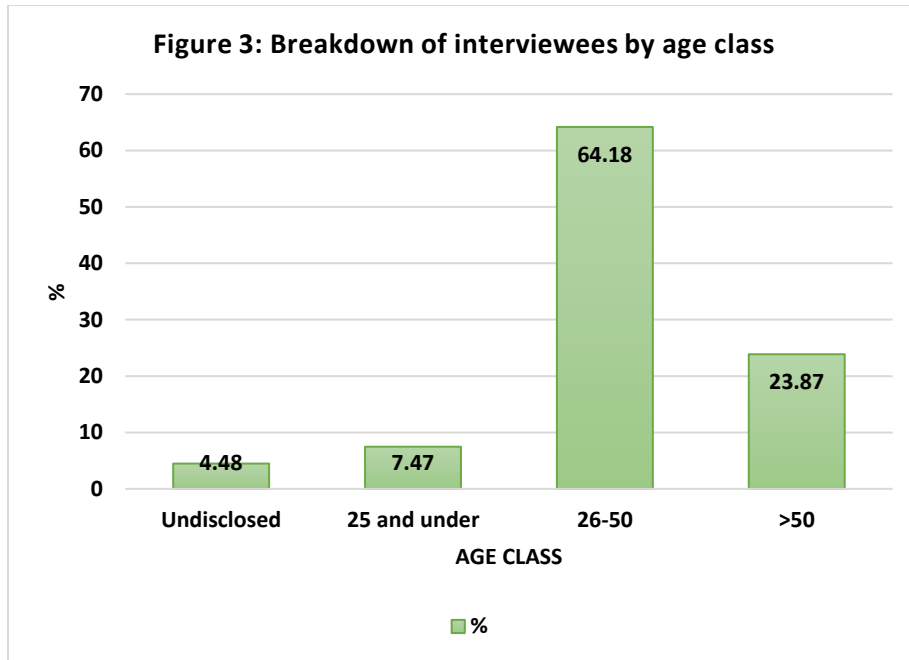
A total of 67 persons were interviewed with just 3 persons (4.5%) declining to give their names (see Annex I). The response from public officials was exceptional and the team was able to speak to the Regional Chairman-Region 7, representatives of NIS (Bartica) and staffs of the Bartica regional hospital

The overall response to the survey was encouraging and there was satisfactory diversity in the interviewees. Figure 1 shows the interviewees by location, Figure 2 shows the relative gender mix of the



interviewees, Figure 3 shows the interviewees by age group and Figure 4 shows the interviewees by occupation.





**There were three main concerns recorded:**

- a) Residents at Kartabu Point believes that water flowing past Iteballi Waterfront to Kartabu Point is tainted with rotting bark. This is a general cause for concern, but RTI will not be storing logs there
- b) Trucks traversing Iteballi create a major dust nuisance for residents: although trucks carrying timber were mentioned, the fact is that the mining community also use heavy trucks that traverse the community due to the ferry crossing there.
- c) Residents want their residents who are employed with loggers to have fixed pay dates for their remuneration. This concern also relates to their NIS payments.

**D. Discussion**

The commercial sector at Iteballi is expanding rapidly, while housebuilding projects at Iteballi and at Batavia are also expanding rapidly. Residents of Kartabu and Batavia cherish their quiet lifestyles

The team paid careful attention to the views of residents. Unlike 'residents' of other areas in the Kartabu Triangle, the residents of the three communities **live** there and are not inclined to migrate. (In the case of other communities, the residents treat their 'communities' as workplaces, and they live outside the Kartabu Triangle, at Bartica, Linden, or coastal locations.

Overall, everyone is looking forward to more employment opportunities in the area, especially for females since none of the residents want to migrate from their villages.

None of the interviewees in Bartica, Kartabu and Iteballi gave any opinion about RTI' proposed logging operations; many are aware of planned timber harvesting discussions in other forest concessions west of Puruni River because, unlike RTI, those concessionaires have been making inquiries about space at the waterfront at Iteballi (for lease, rental or even sharing facilities with existing holders of timber depots there).

It also emerged that many loggers had done 'consultations' at Iteballi and Kartabu and not all commitments given were eventually honoured.

#### **E. Main recommendations/conclusions**

In view of the surge in business over the last ten years, and residents' disposition to invest more in the community, the authorities need to start paying attention to the strategic planning of Iteballi Village.

RTI will employ and train youth from all communities in the area. RTI will contribute to ongoing education and youth welfare initiatives at Iteballi and Kartabu Point. RTI already enjoys a business relationship with Batavia Amerindian Village, and this will be strengthened.

In view of the proximity of RTI' Pine Tree Landing facility to Batavia Village as well as the western part of Kartabu Village, RTI will avoid working after 18:00 hours. In addition, in line with the religious preferences of Batavia, work will be suspended on either Saturday or Sunday.

**Annex XIX: List of Persons Interviewed during Social Surveys-Kartabu Triangle**

(a) September 11-17, 2021: April 11-15, 2022: April 21, 2022

#	Name of Interviewee	Occupation	Gender	Community/Location	Engagement	
					Mode	Date
1	Krishna Dhanraj	Forest Manager-Jettoo Lumberyard & Sawmill-KPR	M	KPR-Opposite RTI's SFEP	Meeting	14-Sep-21
2	Mahendra Jettoo	CEO- Jettoo Lumberyard & Sawmill-KPR	M	KPR, Opposite RTI's SFEP	Phone	14-Sep-21
3	Wayne Edwards	Driver/Transporter, Georgetown-Papishou	M	Traversing the KPR	Lunch	14-Sep-21
4	Parbattie Boodhoo	Businessperson	F	Papishou	Meeting	15-Sep-21
5	Anthone La Rose	Businessperson	M	Martin Landing, RB Mazaruni R	Informal	15-Sep-21
6	Caesar, Gideon	Mechanic	M	Pashanamu (SFEP 2/2020)	Informal	12-Apr-22
7	Singh, R	Businessperson	F	Pashanamu (SFEP 2/2020)	Informal	12-Apr-22
8	London, Shawn	Businessperson	M	Puruni Landing	Informal	13-Apr-22
9	Burnette, Mickey	Marine Captain	M	Puruni Landing	Informal	13-Apr-22
10	Ragmuff	Marine Captain	M	Puruni Landing	Informal	13-Apr-22
11	Roxy (Venezuelan)	Businessperson	F	14ml KPR -SFEP 2/2020	Informal	13-Apr-22
12	Rasta Shelly	Cook	F	Kumung-Kumung	Informal	14-Apr-22
13	Dodo	Boat Captain/Miner	M	Kumung-Kumung	Informal	14-Apr-22
14	"Old Boy" Kennedy	Businessperson	M	Kumung-Kumung	Informal	14-Apr-22
15	Rahaman, Bibi	Businessperson	F	Kumung-Kumung	Informal	14-Apr-22
16	Liu Shunping (Chinese)	Operations Manager-Hi-Tech Construction Inc.	M	Georgetown	Meeting	21-Apr-22
17	Chen Daohe (Chinese)	Forest Manager-Hi-Tech Construction Inc. LC 03/15	M	Georgetown	Meeting	21-Apr-22

### Annex XIX: List of Persons Interviewed during Social Surveys-Kartabu Triangle

(b) Kartabu Triangle-March 1-5, 2021

#	Name of Interviewee	Occupation	Gender	Age	Community / Location	Engagement	
						Mode	Date
1	LEON CRAWFORD	Police Officer	M	29	Bartica	Meeting	05-Mar-21
2	SHERRY LEWIS	Nurse	F	47	Bartica	Meeting	05-Mar-21
3	KAREN PRATT	Office Supervisor	F	47	Bartica	Meeting	05-Mar-21
4	KEVIN PERREIRA	Forest Ranger	M	38	Bartica	Telephone	05-Mar-21
5	KENNETH WILLIAMS	Regional Chairman	M	48	Bartica	Telephone	05-Mar-21
6	Anonymous	Doctor	F	NIL	Bartica	Telephone	05-Mar-21
7	COLEEN SINGH	Pastor/Village Chairman	F	50	Iteballi	Telephone	02-Mar-21
8	GARFIELD GIBSON	Boat Captain	M	36	Iteballi	Meeting	02-Mar-21
9	CARL GILFORD	General Assistant	M	64	Iteballi	Meeting	02-Mar-21
10	ANONYMOUS	Mines officer	M	37	Iteballi	Meeting	02-Mar-21
11	TREVON CUDJOE	Forest Ranger	M	NIL	Iteballi	Meeting	02-Mar-21
12	MOHAMED BAKSH	Miner	M	44	Iteballi	Meeting	02-Mar-21
13	RICHARD CREEM	Miner	M	64	Iteballi	Meeting	02-Mar-21
14	JIMMY	Mechanic	M	41	Iteballi	Meeting	02-Mar-21
15	MARCELL JEFFERY	Self-employed	F	23	Iteballi	Meeting	02-Mar-21
16	ROBINARA	Maintenance Supervisor	M	56	Iteballi	Meeting	02-Mar-21
17	ORIN RENAE	Construction worker	M	55	Iteballi	Meeting	02-Mar-21
18	RANDY WADE	Security	M	46	Iteballi	Meeting	02-Mar-21
19	MARK THOMAS	Captain	M	28	Iteballi	Meeting	02-Mar-21
20	AMANDA JONES	Businessperson	F	25	Iteballi	Meeting	02-Mar-21
21	SHAWN DANIELS	Community Health Worker	M	19	Iteballi	Meeting	02-Mar-21
22	MARK DE FREITAS	Manager	M	44	Iteballi	Meeting	02-Mar-21
23	SUZANA ASAN	Businessperson	F	28	Iteballi	Meeting	02-Mar-21
24	FARIDA DA SILVA	Businessperson	F	64	Kartabu	Meeting	03-Mar-21

#	Name of Interviewee	Occupation	Gender	Age	Community / Location	Engagement	
						Mode	Date
25	MARRISA CREAME	Community Health Worker	F	27	Kartabu	Meeting	03-Mar-21
26	NATESHA GOUVEIA	Shop Assistant	F	24	Kartabu	Meeting	03-Mar-21
27	ANONYMOUS	Logger	M	35	Kartabu	Meeting	03-Mar-21
28	SANDRA WILLIAMS	Homemaker	F	56	Kartabu	Meeting	03-Mar-21
29	BEVERLY MC CURDY	Homemaker	F	50	Kartabu	Meeting	03-Mar-21
30	RONDA FREEMAN	Homemaker	F	35	Kartabu	Meeting	03-Mar-21
31	LISA	Teacher	F	27	Kartabu	Meeting	03-Mar-21
32	WILLIAM MC INTYRE	Miner	M	57	Kartabu	Meeting	03-Mar-21
33	CECELIA CORNELIUS	Businessperson	F	44	Kartabu	Meeting	03-Mar-21
34	JUNE WILLIAMS	Businessperson	F	40	Kartabu	Meeting	03-Mar-21
35	CECIL DA SILVA	Businessperson	M	72	Kartabu	Meeting	03-Mar-21
36	SAMANTHA PERSAUD	Community Support Worker	F	32	Kartabu	Meeting	03-Mar-21
37	CARLA LAWLIST	Community Health Worker	F	33	Kartabu	Meeting	03-Mar-21
38	LLOYD WILLIAMS	Village Chairman/Farmer/Logger	M	44	Kartabu	Meeting	03-Mar-21
39	ANNETTA STRAUGHT	Homemaker	F	45	Kartabu	Meeting	03-Mar-21
40	ARLAN WILLIAMS	MINER	M	54	Kartabu	Meeting	03-Mar-21
41	MARK WILLIAMS	Miner	M	32	Kartabu	Meeting	03-Mar-21
42	REUBEN STRAUGHT	Miner	M	45	Kartabu	Meeting	03-Mar-21
43	VANESSA BOYAL	Homemaker	F	42	Batavia	Meeting	04-Mar-21
44	AUDREY RODRIGUES	Homemaker	F	29	Batavia	Meeting	04-Mar-21
45	DIANE THOMAS	Homemaker	F	43	Batavia	Meeting	04-Mar-21
46	DONNA BOYAL	Self-employed	F	29	Batavia	Meeting	04-Mar-21
47	GENE ANITA	Logger/Farmer/Hunter	M	NIL	Batavia	Meeting	04-Mar-21
48	ELON WILLIAMS	Boat Captain	M	31	Batavia	Meeting	04-Mar-21
49	VALDA FERREIRA	Teacher	F	45	Batavia	Meeting	04-Mar-21
50	JACINTHA THOMAS	Homemaker	F	28	Batavia	Meeting	04-Mar-21
51	FELIX GOMES	Pastor/farmer	M	65	Batavia	Meeting	04-Mar-21

#	Name of Interviewee	Occupation	Gender	Age	Community / Location	Engagement	
						Mode	Date
52	SOFIA PHILLIPS	Homemaker	F	29	Batavia	Meeting	04-Mar-21
53	SUBRINA	Homemaker	F	24	Batavia	Meeting	04-Mar-21
54	ROY PRINCE	Labourer	M	56	Batavia	Meeting	04-Mar-21
55	MALITA WILLIAMS	Self-employed	F	33	Batavia	Meeting	04-Mar-21
56	BEVON CREAME	Homemaker	F	32	Batavia	Meeting	04-Mar-21
57	FITZROY MC WATT	Businessperson	M	68	Batavia	Meeting	04-Mar-21
58	PAUL REEVERS	Boat Captain	M	38	Batavia	Meeting	04-Mar-21
59	BRYAN	Logger	M	41	Batavia	Meeting	04-Mar-21
60	RYAN JOSEPH	Community Health Worker	M	34	Batavia	Meeting	04-Mar-21
61	HAROLD DASS	Farmer	M	58	Batavia	Meeting	04-Mar-21
62	HARRY HERALALL	Miner	M	45	Batavia	Meeting	04-Mar-21
63	ROMEL WILLIAMS	Logger	M	52	Batavia	Meeting	04-Mar-21
64	EXLY BOYAL	Miner	M	37	Batavia	Meeting	04-Mar-21
65	ROYSTON WILLIAMS	Miner	M	59	Batavia	Meeting	04-Mar-21
66	ALBERT JOSEPH	Cook	M	60	Batavia	Meeting	04-Mar-21
67	OREN WILLIAMS	Toshao/Boat Captain	M	47	Batavia	Meeting	04-Mar-21

**Annex XIX: List of Persons Interviewed during Social Surveys-Kartabu Triangle**

(c) List Of Persons Formally Interviewed Via Questionnaires: April 24-27, 2018

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Q#	Name	Age	Gender	Occupation	Location	Key concern	Date
1	ALLEN, Elvis	58	M	Businessman	Puruni L	Roads	24-Apr-18
2	OSELMO, Charles	20	M	Miner	Puruni L	CSR	24-Apr-18
3	THOMAS, Allan	42	M	Miner	Puruni L	Security	24-Apr-18
4	ELCOCK, Floyd	44	M	Businessman	Puruni L	Security	24-Apr-18
5	DECOSTA, David	55	M	Boat Captain	Puruni L	None	24-Apr-18
6	GRIFFITH, Rudolp	58	M	Boat Captain	Puruni L	Security	24-Apr-18
7	JANKI, Kudasi	27	M	Mines Officer	Puruni L	Security	24-Apr-18
8	BLONDT, William	28	M	Accountant	Puruni L	EMPLYMT	24-Apr-18
9	VELOSA, Xago Marcos	24	M	Businessman	Puruni L	Security	24-Apr-18
10	RAMSINGH, Andy	33	M	Businessman	Puruni L	Security	24-Apr-18
11	THOMPSON, Raphael	35	M	Security	Puruni L	Security	24-Apr-18
12	SEALLY, Kurdella	34	F	Internet Clerk	Puruni L	Security	24-Apr-18
13	JOHN, Royden	26	M	Forest Officer	Iteballi	CSR	25-Apr-18
14	VANLANGE, Wayne	59	M	Forest Officer	Iteballi	Env. Education	25-Apr-18
15	JAMES, Chris	30	M	Timber Grading Inspector	Iteballi	None	25-Apr-18
16	DANIELS, Theresa	44	F	Businesswoman	Iteballi	EMPLYMT	25-Apr-18
17	BROWN, Laureen	27	F	Sales person	Iteballi	CMNTY DEV	25-Apr-18
18	MOHAMMED, Bibi	43	F	Businesswoman	Iteballi	None	25-Apr-18
19	INNISS, Rickford	53	M	Forest Manager	Iteballi	Educational Fac	25-Apr-18
20	COLEEN	47	F	Pastor	Iteballi	CSR	25-Apr-18
21	GOODLUCK, Jonella	33	F	Businesswoman	Iteballi	EMPLYMT	25-Apr-18
22	SINGH, Rodwell	34	M	Businessman	Iteballi	CMNTY DEV	25-Apr-18
23	BHARAT, Tyrone	39	M	Boat Captain	Iteballi	EMPLYMT	25-Apr-18
24	GARY	49	M	Boat Captain	Iteballi	Security	25-Apr-18
25	SMITH, Emily	23	F	Sales person	Iteballi	Sawmill	25-Apr-18
26	JULIANNA	21	F	Sales person	Iteballi	CMNTY DEV	25-Apr-18
27	BAKSH, Mohammed	41	M	Driver	Iteballi	Educational Fac	25-Apr-18
28	BAGOT, Dillon	21	M	Police Officer	Iteballi	None	25-Apr-18
29	AKESHA	21	F	Sales person	Takutu	None	25-Apr-18
30	HUDSON, Johanna	33	F	Hair Dresser	Takutu	Sawmill	25-Apr-18
31	RAJESH	43	M	Welder	Takutu	Security	25-Apr-18
32	BACCHUS	29	M	Carpenter/Mason	Takutu	None	25-Apr-18
33	BARCLAY, Timolyn	34	F	Office Manager	Tiger Creek J	CMNTY DEV	26-Apr-18
34	DANIELS, Thomas	58	M	Sales person	Tiger Creek J	Environment	26-Apr-18
35	WHITTER, Mark	46	M	Miner	Tiger Creek J	None	26-Apr-18

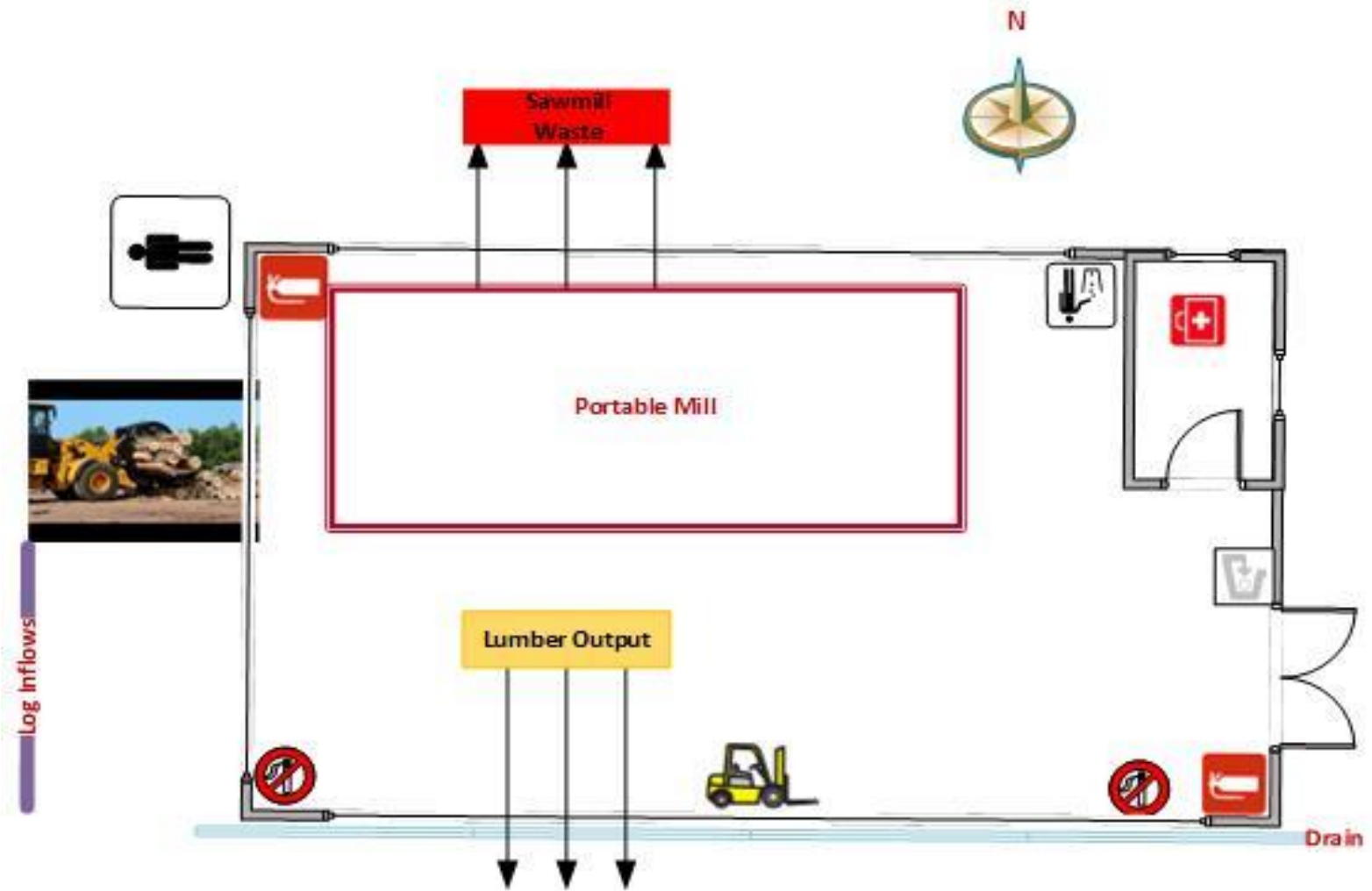


ANNEX XV: LIST OF PERSONS FORMALLY INTERVIEWED VIA QUESTIONAIRES

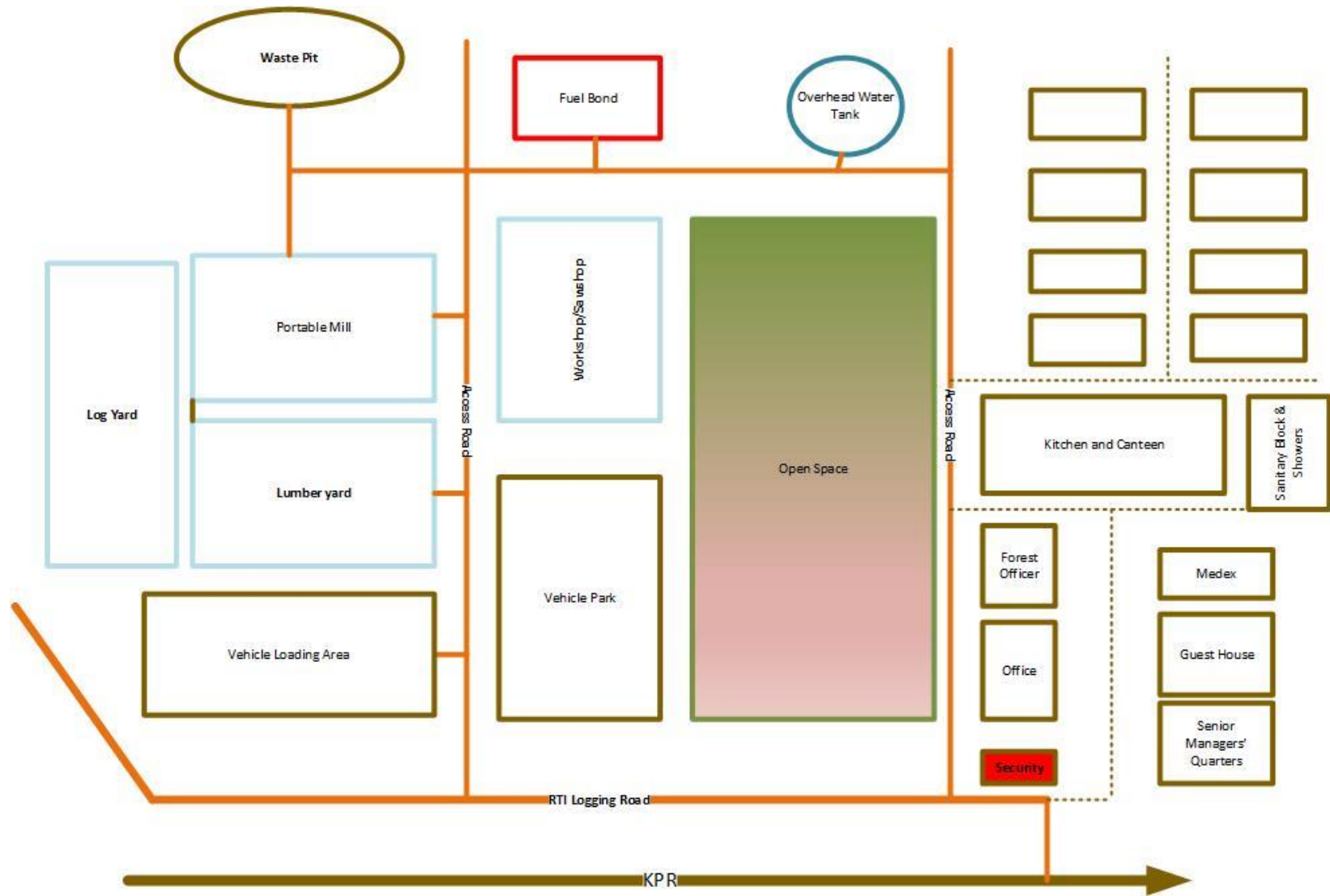
Page 2 of 2

Q#	Name	Age	Gender	Occupation	Location	Key concern	Date
36	ANDRIES, Terry	60	M	Labourer	Tiger Creek J	CMNTY DEV	26-Apr-18
37	GILL, Augustus	62	M	Mechanic	Tiger Creek J	CMNTY DEV	26-Apr-18
38	OREALLA, Louis	51	M	Farmer	Tiger Creek J	None	26-Apr-18
39	RANDY	34	M	Miner	Tiger Creek J	EMPLYMT	26-Apr-18
40	BERETON, Ryan	30	M	Shop Keeper	Puruni L	EMPLYMT-FEMALES	27-Apr-18
41	MURPHY, Andy	20	M	Receptionist	Puruni L	EMPLYMT-FEMALES	27-Apr-18
42	KISANA	22	F	Chef	Puruni L	None	27-Apr-18
43	REYNOLDS, Gillana	24	F	Sales person	Puruni L	None	27-Apr-18
44	ABRAMS, Emery	45	M	Internet Clerk	Puruni L	Security	27-Apr-18
45	CHARLES, Errol	56	M	Self-employed	Puruni L	Security	27-Apr-18
46	BEARD, Terrence	37	M	Pontoon Operator	Puruni L	CMNTY DEV-Bridge	27-Apr-18
47	NURSE, Carl	56	M	Boat Captain	Puruni L	Security	27-Apr-18
48	HENRY, Conrad	31	M	Taxi Driver	Puruni L	Security	27-Apr-18
49	FRANCE, Fay	42	M	Self-employed	Puruni L	Security	27-Apr-18
50	NOT PROVIDED	26	M	GGMC Officer	Iteballi	None	25-Apr-18

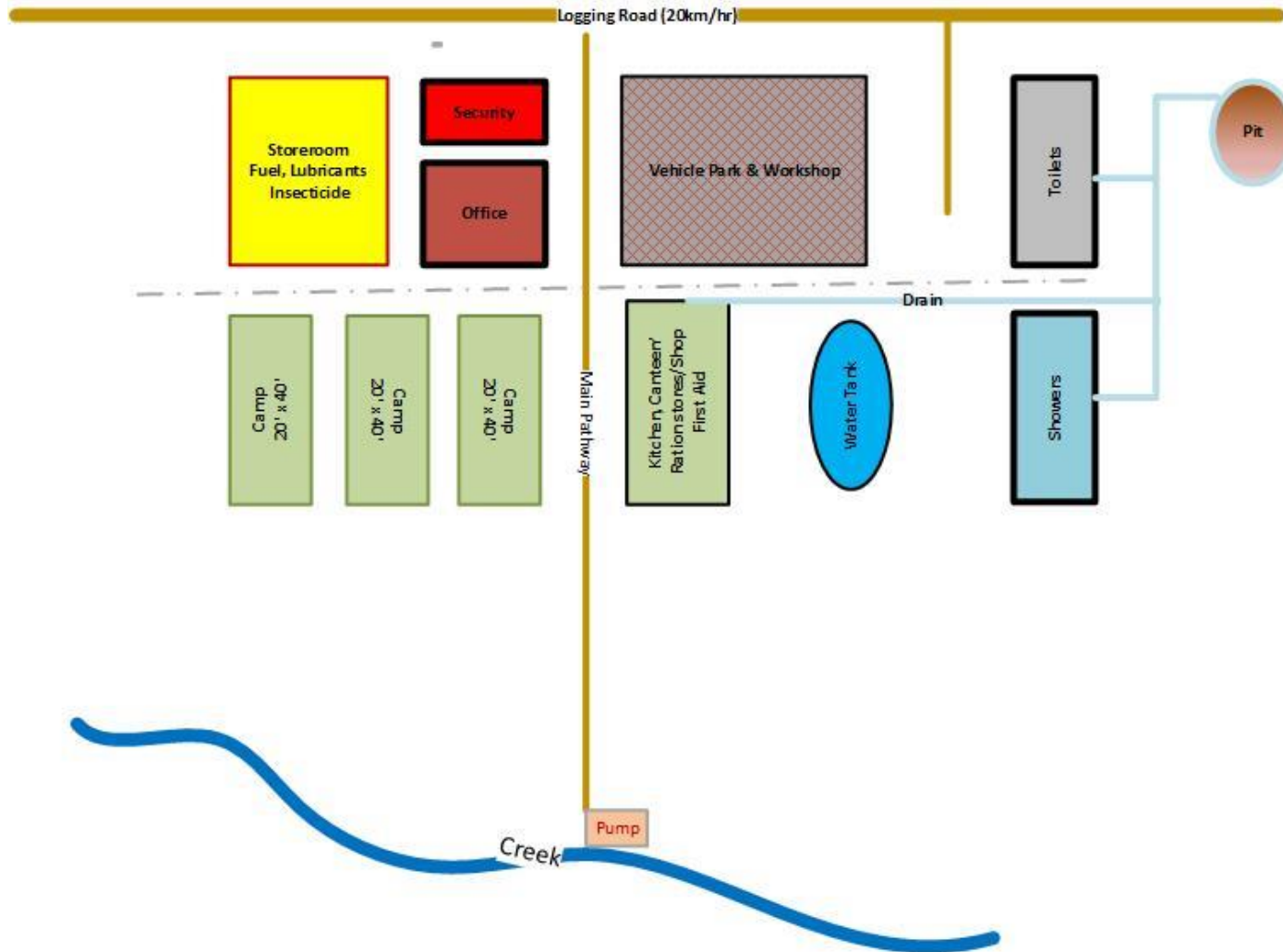
Annex XX: Sketch of RTI's sawmill Layout



Annex XXI: Sketch of plan for RTI's Base Camp, northern side, Kartabu-Puruni Road



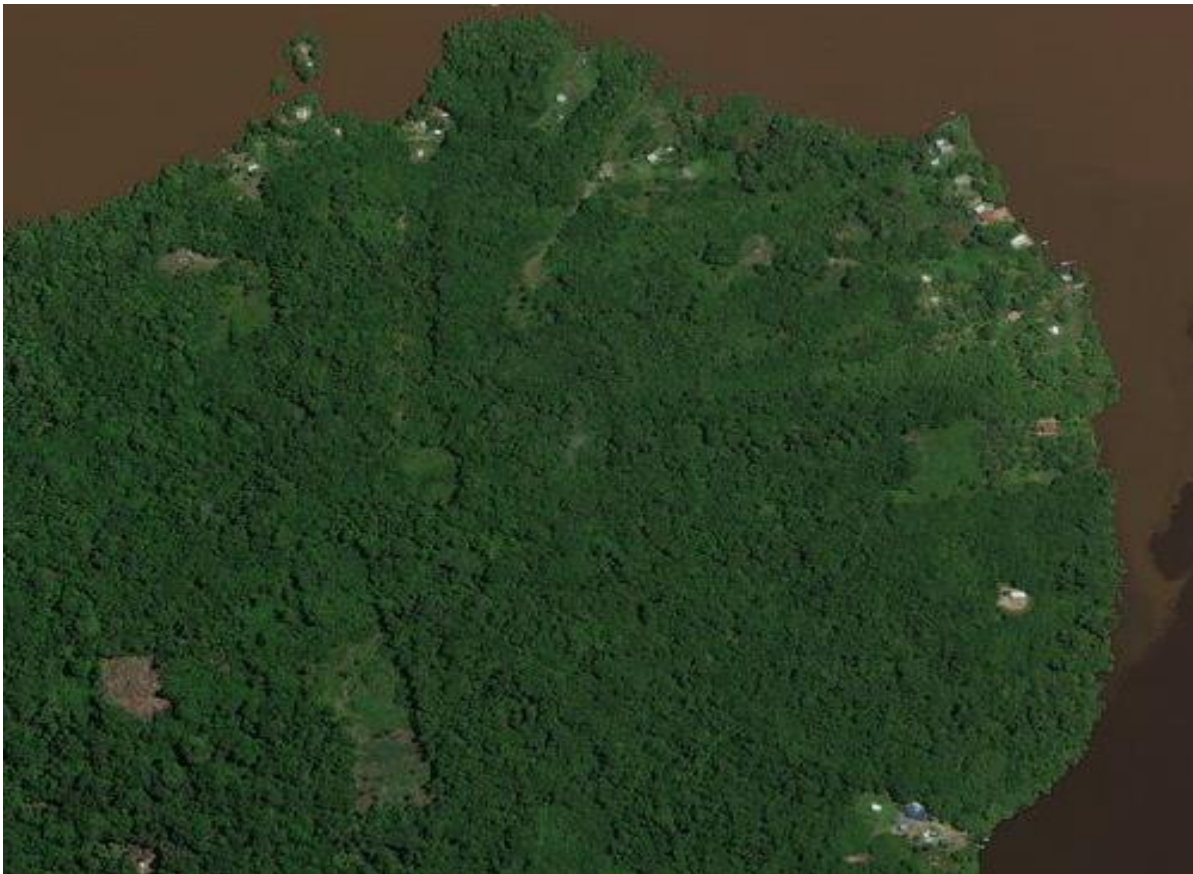
Annex XXII: generic sketch of RTI's forward camp(s): Area-2.5 ha



Annex XXIII: Communities subject to long term impact from RTI's Operations



Aerial photograph of Batavia, Lower Cuyuni River (Google Maps).



Aerial Photo of Kartabu Village (google Maps)



Aerial Photograph of Iteballi (google maps)



Photographs of Papishou, left bank Mazaruni River

Annex XXIV: Copy of certificate from Kaizen relating to the parameters BOD, Total Mercury, and O&G



26 Wolford Avenue,  
Thomas Lands,  
Georgetown, Guyana.  
Tel: (592) 231-0346 / (592) 231-0348  
Email: inquiries@kaizen-guy.com

**ANALYSIS DATA REPORT**

**Customer:** Environmental Engineering Solutions (EES) **Lab File # :** 001223-1-8  
**Customer's Address:** Georgetown, Guyana  
**Customer Contact:** Mr. Isidro Ubaldo Espinosa  
**Client Job #:** 22-007  
**Item(s) Analyzed:** Water Samples  
**Date of Sampling:** 22-Apr-22  
**Sampled By:** Client  
**Date of Receipt:** 22-Apr-22  
**Report Date:** 10-May-22


**ANALYSIS RESULTS**

Parameter Name	Units	Results							
		RT 1 001223-1	RT 2 001223-2	RT 3 001223-3	RT 4 001223-4	RT 5 001223-5	RT 6 001223-6	RT 7 001223-7	RT 8 001223-8
Biochemical Oxygen Demand	mg.L-1	12.1	10.6	11.5	10.3	11.2	4.76	6.54	14.2
Total Mercury	mg.L-1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000901	<0.0005	<0.0005
Total Oil and Grease	mg.L-1	0.40	0.20	0.40	0.40	0.40	0.20	0.20	0.40

\* Detailed Test Methodologies and QA/QC data available upon request.

**Test Methodologies:** Biological Oxygen Demand: SMEWW 5210 B  
 Total Mercury in Water: Modified from EPA 1631 Revision E  
 Oil and Grease (Liquid): USEPA 1664

**Comments:** Kaizen Environmental Services (Guyana) Inc. is Certified by the Guyana National Bureau of Standards (GNBS), conforming to GYS 170: 2009; General Requirements for the operation of a Laboratory. Certificate No. 019.  
 Total Mercury was analysed at Kaizen Lab (Calgary) which is Accredited under the Canadian Association for Laboratory Association Inc.

Report Authorized By:   
 Senior Laboratory Technician

*This test report relates only to the items tested and shall not be reproduced except in full, without written approval of the laboratory.*

# Lovibond® Water Testing

Tintometer® Group



## Certificate of Compliance

Instrument

# MD 600

Serial No. 19/17449

**Calibration** The instrument is calibrated according to the procedures which are part of our QM documentation.  passed

**Measurement Function** QC-Test  passed

**General Inspection** No visual flaws, burrs or loose parts/fastenings (not applicable for returned instruments )  passed

**Release** Date: 18th November 2019

Technician: *[Signature]*

Quality Manager: *[Signature]*



The Tintometer GmbH is ISO 9001 certified - Reg. No. 5394  
Tintometer GmbH, Lovibond® Water Testing  
P.O. Box 410384, 44273 Dortmund, Germany



Certificate FB\_8.5-234 Rev. A



