

FORM GHANA LIMITED

ENVIRONMENTAL MANAGEMENT PLAN FOR FORM GHANA REFORESTATION PROJECT IN ASUBIMA AND AFRENSU- BROHUMA FOREST RESERVES NEAR AKUMADAN IN THE OFFINSO NORTH DISTRICT OF ASHANTI REGION.





VALIDITY PERIOD: August 2021 - August 2024.

DATE OF SUBMISSION: July, 2021



ENVIRONMENTAL PROTECTION AGENCY



ENVIRONMENTAL MANAGEMENT PLAN FOR FORESTRY SECTOR PROJECTS (EMP-FSP)

IN ACCORDANCE WITH THE

ENVIRONMENTAL ASSESSMENT REGULATIONS, 1999 (LI 1652)

Read These Instructions Carefully Before Completing The Form

1. All necessary information required must be provided in full in order to avoid delays in processing the application. Where separate or additional sheets are used and other technical documents provided these must be labelled appropriately.

2. Processing and permit fees are payable in accordance with the Fees and Charges (Amendment) Instrument, 2019 (LI 2386) or subsequent amendments that may be promulgated. Permits will only be issued after full payment of the required processing and permit fees.

- 3. Attach Certificate of incorporation, Certificate to commence business, Material Safety Data Sheets (MSDS) for chemicals and other relevant attachments (if any)
- 4. Submit the completed form with relevant supplementary information *in triplicate and an electronic copy* to:

The Executive Director Environmental Protection Agency P O Box M326 Accra-Ghana Tel: 233 (0) 302 662465; 233 (0) 302 664697/8662465 Fax: 233 (0) 302 662690 E-mail: support@epa.gov.gh Web-site: http://:www.epa.gov.gh

- 5. For any other information relating to this form, contact the *Natural Resources Department* of EPA via *natural.resources* @epa.gov.gh/info@epa.gov.gh
- 6. Failure to fully complete the form and attach all relevant document may lead to a delay in Processing



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COMPANY INFORMATION

Registered Name of	Form Ghan	a Ltd.	
Undertaking			
Type of undertaking	Plantation B	usiness	
Date of Incorporation of		2007- CA -37,338	
Company	24 Mugust,	2007 CH 57,550	
Company TIN	C000341781	6	
Date of Commencement		2007- TIN824V0259	97
Total Land take	3,553 hectare		
Address for	Form Ghana		
Correspondence	P.O. Box SY		
contespondence	Sunyani		
	Bono Region	1	
	Ghana		
Telephone	+233(0) 544	441 440	
-			
E-mail	w.fourie@fo	rmghna.com	
Website	www.formgl	nana.com	
Contact person from	Mr. W Fouri	e, Managing	
company	Director Form	m Ghana Ltd.	
Telephone	+233(0) 544	441 440	
Mobile	+233(0) 544	441 440	
E-mail	w.fourie@fo	rmghana.com	
Location of undertaking	Town: Sunya	ani	
	Region: Aku	madan	
Major Landmark	None		
<u></u>			
Global Positioning	Point	X-coordinate	Y-coordinate
System Coordinates of	1	630.857,53	813.998,60
the undertaking (WGS 84-UTM)	2	628.112,11	822.930,15
84-01M)	3	620.644,40	820.840,93
	4	624.388,38	817.874,20
	5	622.666,10	815.162,44

Others (specify)



WORKFORCE

Division	General Workers			Man	Total		
	Male	Female	Total	Male	Female	Total	
Sunyani (HQ)	4	2	6	8	2	10	16
Akumadan P	120	48	168	11	1	12	180
Akumadan C	83	82	165	1	1	2	167
Allanblakia P	1	0	1	1	0	1	2
Allanblakia C	2	0	2	0	0	0	2
Berekum P	177	43	220	22	6	28	248
Berekum C	223	72	295	0	0	0	295
Palladium P	0	1	1	2	1	3	4
Grand Total	610	248	858	45	11	56	914
Percentage (%)	71.09	28.9	100.00	80.35	19.64	100.00	
Permanent Staff	Permanent Staff (P)- 450						
Casual Staff (C)- 464							



ORGANIZATIONAL CHART OF FORM GHANA

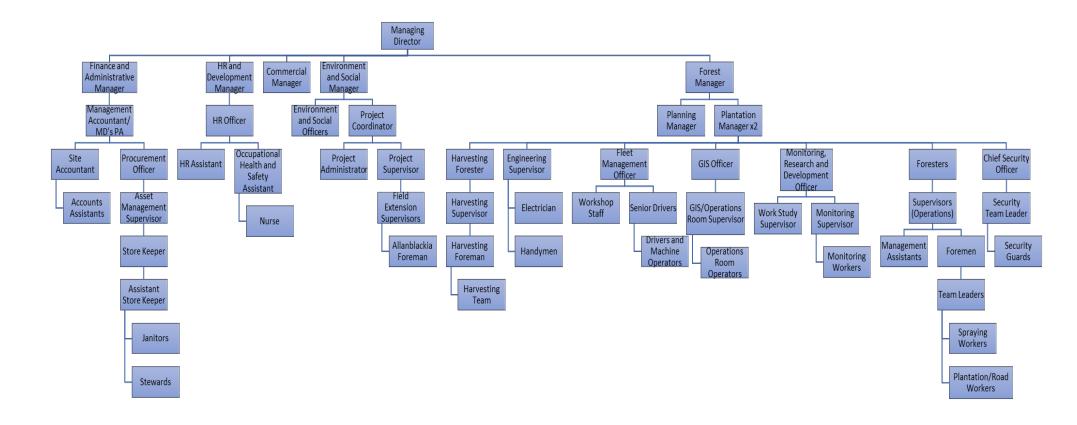


Figure 1: Organizational Chart

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PERMITS/LICENCES AND CERTIFICATES

S /	Institution	Permi	t	Permit No/License No/Date of
Ν		Yes	No	Issue/Expiry
1	Environmental Protection Agency	X		CF: 62/LG/FO/02
				15/08/2018 - 14/08/2021
2	Water Resources Commission	X		FGLID 421/18
				01/01/2019 - 31/12/2021
3	Forestry Service Division		X	
4	Wildlife Division		X	
5	Others			
	Ghana National Fire Service Certificate	X		AK-489-6001/
				30/06/2021- 30/06/2022
	Forest Stewardship Council TM (FSC-	X		CU-FM/COC-811445 / FSC TM - (FSC-
	C044035)			C044035)
				19/01/2020 - 18/01/2025

MEMBERS OF ENVIRONMENTAL COMMITTEE

No	Name	Designation	Department
1	Willem Fourie	Managing Director	Management
2	Willem Kotze	Forest Manager	Plantation
3	Paul Ontoaneyin	E&S Manager	Environment and Social
4	Evelyn Affreh	E&S Officer	Environment and Social
5	Bismark Adjei Manu	E&S Officer	Environment and Social
6	Vida Owusu	OHS Assistant	E&S/HR
7	Alex Amoako	Monitoring Officer	Plantation

PREPARED BY:

SIGNATURE & DATE:

Bismark Adjei Manu (Environment and Social Officer)

Evelyn Affreh (Environment and Social Officer)

REVIEWED BY:

Paul Ontoaneyin (Environmental & Social Manager)

APPROVED BY: Willem Fourie, Managing Director



SIGNATURE, STAMP & DATE: _____



1.0 INTRODUCTION

FORM Ghana Limited is a reforestation company established in 2007 with the aim of largescale reforestation of degraded forest reserves in Ghana, while conserving and restoring natural, riparian forest. FORM Ghana has established plantations within the Asubima & Brohuma Forest Reserves at Akumadan in the Offinso North District of Ashanti Region and the Tain II Forest Reserve in the Berekum Municipal of Bono Region.

In line with Ghana's environmental requirements for Environmental Management Plan for the Forestry Sector Projects as contained in the Environmental Assessment Regulations 1999 (LI 1652), Form Ghana conducted independent environmental impact assessments on the degraded reserves that were acquired for the plantation establishment. The Environmental Protection Agency operating under the legal mandate of Environmental Protection Agency Act, 1994 (Act 490) granted Form Ghana a permit (CF: 62/LG/FO/02) to carry out its operations. Also, as part of the requirements for the grant of permit, Form Ghana prepared an Environmental Management Plan (EMP) that spanned from 2018 - 2021. The plan spelled out various mitigation measures that were going to implemented to manage the environmental and social impact that its operations were yielded.

As part of the conditions for the renewal of environmental permit, FORM Ghana is expected to update its Environmental Management Plan (EMP) and update the Agency in compliance with the Environmental Assessment Regulations, 1999 (LI 1652). This EMP thus seeks to meet this requirement for the renewal of permit. The report specifically presents various environmental and social aspects of the Company's operations and revised management plans that are in place to ensure the avoidance and mitigation of impacts (in case they cannot be avoided). The report is structured according to the specific requirements by the EPA Ghana as outlined in the EMP-Forestry Form in accordance with the Environmental Assessment Regulations, 1999 (LI 1652)



2.0 DESCRIPTION OF UNDERTAKING

2.1 Site Description and External Environment

The plantations are located within the Asubima and Afrensu-Brohuma Forest Reserve in Offinso Forest District near Akumadan in the Ashanti Region. GPS coordinates (WGS 84-UTM) for the reserves are: Point 1 (X-630857.53, Y-813998.60), Point 2 (X-628112.11, Y-822930.15), Point 3 (X-620644.4, Y-820840.93), Point 4 (X-624388.38, Y-817874.20) and Point 5 (X-622666.10, Y-815162.44). The forest area consists of parts of two forest reserves. 3554.6 hectares of these reserves are allocated to Form Ghana Ltd. for commercial forest plantation development (see location of site in national context in Figure 1).

The Asubima Forest Reserve (AFR) lies around a grid reference of 7N27/2W52 with an area of 7,900 hectares. It was reserved in 1945 and last logging was recorded in 1989. The part of the Forest Reserve managed by Form Ghana is located within Offinso Forest District in the Ashanti Region. Parts of the reserves are located in the Offinso North District of the Ashanti Region, the Nkoranza North District and the Techiman Municipal of the Bono East Region.

The Afrensu-Brohuma Forest Reserve (ABFR) also lies in the Offinso North District near Akumadan, in the Ashanti Region. The ABFR lies around a grid reference of 7N22/2W53. It became a forest reserve in 1934. Last logging was recorded in 1991. The Asubima Reserve covers a total area of 7,870 hectares. The Afrensu-Brohuma Forest Reserve covers a total area of 7,300 hectares. Approximately 1778 hectares of this reserve constitute the area allocated to Form Ghana Limited for commercial plantation development.

Both reserves are located within the dry semi-deciduous forest zone (DSFZ). The terrain is undulating and covered with a very open canopy alternating with sandy-rock patches. The soils in the area have developed in weathered sandstone and generally have a sandy loam to sandy clay loam texture. Deeper horizons have a clay loam to clay texture due to illuviation of clay particles. The detailed inventories of the soils in Asubima and Afrensu-Brohuma Forest Reserves are presented in the reconnaissance soil survey reports by H. Scholten, 2012.

Valuable timber trees such as Wawa (*Tripochiton scleroxylon*), Odum (*Milicia excelsa*), Sapele (*Entandrophragma cylindricum*) and Kokrodua (*Pericopsis elata*) are characteristic for the area (Amponsa-Kwatiah, 1993). Inventories demonstrated that there is virtually no stretch of land within the project area covered with natural forest due to intensive farming and reported annual fires (Abeney et al., 2008). Weeds and grasses (e.g. *Chromolaena odorata* (Akyeampong) and *Pennisetum purpureum* (Elephant grass)) and *Broussonetia papyrifera*



(York), introduced for fibre production, have replaced the original high forest, hampering native forest restoration.

Mean annual temperature is 26°C. February and March are the warmest months. The total average annual rainfall is 1227 mm.

Water bodies

Afrensu-Brohuma Forest Reserve is named after the Brohuma River that originates largely within the reserve. From the Western and Northern Border, 6side-arms of Brohuma enter/within the project area. All assemble into the Brohuma River, that exits between the area on the East. The Brohuma then changes its name to the Brehama and joins the Pru River, flowing North and then East to join Afram River on its course to Lake Volta.

The Asubima Forest Reserve is source of various streams that flow from the Western and Northern Border to the South Eastern Border. These streams all join to a side arm of the Bebui River. The Bebui joins the Pru River, flowing North and then East to join Afram River on its course to Lake Volta.

Soils

The soils in the area have developed in weathered sandstone. As a result, they generally have a sandy loam to sandy clay loam texture. Deeper horizons have a clay loam to clay texture due to illuviation of clay particles.

Soils in Asubima and Afrensu-Brohuma Forest Reserves are very similar. In both Reserves the same series are found. These series are the deep soils of the Bediesi and Sutawa series, and the shallow soils of the Pimpimso series. The well drained soils, the Bediesi series, are dusky red to reddish brown at the surface, and red in deeper horizons. The moderately drained soils, the Sutawa series, are dark brown to brown at the surface to strong brown in deeper horizons. The Pimpimso series are soils which are found in places where sandstone is at or near the surface. These soils are quite shallow and have highly weathered rock or rock fragments within 50 cm from the surface. In the soil survey, the Bediesi series were classified as suitable for teak, the Sutawa series as moderately suitable, and the Pimpimso series as marginally suitable.

Shallow soils are found mainly on hill slopes. In these soils stunted growth of young teak has been observed. The main cause is the shallow soil, but growth is also obstructed by weeds which over-grow young teak plants. It is doubtful whether efforts to reduce weed growth will pay off; the shallow soil will still remain only marginally suitable for teak. The area where the last teak trees were planted has deep soils of the Bediesi series. In this area many farmers' fields were observed. In all other blocks deep soils have been found of both Bediesi and Sutawa series.



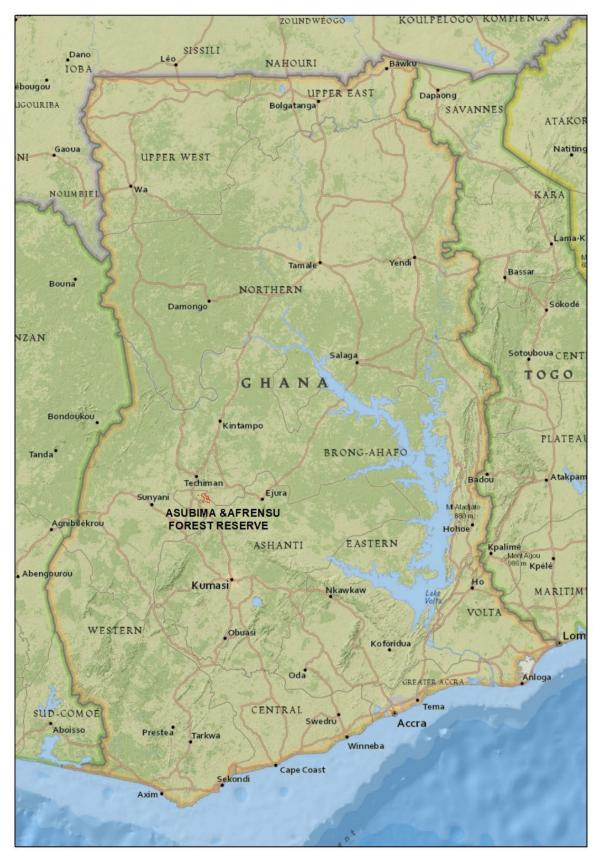


Figure 1: Location of Asubima & Afrensu-Brohuma Forest Reserve within national context

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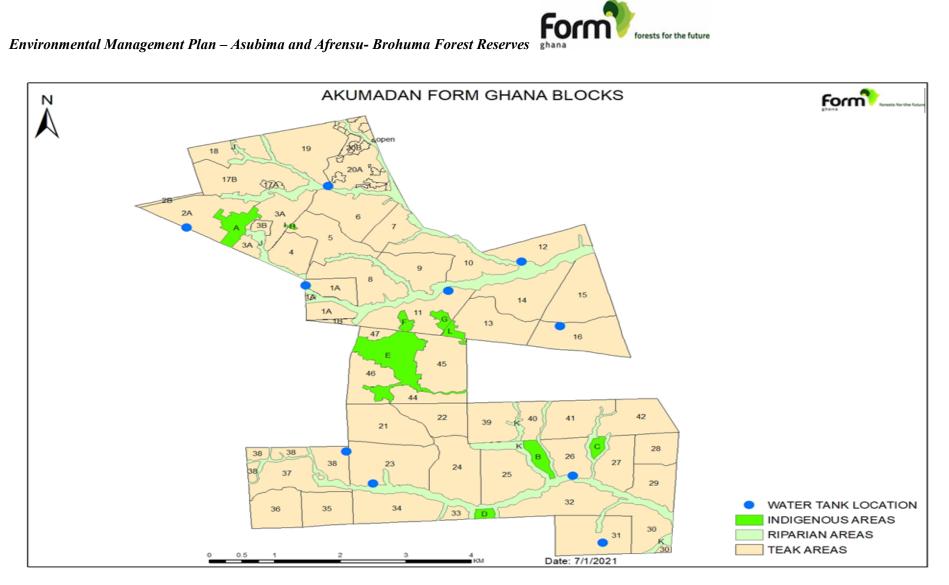


Figure 2: Map of project location



2.1.1 Total Land Take (Hectare)

The total land take for the Asubima and Afrensu-Brohuma forest reserves is 3,446.22 hectares GIS area.

2.1.2 Actual area/plot/compartment developed

Table 2.1: Actual area developed

The actual area forested by FORM Ghana in the Asubima and Afrensu-Brohuma forest reserves is 3446.22 hectares. Details of actual forested area are shown in the table below:

Planted Areas	Lease Area (Ha)	Area Planted Per Reserve (Ha)	Year (Ha)	Total Area (Ha)	Indigenous (Ha)	Teak (Ha)	Natural (Ha)
ASUBIMA	1776.50	1,668.63	2001	245.69	192.56	53.13	
		2006	65.10		65.10		
			2008	225.00		225.00	
			2009	512.20		511.66	0.54
			2010	595.77	47.68	538.33	9.75
			2012	24.88		24.88	
AFRENSU-	1778.10	1,777.59	2011	1,030.96	181.48	845.57	3.90
BROHUMA			2012	746.64	80.43	666.20	
TOTAL				3,446.22	502.17	2,929.87	14.19

2.1.3 Land take (area) under conservation

Area under conservation	516.36 hectares
Type of Conservation: Strict	0
Type of Conservation: Partial	516.36 hectares

NB: The actual area planted include the conservation area. The area under conservation comprises of the planted indigenous area (502.17 ha) and the natural area (14.19 ha).



2.1.4 List fauna /flora species found in the conservation area

List some species found:	Species monitoring within the conservation areas is undertaken within every 5-year interval. From the last survey in 2015 & 2018, the following floral, mammal and avifauna species were identified.
Flora:	Afzelia africana, Albizia ferruginea. Antiaris toxicaria, Ceiba pentandra, Hildegardia bar-teri, Erythrophleum ivorense, Khaya an- thoteca, Khaya grandifoliola, Milicia excelsa, Triplochiton scleroxylon, Terminalia superba.
Mammals:	The most frequently observed species were <i>Praomys tullbergi</i> and <i>Crocidura crossei. Lemniscomys striatus</i> and <i>Crocidura jouvenetae</i> were the least observed species, with only one sighting of each species. Large quantities of the straw-coloured fruit bat (<i>Eidolon helvum</i>) can be observed flying over the plantation area at dusk. In daytime, bats rest on trees at the plantation site.
Avifauna:	The moustached grass warbler was the most frequently recorded species. This is likely to be the result of the abundance of grasses in the area, providing suitable habitat for the moustached grass warbler and other weaver species.

2.1.5 Total land take of nursery

The total land take of nursery is 6 hectares.

2.2 Adjacent Land Uses

North	Teak plantation
South	Degraded forest Reserve/agriculture /teak plantations
East	Agriculture
West	Agriculture

2.3 Water Resources

1. River(s)/Stream(s) traversing the forestry development project

The Asuasu (Bebui)/Asubima stream with various affluent flow through the Asubima Forest Reserve. Also, various branches of the Brohuma stream are found in Afrensu-Brohuma Forest Reserve.

2. Distance of undertaking to the nearest stream

The Asuasu (Bebui)/Asubima stream and Brohuma stream traverse through the project area

3. Source of water for nursery

GIDA dam and rain water are the sources of water for the nursery. The GIDA dam has its sources from the Ayadam River.



4. Mode of extraction or irrigation system used

Water is extracted using a pump and is fed into a pipe system connected to sprinklers

5. Buffer distance maintained between undertaking and River(s)

The buffer distance between the teak plantation and the streams, which have about 4-5m wide stream beds is thirty meters (30m).

6. Approximate distance of river(s) to the nearest settlement

Kumu village is some 500metres away from the plantation and some 200metres from the Asuasu (Bebui) stream. Nkubem is on the border of the plantation and also on the side of an affluent of the Brohuma stream. Other villages are more than a kilometre away or not bordering any stream.

7. List of communities within undertaking

There are no communities within the undertaking

8. List of communities around the Undertaking (at least 200m away from Site)

The nearest major town to the Plantation is Akumadan which is about 5kilometres. Surrounding settlements/villages such as Esereso/Konkomba and Atrensu are within a distance of 1kilometre to the plantation.

9. Do any of the water bodies originate/take their sources from the undertaking?

🛛 Yes 🗆 No

10. Management measures in place to protect the source of undertaking

- In road construction, bridges are allowed to cross the buffer zone along the water courses with no obstruction to the natural water coarse and have a minimum impact on the vegetation along the water.
- Establishment of buffer zones along water bodies
- Erosion control measures
- Construction of dams is not allowed in the plantation. Drainage is guided towards the vegetation for infiltration
- Drainage control is mainly along roads
- \circ No ploughing is allowed within the plantation

NB: However, ploughing is done at the nursery during land preparation

11. Indicate activities upstream that are likely to be impacted negatively on the quality of any of the water bodies.

Form Ghana's operations are aimed at improving water quality, restore aquatic ecology and minimize negative impact of plantation establishment and management on water bodies thus has no negative impact on water bodies. These measures are elaborated in the Forest Management Plan.



2.4 Bushfire prevention, control of weeds/pest and biodiversity

a) Measures put in place to prevent bushfires

FORM Ghana has an intensive fire prevention program. The program is based on:

- Awareness raising among the neighbouring villages and the workers
- The creation of fire breaks
- Fire surveillance using fire towers (manned towers (4)
- Continuous posting of rapid response teams that have been specifically trained in firefighting.

b) Practices employed to control weeds and pest

Weeding is an intensive operation which takes place 2 to 3 times a year. The terrain is weeded manually with cutlasses twice and weeded chemically once.

Regular surveillance in line with an operational protocol on integrated pest management (Protocol 29) guides the control of pest in the plantation. For the period, no pest that required control were identified in the plantation.

c) Practices employed to conserve biodiversity

Biodiversity conservation is ensured by FORM Ghana through the protection of buffer zones within indigenous vegetation, prohibition of hunting and through fire prevention. The monitoring of the effect of these conservation measures is undertaken periodically within every 5 years (latest report on flora monitoring is available at <u>www.formghana.com</u>).

2.4.1 Soil Management Practices

FORM Ghana protects the soil through reforestation practices and erosion control. Erosion control is mainly along the roads.

2.4.1.1 Contribution of soil management practices to increasing production levels

No increase in production is detected or expected from soil management practices. However, management practices continue to conserve and stabilize the soil for suitable growth of the plantation.

2.4.1.2 Incidence of disease/pest infestation

No disease/pest infestation was experienced in the Asubima and Afrensu-Brohuma Forest Reserve for the period under review.

a) Practices employed to manage admitted farms

There are no admitted farms in the plantation



b) Practices employed to manage neighbouring communities

FORM Ghana actively engages neighbouring communities through the organisation of stakeholder meetings and sensitisation fora. FORM Ghana beliefs in the building and maintenance of good relations with neighbouring communities and has several protocols to help staff in the interaction with fringe communities.



2.5 Public Complaint

Table 2.5: Complaints received and managed or addressed during the last three years

				EXTER	NAL GRIEVANCES - 2	018 To 202	0	
No	Gender	Date of Complaint	Channel of Complaint	Location	Complaint	Date of Response	Response	Status
1	М	4 Dec 2018	Stakeholders Meeting	Akumadan	Daah Alex raised complaint on recruiting members of the fringed communities to be part of the fire teams (Rapid Response Team and Support team) of FORM GHANA.	4 Dec 2018	Matthew responded that we have some of the rapid response team and other workers that were recruited from the fringe communities.	Resolved
2	М	July, 2019	Stakeholder Meeting	Akumadan	Dery Sompoa complaint on those who had already planted teak trees on the new land that has been allocated to Form Ghana.	July, 2019	Matthew (Plantation Manager) explained that FC has not officially leased any additional land to Form Ghana. Therefore, Form Ghana has not taken additional land for development.	Resolved
3	М	December, 2019	Stakeholder Meeting	Akumadan	A representative from stool lands complaint on compensation of time lost by the stakeholders attending these meetings. He suggested that at least Form Ghana can give some sitting allowance in the form of cash to the	September, 2020	The issue was addressed. Sitting allowance was paid to stakeholder member in the subsequent meetings	Resolved



					stakeholder representatives to compensate for the time lost.			
4	M	September, 2020	Stakeholder Meeting	Akumadan	Wilfred Addai complaint that in terms of recruitment Meta community members hardly get notice from Form Ghana.	September, 2020	The Plantation Manager explained that Form Ghana usually communicate such information through the information centers and traditional leaders in the communities. He added that in the future, the unit committees will be included to help disseminate the information in communities.	Resolved
5	М	September, 2020	Stakeholder Meeting	Akumadan	Nana Acheampong (Linguist) plead Form Ghana for a community centree to be built at Akumadan	January, 2021	The plantation Manager said it will be sent to management and feedback will be communicated in next meeting. Form Ghana explained to Nana Acheampong and other stakeholders that, Form Ghana do not have the ability in terms of finance to build community centre for Akumadan community. They were however advised to send the request to the District Assembly.	Resolved



2.5.1 Does the company have a mechanism for addressing complaints? ⊠ Yes □ No

2.6 Procedure for addressing complaints

Grievance Redress Mechanism (Protocol 7) describe the ways Form Ghana manages complaints and conflict situations.

NB: Grievance Redress Mechanism, Protocol 7 is attached at the appendix.

2.7 Description of Operations

2.7.1 Type of forestry development:

FORM Ghana carries out sequence of activities from its nursery facility for teak and various indigenous seedlings to the final harvesting of teak. At all stages of production, various environmental, social, and health and safety considerations are made to ensure that impacts are either avoided or mitigated. The following are stages are description of FORM Ghana's operations within the continuum of production management:

- Plant production: In the nurseries located at the Akumadan site teak plants are produced. The provenances used for main planting are Bouaké (from a stand in Asubima FR) and Kihuhwi (from a stand in Bia Tano FR). For research purposes provenances from other sites in Ghana and from abroad are also used. Sowing of the seeds is done between June and September. Care consists of watering and weeding or weeding alone depending on the presence of irrigation. Each year the terrain for the nursery is cleared of weeds, plowed and beds are created by creating footpaths every 1 by 5 meters. The seeds are then positioned in rows 10 centimeters apart and 15 centimeters apart in the row. Weeding is done every month. Spraying is only foreseen when insects or fungi attack the plants. Indigenous trees are produced as potted seedlings with local seed. This only takes place in Akumadan.
- **Terrain preparation**: Terrain preparation is done in several separate activities; land demarcation, land clearing, spraying, ploughing, road construction and pegging.
 - *Land demarcation:* This activity consists of the measuring and marking in the field of planting blocks. The work consists of tracing lines using compass and GPS. Along the lines, pegs are planted and the vegetation is cleared with cutlasses.
 - *Land clearing:* This involves manually cutting weeds and bushes as well as the removal of small trees with chainsaws. When necessary, the vegetation removed is burned to provide clean terrain for ploughing and subsequent work.



- *Spraying:* This is the application of glyphosate on the weeds that sprout again after land clearing.
- *Ploughing:* This activity consists of opening up and turning the soil with a tractor pulling a disc plough. Ploughing can only be done in areas with few tree stumps present, and where the soil is of a type allowing it. Some soils react to this activity by severe concretion forming.
- *Road construction:* This work consists of the removal of the top layer of the soil in a straight line to a width of 6 meters. This work is done using a Bulldozer. The removed soil is pushed to the side of the road. The profile of the roads is rounded with a drainage ditch to either side. At regular intervals exit drains are created to allow water to drain of the surface into the vegetation on the site. Drains are made in such a way that water is not directed into streams.
- *Pegging:* This activity entails the placement of sticks at intervals of 3 by 3 meters in the terrain. It is done to provide a regular grid based on straight lines on which to plant trees. The sticks for this work are collected in the surroundings and are often made of sticks from pruning activities.
- **Planting stumps**: Stump planting consists of digging a small hole of 20 centimeters diameter and 25 centimeters depth. In this hole a stump is placed in an upright position, and the soil is filled back into the hole around it. After filling the soil is compacted by the workers using their heel.
- **Planting polybags**: Indigenous trees in polybags are planted in a fashion similar to the planting of stumps. It is done by digging a small hole of 20 centimeters diameter and 25 centimeters depth. In this hole the polybag is placed in an upright position. The polybags are removed from the root ball of the plant, and the soil is filled back into the hole around it. After filling the soil is compacted by the workers using their heel. Polybags are collected from the field after planting and disposed of into waste containers at site for final disposal by Zoomlion Ghana Limited.
- Weeding: weeding consists of the removal of vegetation growing up around the Teak or indigenous trees. This needs to be removed in order to avoid competition. The weeding technique employed are either manual weeding or chemical weeding. Chemical weeding with glyphosate (done by teams using droplet applicators) and circle weeding (done by teams using hoes to scrape the soil in a circle around the young plants).



- **Pruning**: the branches that the tree produces have to be removed at regular two-year interval. Trees can be removed to a height of about one third of total tree height. Taking of more branches reduces the growth speed of trees. Work is done manually using telescopic hand saws. Pruned branches are either left on the field to decompose or collected by people from local communities as firewood.
- Thinning: When the trees grow, they start competing with each other for space and resources such as nutrients, water and light. In order to assure continued growth part of the trees will need to be removed. These trees are sawn down using chainsaws or harvester machines. The first thinning's have no commercial value and are left to decompose and enrich the soil. In subsequent thinning's the stems are taken to the road side for loading on trucks.
- **Final felling:** At the end of the rotation the trees will be harvested. This activity consists of the felling and cross-cutting of the trees. This activity will be done using harvesters.
- Monitoring: The project activities and intended results are monitored according to a predefined plan (see monitoring plan) to see how effective project implementation is and whether the intended results (growth, biodiversity development etc.) are achieved. Monitoring can consist of measurements in plots (in Teak or indigenous planting for instance), inventories (biodiversity studies) or regular checks (cleanliness of the site, waste disposal etc.).
- Other production management: Buffer zones of approximately 30 meters to each side of streams and swamps are respected. This concerns permanent streams only. If tree cover in these zones is insufficient, additional trees are planted of indigenous species. Management of the trees consists of weeding for the initial years. Then the trees will be left in their natural environment to allow other types of plants to recolonize the area as well (shrubs, herbs and climbers).

A brief description of operations in an environmentally based process flow chart from nursery to harvesting is attached in Figure 2.7 below.

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Brief description of operations from nursery to harvesting (attached is an environmentally based process flow chart, indicating waste streams) and how waste is management

Operational	Brief Description of	Waste streams	Waste Management
Sector	operations	generated	
Nursery	Nursery activities involve seed collection and storage from existing plantation, land preparation (ploughing and stump bed preparation), sowing, maintenance, monitoring, harvesting stumps, production of indigenous species in polybags, and transportation to planting areas.	Non-hazardous solid wasted are generated from nursery. Wastes include: phytosanitary products, polybags, sacks.	Waste is segregated into organic and plastic at disposal points. Final disposal of waste is done by a licensed waste management company (Zoomlion Ghana Ltd). Plant waste is left in nursery to add to organic matter.
	Ground Preparation: The area to be planted is cleared by ploughing and/or harrowing. When necessary, herbicides are sprayed to control weeds.	Hazardous empty chemical containers (generated only when chemical pesticide is used for ground preparation).	Waste is stored separately on site for collection by a licensed waste dealer (Zoomlion Ghana Ltd).
	Plantation establishment: Involves planting and beating up (depending on the mortality rate of planted material).	Non-hazardous waste including: domestic waste (food waste, plastic/paper wrappers), stump debris, sacks.	Waste is segregated into organic and plastic at disposal points. Final disposal of waste is done by a licensed waste management company (Zoomlion Ghana Ltd). Plant waste is left in nursery to add to organic matter.
Silviculture	Weeding: This is done at least twice a year until 3 rd - 4 th year when canopy closes. Involves the both mechanical and chemical weeding (when necessary, to control weeds).	Non-hazardous waste including: domestic waste (food waste, plastic/paper wrappers), from mechanical weeding. Hazardous empty chemical containers.	Domestic waste is segregated into organic and plastic at disposal points. Final disposal is done by Zoomlion Ghana Chemical waste is stored separately on site for collection by a licensed waste dealer (Zoomlion Ghana Ltd).
-	Singling: Involves removing extra stems that sprout from one stump.	Tree waste from singling activity, domestic waste from workers (food waste, plastic/paper wrappers.	Tree waste is left in plantation to decompose. Domestic waste is segregated into organic and plastic at disposal points. Final disposal is done by Zoomlion Ghana Ltd.
hf 2	Pruning: Done in the dry season to remove branches up to 1/3 of the height of the tree.	Tree waste from pruning activity, domestic waste from workers (food waste, plastic/paper wrappers.	Tree waste is left in plantation to decompose. Domestic waste is segregated into organic and plastic at disposal points. Final disposal is done by Zoomlion Ghana Ltd.

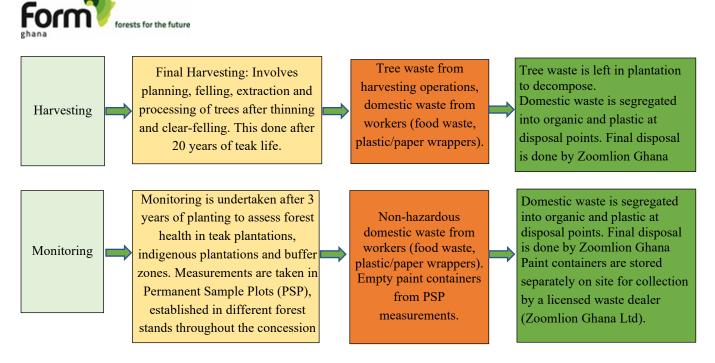


Figure 2.7: An environmental-based flow chart of FORM Ghana's operations from nursery to harvesting

2.7.2 Any value addition processing done?

 \Box Yes \boxtimes No

2.7.3 Description of harvesting methods and post harvesting operations

Harvesting methods and post-harvest operations are described in Protocol 25 (Harvesting Protocol). This protocol describes the harvesting strategies adopted by Form Ghana for the planning, felling, extraction and processing of trees after thinning and clear-felling. These strategies are derived from the reduced impact logging guidelines stipulated in the Ghana logging manual.

NB: The protocol is aimed at teak harvesting. Protocol 25 (Harvesting Protocol)



2.8 Production Details

2.8.1 Planting Material Information

Table 2.8.1: Planting material information

Species cultivated/Planted	Source	Area (Ha)	% of Planted Area
Teak	Own nursery	2,729.97	84.46%
Indigenous: Ofram, Awiem-fosamina, Kokrodua, Potrodom, Onyina, Emeri, Watapuo	Own nursery and contract nursery	502.17	15.53%
Expected Products from the development	Teak billet Teak poles Carbon Cre		



2.8.2 Input materials/Agro-chemicals (Sources, types and use)

Table 2.8.2: Input/ agrochemical use

Name of Agro-	Туре	Source (Supplying Company)	Quant	ities		Mode of application
chemical			2018	2019	2020	
Glyphosate	Weedicide	Cali Ghana Ltd,	379 kg	857 kg	1747 kg	Manual Foliar
(Kalach/		• Louis Dreyfus Company Ltd				application
Sunphosate/		• Wynca Sunshine Company				
Glyphader)		Ltd				

*MSDS for chemical attached in Appendix

2.8.3 List of Farm Equipment

Name/Type of Equipment	Purpose	Power rating	Country of Origin/year of manufacture	Capacity
Tractor (2)	Used for harvesting operations	New Holland-59kw New Holland-63.4kw	Netherland Netherland	New Holland-80hp New Holland-85hp
Chainsaw	Used for thinning/ harvesting	3.6kw	Sweden	2.4hp
Grader	Used for road maintenance	128kw	USA	171hp
TLB	Used for road maintenance	68.5kw	USA	93hp
Knapsacks	Used for spraying	Manual	Spain	16litres



2.8.4 Resources Use for the last three years (Water, electricity, fuel)

2.8.4.1 Water use

Table 2.8.4.1: Water use

Sources (surface, underground, pipe borne)	Quantity (m ³)		
	2018	2019	2020
Domestic			·
Underground	13443 m³	14009 m³	6092 m ³
Nursery		I I	I
N/A	N/A	N/A	N/A

2.8.4.2 Electricity Use

Table 2.8.4.2: Electricity Use

	Consumption (KWh)				
	2018	2019	2020		
Solar Generation	377078	805467	10,635.00		
National Grid purchased	29,522.95	31,671.1	33,722.40		
Total	406,601	837,138.1	44,357.40		



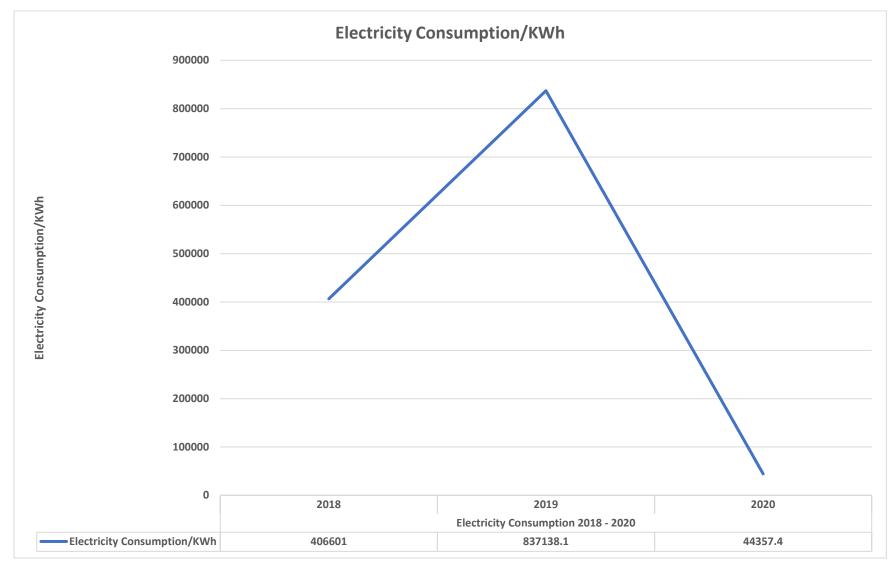


Figure 2.8.4.2: Electricity consumption 2018-2020

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2.8.4.3 Fuel Use

Table 2.8.4.3: Fuel Use

Type (Gasoline, diesel, LPG, RFO, biomas etc)Process stage used		Consum	ption (Litres)	
		2018	2019	2020
Diesel	Outsourced	35,673	34,782	45,607
Petrol	Outsourced	9,631	9,887	3,336

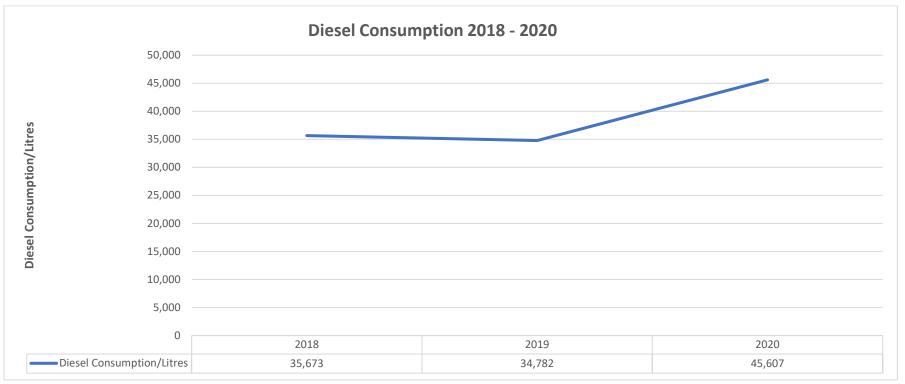


Figure 2.8.4.3a: Diesel consumption 2018-2020

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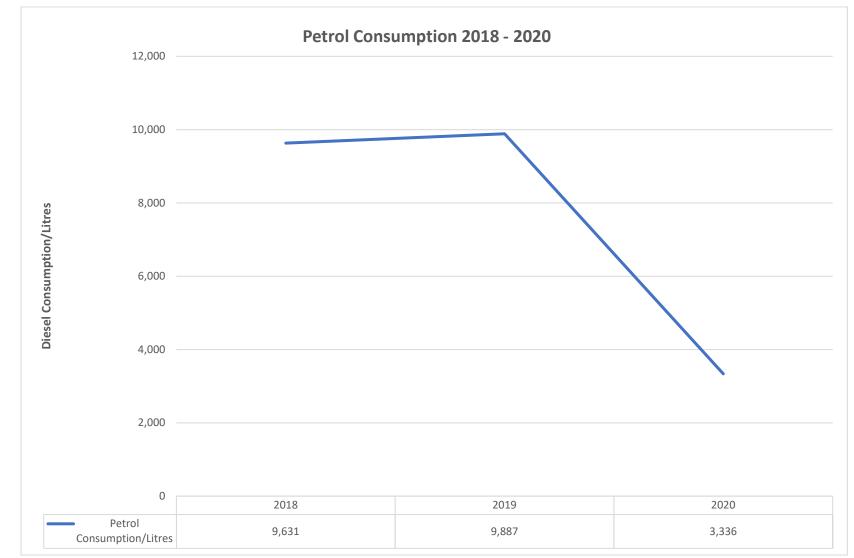


Figure 2.8.4.3b: Petrol consumption 2018-2020

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2.8.5 Waste Oil Generation (hydraulic and engine oils)

Table 2.8.5: Waste oil generation

Sources (genset, chainsaw, caterpillars)	Quantities (Litres)		
	2018	2019	2020
Engine Oils	407	340	416

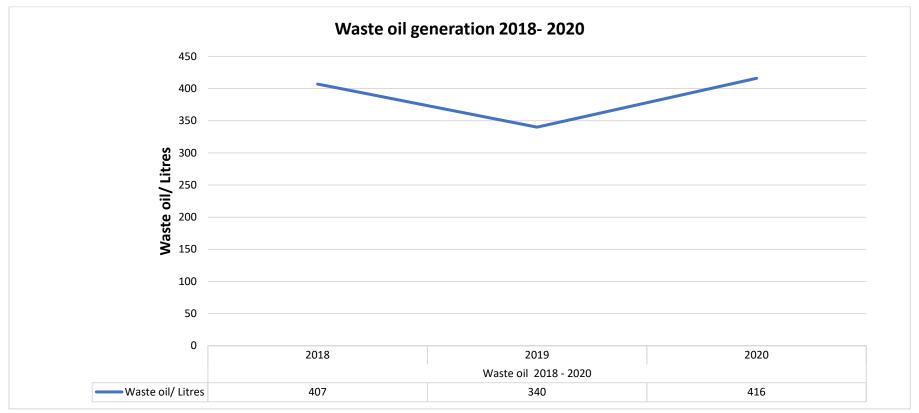


Figure 2.8.5: Waste oil generation 2018-2020

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2.8.6 Solid Waste Generation

Table 2.8.6: Solid waste generation

Type of waste	Quantity	generated _I	per annum	Type of treatment/disposal method (Composting,	Quantity disposed
Solid (biomass, poly (tonnes)				recycling/incineration)	
pots, chemical	2018	2019	2020		
containers)					
Solid waste	13.10	16.40	18.42	Waste is sorted and stored in designated containers on site	47.92 tonnes
				(Organic, Plastic, Medical, HazMat) and finally disposed by	
				waste management company- Zoomlion Ghana Limited	

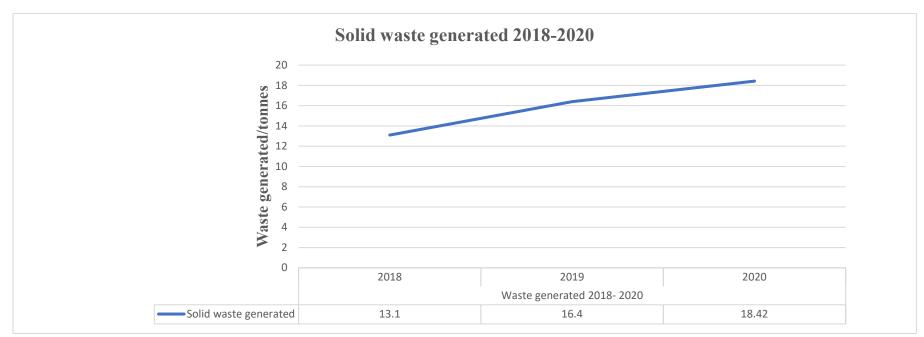


Figure 2.8.6: Solid waste generation 2018-2020

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2.8.7 Obsolete/ Expired chemicals

Name of chemical	Approximate Qty (specify units)	Current mode of storage	Planned method of disposal
N/A			

NB: No chemicals expired within the period under review

2.8.8 Water Quality Monitoring data of Rivers 2018 - 2020

Table 2.8.8.1: Water Quality Monitoring Data of Asubima River

S/N				Ι	Asubima River			
	PARAMETERS Freq of Monitoring		Mo	Monitoring Values (mean values)			GPS Coordinates (UTM)	
				2019	2020	Longitude	Latitude	
			Stream	Stream	Stream	624354	818512	
1	Dissolved Oxygen	Quarterly	5.00	6.87	-			
2	PH	Quarterly	6.55	7.32	6.22			
3	Temperature	Quarterly	27.80	28.00	28.83			
4	Nitrate	Quarterly	8.10	2.30	4.91			
5	Ammonia	Quarterly	0.21	0.31	0.13			
6	Phosphate	Quarterly	0.20	0.17	1.38			
7	Turbidity	Quarterly	10.86	13.45	15.95			
8	COD	Quarterly	72.50	9.00	-			
9	TDS	Quarterly	29.50	30.00	29.00			



NB: The blank values for both dissolved oxygen and COD in the year 2020 was an oversight as they were omitted among the parameters sent for laboratory analysis. However, they have since been included in subsequent laboratory analysis in 2021 and copies attached as appendix.

Generally, COD increases as the concentration of organic material increases. It also increases if inorganic compounds susceptible to oxidation by the oxidant (typically dichromate) are present. Water with high COD typically contains high levels of decayed plant matter. Water sampling for quality test analysis in the first quarter of 2018 was carried out on 12th February, 2018 which was during the dry season with no rainfall and low water levels of streams unlike in 2019, where water sampling was done on 19th March, 2019 within the rainy season with high water levels and actively flowing streams. Water flow in parts of the streams are either low or stagnant in the dry season (12th February, 2018). When plant shed their leaves in the dry season into the streams, they decay resulting in high levels of COD.

The season in which samples are picked influence greatly the results from the laboratory analysis carried out. The COD figures in the dry season vary from the figures in the rainy season and this this largely due to the concentration of organic materials coupled with low flow of water in the streams during the dry season.



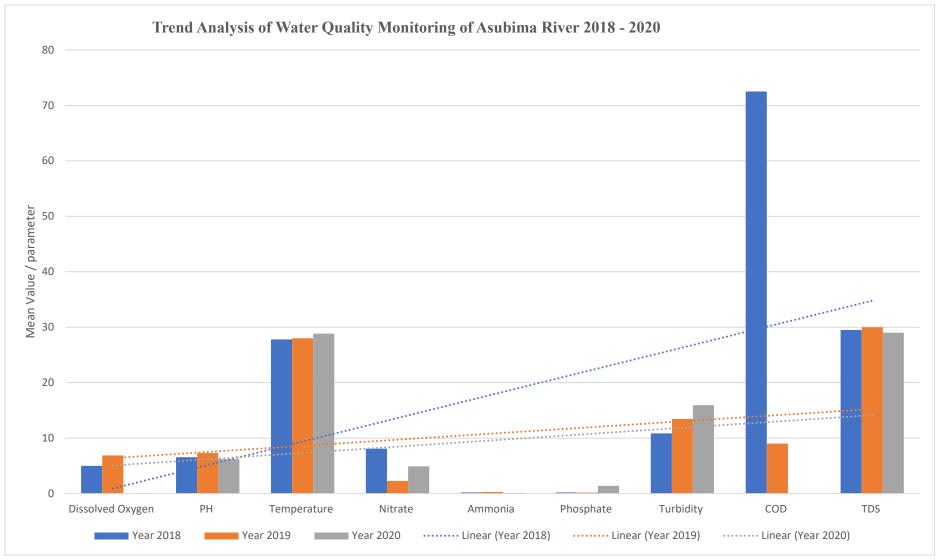


Figure 2.8.8.1: Trend Analysis of Water Quality Monitoring of Asubima River

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S/N				Afrensu	-Brohuma River		
	PARAMETERS Freq of Monitoring		Moni	toring Values (mean	GPS Coordinates (UTM)		
			2018	2019	2020	Longitude	Latitude
			Stream	Stream	Stream	625340	814595
1	Dissolved	Quarterly	4.00	6.07	-		
	Oxygen						
2	PH	Quarterly	6.84	6.95	6.14		
3	Temperature	Quarterly	28.20	27.57	28.85		
4	Nitrate	Quarterly	6.65	2.27	3.43		
5	Ammonia	Quarterly	0.10	0.15	0.03		
6	Phosphate	Quarterly	0.16	0.20	1.42		
7	Turbidity	Quarterly	30.75	8.49	10.60		
8	COD	Quarterly	114.50	5.60	-		
9	TDS	Quarterly	34.50	31.00	33.00		

Table 2.8.8.2: Water Quality Monitoring Data of Afrensu-Brohuma River

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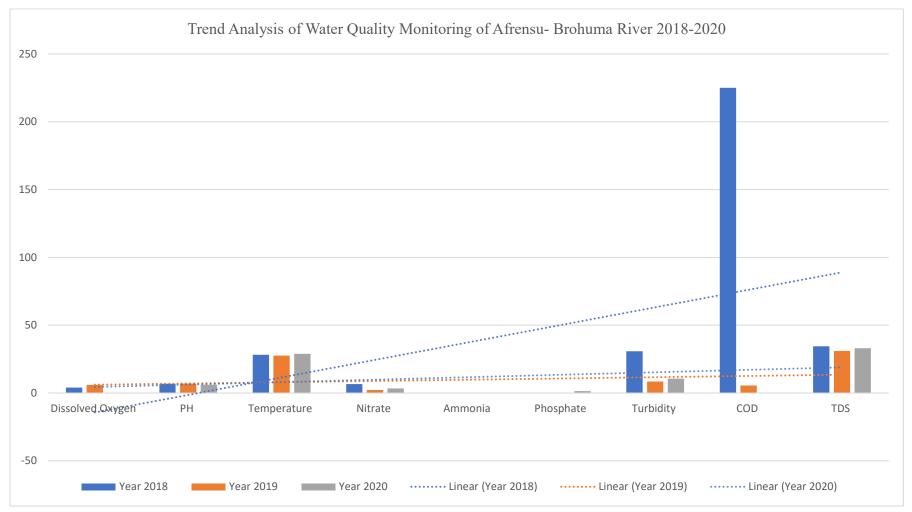


Figure 2.8.8.2: Trend Analysis of Water Quality Monitoring of Afrensu- Brohuma River

NB:

The water quality analysis results show there is no exceedance in relation to the baseline parameters

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2.8.9 Environmental Challenges Encountered (e.g. Pest infestation, erosion, diseases, pollution of water bodies, waste management bushfires)

For the period 2018-2020, Form Ghana encountered a number of environmental challenges relating to waste management, bushfires, and illegal grazing. Continuous surveillance and efficient management practices as defined in the EMP and operational protocols have served as safeguard mechanisms to prevent pest and disease infestation in the plantation. Table 2.8.9 below gives details of the various environmental challenges, description and responses for the period between 2018 - 2020.

Table 2.8.9: Environmental challenges

Type of challenge	Description	Response
Waste	Waste generated are sometimes placed in the wrong container	Continues sensitization and regular training of all staff on waste
segregation	provided for waste separation.	management.
		Regular monitoring carried out both on site and in plantation
Bushfire	The plantations of Form Ghana are situated in a landscape with	FORM Ghana has an intensive fire prevention program. The
	savannah characteristics. Grass species such as Elephant grass,	program is based on:
	Guinea grass and Spear grass, that grow up to 5m tall, cover most	• Awareness raising among the neighbouring villages and
	of the area. This vast area of combustible material easily catches	the workers
	fire in the dry season (November-March), either naturally or	• The creation of fire breaks
	human induced. Due to a strong desert wind from the North, the	• Fire surveillance using fire towers (manned towers (3)
	harmattan, these fires can spread extremely fast	and electronic detection tower systems (3))
		• Continuous posting of rapid response teams that have
		been specifically trained in firefighting.
		• Establishment of community fire volunteer squad in
		fringe communities



Animal	Within the Tain II FR and around the project area, cattle grazing	The herdsmen are not allowed inside the FG lease.
grazing	takes place, led by Fulani herdsmen.	Security officers are positioned at the various location within the
		plantation to monitor illegal activities including cattle
		movement.
		Interaction with community leaders, officials and the forestry
		commission has led to sensitization and action for the eviction of
		herds of cattle from the reserve

2.8.10 OHS trainings undertaken during the last three years under review

Table 2.8.10: OHS trainings undertaken

ΤΟΡΙΟ	ORGANIZATION	DATE	DURATION	NUMBER OF WORKERS
Waste management	Form Ghana	04/01/2018	1hr	35 Permanent
Safety Issues	Form Ghana	04/01/2018	1hr	7 Permanent
First Aid	Form Ghana	04/01/2018	1hr	55 Permanent
Cough	Form Ghana	26/01/2018	1hrs	94 Permanent
Lassa Fever	Form Ghana	28/02/2018	1hr	94 Permanent
Lassa Fever	Form Ghana	28/02/2018	1hr	125 Permanent, 54 Casual
Waste management	Form Ghana	20/04/2018	1hr	11 Permanent
Protocol 9-Transport of Personnel, and Vehicle management	Form Ghana	22/05/2018	2hrs	27 Permanent
Peptic Ulcer	Form Ghana	01/06/2018	1hr	101 Permanent
Waste management	Form Ghana	20/06/2018	1hrs	103 Permanent

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ΤΟΡΙΟ	ORGANIZATION	DATE	DURATION	NUMBER OF WORKERS
Chainsaw training	Form Ghana	23 to 28-06- 2018	1hr	13 Permanent
HIV Awareness	Form Ghana	27/07/2018	1hr	88 Permanent
Safety in harvesting, Log scaling, log handling, tally and tagging	Form Ghana	7/8-08-2018	1hr	15 (8 casual)
Fire bosses and RRT	СМО	17-22-09-18	3hrs	12 Permanent
Spraying Team	Form Ghana	2-4-10-2018	1hr	14 permanent 9 casual
Excel training	Form International	22/11/2018	1hr	7Permanent
Forest fire fighting training	Form Ghana	28-29-11-18	1hr	15 Permanent 35 Casual
Domestic fire	Form Ghana	29/11/2018	1hr	29Permanent, 2 Casuals
Sexually transmitted disease	Form Ghana	29/03/2019	2hr	117 all workers
Personal Hygiene	Health Practitioner	26/04/2019	1hr	162 Permanent
Waste Management	Form Ghana	2-3-05-19	1hrs	136 Permanent
First Aid	Health Practitioner	9-13-05-19	1hr	89 Permanent
Stress Management	Health Practitioner	28/05/2019	1hr	137 Permanent
General first aid training	Health Practitioner	26/07/2019	1hr	108 Permanent



ΓΟΡΙΟ	ORGANIZATION	DATE	DURATION	NUMBER OF WORKERS
HIV/AIDS education and screening	Public Health Nurse	26/07/2019	2hrs	108 Permanent
Flooding and Domestic Fire	NADMO, Sunyani	26/07/2019	1hr	5 Permanent
Defensive driving, safety tips and ethics in driving	Form Ghana	29/08/2019	1hr	14 Permanent
Family Planning	Health Practitioner	30/08/2019	1hr	140 Permanent
Harvesting refresher training	Form Ghana	19/09/2019	2hrs	40 Permanent
Hygiene	Health Practitioner	25/09/2019	1hr	19 Permanent
Waste Management	Form Ghana	02/10/2019	1hr	9 Permanent
Responsible use of chemicals	Form Ghana	02/10/2019	1hr	9 Permanent
information on contagious diseases	Form Ghana	08/10/2019	1hr	9 Permanent
chemical weeding	Form Ghana	04/11/2019	1hr	13Permanent
Healthcare policy implementation	Form Ghana	21/11/2019	1/2hr	10 Permanent
Fire fighting	Form Ghana	25/11/2019	1hr	20 Permanent
Fire fighting	Form Ghana	26-27/11-19	2hrs	56 Permanent

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TOPIC	ORGANIZATION	DATE	DURATION	NUMBER OF WORKERS
Fire fighting	Form Ghana	28-29/11-19	1hr	188 Permanent
domestic fire	Ghana fire service officer	18/12/2019	2hrs	23 Permanent
Fire fighting	СМО	24/01/2020	1hr	29Permanent
COVID-19	Form Ghana	20/03/2020	1hr	115Permanent, 22Casua
Chainsaw Refresher Training	СМО	23/03/2020	1hr	17Permanent
General fleet user practical assessment	Form Ghana	26/03/2020	2hrs	11Permanent, 2Casuals
Waste Management	Form Ghana	04/06/2020	1hr	134Permanent
First Aid refresher training	Form Ghana	16-17/06/20	1hr	81Permanent
Chemical weeding refresher training	Form Ghana	19/06/2020	1hr	16Permanent
Snake and Insect Bite	Form Ghana	16/07/2020	1hr	2Casual, 155Permanent
Defensive Driving Fundamentals	Form Ghana	14/08/2020	1hr	2Casual, 13Permanent
Security issues	Form Ghana	19/08/2020	1hr	33Permanent
Personal Hygiene	Form Ghana	28/08/2020	1hr	116Permanent, 4Casual



TOPIC	ORGANIZATION	DATE	DURATION	NUMBER OF WORKERS
HIV/AIDS awareness and screening	Akumadan Health centre	28/08/2020	2hrs	116Permanent, 4Casual
COVID-19 Refresher training	Form Ghana	01/09/2020	3hrs	110Permanent, 4Casual
Forest Fire Refresher Training	Form Ghana	7–11/09/20	2hrs	22Permanent, 2Casual
COVID-19 Protocol Training	Form Ghana	08/09/2020	2hrs	132Permanent, 4Casual
Transport Protocol	Form Ghana	01/10/2020	1hr	12Permanent, 2Casual
Training on Complaints, Grievance and Concerns	Form Ghana	28/10/2020	2hrs	4Permanent
Communicable diseases	Form Ghana	30/10/2020	1hr	110Permanent, 4Casual
Pruning training	Form Ghana	10-11/11/20	2hrs	46Permanent ,4Casual
Forest Fire fighting	Form Ghana	16/11/2020	2hrs	27Permanent, 25Casual



2.8.11 Environmental Management Roles and Responsibilities

Are environmental management roles and responsibilities among employees well defined? 🛛 Yes 🗆 No

Management requirements & responsibilities of Senior Staff (Protocol 17); Describes environmental management roles and responsibilities of employees.

Table 2.8.11 Summary of Management roles and responsibilities

S/N	Designation	Roles and Responsibilities	
1.	Managing Director	• Oversees that implementation of entire project conforms with environmental specifications.	
		• Approves all documents relating to the environment for implementation.	
2.	Forest Manager	 Ensures that all forest development activities consider environmental requirements 	
		• Provides technical recommendations for continuous improvement of forest operations.	
3.	E&S Manager	• Supervises the implementation of all environment and social requirements within the project area of influence.	
		• Collaborates with necessary institutions/stakeholders for resolution of any environmental issues.	
		• Reviews all environmental documentations and reports.	
4.	E&S Officer	• Develops implementation plan of environment and social issues.	
		• Collects environmental data for analysis and documentation.	
		• Provides support to monitoring environmental issues.	
		Conducts training on environmental issues.	
5.	OHS Assistant	• Provides training on all occupational health and safety issues within the Company.	
		• Conducts incident investigations and make necessary recommendations to management.	
		• Conducts compliance monitoring on occupational health and safety protocols set by the Company.	
6.	Monitoring	• Ensures all activities within plantation comply to project design details.	
	Officer	• Carries out periodic environmental auditing to identify areas for continuous improvement.	
		• Provides recommendations based on research and development for improvement of operations.	



2.8.12 Corporate Social Responsibilities (CSR) undertaken within the period under review

Table 2.8.12: Corporate Social Responsibilities (CSR) undertaken

CSR Actions	Beneficiary(s)	Amount Budgeted
Construction of Six Unit Classroom Block	Akumadan	100,000.00
Schools quiz competition	Offinso North District Directorate	500.00
Grading works at Akumadan Health Centre	Akumadan	3,700.00
HIV/AIDS counselling exercise	Akumadan Health Directorate	1,500.00



3.0 CORPORATE POLICY ON ENVIRONMENT, HEALTH AND SAFTEY

The company's objective is to reforest 20,000 hectares of degraded forest reserve in Ghana whilst operating according to the highest technical, social and environmental benchmarks set by the Forest Stewardship CouncilTM (FSC- C044035) and by the Verified Carbon Standard (VCS).

The vision of Form Ghana is that reforestation of degraded forest land should be done in accordance with the highest standards for sustainable forest management, serving the needs of the local communities and restoring vital environmental services within an economically viable business model.

3.1 Company's policy statement on environment

Form Ghana commits itself to have an environmental management system in place which is in line with the principles and criteria for sustainable forest management of the FSCTM (FSC-C044035). This is the highest standard for forestry activities available. This objective is translated into work methods that always have the environment in scope. For all activities that may have an impact on the environment protocols have been developed that explain how to act in order to avoid damaging the environment.

These protocols are the subject of annual training sessions.

3.2 Environmental Objectives:

To ensure that our operational activities throughout 2020 are in conformance with the specified standards by local regulators such as Environmental Protection Agency, Water Resources Commission, Forestry Commission; and international organizations such as Forest Stewardship CouncilTM (FSC- C044035) and African Development Bank.

- To achieve best environmental performance through periodic monitoring of water quality, biodiversity restoration and conservation in the year 2020.
- To continuously improve waste segregation, disposal and reporting throughout 2020.

3.3 Specific targets on environment

Table 3.3: Environmental targets

Target	Timeline
To achieve minimal environmental pollution from waste and operational	December 2020
activities of the Company	
Meet all environmental monitoring and reporting timelines for both local and international regulators/ institutions.	December 2020



To restore biodiversity by planting not less than 350ha of indigenous tree	December 2020
species	

3.4 Company's policy statement on Health and Safety

Form Ghana is committed to providing a safe and healthy work environment for its employees. Form Ghana achieves this through annual work place evaluations, training of workers, provision of PPE's, first aid training, health checks, clean drinking water, National Health Insurance Scheme and an on-site nurse for emergency treatments and for minor medical issues. The various systems and protocols concerning health and safety and annually monitored for continuous improvement.

3.5 Occupational Health and Safety Objectives:

- To attain a Disability Injury Frequency Rate of not more than 1.0 by the end of 2020.
- To ensure the regular use of appropriate PPE's by employees throughout the year 2020.
- To conduct monthly Occupational Health and Safety trainings for employees throughout 2020.

3.6 Specific targets on Health and Safety

Table 3.6 Health and safety targets

Target	Timeline
A reduction in the number of work-related accidents and incidents	December 2020
An improvement in the investigation and reporting of incidents (major and minor accidents)	December 2020
Increased awareness among employees on Occupational Health and	December 2020
Safety.	

3.7 Legal/Regulatory Requirements

- a) 1992 Constitution of the Republic of Ghana
- b) Environmental Protection Agency Act, 1994 (Act 490) Section 44 and 48
- c) Environmental Assessment Regulations, 1999 (LI 1652) Section 24(1)
- d) Fees and Charges (Amendment) Instrument, 2019 (LI 2386)
- e) Water Use Regulations, 2001 (LI 1692)
- f) Local Governance Act, 2016 (Act 936)
- g) Forests Act, 1927 (CAP. 157)
- h) Forest Protection Act, 1974 (NRCD 243)
- i) Forestry Commission Act, 1999 (Act 571)

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- j) Plants and Fertilizer Act, 2010 (Act 803)
- k) African Convention on the Conservation of Nature and Natural Resource
- 1) Workmen's Compensation Law, 1987 (PNDC 187)
- m) Children's Act, 1998 (Act 560)
- n) Labour Law, 2003 (Act 651)
- o) Riparian Buffer Zone Policy for Managing Freshwater Bodies in Ghana, 2013
- p) Ghana National Environmental Policy, 2013
- q) Ghana National Climate Change Policy (NCCP), 2012
- r) National Gender Policy, 2015
- s) Nationally Determined Contributions (NDCs)
- t) Ghana Standards for Environment and Health Protection
- u) Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)
- v) Hazardous, Electronic and other Wastes (Classification), Control and Management Regulations 2016 (LI 2250)
- w) Persons with Disability Act, 2006, Act 715
- x) Public Health Act, 2012, Act 851
- y) Water Resources Commission Act, 1996, Act 522
- z) Factories, Offices and Shop Act 1970, Act 328
- aa) Fire Precaution (Premises) Regulation 2003, LI 1724

3.8 Company's obligations under EPA legislation and standards

Environment:

- Have Environmental Impact Assessment done for its operations
- Develop Environmental Management plans based on the EIA's
- Obtain environmental permits for the operations
- Report annually to the EPA on matters concerning the Environmental Permits
- Obtain relevant permits when importing plant material

Water:

- Have a water use permit from Ghana Water Resources Commission (GWRC)
- Report quarterly on water use and water quality to the GWRC

Health and safety:

- Ensure a safe work environment
- Provide the necessary PPEs to workers

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4.0 CURRENT ENVIRONMENTAL PRACTICES AND MANAGEMENT OF IDENTIFIED IMPACTS

Table 4.0: Environmental practices and management of identified impacts

Identified Impact/Management Issue	Current environmental management practices	Limitations to management practice	Improvement required	Timelines for the implementation of improvement action
Land preparation	Protocol 15 . Technical Performance in the plantation. This describes the work procedures for all plantation activities	No limitations identified	N/A	NIL
Nursery development and Mgt. (mgt. of poly pots)	Protocol 14 Nursery Management and Propagation This document describes all the activities in the nursery and presents quality standards	Reliance on rainfall for irrigation at Berekum	N/A	NIL
Management of water bodies (buffer zones, pollution mgt.)	 Buffer zones of approximately 30metres to each side of streams and swamps are respected. This concerns permanent streams only. If tree cover in these zones is insufficient, additional trees are planted of indigenous species. Management of the trees consists of weeding for the initial years. Then the trees will be left to their own devices in order to allow other types of plants to recolonize the area as well (shrubs, herbs and climbers). 	No limitations identified	N/A	NIL



	Monitoring (Protocol 13)			
Chemicals Management	Responsible use of chemical (Protocol5). This document describes howpesticides needs to be handled. It alsodescribes the necessary safety measures.Storage of fuel, lubricants and toxins(Protocol 16). This document prescribes	No limitations identified	N/A	NIL
	how hazardous substances must be handled and stored.			
Handling, storage and use	 Storage of fuel, lubricants and toxins (Protocol 16). This document prescribes how hazardous substances must be handled and stored. Responsible use of chemical (Protocol 5). This document describes how pesticides are used and the necessary safety measures instituted. 	identified	N/A	NIL
Disposal of waste chemical containers)	 Waste Management Protocol (Protocol 4). Form Ghana produces several types of waste including waste chemical containers. Form Ghana has therefore adopted a clear strategy on waste management. This strategy is described in this protocol. 	No limitations identified	N/A	NIL



Management of obsolete	Form Ghana only procures chemicals	No limitations	N/A	NIL
and expired chemicals	required for specific activities within a	identified		
/ 11 · 1 6 · · 1	specific period with special consideration			
(weedicides, fungicides, arboricides)	to the expiry dates of these chemicals.			
Solid Waste management.	Waste Management Protocol (Protocol	No limitations	N/A	NIL
	4). This Protocol describes how solid	identified		
	waste is handled and managed.			
Management of fuel and oil	Storage of fuel, lubricants and toxins	No limitations	N/A	NIL
including biomass	(Protocol 16). This document prescribes	identified		
	how hazardous substances must be			
	handled and stored.			
Management of waste oil	Waste Management Protocol (Protocol	No limitations	N/A	NIL
	4). This Protocol describes how waste oil	identified		
	is handled and managed.			
Land and soil	Annually the soil is supplemented with		N/A	NIL
conservation methods	NPK fertilizer at the recommended dose.	identified		
	The terrain is ploughed annually			
	(ploughing is done only at the nursery			
	during land preparation) and provisions			
	are made to prevent erosion in the drains			
	(fascines to slow the speed of the water)			
	in the nursery.			
	The terrain for nursery and plantation			
	establishment is cleared manually,			
	sown/planted with teak seeds/stumps and			
	weeded as needed.			







Bush fire prevention	Fire prevention and firefighting	No limitations	N/A	NIL
and control	(Protocol 21). This document describes how fires are prevented and combated.	identified		
Biodiversity conservation and reservation of natural vegetation as refugia	Form Ghana engages in the management and restoration of 10% of the planted area as natural forest specifically to enhance and conserve biodiversity. The effectiveness of this measure is checked through 5-year monitoring activities.	No limitations identified	N/A	NIL
Pest and disease control	Integrated Pest Management (Protocol 29). This protocol describes how to manage pest damage by the most economical means and with the least possible hazard to people, property and environment.		N/A	NIL
Occupational, health and safety management.	Several protocols are geared toward the maintenance of health and safety in the plantation and elsewhere. P 08 First Aid Procedures & Emergency Evacuation This document prescribes how to deal in cases of emergency. P 09 Transport of personnel This document prescribes how personnel can be transported. P 10 Personal protection This document assesses the risks related to the various work places and prescribes the safety gear people need for various jobs. P 11 Training of personnel	No limitations identified	N/A	NIL



Environmental Management Pla	n – Asubima and Afrensu- Brohuma Forest Re	eserves ghana	sts for the future	
	This document presents the general recurrent planning for training P 14 Technical performance in the nursery This document describes all the activities in the nursery and presents quality standards P 23 Envenomation by snakes and insects This document describes the possible snakes and insects that may harm people and how to act in case of bites and stings. P 27 information on contagious diseases This document serves as a basis for sensitization on contagious diseases. P 21 Fire prevention and fire-fighting – Tain This document describes how fires will be prevented and when needed combatted.			
Mgt. of wood offcuts (pruning, thinning, fallen trees etc.)	Offcuts are left in the plantation to decompose to enrich the soil.	No limitations identified	N/A	NIL
Road Maintenance	Road construction and maintenance (Protocol 24). This Protocol describes how roads are constructed and maintained	No limitations identified	N/A	NIL



5.0 EVALUATION OF ENVIRONMENTAL PERFORMANCE

5.1 Previous environmental management commitments, actions and environmental permit conditions

Table 5.1: Previous environmental management commitments, actions and environmental permit conditions

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
5.1	Commitment to Project Specification Comply with all project specifications, mitigation,	All project specifications, mitigation,	Continuous	Compliant
	monitoring and other environmental management provisions as indicated in the project's Environmental	monitoring and other environmental management provisions as indicated in the	planting of specified tree	
	Management Plan (EMP). The project involves the following: plantation development and maintenance	ESIA are implemented.	species	
	using the following under listed species: Tectona grandis			
	(Teak), Mansonia altissima (Mansonia), Triplochiton scleroxylon (Wawa), Bombax buonopuenze (Bombax),			
	Erythrophleum ivorense (Potrodom), Terminalia superba			
	(Ofram), Terminalia ivorensis (Emere), Nauclea diderichii (Kusia), Cola giganten (Watapuo), Albizia			
	ferruginea (Awiemfosamina), Pericopsis elata			
5.1.2	(Kokrodua).At least 10% of the Forest Reserve should be reforested	Planting is still underway and provisions	Continuous	Compliant
3.1.2	with indigenous tree species.	are made in each planting season for	planting of	Compnant
		indigenous tree species to reach the 10%	specified tree	
		cover	species	



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
5.2	Location and Coverage:			
	i. The project is located in the Tain II Forest reserve in the Berekum District of the Bono Region.ii. Grid Reference: 7N35,2W30.iii. Labour force of 155.	Location and coverage of the project remains the same. However, administrative names have changed from Berekum District to Berekum Municipal and from Brong-Ahafo Region to Bono Region. Labour force has also changed (543).	Maintenance of facilities	Compliant
5.3	Pesticide and Chemical Usage			
5.3 i.	Use only pesticides that have been registered with the EPA according with part II of the EPA Act (Act 490).	Form Ghana uses only pesticides through registered dealers in Ghana	Continuous monitoring	Compliant
5.3 ii.	Ensure that the applicators of pesticides and chemicals are trained and licensed in accordance with the EPA Act (Act 490)	Pesticide applicators are trained at the beginning of every spraying season alongside medical screening.	In progress	Compliant
5.3 iii.	Comply with the requirements of the EPA Act, 1994 (Act 490), Part II on Chemicals/Pesticides Management.	Form Ghana uses only pesticides through registered dealers in Ghana.	Continuous monitoring	Compliant
5.3 iv.	Provide appropriate storage facilities for pesticides and other agrochemicals.	Form Ghana stores chemicals according to its protocol on Storage of fuel , lubricants and toxins (P 16) . This document prescribes how hazardous substances must be handled and stored. P 05 Responsible use of chemicals	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.		
5.3 v.	Ensure adequate measures to contain accidental spillage of pesticide and chemicals to avoid contamination of soil and water.	P 05 Responsible use of chemicals This document prescribes how pesticides need to be handled including measures to contain accidental spillage of pesticides to prevent contamination of water and soil.	Continuous monitoring	Compliant
5.3 vi	Ensure that empty pesticide and chemical containers and packaging materials are managed and disposed off in an environmentally sound manner in accordance with EPA guidelines for disposal of waste chemical containers.	Empty containers and packaging materials are stored on site and hauled by Zoomlion Ghana Limited for safe disposal. Waste Management Protocol (P 04) serves as a guide to the management and disposal of waste.	Continuous monitoring	Compliant
5.3 vii	Keep an inventory of quantities of pesticides and agrochemicals	The store at Form Ghana is responsible for keeping stock data. P 05 Responsible use of chemicals This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
5.3 viii.	Pesticides should be sprayed during periods when drift is expected to be minimal	P 05 Responsible use of chemicals This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.	Continuous monitoring	Compliant
5.4	Land Preparation and Water Resources Protection		<u> </u>	
5.4.1	Undertake land preparation and cultivation in such a way to minimise disruption of soil structure and exposure of soil to erosion. Institute appropriate drainage control measures to minimise flooding.	Protocol 13. This protocol entails Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management	Continuous monitoring	Compliant
	Comply with national buffer zone policy by establishing and maintaining the appropriate buffer zone distances along the water bodies traversing the project areas	Protocol 13. This protocol entails Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management	Continuous monitoring	Compliant
	Monitor the water quality parameters is conducted for ground water which is used for domestic purposes. Water from the various sampling points are analyzed quarterly and included in the Annual Environmental Reports.	Water quality parameters are submitted to GWCL on quarterly basis for lab analysis to determine variations from standard parameters.	Continuous monitoring	Compliant
	GPS coordinates of the sampling stations/locations should be determined for all sampling sites and reported.	GPS sampling locations are identified and reported on quarterly basis.	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
5.5	Solid Waste Management Explore conversion of solid waste from plant materials into compost for use on the farm/plantation	P04(Waste Management) Form Ghana produces several types of waste that should each be treated in a different way. Form Ghana therefore adopted a clear strategy on waste management. This strategy is described in this protocol.	Continuous monitoring	Compliant
	Provide garbage bins for solid waste generated to prevent littering	Waste is collected separately and disposed of as described by the Protocol (P04 Waste Management)	Continuous monitoring	Compliant
	Plastic wastes from the plantation should be disposed off at approved disposal points as directed by Berekum Municipal Assembly	Waste is collected separately and disposed of as described by the Protocol (P04 Waste Management)	Continuous monitoring	Compliant
	Disposal of solid waste should be done at Berekum Municipal Assembly approved landfill sites	Waste is collected separately and disposed of as described by the Protocol (P04 Waste Management)	Continuous monitoring	Compliant
	Consult EPA for advice before disposing any expired chemicals	Expired chemicals shall be collected by the suppliers in consultation with EPA as provided in Protocol 04. NOTE: There were no expired chemicals within the period under review	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	In order to prevent soil contamination at the mechanical workshops, all exposed surfaces at the workshop should be concreted	Protocol 16 (Storage of fuel, lubricants and chemicals)This protocol describes procedures for the purchase, storage and distribution of all fuels and chemicals used by Form Ghana.	Continuous monitoring	Compliant
	Over aged trees felled should be used for fuel or composted to be used as soil amendments	Waste from harvest operations Branches and tree tops that are left after felling are left in the forest. Felling waste is minimized by proper felling techniques as outlined in Protocol 04 (Waste Management)	Continuous monitoring	Compliant
5.6	Health and Safety			
	Ensure good housekeeping in the office areas and residential camp where applicable	Protocol 11(Training of personnel) Training of personnel is essential for the safety on the work floor and the quality of the work. Trainings are given on various subjects and some types of training will be periodically refreshed to assure the highest level of capacity	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Field workers handling chemical products must have adequate training on the appropriate use of products	Protocol 5 (Responsible use of chemicals) Form Ghana's company policy is to minimize the use of pesticides and to avoid possible risks for the safety and health of the employees. This is also valid for situations in which dangerous or toxic material is used.	Continuous monitoring	Compliant
	Ensure that persons applying pesticides and chemicals undergo periodic medical check-ups	Protocol 5 (Responsible use of chemicals) Form Ghana's company policy is to minimize the use of pesticides and to avoid possible risks for the safety and health of the employees. This is also valid for situations in which dangerous or toxic material is used	Continuous monitoring	Compliant
	Provide appropriate personnel protective clothing/gear such as rubber, gloves, overall, safety boots, hand gloves etc. to workers	Protocol 10(Personal protection) Safety is of the utmost importance to Form Ghana. To ensure that everybody works in a safe manner in a safe environment three approaches are used: Use of individual protective gear Training of personnel in the safe use of equipment and in safe working techniques. (Protocol 11)	Continuous monitoring	Compliant
	Provide a well-stocked first aid kit for minor injuries that might occur	Protocol 8 B (First Aid Procedures & Emergency Evacuation) This protocol describes the procedures for first aid	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		training, usage and composition of the first aid kit and handling of accidents		
	Adhere to the Health and Safety Action Plan indicated in the project EMP	Protocol 10 (Personal protection) Safety is of the utmost importance to Form Ghana. To ensure that everybody works in a safe manner in a safe environment three approaches are used. The use of protective equipment is based on the ILO Standard 'Health and Safety in Forestry Work'. This can be modified due to local conditions.	Continuous monitoring	Compliant
	Ensure adequate record keeping and establish an inventory of accidents and disease outbreak and treatment on the farms	All work-related injuries, even those not requiring medical attention, must be reported and recorded by the operational health practitioner. A summary is presented to the Management every month, and an annual summary of these reports is presented in the Public Monitoring Report. Protocol 8 B (First Aid Procedures & Emergency Evacuation)	Continuous monitoring	Compliant
	Workers must undergo medical check-ups at least twice a year to assess their health status with respect to operations on the farm	Form Ghana personnel is subject to regular medical checks	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Protection of Biodiversity Resources		Continuous monitoring	Compliant
	Implement measures to conserve biodiversity by maintaining vegetation along the various streams in the concession	Protocol 15 (Technical performance in the Plantation)Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management	Continuous monitoring	Compliant
	Create conservation areas that act as corridors and avoid harvesting in the corridors	Protocol 25 (Harvesting) This protocol describes the harvesting strategies adopted by Form Ghana for the planning, felling, extraction and processing of trees after thinning and clear-felling. These strategies are derived from the reduced impact logging guidelines stipulated in the Ghana logging manual. The protocol is aimed at teak harvesting. Growth of indigenous trees is much slower than teak, so harvesting of planted indigenous trees is not expected to take place in the near future.	Continuous monitoring	Compliant
	Ensure that rare floral identified and indigenous species	Form Ghana is managing / planting 10% of		Compliant
	are retained within the plantation	the plantation for biodiversity conservation and wildlife. In addition, the planting program will include rare and endangered	monitoring	



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		species if these can be successfully grown in the nursery.		
	Avoid contiguous harvesting of large areas in order to minimize disruption to landscape	Harvesting will be done in accordance with the growth performance of the trees. It is certain, this will be patchier than the planted areas.	Continuous monitoring	Compliant
	Foliage should be left on the soil to protect against moisture loss and provide nutrients to the soil	All slash is left in situ, with the exception of the fire strips	Continuous monitoring	Compliant
	Soil and Water Quality Monitoring	-		
	Establish an environmental monitoring programme in the adjacent or traversing water bodies to cover the following:			
	Water quality: pH, Turbidity, Colour, TSS, TDS, Phosphates, Ammonia- Nitrogen, Nitrate-Nitrogen, Potash, Total Coliforms, E. Coli etc	Form Ghana monitors the water in the streams twice yearly as per it's monitoring protocol: P 13 (Monitoring) This protocol describes the various monitoring activities	Continuous monitoring	Compliant
	Monitor the nutrient status of the soil in respect of soil organic carbon every year	The need for nutrient application is under investigation.	Continuous monitoring	Compliant
	Submit the results of the monitoring as part of Annual Environmental Reports (AER)	The findings from the nutrients investigated will be reported on in the Annual Environmental Report	Continuous monitoring	Compliant



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Social Economic Impacts			
	Ensure that the livelihoods of adjoining communities are not impacted negatively by the project operations	Form Ghana believes that investing in local communities is very important and this is as such incorporated in the company's Corporate Social Responsibility policy. Communities are important stakeholders in the area and play a key role in the company's operations. (Protocol 28 Community Development)	Continuous monitoring	Compliant
	Integrate social and environmental agreements/clauses in suppliers' contracts	Form Ghana is aware of all applicable legislation. This protocol describes the system implemented to collect relevant Ghanaian legislation and international conventions ratified by Ghana, and keep these texts up to date. Protocol 1(Follow- up of legislation and international conventions)		Compliant
	Undertake corporative social responsibility activities in accordance with the company's policy and agreement with the relevant communities	FG has a corporate social responsibility statement and a community development plan. Activities are executed as planned and will be reported upon annually.	Continuous monitoring	Compliant



Req.	Environmental Management Plan – Asubima and Afrensu- Bro Environmental management	huma Forest Reserves Ghana	future Outstanding	Proposed actions
	Actions/Conditions in the permit schedule		actions to be implemented	to be implemented to ensure compliance
5.10	Compliance with Mitigation Measures			
	Comply with all the mitigation, monitoring and environmental management commitments made in the Environmental Management Plan (EMP)	Compliant	Continuous monitoring	Compliant
	Compliance with the Factories, Offices and Shops Act 19	979 (328)	1	
	Comply with the requirements of the Factories, Offices and Shops Act, 1979 (328). Consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act		Continues monitoring	Compliant
	Compliance with Fire Precaution (premises) Regulation	, 2003 (L. I 1724)	'	· ·
	Provide appropriate fire extinguishers and other requirements as recommended by the Ghana National Fire Service	Appropriate fire extinguishers are installed at vantage places	Continuous monitoring	Compliant
	Install fire alarm system and smoke detectors at vulnerable areas to give early warning of any fire outbreak	There are adequate fire alarm system and smock detectors installed	Continuous monitoring	Compliant
	No smoking signs should be posted at areas where flammable solvents and fuel are stored	There are adequate signages in place with various inscriptions	Continuous monitoring	Compliant
	Fire belts or boundary lines should be created to prevent fire spreading to adjoining areas	Five-metre fire buffer constructed to prevent wild fire from entering the project area and to ensure that fire emanating from	Continuous monitoring	Compliant



	Environmental Management Plan – Asubima and Afrensu- Brohuma Forest Reserves							
Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	 Proposed actions to be implemented to ensure compliance 				
		one subplot does not enter the other subplots						
	Compliance with Water Resources Commission Act, 19							
	Comply with the requirements of the Water Resources Commission Act, 1996, Act 522 and obtain water abstraction Permits		Continuous monitoring	Compliant				



5.2. Variations (trends) between the base line and current values of rivers that traverse the plantation

Table 5.2.1: Variations (trends) between the baseline and current values of Asubima River

No	Parameter	Baseline Date: 9-11-2011			
			2018	2019	2020
1	Dissolved Oxygen	66.9	5.00	6.87	-
2	РН	6.6	6.55	7.32	6.22
3	Temperature	26.1	27.80	28.00	28.83
4.	Nitrate	0.3	8.10	2.30	4.91
5.	Ammonia	-	0.21	0.31	0.13
6.	Phosphate	0.4	0.20	0.17	1.38
7	Turbidity	FAU 20.4	10.86	13.45	15.95
8	COD	-	72.50	9.00	-
9	BOD	-	-	-	-
10	Total Coliforms	-	-	-	-
11	Conductivity	-	-	-	-
12	Oil and grease	-	-	-	-



No	Parameter	Baseline	Year				
		Date: 9-11-2011	2018	2019	2020		
1	Dissolved Oxygen	66.9	4.00	6.07	-		
2	PH	6.6	6.84	6.95	6.14		
3	Temperature	26.1	28.20	27.57	28.85		
4.	Nitrate	0.3	6.65	2.27	3.43		
5.	Ammonia	-	0.10	0.15	0.03		
6.	Phosphate	0.4	0.16	0.20	1.42		
7	Turbidity	FAU 20.4	30.75	8.49	10.60		
8	COD	-	225.00	5.60	-		
9	BOD	-	-	-	-		
10	Total Coliforms	-	-	-	-		
11	Conductivity	-	-	-	-		
12	Oil and grease	-	-	-	-		

Table 5.2.2: Variations (trends) between the baseline and current values of Afrensu-Brohuma River

5.3 NB: The water quality analysis data shows there is no exceedance in relation to the baseline parameters.



6.0 ENVIRONMENTAL ACTION PLAN

Table 6.0: Develop an action plan for environmental measures and other commitments not implemented in section 4 and 5

Improvement Programme as identified in Section 4 and 5 and any other actions for improvement and to ensure compliance to EPA Standards	Actual Actions proposed for implementation	Environmental quality objectives	Targets/scope	Time fram Implementat including mo 2022	× •		Budget	Responsible Officer
Continue to plant specified species and ensure that at least 10% of the entire area is planted with indigenous species for biodiversity conservation.	development of nursery and planting area	Improve biodiversity conservation in degraded forest areas	Entire area leased to Form Ghana	Every planting season	Every planting season	Every planting season	Part of designated duties and budgeting	Plantation Team
Continue to adopt behavioural change strategies through training, sensitization and motivation schemes.	 Sensitization Training Internal auditing 	Improve environmental awareness and employee participation in environmental management.	Total compliance to FSC TM (FSC- C044035) Principles and Criteria, and national regulatory requirements.	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	Environmental and Social Team
Continue to monitor all environmental and social parameters to ensure that operations of Form Ghana do	Monthly monitoring and reporting.Training on use of the environment	Ensure that all operational activities meet	All year-round monitoring of environmental parameters and	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	 Environmental and Social Team Plantation Team

1 Indicate the end date or the Actual month within which the programme will be implemented



Environmental M Improvement Programme	anagement Plan – Asubi Actual Actions	ima and Afrensu- E Environmental	Brohuma Forest R Targets/scope	Reserves Fo Time fram	forest	s for the future dates for	Budget	Responsible
as identified in Section	proposed for	quality		Implementa		<u>,</u>		Officer
4 and 5 and any other actions for improvement and to ensure compliance to EPA Standards	implementation	objectives		2022	onth and Year 2023	·) 2024		
not contaminate the environment.		best standard practices.	subsequent reporting					
Ensure that employees health and safety is prioritized	 Provision of required PPEs Incident investigation and reporting Training and sensitization 	Provide a safe working environment for undertaking operational activities	All employees	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	 Environmental and Social Team Plantation Team
Continue to foster cordial relationship with fringing communities	 CSR projects Employment opportunities to communities Stakeholder engagement 	Reduce public/ community complaints	Minimize community complaints	Throughout the year	Throughout the year	Throughout the year	Variable	 Environmental and Social Team Plantation Team
Implement measures to manage pollution	servicing of vehicles and machinery.	 Reduce environmental footprints Reduce the incidence of surface and ground water pollution 	 Close to zero environmental footprints. Close to zero pollution of surface and ground water. 	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	 Environmental and Social Team Plantation Team Fleet Management Team.



Improvement Programme as identified in Section 4 and 5 and any other actions for improvement	anagement Plan – Asubi Actual Actions proposed for implementation	<i>ma and Afrensu- B</i> Environmental quality objectives	Brohuma Forest R Targets/scope	Time fram Implementa	ne ¹ (specific		Budget	Responsible Officer
and to ensure compliance to EPA Standards								
	 containment measures. Waste is managed using standard practices 	 Comply with all legal requirements of EPA, WRC, FC, FSCTM (FSC- C044035), AfDB. 						
Continuous management of conservation areas.	 Non-disturbance of conservation areas 	• Enhance biodiversity through conservation practices	 Indigenous /remnant species conservation areas 	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	 Environmental and Social Team Plantation Team



7.0 PROGRAMMES FOR MEETING REQUIREMENTS OF ACTION PLAN

Table 7.1: Environmental Management Priority

Immediate/short term (up to 1 year) Programme	Timeline	Responsible Officer
Continue to plant specified species and ensure that at least 10% of the entire area is planted with indigenous species for biodiversity conservation.	Throughout the year	Environmental and Social TeamPlantation Team
Continue to adopt behavioural change strategies through training, sensitization and motivation schemes.	Throughout the year	 Environmental and Social Team Plantation Team
Continue to monitor all environmental and social parameters to ensure that operations of Form Ghana do not contaminate the environment.	Throughout the year	Environmental and Social TeamPlantation Team
Ensure that employees health and safety is prioritized	Throughout the year	 Environmental and Social Team Plantation Team
Continue to foster cordial relationship with fringing communities	Throughout the year	Environmental and Social TeamPlantation Team
Implement measures to manage pollution	Throughout the year	Environmental and Social TeamPlantation TeamFleet Management Team
Continuous management of conservation areas.	Throughout the year	Plantation TeamEnvironmental and Social Team



Long term (3 or more years) Programme		
Protect plantation from bushfires, illegal grazing, hunting	Throughout the year	Security team
and poaching		Plantation Team
		• Environmental and Social Team
Continue to foster cordial relationship with fringing	Throughout the year	Environmental and Social Team
communities		Plantation Team
Continue to monitor all environmental and social	Throughout the year	Environmental and Social Team
parameters to ensure that operations of Form Ghana do		Plantation Team
not contaminate the environment		
Implement measures to manage pollution	Throughout the year	 Environmental and Social Team
		Plantation Team
		• Fleet Management Team
Continue to adopt behavioural change strategies through	Throughout the year	Environmental and Social Team
training, sensitization and motivation schemes.		Plantation Team

Table 7.2: Trainings, awareness and competence building programme(s)

Training/Awareness/ Competence	Budget	Timeline	Frequency	Responsible Officer
Programme				
Firefighting Training	In house training	September	Annually	Plantation Manager
Waste Management Training	In house training	June	Annually	E&S Manager
Conflict Resolution/Mediation Training	GHS10,000.00	December	Annually	E&S Manager
Health and Safety Training	GHS4,000.00	October	Half yearly	Human
				Resource/Development
				Manager
Security Alertness Training	In house training	December	Annually	Chief Security Officer



Action/commitment	Timeline	Comments
Conduct annual internal audit to ensure that operations	Annually	Audits are carried out annually and corrective
meet required standards.		actions implemented.
Ensure that workers health and safety is prioritized	Throughout the year	Management is committed to ensuring that PPEs are
		supplied to employees every year per the
		specifications in the Personal Protection Protocol (P
		10).
Monitor underground water quality	Quarterly	Management devotes resources to ensure that the
		quality of underground water used for domestic
		purposes is assessed in every quarter.
Monitor resource use efficiency	Monthly	Energy use meters, water use meters, fuel pump
		meters and other resource use metrics are monitored
		and reported at the end of each month.
Adopt strategies to promote ecological, economic and	Daily	Operational protocols are in place to guide daily
social sustainability principles.		decision making in the plantation.
Ensure compliance with all permits/ licenses/	Variable	All permits/ licenses/ including EPA, WRC, Fire
certification requirements for operations.		Certificate are constantly monitored for renewal.
		All reporting conditions/ requirements are met.

Table 7.3: Management commitments to environmental/performance reviews and corrective actions



8.0 STANDARD OPERATING PROCEDURE MANUALS AND AVAILABLE DOCUMENTS

Table 8.1: List of Standard Operating Manuals and other documents

Type of Standard Operating Procedure	Area of Operation	Date Developed	Responsible Officer to ensure implementation
Follow up of legislation and convention (Protocol 1)	International/National	5 th June, 2019	Project Accountant
Prevention of illegal activities (Protocol 2)	Form Ghana land lease area	19 th June, 2019	Chief Security Officer
Periodical review of documentation (Protocol 3)	Form Ghana Mgt	5 th June, 2019	Project Accountant
Waste Management (Protocol 4)	Form Ghana land lease area	25 th Nov, 2019	Plantation Manager
Responsible use of chemicals (Protocol 5)	Form Ghana land lease area	27 th May, 2019	Chemical Supervisor and Plantation Manager
Stakeholder Management (Protocol 6)	Form Ghana and stakeholders	25 th Nov, 2019	Environmental and Social Manager
Grievance Redress Mechanism (Protocol 7)	Form Ghana, employees and public	17 th Aug, 2019	Human Resources Manager
First Aid Procedures and Emergency Evacuation (Protocol 8)	Form Ghana workplace	17 th June, 2019	Nurse
Employee Transport and vehicle and equipment policy and procedure (Protocol 9)	Form Ghana employees and fleet	20 th Aug, 2018	Fleet Management Officer
Personal Protection (Protocol 10)	Form Ghana Employees	1 st Nov, 2019	Plantation Manager



Environmental Management Plan – Asubima and Afrensu-	- Brohuma Forest Reserves	Form forests for t	he future
Training of Personnel (Protocol 11)	Form Ghana Employees	10 th Oct, 2017	Human Resource/Development Manager
Internal Audit (Protocol 12)	Form Ghana	20 th May, 2019	Consultant
Monitoring (Protocol 13)	Form Ghana Plantation	7 th Oct, 2018	Monitoring, Research & Development Officer
Nursery Management and Plant Propagation (Protocol 14)	Nursery	30 th May, 2019	Nursery Supervisor
Technical Performance in Plantation (Protocol 15)	Plantation	10 th June, 2019	Plantation Manager
Storage of Fuel, Lubricants and Chemicals (Protocol 16)	Stores	14 th June, 2019	Storekeeper
Management Requirement and Responsibility of senior Staff (Protocol 17)	Senior Staff	25 th Nov, 2019	Human Resource/Development Manager
Machine maintenance (Protocol 18)	Form Ghana equipment	4 th June, 2019	Fleet Management Officer
FSC TM (FSC-C044035) Trade Map Usage (Protocol 19)	Form Ghana	20 th May, 2019	Consultant
Meeting Schedule (Protocol 20)	Form Ghana	24 th June, 2019	Plantation Manager
Fire Prevention and Fire Fighting (Protocol 21)	Plantation	24 th June, 2019	Plantation Manager
Chain of Custody (Protocol 22)	Form Ghana	24 th May, 2019	Forest Engineer
First Aid Envenomation and Rabies (Protocol 23)	Employees	11 th June, 2019	Nurse
Road Construction and Maintenance (Protocol 24)	Plantation	24 th June, 2019	Plantation Manager
Harvesting (Protocol 25)	Form Ghana Plantation	24 th May, 2019	Forest Engineer
Information on contagious Diseases (Protocol 27)	Employees and Visitors	11 th June, 2019	Nurse
Community Development (Protocol 28)	Fringe communities	20 th May, 2019	Managing Director
Integrated Pest Management (Protocol 29)	Plantation and Nursery	24 th June, 2019	Plantation Manager



Intercropping (Protocol 30)	Intercropping farmers	18 th Feb, 2020	Intercropping Supervisor
Prevention, Control and Management of	Form Ghana	May 2020	Environment & Social Manager
Coronavirus Disease 2019 (COVID-19)			

8.2 Data collection, documentation and archiving methods

Table 8.2 Data collection, documentation and archiving methods

Type of Data Required	Laboratory responsible for analysis	Responsibility for collection at the facility	Responsibility for collection from third party	Responsibility for verification	Procedure for Data Collection, Storage/Archiving Method
Solid Waste	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana
Quality of Surface waterbodies	Ghana Water Company Limited (GWCL)	Environmental & Social team	N/A	Environmental & Social team	Water samples are collected from the plantation and submitted to Ghana Water Company Ltd lab for quality analysis
Used Chemical containers	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana
Plastics (seedling bags, etc)	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana



Used Oil	N/A	JOPONAP Waste	N/A	Environmental &	Waybills issued upon collection from
		Management		Social team	Form Ghana
		Solutions -(Sunyani)			

8.3 Monitoring and Reporting

8.3.1 Performance Indicators

 Table 8.3.1: Performance indicators
 Initial

Performance indicator	Frequency	Actual actions to be implemented	Responsibility for Implementation	Responsibility for Monitoring
Energy Consumption	Daily	Meter reading and recording of figures on monthly basis	Site Engineer	Environmental & Social team
Water Consumption	Daily	Meter reading and recording of figures on monthly basis	Site Engineer	Environmental & Social team
Fuel Consumption	Daily	Use of log book to record issuance of fuel and mileage covered	Asset management Supervisor	Fleet Management Officer
Raw Material Usage	N/A	N/A	N/A	N/A
Chemical Use	Daily	Waybills issued on supply on daily basis	Storekeeper	Chemical Supervisor
Annual Environmental Reporting	Yearly	Annual reports generated	Environmental & Social team	Managing Director



Environmental Management Plan	– Asubima and A	Afrensu- Brohuma Forest Reserves	forests for the future	
Quality of surface water bodies	Biannual	Water Samples submitted to GWCL Lab for quality analysis on biannual basis		Forest Manager
		(Dry season & Rainy season)		
Solid Wastes Generated e.g.	Daily	Waste generated is collected in bins from	Environmental &	Environmental &
Plastics		various collection points into a skip	Social team	Social Manager
		container for disposal by Zoomlion		
		Ghana Limited		



9.0 EMERGENCY PREPAREDNESS AND RESPONSE/CONTINGENCY PLAN

FORM Ghana has a protocol which outlines the actions to be taken in the case of an emergency. This is Protocol 08 First Aid Procedures & Emergency Evacuation. The protocol makes provisions for first aid training, usage and composition of the first aid kit and handling of accidents.

In addition to the protocol, Form Ghana has put in place emergency control measures such as installation of smoke detectors, creation of assembly point, posting of warning/caution signages on buildings and equipping every vehicle and building with fire extinguishers.

Does company have an emergency Response Plan? Yes No

9.1 Potential hazards and response procedure (eg fire outbreak, flooding, hazardous and flammable materials etc)

,	
Table 9.1: Potential hazards and response proc	cedure

Potential Hazard	Emergency Response	System in place to handle hazard
	procedure	
Conflict	Entry and registration of	Grievance Redress Mechanism (Protocol 7)
	complaint and instant resolution	describe the ways Form Ghana manages
	by the Conflict Resolution	complaints and conflict situations
	Staff.	
Fire outbreak	The fire Rapid Response Team	Fire Prevention and Fighting (Protocol 21)
	moves to the fire scene to	Describes how fires will be prevented and
	extinguish it upon detection by	combated when needed
	the fire detection system in	
	place	
Snakes and	A first aider stabilizes the	First Aid for Envenomation and Rabies
insect bites	victim following the	(Protocol 23) describes the preventative
	instructions in Protocol 23. First	measures as well as the procedures in case of an
	Aid for envenomation and	emergency
	rabies and subsequently	
	reported to the nurse	
Fuel, lubricants	Filling station equipped with	Storage of fuel, lubricants and chemicals
or chemicals	fire extinguishers and buckets	(Protocol 16) describes procedure for the
spillage	of sand to control spillage	purchase, storage and distribution of all fuel and
		chemicals used by Form Ghana.
		Prorocol5 also outlines the responsible use of
		chemical.



9.2 Incidence /Accidents

Procedure for environmental incidence/accidents investigation

- The first Aider reports incidence/accidents to the OHS Officer within 24hours
- The OHS Officer immediately follows up to the accident/accident scene for investigation
- An accident/incident docket is opened for the case
- Recommendations are made to prevent future occurrences of such incidence after investigation

9.3 Information on emergencies during last permit implementation period

Table 9.3: Emergencies recorded over the period

Emergency	Date of	Response action	Remark
	occurrence		
Cut (1)	June 2018	Referred to hospital for treatment.	Referral- Major incident
			Non-referral- Minor incident
Cut (1)	July 2018	Referred to the hospital for treatment	Referral- Major incident
			Non-referral- Minor incident
Cut	August 2018	Cut referred to the hospital and insect	Referral- Major incident
(1), Insect		bite treated at the site clinic	Non-referral- Minor incident
bite (1)			
Insect bite	September	Insect bite treated at the site clinic.	Referral- Major incident
(1)	2018		Non-referral- Minor incident
Cut (4),	October 2018	3 cut cases referred to the hospital. 1	Referral- Major incident
Insect bite		cut and the case of insect bite treated	Non-referral- Minor incident
(1)		at the site clinic	
Cut (1)	November	Referred to the hospital	Referral- Major incident
	2018		Non-referral- Minor incident
Cuts (3)	January 2019	1 case referred and the other 2 cases	Referral- Major incident
		treated at site	Non-referral- Minor incident
Cut (1)	February	Treated at site clinic	Referral- Major incident
	2019		Non-referral- Minor incident
Insect bite	March, 2019	All treated at site clinic	Referral- Major incident
(1), cut (1)			Non-referral- Minor incident
Cut (5)	April, 2019	3 cases treated at site and the other 2	Referral- Major incident
		referred to hospital	Non-referral- Minor incident
insect bite	May 2019	Insect bite treated at site clinic and	Referral- Major incident
(2), 1 case		the snake bite was referred to the	Non-referral- Minor incident
		hospital	



Emergency	Date of occurrence	Response action	Remark
of snake bite			
Insect bite (2), cuts (4)	June 2019	All insect bites and 3 cases of cuts were treated at clinic and one cut cases was referred to the hospital	Referral- Major incident Non-referral- Minor incident
Cut (5), insect bite (2)	July 2019	1 insect bite and 4 cuts treated at site clinic. 1 insect bite and 1 cut referred to hospital	Referral- Major incident Non-referral- Minor incident
Cut (2), insect bite (1)	August 2019	1 case of cut and insect bite treated at site clinic and 1 cut case referred to hospital for treatment	Referral- Major incident Non-referral- Minor incident
Cut (4), insect bite (2)	September 2019	1 case of insect bite and 3 cases of cut treated at site clinic. 1 case of cut and 1 case of insect bite referred to hospital	Referral- Major incident Non-referral- Minor incident
Cut (1), insect bite (1)	October 2019	All cases treated at site clinic	Referral- Major incident Non-referral- Minor incident
Insect bite (2)	November 2019	All treated at site clinic	Referral- Major incident Non-referral- Minor incident
Cut (1)	December 2019	Treated at sit clinic	Referral- Major incident Non-referral- Minor incident
Fracture (2)	January 2020	All referred to the hospital for treatment	Referral- Major incident Non-referral- Minor incident
Cut (2), Sprain (1)	February 2020	2 cases of cut received first aid treatment and sprain referred to hospital.	Referral- Major incident Non-referral- Minor incident
Cut (1), Bruises (3), Insect bite (4)	March 2020	1 Cut and 3 bruises received first aid treatment. 4 insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
Cut (8)	April 2020	6 received first aid and 2 cases referred to hospital for treatment.	Referral- Major incident Non-referral- Minor incident



Emergency	Date of occurrence	Response action	Remark
Cut (5), Insect bite (1)	May 2020	All cases received first aid treatment.	Referral- Major incident Non-referral- Minor incident
Cut (5), Insect bite (7)	June 2020	2 insect bite and 4 cuts received first aid treatment. 5 insect bite and 1 cut received treatment at the site clinic.	Referral- Major incident Non-referral- Minor incident
Cut (6), insect bite (11)	July 2020	9 cases of insect bite and 5 cutsreceived first aid treatment. 1 cut and2 insect bite were treated at the siteclinic.	Referral- Major incident Non-referral- Minor incident
Cut (7), Insect bite (6)	August 2020	6 cases of insect bite received first aid and 3cuts received first aid. 1 cut treated at clinic and 2 cuts 3 referred to hospital.	Referral- Major incident Non-referral- Minor incident
Cut (5), insect bite (2),	September 2020	1 case of insect bite and 3 cuts received first aid treatment. 1 insect bite and 1 cut received treatment at site clinic and 1 cut referred to the hospital.	Referral- Major incident Non-referral- Minor incident
Cut (8), insect bite (4)	October 2020	4 cases of insect bite and 7 cuts received first aid and 1 cut treated at the site clinic.	Referral- Major incident Non-referral- Minor incident
Cut (2), Insect bite (5)	November 2020	All cases treated at site clinic	Referral- Major incident Non-referral- Minor incident
Cut (11), insect bite (1)	December 2020	3 cases of cut received first aid treatment and the rest treated at the site clinic.	Referral- Major incident Non-referral- Minor incident



10.0 COST/BENEFIT OF IMPLEMENTING THE ENVIRONMENTAL MANAGEMENT PLAN

Table 10.0: Costs and benefits of implementation of previous EMP (& or current EMP)

Activity	Benefits	Costs
Biodiversity study	To assess the impact of the Form Ghana's project on biodiversity.	100,000.00
Soil quality analysis	To assess the impact of the project on soil quality. Provides information for effective soil conservation and management practices.	100,000.00
Fire management	To protect lives and property from fires.	281,932.17
Community Development projects (CSR)	To invest in local communities to improve and protect their livelihoods	746,424.24
Weed/pest/diseaseTo manage and prevent damagesManagementpests/weeds and diseases in the plantation		2,651,540.99
Waste Management	To effectively manage waste generation	293,125.32
Training/ Capacity building	To equip employees with the requisite skills and knowledge for effective job execution.	333,933.14
Health and Safety To create a conducive work environment and healthy workforce.		1,779,330.25



11.0 CONCLUSION

As a result of the expiry of the Environmental Protection permit which was issued to Form Ghana in 2016 based on the information published in the Environmental Management Plan December 2016, Form Ghana wishes to apply for a new Permit to enable the company carry out its operational activities. This is in fulfilment of the all the permit conditions and commitment to project specification issued thereafter.

Secondly, an evaluation of environmental performance of previous environmental management plan, actions and permit conditions prove that Form Ghana has implemented the environmental requirement presented in the environmental permit and thus the basis for the renewal of the environmental permit to enable the company carry out its operations in accordance with Environmental Assessment Regulation, 1999 (LI 1652) for forestry sector projects.

As a company, we endeavour to continually improve our environmental performance and prevent pollution of any kind. All employees shall continue to support our environmental goals while we strive to provide clean and environment friendly means of working practices and minimise incident rate.

Based on the presentations and as a statutory requirement, meeting all regulatory requirement for the issuance of a new permit, meeting and followed all conditions in the first-generation Environmental Management Plan we wish to submit a new Environmental Management Plan to enable us execute our project objectives.



REFERENCES

- 1. Abeney, E.A., Darko Obiri, B., Nutakor, E., Oduro, W. and Owusu Boateng, W., 2008. Social and Environmental Impact Assessment of the FORM Agro-forestry Project in Asubima Forest Reserve, Ghana.
- 2. Amponsah-Kwatiah, 1993. The Effects of Changes In Rural Land Use Pattern On Agricultural Development I Rural Ghana. A Case Study of Offinso District: Student Dissertation, KNUST Faculty of Social Sciences, Department of Land Economy and Estate Management.
- 3. Scholten, H., Augustine, A., 2012. Soil reconnaissance mission to Afrensu-Brohuma Forest Reserve in Ghana.



APPENDICES/ATTACHMENTS

Appendix 1: EPA Permit and Schedule to the Permit

Tel: (0302) 664697 / 664698 / 662465
 667524 / 0289673960 / 1 / 2
 Fax: 233 (0302) 662690
 Email: info@epa.gov.gh



Environmental Protection Agency

P. O. Box MB 326 Ministries Post Office Accra, Ghana **Website:** http://www.epa.gov.gh

CF: 62/LG/FO/02
ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL PERMIT
ENVIRONMENTAL ASSESSMENT REGULATION, 1999 L.I.1652
This is to authorize
FORM GHANA LIMITED
To continue operating an existing 3,553 hectare Reforestation project located at Akumadan, within the degraded Asubima and Afrenso Brohuma Forest Reserves in the Offinso North District of the Ashanti Region, as per the attached schedule
Date Issued: AUGUST 15, 2018
Expiry Date: AUGUST 14, 2021
EBENEZER APPAH – SAMPONG DEPUTY EXECUTIVE DIRECTOR/TECHNICAL FOR: Ag. EXECUTIVE DIRECTOR
NB: This Permit is only valid with the Seal of the Environmental Protection Agency.



- Tel: (0302) 664697 / 664698 / 662465 667524 / 0289673960 / 1 / 2
- · Fax: 233 (0302) 662690
- Email: info@epa.gov.gh



Environmental Protection Agency P. O. Box MB 326 Ministries Post Office Accra, Ghana Website: http://www.epa.gov.gh

SCHEDULE TO THE ENVIRONMENTAL PERMIT

1.0	CONTACT PERSON	:	THE MANAGING DIRECTOR
2.0	PROPONENT	:	FORM GHANA LIMITED
3.0	CONTACT	:	+233-0544441440
4.0	REGISTRATION NO.	:	CF: 62
5.0	PERMIT NUMBER	:	CF: 62/LG/FO/02

6.0 ENVIRONMENTAL ASSESSMENT OF AN EXISTING 3,553 HECTARE REFORESTATION PROJECT LOCATED AT AKUMADAN, WITHIN THE DEGRADED ASUBIMA AND AFRENSO BROHUMA FOREST RESERVES - IN THE OFFINSO NORTH DISTRICT OF THE ASHANTI REGION

In pursuance of the Environmental Protection Agency Act 1994, Act 490 (Sections 2 (i) and 12 (I) and the Environmental Assessment Regulations, 1999, L.I. 1652 and on the basis of the information published in the Environmental Management Plan (EMP) March, 2017, this Environmental Permit is issued to **FORM GHANA LIMITED** authorising the company to continue operating the existing 3,553 hectare Reforestation project located at Akumadan, within the degraded Asubima and Afrenso Brohuma Forest Reserves in the Offinso North District of the Ashanti Region.

7.0 CONDITIONS OF PERMIT

7.1 COMMITMENT TO PROJECT SPECIFICATION

- Comply with all project specifications, mitigation, monitoring and other environmental management provisions indicated in the project's Environmental Management Plan (EMP).
- The project involves the following: plantation development and maintenance using the following under listed species:
- Tectona grandis (Teak)
- Mansonia altissima (Mansonia)
- Triplochiton scleroxylon (Wawa)
- Bombax buonopozense (Bombax)
- Erythrophleum ivorensis (Potrodom)
- *Terminalia superba* (Ofram)
- Terminalia ivorensis (Emere)
- Nauclea diderrichii (Kusia)
- Cola gigantea (Watapuo)
- *Albizia ferruginea* (Awiemfosamina)
- Pericopsis elata (Kokrodua)

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Form forests for the future

7.1.2 At least 10% of degraded forest area should be reforested with indigenous tree species.

7.2 Location and Coverage

- i. The project is located at Akumadan, within the degraded Asubima and Afrenso Brohuma Forest Reserves in the Offinso North District, Ashanti Region
- ii. Grid Reference: 7N23, 1W38, 7N27, 2W52
- iii. Land Take: 3,553 hectares
- iv. Labour force of 129

7.3 Pesticide and Chemical Usage

- i. Use only pesticides and chemicals that have been registered with the EPA in accordance with the EPA Act, 1994 (Act 490).
- ii. Ensure that applicators of pesticides and chemicals are trained and licensed in accordance with the EPA Act, 1994 (Act 490).
- iii. Comply with the requirements of the EPA Act, 1994 (Act 490), Part II on Chemicals/Pesticides Management.
- iv. Provide appropriate storage facilities for pesticides and other agrochemicals.
- v. Ensure adequate measures to contain accidental spillage of pesticides and chemicals to avoid contaminated of soil and water.
- vi. Ensure that empty pesticides and chemical containers and packaging materials are managed and disposed off in an environmentally sound manner in accordance with EPA guidelines for disposal of waste chemical containers.
- vii. Keep inventory of quantities of pesticides and agro chemical usage.
- viii. Pesticides should be sprayed during periods when drifts are expected to be minimal.

7.4 Land Preparation and Water Resources Protection

- i. Undertake land preparation and cultivation in such a way to minimise disruption of soil structure and exposure of soil to erosion. Institute appropriate drainage control measures to minimise flooding.
- ii. Comply with the national buffer zone policy by establishing and maintaining the appropriate buffer zone distances along the water bodies traversing the project area.
- iii. Monitor the water quality parameters of the various streams quarterly and include returns in the Annual Environmental Reports. The parameters to be monitored are as indicated in Section 7.8. The preferred sampling times should be close to sunrise and sunset.
- iv. GPS coordinates of the sampling stations/locations should be determined for all sampling sites and reported.

7.5 Solid Waste Management

- i. Explore conversion of solid waste from plant materials into compost for use on the farm.
- ii. Provide garbage bins for solid waste generated to prevent littering.
- iii. Plastic wastes from the plantation should be disposed off at approved disposal points as directed by Offinso North District.
- iv. Disposal of solid waste should be done at Offinso North District approved landfill sites.
- v. Consult the EPA for advice before disposing any expired chemicals.
- vi. In order to prevent soil contamination at the mechanical workshop, all exposed surfaces at the workshop should be concreted.

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Former forests for the future

vii. Over aged trees felled should be used for fuel or composted to be used as soil amendments.

7.6 Health and Safety

- i. Ensure good housekeeping in the office areas and residential camp where applicable
- ii. Field workers handling chemical products must have adequate training on the appropriate use of products.
- iii. Ensure that persons applying pesticides and chemicals undergo periodic medical check-ups.
- iv. Provide appropriate personnel protective clothing/gear such as rubber, gloves, overall, safety boots, hand gloves, etc. to workers.
- v. Provide a well-stocked first aid kit for minor injuries that might occur.
- vi. Adhere to the Health and Safety Action Plan indicated in the project EMP.
- vii. Ensure adequate record keeping and establish an inventory of accidents and disease outbreak and treatment on the farms.
- viii. Workers must undergo medical check-up at least twice a year to assess their health status with respect to operations on the farm.

7.7 Protection of Biodiversity Resources

- i. Implement measures to conserve biodiversity by maintaining vegetation along the various streams in the concession.
- ii. Create conservation areas that act as corridors and avoid harvesting in the corridors.
- iii. Ensure that rare floral identified and indigenous species are retained within the plantation.
- iv. Avoid contiguous harvesting of large areas in order to minimize disruption to landscape.
- v. Foliage should be left on the soil to protect against moisture loss and provide nutrients to the soil.

7.8 Soil and Water Quality Monitoring

- i. Establish an environmental monitoring programme in the adjacent or traversing water bodies to cover the following:
- ii. Water quality: pH, Turbidity, colour, TSS, TDS, Phosphates, Ammonia-Nitrogen, Nitrate-Nitrogen, Nitrite Nitrogen, Potash, Total Coliforms, E. Coli, etc.
- iii. Monitor the nutrient status of the soil in respect of soil organic carbon every year.
- iv. Submit the results of the monitoring as part of Annual Environmental Reports (AER).

7.9 Social Economic Impacts

- i. Ensure that the livelihoods of adjoining communities are not impacted negatively by the project operations.
- ii. Integrate social and environmental agreements/clauses in suppliers' contracts.
- iii. Undertake corporative social responsibility activities in accordance with the company's policy and agreements with the relevant communities.

7.10 Compliance with Mitigation Measures

i. Comply with all the mitigation, monitoring and environmental management commitments made in the Environmental Management Plan (EMP).

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7.11 Compliance with the Factories Offices and Shops Act 1979 (Act 328)

i. Comply with the requirements of the Factories, Offices and Shops Act, 1979 (Act 328). Consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act.

7.12 Compliance with Fire Precaution (Premises) Regulations, 2003 (L.I. 1724)

- i. Provide appropriate fire extinguishers and other requirements as recommended by the Ghana National Fire Service.
- ii. Install fire alarm system and smoke detectors at vulnerable areas to give early warning of any fire outbreak.
- iii. No smoking signs should be posted at areas where flammable solvents and fuel are stored.
- iv. Fire belts or boundary lines should be created to prevent fire from spreading to adjoining areas.

7.13 Comply with Water Resources Commission Act, 1996, (Act 522)

i. Comply with the requirements of the Water Resources Commission Act, 1996, Act 522 and obtain water abstraction Permits.

7.14 Notification of Changes

i. Notify EPA of any changes in the planned development of the project contrary to the specification provided in the project's Environmental Management Plan (EMP).

7.15 Annual Environmental Report

i. Submit Annual Environmental Reports on the company's operations in accordance with Section 25 of L.I 1652. The first report should be submitted by August 15, 2019.

7.16 Permit Awareness

- i. A copy of this Permit shall be displayed prominently on the premises at all times.
- ii. All operations staff at the premises shall be familiar with the conditions of the Permit.

7.17 Renewal of Permit

i. This Permit should be renewed by August 14, 2021 upon submission of a satisfactory Environmental Management Plan (EMP).

7.18 Accessibility to the Site

i. Make all facilities available for inspection and cooperate with EPA officials during Inspections.

7.19 Other Permits

i. Notwithstanding this Permit, the project is further subject to other relevant regulations and Permit s pertaining to the sector and must be observed.

EMP/Form Ghana Limited. Asubima and Afrenso Brohuma Forest Reserves - Offinso North District/ August, 2018 doc

Page 4 of 5



i.

7.20 Permit Transferability and Limitation

- i. This Permit is not transferable. It can be used only for **FORM GHANA LIMITED**'s existing 14,576 hectare Reforestation project located within the degraded Asubima and Afrenso Brohuma Forest Reserves in the Offinso North District of the Ashanti Region.
- ii. This Permit does not cover the company's processing activities. A separate Permit must be obtained for all produce processing operators.

7.21 Revocation, Suspension and Refusal of Permit

- The Agency shall revoke or suspend a Permit issued or shall refuse to renew a Permit where:
 - a) The provisions and conditions of this Permit are not being satisfactorily complied with.
 - b) The continued operation of the project poses a risk to the environment, public health and safety.
 - c) The operations by the proponent have deteriorated below the required standard.
 - d) Different species of plant have been introduced into the farm without approval of the Agency.

7.22 Penalty for Breach of Conditions of Environmental Permit

Providing false information or failure to comply with or observe any or all the Permit conditions above shall:

- a) Attract administrative penalties and or the necessary fines as shall be prescribed by the Agency, in line with the Fees and Charges (Amendment) Instrument 2015, (L.I. 2228).
- b) Attract the necessary sanctions prescribed under Regulation 26 of the Annual Environmental Report 1999, LI 1652.
- c) Render this Environmental Permit invalid.
- d) Lead to the suspension or revocation of this Permit or Prosecution.

EBENEZER APPAH - SAMPONG DEPUTY EXECUTIVE DIRECTOR/TECHNICAL FOR: AG. EXECUTIVE DIRECTOR August 15, 2018 Date Issued

August 14, 2021 Expiry Date

Notification:

The Hon. Minister Ministry of Environment Science Technology and Innovation, Accra The Ag. Executive Secretary, Water Resources Commission, Accra. The District Chief Executive, Offinso North District Assembly, Akumadan. The Regional Director, Environmental Protection Agency, Ashanti Region, Kumasi.

EMP/Form Ghana Limited. Asubima and Afrenso Brohuma Forest Reserves - Offinso North District/ August, 2018 doc

Page 5 of 5



Appendix 2: Water Resources Commission Permit





Appendix 3: Forestry Commission Permit

LUD/ASR/3061/12 FORESTRY COMMISSION DOC NASH-36-11-2012 LAND LEASE FOR ACCESSING DEGRADED FOREST RESERVE LANDS FOR FOREST **PLANTATION DEVELOPMENT** BETWEEN FORESTRY COMMISSION AND **MESSRS FORM GHANA LIMITED**

Page 101 of 269

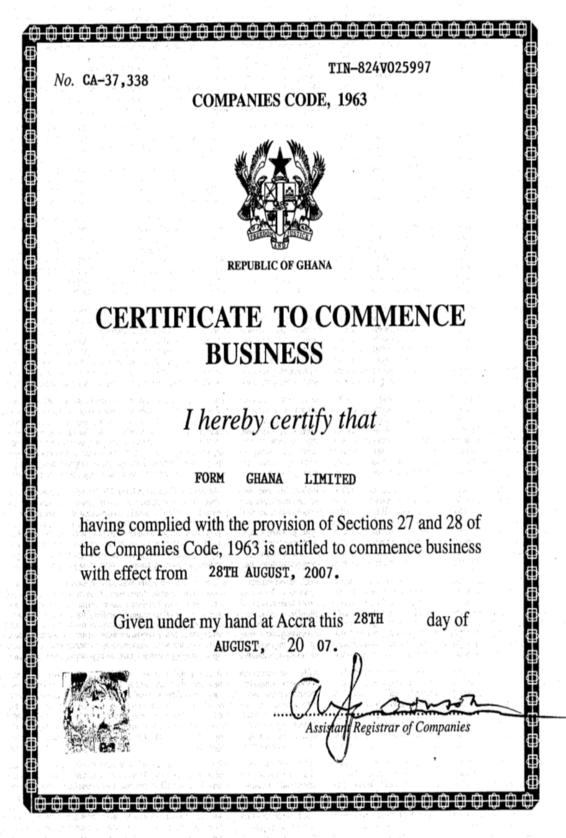


Appendix 4: Certificate of incorporation

N	o. CA-37,338
	W Contraction of the second
	REPORT COLOTIANA
	Certificate of Incorporation
	I hereby certify that the
	FORM GHANA LIMITED
	is this day incorporated under the Companies Code, 1963
	(Act 179) and that the liability of its members is limited.
	Given under my hand and official seal at Victoriaborg, Accra,
	this 24TH day of AUGUST, 20 07.
	Ahoom
	FOR: Registrar of Companies, Ghana

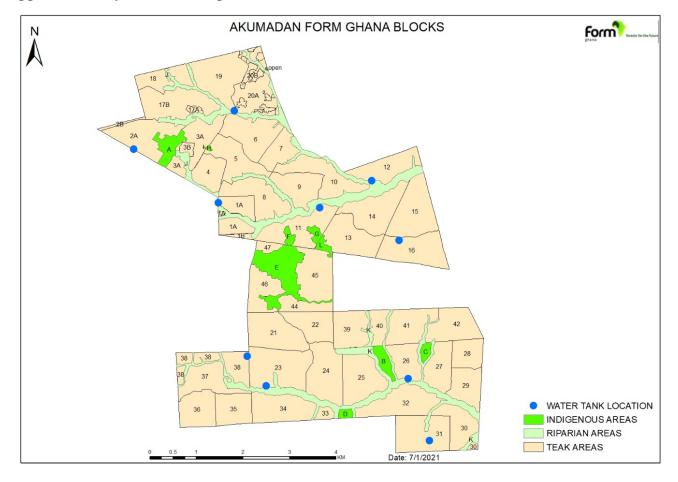


Appendix 5: Certificate to commence business



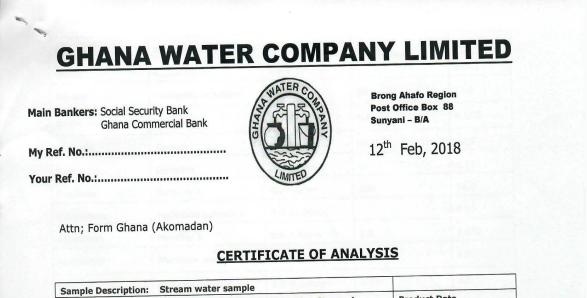


Appendix 6: Layout Plan/Compartment Plan





Appendix 7: Water quality analysis report



Sample Description: Stre	am water sample	
	n Ghana Akomadan(Plantation Stream.)	Product Date
Country of Origin: Gha		Expiry date
Net wt/ volume: -		Batch No.
Packaging Type: Bull		

TEST RESULTS

PHYSICO-CHEMICAL	ANALYSIS:		DATE OF ANALYSIS	. 05/02/2010
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION (EPA)	Stream (2)
Temperature		°C	-	31.9
рН	Electrometric	-	6- 9	6.52
Residual free chlorine	Colorimetric	-	0.0	0.0
Colour	Platinum-cobalt	Pt.Co	0-15	30.0
Turbidity	Nephelometric	FTU	75	7.49
Conductivity	Electrometric	µs/cm		67.0
Total Dissolved Solids	Electrometric	ppm	1000	33.0
Total Hardness	Titrimetric	ppm	500	33.0
Calcium Hardness	Titrimetric	ppm	-	21.0
Dissolved Oxygen	Electrometric	mg/l	5	3.0
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	225.0
Alkalinity	Titrimetric	ppm	-	48.0
Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	126.0

Form forests for the future

Chloride	Argentometric titration	ppm	250	26.0
Nitrite	Diazotization	0.0-0.300ppm	-	0.043
Nitrate	Cadmium reduction	0.0-30ppm	50	11.0
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.0	0.157
Fluoride	Spands	0.0-2.00ppm	10.0	5.22
Iron	FerroVer	0.0-3.00ppm	-	0.311
Sulphate	Sulfaver 4	0.0-70ppm	250	10.0
Manganese	Periodate oxidation	0.0-20.0ppm	-	0.05
Phosphate	PhosVer 3	0.0-2.5ppm	2.0	0.072
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

05/02/2018

PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Stream (2)
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	32.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	6.0	24.0
Total Viable Count	Total plate count	CFU	0-3	70.0

REMARKS:

The source water sample as submitted to the laboratory does satisfy the required Standard for its Chemical parameters but fail the Microbia and is recommended for treatment before domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

REGIONAL W. Q. A. MANAGER GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

Water Quality Assurance Supervisor

(Unity.k. Agudogo)

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (Managing Director), Mr Joseph Obeng- Poku, Mr Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr.Clement Alosebuno Kaba, Dr.Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson.Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT website: www.gwcl.com.gh e-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank

My Ref. No.:..... Your Ref. No.:....



Brong Ahafo Region Post Office Box 88 Sunyani - B/A

12th Feb, 2018

Attn; Form Ghana (Akomadan)

CERTIFICATE OF ANALYSIS

Sample Description:	Stream water sample	7
Brand Name :	Form Ghana Akomadan(Plantation Stream.)	Product Date
Country of Origin:	Ghana	Expiry date
Net wt/ volume:	-	Batch No.
Packaging Type:	Bulk	

TEST RESULTS

PHYSICO-CHEMICAL	ANALYSIS:		DATE OF ANALYSIS	: 05/02/201
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION (EPA)	Stream (1)
Temperature		°C	-	31.5
рН	Electrometric	-	6- 9	6.59
Residual free chlorine	Colorimetric	-	0.0	0.0
Colour	Platinum-cobalt	Pt.Co	0-15	20.0
Turbidity	Nephelometric	FTU	75	4.62
Conductivity	Electrometric	µs/cm	-	48.0
Total Dissolved Solids	Electrometric	ppm	1000	24.0
Total Hardness	Titrimetric	ppm	500	30.0
Calcium Hardness	Titrimetric	ppm	-	22.0
Dissolved Oxygen	Electrometric	mg/l	5	4.0
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	140.0
Alkalinity	Titrimetric	ppm	-	53.0
Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	110.0

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Chloride	Argentometric titration	ppm	250	21.0
Nitrite	Diazotization	0.0-0.300ppm	-	0.037
Nitrate	Cadmium reduction	0.0-30ppm	50	15.0
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.0	0.259
Fluoride	Spands	0.0-2.00ppm	10.0	1.4
Iron	FerroVer	0.0-3.00ppm	-	0.24
Sulphate	Sulfaver 4	0.0-70ppm	250	10.0
Manganese	Periodate oxidation	0.0-20.0ppm	-	0.03
Phosphate	PhosVer 3	0.0-2.5ppm	2.0	0.049
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

05/02/2018

PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Stream (1)
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	20.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	6.0	15.0
Total Viable Count	Total plate count	CFU	0-3	60.0

REMARKS:

The source water sample as submitted to the laboratory does satisfy the required Standard for its Chemical parameters but fail the Microbia and is recommended for treatment before domestic use.

Note: These results are only applicable to the samples submitted to the laboratory. REG:ONAL W. Q. A. MANAGER

GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

Water Quality Assurance Supervisor

(Unity.k. Agudogo)

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (Managing Director), Mr Joseph Obeng- Poku, Mr Michael Ayesu., Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson.Mr. Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT website: www.gwcl.com.gh e-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

12th Feb, 2018

Attn; Form Ghana (Akomadan)

CERTIFICATE OF ANALYSIS

Sample Description:	Borehole water sample	
Brand Name :	Form Ghana Akomadan(Site.) Borehole Water.	Product Date
	Ghana	Expiry date
Country of Origin:		Batch No.
Net wt/ volume:	-	
Packaging Type:	Bulk	

HYSICO-CHEMICAL	ANALYSIS:	for Looky	DATE OF ANALYSIS	: 05/02/2018
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Borehole (Site)
Temperature		°C	-	31.6
рН	Electrometric	-	6.5-8.5	5.39
Residual free chlorine	Colorimetric	-	0.0	0.0
Colour	Platinum-cobalt	Pt.Co	0-15	6.0
Turbidity	Nephelometric	FTU	5	3.02
Conductivity	Electrometric	µ₅/cm	-	38.0
Total Dissolved Solids	Electrometric	ppm	1000	19.0
Total Hardness	Titrimetric	ppm	500	28.0
Calcium Hardness	Titrimetric	ppm	-	17.0
Dissolved Oxygen	Electrometric	mg/l	-	3.8
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	0.0
Alkalinity	Titrimetric	ppm	-	25.0
Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	0.0
Chloride	Argentometric titration	ppm	250	24.0

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Nitrite	Diazotization	0.0-0.300ppm	3.0	0.050
Nitrate	Cadmium reduction	0.0-30ppm	50	1.0
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.239
Fluoride	Spands	0.0-2.00ppm	1.5	0.94
Iron	FerroVer	0.0-3.00ppm	0.3	0.024
Sulphate	Sulfaver 4	0.0-70ppm	250	5.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.012
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.077
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

05/02/2018

PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Borehole
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	3.0
Total Viable Count	Total plate count	CFU	0-3	10.0

REMARKS:

The source water sample as submitted to the laboratory does satisfy the required Standard for its parameters except pH and Microbia .It is recommended for treatment before domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

REGIONAL W. Q. A. MANAGER GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

Water Quality Assurance Supervisor

(Unity.k. Agudogo)

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (Managing Director), Mr Joseph Obeng- Poku, Mr Michael Ayesu., Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba ,Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson.Mr. Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT website: www.gwcl.com.gh e-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

26th June, 2018

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Stream water samples	
Brand Name :	Form Ghana Akumadan Stream Water	Product Date
Country of Origin:	Ghana	Expiry date
Net wt/ volume:	500ml	Batch No.
Packaging Type:		

PHYSICO-CHEMICAL	ANALYSIS:	and the set	DATE	OF ANALYSIS: 2	2/05/2018
PARAMETER	TEST METHOD	METHOD	STANDARD SPECIFICATI	RESULTS	
print proce Court Print Reporter		LIMIT/UNITS	ON (EPA)	Stream (1)	Stream (2)
Temperature		°C	- 10	24.1	24.5
pH	Electrometric	-	6.0- 9.0	6.5	7.15
Dissolved Oxygen	Electrometric	ppm	-	6.0	5.0
COD	Reactor Digestion	ppm	250	5.0	4.0
Turbidity	Nephelometric	FTU	75	17.1	54.0
BOD	Manometric	ppm	50	20.0	30.0
Total Dissolved Solids	Electrometric	ppm	1000	35.0	36.0
Total Hardness	Titrimetric	ppm	500	69.0	93.0
Calcium Hardness	Titrimetric	ppm	-	37.0	64.0
Magnesium Hardness	Titrimetric	ppm	-	32.0	29.0
Alkalinity	Titrimetric	ppm		132.0	97.0
Chloride	Argentometric titration	ppm	250	23.0	20.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.068	0.078
Nitrate	Cadmium reduction	0.0-30ppm	50	1.2	2.3

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Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.0	0.16	0.05
Fluoride	Spands	0.0-2.00ppm	10	1.89	2.70
Iron	FerroVer	0.0-3.00ppm	-	0.17	0.19
Sulphate	Sulfaver 4	0.0-70ppm	250	8.0	7.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.244	0.212
Phosphate	PhosVer 3	0.0-2.5ppm	2.0	0.35	0.25
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.051	0.059
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0023	0.039
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 22/05/2018		
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	
			METHOD DETECTION LIMIT (EPA)	Stream(1)	Stream 2)
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	5.5	6.1
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	3.0	4.0
Total Viable Count	Total plate count	CFU	0-3	50.0	100.0

P/A: PRESENT/ABSENCE

REMARKS: The Stream water samples as submitted to the laboratory do satisfy the required standards for their chemical parameters except that of the Microbiological parameters.

Note: These results are only applicable to the samples submitted to the laboratory.

GHANA WATER CO. LTD. YANI BRONG AHAFO As Water Quality Assurance Manager

{Hadisu Alhassan}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-65552 Telegrams: DIRWAT

Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

26th June, 2018

My Ref. No.:.... Your Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Borehole water sample	
Brand Name :	Form Ghana Akumadan Borehole Water	Product Date
Country of Origin:	Ghana	Expiry date
Net wt/ volume:	500ml	Batch No.
Packaging Type:	Contraction of the second s	

TEST	RESULT	5

PHYSICO-CHEMICAL	ANALYSIS:		DATE	OF ANALYSIS: 22/05/2
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATI ON	RESULTS Borehole (site)
Temperature	Manufacture Plant	°C	-	24.1
pH	Electrometric	-	6.5-8.5	6.5
Dissolved Oxygen	Electrometric	ppm	-	2.3
Colour	Platinum-cobalt	Pt.Co	0-15	5.0
Turbidity	Nephelometric	FTU	5	0.20
Conductivity	Electrometric	µ₅/cm	-	40.0
Total Dissolved Solids	Electrometric	ppm	1000	20.0
Total Hardness	Titrimetric	ppm	500	53.0
Calcium Hardness	Titrimetric	ppm	-	35.0
Magnesium Hardness	Titrimetric	ppm	-	18.0
Alkalinity	Titrimetric	ppm	-	40.0
Chloride	Argentometric titration	ppm	250	28.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.035
Nitrate	Cadmium reduction	0.0-30ppm	50	0.5
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.12

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Fluoride	Spands	0.0-2.00ppm	1.5	0.8
Iron	FerroVer	0.0-3.00ppm	0.3	0.24
Sulphate	Sulfaver 4	0.0-70ppm	250	3.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.149
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.1
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.072
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

MICROBIOLOGICAL	ANALYSIS:	RELEATE OR &	DATE OF ANALY	SIS: 22/05/	
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD	RESULTS	
	Perce Dears Montal	DETECTION LIMIT		Borehole (site)	
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0	
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	0.0	
Total Viable Count	Total plate count	CFU	0-3	0.0	
Pseudomonas	Membrane filter technique	P/A	+/-	-ve	
Clostridium	Membrane filter technique	P/A	+/-	-ve	
Streptococcus	Membrane filter technique	P/A	+/-	-ve	

P/A: PRESENT/ABSENCE

REMARKS: Source water sample as submitted to the laboratory do satisfy the required standards for their parameters and is recommended for domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

HANA WATER CO. LTD. Ag. Water Quality Assurance Manager

{Hadisu Alhassan}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani - B/A

19th March, 2019

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Stream water samples	
Brand Name :	Form Ghana Akumadan Stream Water	Product Date
Country of Origin:	Ghana	Expiry date; 19/03/2020
Net wt/ volume:	500ml	Batch No.
District:	Akumadan	

PHYSICO-CHEMICAL	ANALYSIS:		DATE	OF ANALYSIS: 06	/02/2019
PARAMETER	TEST METHOD	METHOD DETECTION	STANDARD SPECIFICATI	RESULTS	
		LIMIT/UNITS	ON (EPA)	Block 1(64Ha)	Block23
Temperature		°C	-	28.0	27.0
pH	Electrometric	-	6.0- 9.0	7.5	6.8
Dissolved Oxygen	Electrometric	mg/I	-	6.0	5.4
COD	Reactor Digestion	mg/l	250	8.0	5.0
Turbidity	Nephelometric	NTU	75	16.7	7.15
BOD	Manometric	mg/l	50	25.0	28.0
Total Dissolved Solids	Electrometric	mg/l	1000	44.0	39.0
Total Hardness	Titrimetric	mg/l	500	30.0	90.0
Calcium Hardness	Titrimetric	mg/l	-	25.0	72.0
Magnesium Hardness	Titrimetric	mg/l	-	5.0	18.0
Alkalinity	Titrimetric	mg/l	-	130.0	93.0
Chloride	Argentometric titration	mg/l	250	29.0	20.0
Nitrite	Diazotization	mg/l	3.0	0.068	0.077
Nitrate	Cadmium reduction	mg/l	50	1.2	2.2
Ammonia(Nitrogen)	Nessler	mg/l	1.0	0.15	0.05

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Fluoride	Spands	mg/l	10	1.80	2.78
Iron	FerroVer	mg/l	-	0.499	0.35
Sulphate	Sulfaver 4	mg/l	250	5.0	6.0
Manganese	Periodate oxidation	mg/l	0.5	0.030	0.007
Phosphate	PhosVer 3	mg/l	2.0	0.10	0.10
Aluminium	Aluminon method	mg/l	0.2	0.051	0.059
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.006	0.004
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

	TECT METHOD		COFCETTON TION (
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS		
			METHOD DETECTION LIMIT (EPA)	Block 1 (64Ha)	Block(23)	
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	18.0	15.0	
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	4.0	6.0	
Total Viable Count	Total plate count	CFU	0-3	TNC	TNC	

P/A: PRESENT/ABSENCE

REMARKS: The Stream water samples, as submitted to the laboratory, do satisfy the required standards for their chemical parameters except that of the Microbiological parameters.

only applicable to the samples submitted to the laboratory. Note: These resul REGIONAL W. Q. A. MANAGER GHANA WATER CO. LTD. ssurance Manager SUNYANI BRONG AHAFO Ag White

{Hadisu Alhassan}

ard of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku Ar.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

19th March, 2019

Your Ref. No.:....

My Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Borehole water sample	
Brand Name :	Form Ghana Akumadan Borehole Water	Product Date
Country of Origin:	Ghana	Expiry date; 19/03/2020
Net wt/ volume:	500ml	Batch No.
District:	Akumadan	

PHYSICO-CHEMICAL	ANALYSIS:		DATE	OF ANALYSIS: 06/02/	
PARAMETER	TEST METHOD	METHOD DETECTION	STANDARD SPECIFICATI	RESULTS	
		LIMIT/UNITS	ON	Borehole (site)	
Temperature	Membrane Ohio	°C	2.0	31.0	
рН	Electrometric	-	6.5-8.5	6.6	
Dissolved Oxygen	Electrometric	mg/l	-	2.5	
Colour	Platinum-cobalt	Pt.Co	0-15	6.0	
Turbidity	Nephelometric	NTU	5	2.55	
Conductivity	Electrometric	µ₅/cm	-	44.0	
Total Dissolved Solids	Electrometric	mg/l	1000	23.0	
Total Hardness	Titrimetric	mg/l	500	50.0	
Calcium Hardness	Titrimetric	mg/l	-	35.0	
Magnesium Hardness	Titrimetric	mg/l	-	15.0	
Alkalinity	Titrimetric	mg/l	-	40.0	
Chloride	Argentometric titration	mg/l	250	25.0	
Nitrite	Diazotization	mg/l	3.0	0.035	
Nitrate	Cadmium reduction	mg/l	50	0.4	
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.20	

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Fluoride	Spands	mg/I	1.5	0.7
Iron	FerroVer	mg/l	0.3	0.22
Sulphate	Sulfaver 4	mg/l	250	3.0
Manganese	Periodate oxidation	mg/l	0.5	0.140
Phosphate	PhosVer 3	mg/l	0.3	0.25
Aluminium	Aluminon method	mg/l	0.2	0.072
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0

MICROBIOLOGICAL	ANALYSIS:		DATE OF ANALY	SIS: 06/02/2	019
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	
	Net Charle Margar	en forskold Wilder	METHOD DETECTION LIMIT	Borehole (site)	
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	
Total Viable Count	Total plate count	CFU	0-3	0.0	
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	
Clostridium	Membrane filter technique	P/A	0.0	0.0	
Streptococcus	Membrane filter technique	P/A	0.0	0.0	

P/A: PRESENT/ABSENCE

REMARKS: The borehole water sample, as submitted to the laboratory, do satisfy the required standards for their parameters and is recommended for domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

GHANA WATER CO. LTD. SUNYANI BRONG AHAFO ssurance Manager

{Hadisu Alhassan}

Agett

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah

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GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

28th June, 2019

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Stream water samples	
Brand Name :	Form Ghana Akumadan Stream Water	Product Date
Country of Origin:	Ghana	Expiry date; 28/06/2020
Net wt/ volume:	500ml	Batch No.
District:	Akumadan	Per man

PHYSICO-CHEMICAL	ANALYSIS:	A Real and a real of the second s	DATE	OF ANALYSIS: 14	/06/2019
PARAMETER	TEST METHOD	METHOD DETECTION	STANDARD SPECIFICATI ON (EPA)	RESULTS	
		LIMIT/UNITS		Block 1(64Ha)	Block23
Temperature	Lotsi pato Joont	°C	- 7	28.2	28.0
pH	Electrometric	-	6.0- 9.0	7.08	6.99
Dissolved Oxygen	Electrometric	mg/l	-	7.2	6.0
COD	Reactor Digestion	mg/l	250	9.0 *	5.0
Turbidity	Nephelometric	NTU	75	11.40.3	10.32
BOD	Manometric	mg/l	50	30.0	29.0
Total Dissolved Solids	Electrometric	mg/l	1000	24.0 *	30.0
Total Hardness	Titrimetric	mg/l	500	23.0	40.0
Calcium Hardness	Titrimetric	mg/l	a a ser spinet	13.0	28.0
Magnesium Hardness	Titrimetric	mg/l	-Coal 78	10.0	12.0
Alkalinity	Titrimetric	mg/l	-	132.0	130.0
Chloride	Argentometric titration	mg/l	250	22.0	18.0
Nitrite	Diazotization	mg/l	3.0	0.7	0.6

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Nitrate	Cadmium reduction	mg/l	50	2.8	2.2
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.38	0.20
Fluoride	Spands	mg/l	10	1.2	0.76
Iron	FerroVer	mg/l		0.75	1.10
Sulphate	Sulfaver 4	mg/l	250	3.0	3.0
Manganese	Periodate oxidation	mg/l	0.5	0.5	0.4
Phosphate	PhosVer 3	mg/l	2.0	0.20	0.25
Aluminium	Aluminon method	mg/l	0.2	0.050	0.049
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL	ANALYSIS:		DATE OF ANALY	(SIS: 14/0	6/2019
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	
	, Adventuellare		METHOD DETECTION LIMIT (EPA)	Block 1 (64Ha)	Block(23)
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	>18.0	>18.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	>2.2	>2.2
Total Viable Count	Total plate count	CFU	0-3	TNC	TNC

P/A: PRESENT/ABSENCE

REMARKS: The Stream water samples, as submitted to the laboratory, do satisfy the required standards for their chemical parameters except that of the Microbiological parameters.

Note: These results are only applicable to the samples submitted to the laboratory.

0 Regional WOACHINAASCIO, A. MANAGER

{Janet Atebiya} GHANA WATER CO. LTD.

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku "Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr. AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT

Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani - B/A

28th June, 2019

Your Ref. No.:....

My Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Borehole water sample	ANTIN D
Brand Name :	Form Ghana Akumadan Borehole Water	Product Date
Country of Origin:	Ghana	Expiry date; 28/06/2020
Net wt/ volume:	500ml	Batch No.
District:	Akumadan	

	Charles and a second	TEST RESULTS			
PHYSICO-CHEMICAL	ANALYSIS:		DATE OF ANALYS	IS: 14/06/2019	
PARAMETER	TEST METHOD	METHOD DETECTION	STANDARD SPECIFICATI	RESULTS Borehole (site)	
		LIMIT/UNITS	ON		
Temperature	Munitation Star	°C	2.0	27.8	
рН	Electrometric	-	6.5-8.5	6.5	
Dissolved Oxygen	Electrometric	mg/l	-	2.2	
Colour	Platinum-cobalt	Pt.Co	0-15	8.0	
Turbidity	Nephelometric	NTU	5	2.17	
Conductivity	Electrometric	µs/cm	-	33.0	
Total Dissolved Solids	Electrometric	mg/l	1000	17.0	
Total Hardness	Titrimetric	mg/l	500	34.0	
Calcium Hardness	Titrimetric	mg/l	-	25.0	
Magnesium Hardness	Titrimetric	mg/l		9.0	
Alkalinity	Titrimetric	mg/l	-	22.0	
Chloride	Argentometric titration	mg/l	250	17.0	
Nitrite	Diazotization	mg/l	3.0	1.0	
Nitrate	Cadmium reduction	mg/l	50	1.3	
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.30	

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luoride	Spands	mg/l	1.5	0.78
ron	FerroVer	mg/l	0.3	0.05
Sulphate	Sulfaver 4	mg/l	250	2.0
Manganese	Periodate oxidation	mg/l	0.4	0.023
Phosphate	PhosVer 3	mg/l	0.3	0.30
Aluminium	Aluminon method	mg/l	0.2	0.071
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0

MICROBIOLOGICAL	ANALYSIS:	D/	ATE OF ANALYSIS: 14/0	6/2019	
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	
	and an on Adverting	ler Normale Archet	METHOD DETECTION LIMIT	Borehole (site)	
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	
Total Viable Count	Total plate count	CFU	0-3	0.0	
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	
Clostridium	Membrane filter technique	P/A	0.0	0.0	
Streptococcus	Membrane filter technique	P/A	0.0	0.0	

P/A: PRESENT/ABSENCE

REMARKS: The borehole water sample, as submitted to the laboratory, do satisfy the required standards for their parameters and is recommended for domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

RUS A. MANAGER * HALLE Regional WQA-Wallaw WATER CO. LTD. SUNYANI BRONG AMAFO

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah



GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

4th September, 2019

My Ref. No.:..... Your Ref. No.:....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

CERTIFICATE OF ANALYSIS

Sample Description:	Stream water samples	and the second se
Brand Name :	Form Ghana Akumadan Stream Water	Product Date
Country of Origin:	Ghana	Expiry date; 4/09/2020
Net wt/ volume:	500ml	Batch No.
District:	Akumadan	

PHYSICO-CHEMICAL	ANALYSIS:		DATE	OF ANALYSIS: 20	/08/2019	
PARAMETER	TEST METHOD	METHOD DETECTION	STANDARD SPECIFICATI		0/08/2019 Brit 1000	
-		LIMIT/UNITS	ON (EPA)	Block 1(64Ha)	Block23	
Temperature		°C	-	27.8	27.7	
pH	Electrometric		6.0- 9.0	7.36	7.07	
Dissolved Oxygen	Electrometric	mg/l	-	7.4	6.8	
COD	Reactor Digestion	mg/l	250	10.0	8.0	
Turbidity	Nephelometric	NTU	75	12.25	8.46	
BOD	Manometric	mg/l	50	35.0	30.0	
Total Dissolved Solids	Electrometric	mg/l	1000	22.0	24.0	
Total Hardness	Titrimetric	mg/l	500	56.0	57.0	
Calcium Hardness	Titrimetric	mg/l		45.0	44.0	
Magnesium Hardness	Titrimetric	mg/l	-	11.0	13.0	
Alkalinity	Titrimetric	mg/l	-	130.0	132.0	
Chloride	Argentometric titration	mg/l	250	22.0	18.0	
Nitrite	Diazotization	mg/l	3.0	0.8	0.9	
Nitrate	Cadmium reduction	mg/l	50	2.9	2.4	
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.39	0.22	

mg/l Fluoride Spands 10 0.56 0.29 mg/l Iron FerroVer 0.3 0.74 1.10 mg/l Sulphate Sulfaver 4 250 4.0 4.0 mg/l Manganese Periodate oxidation 0.5 0.4 0.3 mg/l Phosphate **PhosVer 3** 2.0 0.20 0.25 mg/l Aluminium Aluminon method 0.2 0.050 0.049 mg/l Cyanide **Pyridine-pyrazalone** 0.07 0.0 0.0 mg/l Arsenic 2822800(EZ arsenic) 0.01 0.0 0.0

MICROBIOLOGICAL	ANALYSIS:		DATE OF ANALY	SIS: 20/0	08/2019	
PARAMETER	TEST METHOD UNIT		SPECIFICATION/	RESULTS		
	-erer afferra -	er stratege	METHOD DETECTION LIMIT (EPA)	Block 1 (64Ha)	Block(23)	
Total Coliform	Multiple tube	MPN Index/ 100mL	9.2	>18.0	>18.0	
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	>2.2	>2.2	
Total Viable Count	Total plate count	CFU	0-3	TNC	TNC	

P/A: PRESENT/ABSENCE

orests for the future

REMARKS: The Stream water samples as submitted to the laboratory, do satisfy the required standards for their chemical parameters except Iron and also Microbiological test failed to meet the standard but not of faecal origin.

Note: These results are only applicable to the samples submitted to the laboratory.

Regional WQA Manager

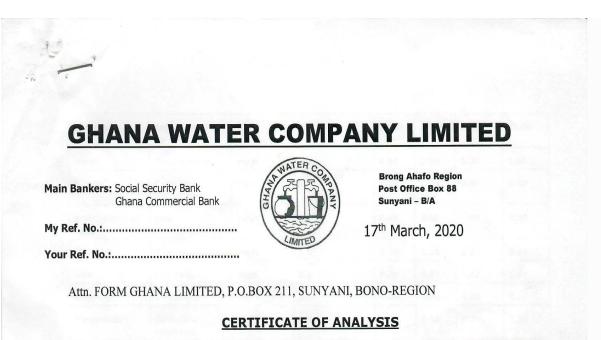
{Janet Atebiya}

CHANA WATER CO. LTD. SUNYANI BRONG AHAFO

oard of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong,

Madam Maria Aba Lovelace-Johnson, Mr. Alexander K. B. Bonney, Mrs. Serena Kwakye-Mintah

Form forests for the future



Sample Description: Borehole	
Brand Name: Form Ghana Boreholes	
Country of Origin: Ghana	Expiry date; 17/02/2021
Name of Community: Aubima/Afrenso (Plantahon)	Batch No.

Т	E	S	Г	R	E	S	U	Ľ	T	S	
LELE	-	1000		-	-	Contraction of the	-		-	-	

PHYSICO-CHEMI	CAL ANALYSIS:			DATE	OF ANA	LYSIS: 17,	/03/2020
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/JNI -TS	GHANA STANDARD SPECIFICATION	RESULTS Asubi- ma (Out)	Asub- ima (In)	Afrenso B. (Out)	Afrenso B. (In)
Temperature		°C	-	29.30	29.20	29.10	29.20
рН	Electrometric	-	6.5-8.5	6.17	6.28	6.24	5.94
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	10.00	8.00	12.00	10.00
Turbidity	Nephelometric	NTU	5	6.86	5.41	8.40	7.48
Conductivity	Electrometric	µ₅/cm	a she is the brigh	72.00	57.00	68.00	105.00
Total Dissolved Solids	Electrometric	mg/l	1000	37.00	29.00	35.00	54.00
Total Hardness	Titrimetric	mg/l	500	35.00	57.00	48.00	83.00
Calcium Hardness	Titrimetric	mg/l		16.00	18.00	14.00	53.00
Magnesium Hardness	Titrimetric	mg/l	-	19.00	39.00	34.00	30.00
Alkalinity	Titrimetric	mg/l	- We felores	23.00	26.00	24.00	23.00

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Chloride	Argentometric titration	mg/l	250	24.00	20.00	19.00	16.00
Nitrite	Diazotization	mg/l	3.0	4.00	3.00	5.00	5.00
Nitrate	Cadmium reduction	mg/l	50	2.20	2.00	2.50	2.80
Ammonia(Nitro gen)	Nessler	mg/l	1.5	0.00	0.00	0.00	0.00
Fluoride	Spands	mg/l	1.5	0.25	0.28	0.13	0.29
Iron	FerroVer	mg/l	0.3	0.86	0.74	1.19	1.47
Sulphate	Sulfaver 4	mg/l	250	6.00	2.00	4.00	8.00
Manganese	Periodate oxidation	mg/l	0.4	0.20	0.10	0.70	0.30
Phosphate	PhosVer 3	mg/l	0.3	0.22	0.16	0.18	0.23
Aluminium	Aluminon method	mg/l	0.2	0.07	0.04	0.01	0.07
Cyanide	Pyridine- pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBIOLO	GICAL ANALYSIS:	DATE OF	ANALYSIS	: 17/03/	2020			
PARAMETER	TEST METHOD	UNIT	SPECIFICATIO -N/ METHOD DETECTION LIMIT	RESULTS				
				Asubi- ma (Out)	Asub- ima (In)	Afrens o B. (Out)	Afrenso B. (In)	
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	>8.0	8.0	4.6	1.1	
E. Coli	Indole Test	Present (P)/Absent(A)	Absent	Absent	Absent	Absent	Absent	

REMARKS: All four samples did not meet the standards for pH, turbidity, Iron and Fecal Coliform. Asubima-Out, Afrenso-Out and Afrenso-In all recorded Nitrite levels above the range. Afrenso-Out also recorded manganese levels above the range. Disinfection, pH correction and Iron removal are recommended for all four water sources. Manganese removal is recommended for Afrenso-Out.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

Regional WQA Manager

{Janet Atebiya}



Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku ,Mr. Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr. AlexanderK.B. Bonney, Mrs. Serena Kwakye-Mintah

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank

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Brong Ahafo Region Post Office Box 88 Sunyani – B/A

1st July, 2020

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date; 19/05/2021
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community:	

PHYSICO-CHEMICAL ANALYSIS: DATE OF ANALYSIS: 19/06/2020 PARAMETER TEST METHOD METHOD GHANA RESULTS DETECTION STANDARD LIMIT/UNITS SPECIFICA-Asubima Asubima Afrenso/ Afrenso/ TION DS US Brohuma Brohuma US DS Temperature °C 29.20 29.20 29.20 29.20 рН Electrometric ... 6.5-9.0 6.70 6.70 6.55 6.52 Colour Platinum-Pt.Co 15.00 35.00 15.00 65.00 cobalt Turbidity Nephelometric NTU 75.0 2.36 4.15 2.01 6.24 Conductivity Electrometric µs/cm 1500.0 70.00 89.00 65.00 58.00 mg/l Total Electrometric 36.00 46.00 33.00 30.00 Dissolved Solids mg/l Total Titrimetric 19.00 72.00 23.00 20.00 Hardness mg/l Calcium Titrimetric 14.00 37.00 11.00 10.00 Hardness mg/l Magnesium Titrimetric 5.00 35.00 12.00 10.00 Hardness mg/l Alkalinity Titrimetric 27.00 38.00 27.00 24.00 mg/l Chloride Argentometric 11.00 9.00 9.00 11.00 titration Nitrite Diazotization mg/l 2.40 1,29 2.01 2.20

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Nitrate	Cadmium reduction	mg/l	14.18	6.20	4.56	5.21	4.56
Ammonia(Nitr ogen)	Nessler	mg/l	1.0	0.30	0.21	0.18	0.07
Fluoride	Spands	mg/l	10.0	0.18	0.00	0.20	0.00
Iron	FerroVer	mg/l		1.92	3.82	1.99	5.24
Sulphate	Sulfaver 4	mg/l	*	8.00	24.00	8.00	31.00
Phosphate	PhosVer 3	mg/l	-	0.22	0.18	0.24	0.20
Aluminium	Aluminon method	mg/l	50 5	0.02	0.15	0.05	0.01
Cyanide	Pyridine- pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBI	OLOGICAL ANALY	SIS:	DATE OF ANALYSIS: 19/06/2020					
PARAME	TEST METHOD	UNIT	SPECIFICATION / METHOD DETECTION LIMIT	RESULTS				
-TER	să mestal			Asubima DS	Asubima US	Afrenso/ Brohuma US	Afrenso/ Brohuma DS	
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL		>8.0	>8.0	>8.0	>8.0	
E. Coli	Indole Test	Present /Absent (P/A)	• (N.R.)	Present	Present	Present	Present	

REMARKS:

Note: These results are only applicable to the sample(s) submitted to the laboratory.

DS Downstream

US Upstream

Regional WQA Manager {Janet Atebiya}

REGIONAL W. Q. A. MANAGER GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku ,Mr. Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr. AlexanderK.B. Bonney, Mrs. Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT

Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh

Form forests for the future

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

1st July, 2020

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE OF ANALYSIS

Sample Description: Borehole	
Country of Origin: Ghana	
Net Volume: 1.5L	Expiry date; 24/05/2021
Name of Community: Site Akumadan	Batch No.

PHYSICO-CHEMICAL ANALYSIS: DATE OF ANALYSIS: 24/06/2020 PARAMETER TEST METHOD METHOD GHANA STANDARD RESULTS DETECTION SPECIFICATION LIMIT/UNITS Site Akumadan Temperature °C -29.20 pH Electrometric -6.5-8.5 6.24 **Residual free** Colorimetric mg/l 0.0 0.00 chlorine Colour Platinum-cobalt Pt.Co 0-15 5.00 Turbidity Nephelometric NTU 5 0.08 Conductivity Electrometric µ₅/cm 2 45.00 Total Dissolved mg/l Electrometric 1000 23.00 Solids **Total Hardness** mg/l Titrimetric 500 19.00 Calcium Hardness mg/l Titrimetric 11.00 mg/l Magnesium Titrimetric 8.00 Hardness mg/l Alkalinity Titrimetric -18.00 mg/l Chloride Argentometric titration 250 7.00 Nitrite Diazotization mg/l 3.0 1.20

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Nitrate	Cadmium reduction	mg/l	50	2.10
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.05
Fluoride	Spands	mg/I	1.5	0.36
Iron	FerroVer	mg/l	0.3	0.08
Sulphate	Sulfaver 4	mg/l	250	0.00
Phosphate	PhosVer 3	mg/l	0.3	0.25
Aluminium	Aluminon method	mg/I	0.2	0.01
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00

MICROBIOLOGIC		DATE OF ANALY	SIS: 24/06/2020		
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD	RESULTS Site	
			DETECTION LIMIT		
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	

REMARKS: The water sample submitted to the laboratory met the standards for all the parameters except pH.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

REGIONAL W. C. A. MANAGER 90 GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

Regional WQA Manager

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku ,Mr. Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr. Alexander K.B. Bonney, Mrs. Serena Kwakye-Mintah

GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank

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Brong Ahafo Region Post Office Box 88 Sunyani – B/A

30th September, 2020

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date; 28/09/2021
Country of Origin: Ghana	-
Net Volume: 1.5L Fach	
Name of Community:	

PHYSICO-CHEN	IICAL ANALYSIS:			D	ATE OF AN	ALYSIS: 28,	/09/2020	
PARAMETER	DETECTION STANDARD	METHOD	GHANA	RESULTS				
		SPECIFICA-	Asubima US	Asubima DS	Afrenso/ Brohuma US	Afrenso/ Brohuma DS		
Temperature	×	°C	я	27.30	27.30	27.30	27.30	
рН	Électrometric		6.0-9.0	6.51	6.37	6.27	6.25	
Colour	Platinum- cobalt	Pt.Co	0-200.00	25.00	20.00	25.00	27.00	
Turbidity	Nephelometric	NTU	0.75.00	37.11	8.12	9.86	14.72	
Conductivity	Electrometric	μ./cm	1500	46.00	42.00	52.00	46.00	
Total Dissolved Solids	Electrometric	mg/l	1000	23.00	22.00	26.00	24.00	
Total Hardness	Titrimetric	mg/l		23.00	21.00	36.00	29.00	
Calcium Hardness	Titrimetric	mg/l	N.	19.00	9.00	30.00	15.00	
Magnesium Hardness	Titrimetric	mg/l		4.00	12.00	6.00	14.00	
Alkalinity	Titrimetric	mg/l	0-150.00	24.00	20.00	45.00	28.00	
Chloride	Argentometric titration	ng/f	U-250.00	10.00	20.00	29.00	18.00	
Nitrate	Diazotization	mg/l		2.60	1.33	2.06	1.89	

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Nitrate		Cadmium		mg/I	0-50.00	8.25	4.00	4.25	3.75
Ammoni: ogen)	i(Nitr	Nessier		rag/1	0-1.00	0.20	0.08	0.13	0.03
Fluoride	1.00	Spands		mg71	0-10.00	0.56	0.60	0.66	0.51
Iron		FerroVer		mg/l		1.49	0.92	1.27	0.89
Sulphate		Sulfaver	4	mg/1		12.50	7.50	37.0	7.50
Phospha	te	PhosVer	3	mg/l	*	3.32	2.90	2.28	3.05
Aluminiu	2014	Aluminon method		mg/l		0.08	0.04	0.036	0.03
Cyanide		Pyridine- pyrazalor		mg/l	0.07	0.01	·0.01	0.01	0.01
Arsenic		2822800 arsenic)	(EZ	mg/l	0.01	0.00	Ö.00	0.00	0.00
MICROBI	OLOGIC	AL ANALY	S15.	Arran and an and a second and a s	no como como a desenvolver necesaria e de sec	DA	TE OF ANAI	YSIS: 28/0	9/2020
PARAME	TEST	AETHOD	UNIT	SPECIFICATION		1.	· · · · · · · · · · · · · · · · · · ·		
-TER					 METHOD DETECTION LIMIT 	Asubima US	Asubima DS	Afrenso/ Brohuma	Afrenso Brohun
Fecal coliform		le tube ntation	MPN 100n	Index/		>8.0	>8.0	US >8.0	DS >8.0
E. Coli	Membi Filter Techni		Press (P/A	ent /Absent }	4 96	Present	Present	Present	Presen
REMARKS.					I			L	1
Note: These Regional (Janet Ala	N (2 X X		RE	Atto)	(s) submitted to t , A. MANASER R CO., L.YO. ING AHAFO	he labot atory.		-	
Anchure Aresu,	Naana M	gri Gewang Johuxan,Mr. Registi	, Hon. I Alexan cred Off	wame Isanna derk.B. Bonney ice: 28 th Febru	n), İng. Dr. Cliffori Amporfo, Mr. Cli Mrs. Serena Kwa, ary Road, (Near In -7 Fax: 233-03)	ement Alosebuno kye-Mintah dependence Sou	(Kaba, Dr. Fe are)	rster Kum-Ani	h Obeng-Po kama Sarpo





Main Bankers: Social Security Bank Ghana Commercial Bank

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For

ghana

My Ref. No.:....

Your Ref. No.:....



Brong Ahafo Region Post Office Box 88 Sunyani - B/A

30th September, 2020

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI. BONO-REGION CERTIFICATE OF ANALYSIS

Sample Description Borehole	
Country of Origint Ghana	
Ner Volume: 1.5L	Expiry date; 28/09/2021
Name of Community: Site Akumadan	Batch No.

and the second	1	EST RESULTS		
PHYSICO-CHEMICAL	ANALYSIS:		DATE OF ANAL	YSIS: 28/09/2020
PARAMETER	TEST METHOD	METHOD	GHANA STANDARD SPECIFICATION	RESULTS
		LIMIT/UNITS	na an annalasa a ser ann an ta ta mhaidh a 2 a sann	Akumadam
Temperature		°C		27.30
рН	Electrometric		6.5-8 5	5.82
Residual free chlorine	Colorimetric	mg/i	0.0	0.00
Colour	Platinum-copplf	PLCo	U-15	7.00
Turbidity	Nepherometric	in Tu	3	0.48
Conductivity	Hectrometric	,µ₀/ĉas		34.00
Total Dissolved Solids	Electrometric	mg/l	1000	17.00
Total Hardness	Titrimetric	mg/i	500	68.00
Calcium Hardness	Titrimetric	mg/I	-	8.00
Magnesium Hardness	Titrimetric	mg/1	•	60.00
Atkalinity	farmetric	mg/l		16.00
Chieride	Arcentimetric titration	ng/i	250	13.00
Nitrite	Diazotization	mg,4	3.0	0.90
Nitrate	Cadmium reduction	mg/1	50	0.25
	and an	An	and a second	and a sugar of the summaries and

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Ammonia(Nitrogen)	Nessler	mg/i	1.5	0.10
Fluoride	Spands	iag/l	1.5	0.62
Iron	FerroVer		0.3	0.12
Sulphate	Sulfaver 4	ng/l	250	0.00
Phosphate	PhosVer 3	mg/l	0.3	1.23
Aluminium .	Aluminon method	mg/i	0.2	0.03
Cyanide	Pyridine-pyrazalone	rsg/l	0.07	0.01
Arsenic	2822800(E2 arsenic)	mg/l	0.01	0.00
	-			

REMARKS: The water sample submitted to the laboratory met the standards for all the parameters except pH and Phosphate. pH correction and Phosphate removal are recommended.

(P/A)

Present/Absent

Absent

Absent

Note: These-results are only applicable to the sample(s) submitted to the laboratory.

Indole Test

CONTRAL W. G. A. MANAGER CHAMA WATER CO. LTD. SUNYANI ERONG ANAFO

Regional WOA Manager

[Janet Atchiva]

E. Coli

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poka "Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twamasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Banney, Mrs.Serena Kwakye-Mintah

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GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

16th December, 2020

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION CERTIFICATE OF ANALYSIS Sample Description: Boreholes Evoiry date: 14

Expiry date; 16/12/2021

PHYSICO-CHEN	ICAL ANALYSIS:			C	ATE OF AN	ALYSIS: 16	/12/2020
PARAMETER	TEST METHOD	METHOD	GHANA	RESULTS			
		DETECTION LIMIT/UNITS	STANDARD SPECIFICA- TION	Asubima US	Asubima DS	Afrenso/ Brohuma US	Afrenso/ Brohuma DS
Temperature	-	°C		29.50	29.60	29.60	29.70
рН	Electrometric		6.0-9.0	5.51	5.54	5.78	5.86
Colour	Platinum- cobalt	Pt.Co	0-200.00	30.00	15.00	15.00	20.00
Turbidity	Nephelometric	NTU	0-75.00	17.47	9.22	9.72	13.96
Conductivity	Electrometric	µs/cm	1500	38.00	38.00	52.00	46.00
Total Dissolved Solids	Electrometric	mg/l	1000	20.00	19.00	26.00	24.00
Total Hardness	Titrimetric	mg/l		22.00	18.00	24.00	14.00
Calcium Hardness	Titrimetric	mg/l		12.00	8.00	8.00	12.00
Magnesium Hardness	Titrimetric	mg/I	-	10.00	10.00	16.00	2.00
Alkalinity	Titrimetric	mg/l	0-150.00	30.00	29.00	39.00	36.00
Chloride	Argentometric titration	mg/l	0-250.00	8.00	18.00	15.00	12.00
Nitrite	Diazotization	mg/l	-	6.00	4.00	3.00	3.00

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Nitrate	Cadmium reduction	mg/l	0-50.00	3.00	1.90	2.50	2.60
Ammonia(Nitr ogen)	Nessler	mg/l	0-1.00	0.20	0.08	0.13	0.03
Fluoride	Spands	mg/l	0-10.00	0.42	0.60	0.66	0.51
Iron	FerroVer	mg/l	-	0.84	0.58	1.07	0.73
Sulphate	Sulfaver 4	mg/l	-	3.00	2.00	3.00	2.00
Phosphate	PhosVer 3	mg/l	-	4.52	2.23	1.83	2.19
Aluminium	Aluminon method	mg/l		0.04	0.05	0.05	0.04
Cyanide	Pyridine- pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBI	DLOGICAL ANALY	515:		DATE OF ANALYSIS: 16/12/2020				
PARAME	TEST METHOD	UNIT	SPECIFICATION		RESULTS			
-TER		. TRET/UNIC	/ METHOD DETECTION LIMIT	Asubima US	Asubima DS	Afrenso/ Brohuma US	Afrenso/ Brohuma DS	
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	-	>8.0	>8.0	>8.0	>8.0	
E. Coli	Membrane Filter Technique	Present /Absent (P/A)	• •	Present	Present	Present	Present	

REMARKS: All four water samples recorded pH values below the standard. Fecal coliform and E-Coli presence was detected in all four samples.

> REGIONAL W. Q. A. MANAGER GHANA WATER CO. LTD.

SUNYANI BRONG AHAFO

Note: These results are only applicable to the sample(s) submitted to the laboratory.

Regional WQA Manager {Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-6655527 Telegrams: DIRWAT

Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh

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GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

16th December, 2020

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION **CERTIFICATE OF ANALYSIS**

Sample Description: Borehole	
Country of Origin: Ghana	
Net Volume: 1.5L	Expiry date; 16/12/2021
Name of Community: Site Akumadan	Batch No.

Phillip Shifest	1	EST RESULTS		61.4
PHYSICO-CHEMICAL	ANALYSIS:		DATE OF ANAL	YSIS: 16/12/2020
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	GHANA STANDARD SPECIFICATION	RESULTS
				Akumadan Site
Temperature		°C	-	29.30
рН	Electrometric	-	6.5-8.5	5.92
Residual free chlorine	Colorimetric	mg/l	0.0	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	5.00
Turbidity	Nephelometric	NTU	5	0.00
Conductivity	Electrometric	µs/cm	-	37.00
Total Dissolved Solids	Electrometric	mg/l	1000	19.00
Total Hardness	Titrimetric	mg/l	500	8.00
Calcium Hardness	Titrimetric	mg/l	-	6.00
Magnesium Hardness	Titrimetric	mg/l		2.00
Alkalinity	Titrimetric	mg/l	-	26.00
Chloride	Argentometric titration	mg/l	250	8.00
Nitrite	Diazotization	mg/l	3.0	0.00
Nitrate	Cadmium reduction	mg/i	50	3.50

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Ammonia(Nitrogen)	Nessler	mg/I	1.5	0.30
Fluoride	Spands	mg/l	1.5	0.41
Iron	FerroVer	mg/l	0.3	0.01
Sulphate	Sulfaver 4	mg/l	250	0.00
Phosphate	PhosVer 3	mg/l	0.3	1.12
Aluminium	Aluminon method	mg/l	0.2	0.07
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00

MICROBIOLOGICA	L ANALYSIS:		DATE OF ANALY	SIS: 15/12/2020	
PARAMETER	TEST METHOD UNIT		SPECIFICATION/ METHOD	RESULTS	
			DETECTION LIMIT		
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	

REMARKS: The water sample as submitted to the laboratory met the standards for all the parameters except, pH and Phosphate.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

REGIONAL DE GUA. MANAGER REGIONAL DE GUA MANAGER REGIONAL DE GUA MANAGER SUNYANI BRONG AHAFO

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (. Managing Director), Mr. Joseph Obeng-Poku ,Mr. Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr. Alexander K. B. Bonney, Mrs. Serena Kwakye-Mintah

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GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank





Brong Ahafo Region Post Office Box 88 Sunyani - B/A

8th April, 2021

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date; 30/02/2022
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community: Berekum	

PHYSICO-CHEMI	CAL ANALYSIS:			DATE OF ANALYS	SIS: 30/03/2021	
PARAMETER	TEST METHOD	METHOD	GHANA STANDARD	RESULTS		
		DETECTION LIMIT/UNITS	SPECIFICATION	Site Berekum	Plantation Bik A24 BK	
Temperature		°C	-	30.40	30.30	
рН	Electrometric	-	6.5-8.5	6.80	6.50	
Residual free chlorine	Colorimetric	mg/I	0.0	0.00	0.00	
Colour	Platinum- cobalt	Pt.Co	0-15	5.00	5.00	
Turbidity	Nephelometric	NTU	5	0.00	0.00	
Conductivity	Electrometric	µ₅/cm	-	199.00	114.00	
Total Dissolved Solids	Electrometric	mg/l	1000	102.00	58.00	
Total Hardness	Titrimetric	mg/l	500	55 00	76.00	
Calcium Hardness	Titrimetric	mg/l	-	42.00	42.00	
Magnesium Hardness	Titrimetric	mg/l	-	13.00	34.00	
Alkalinity	Titrimetric	mg/l	-	90.00	50.00	
Chloride	Argentometric titration	mg/l	250	23.00	15.00	
Nitrite	Diazotization	mg/l	3.0	0.02	0.01	

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Nitrate	Cadmium reduction	mg/l	50	0.70	1.10
Ammonia(Nitro gen)	Nessler	mg/l	1.5	0.00	0.00
Fluoride	Spands	mg/l	1.5	3.74	2.96
Iron	FerroVer	mg/l	0.3	0.07	0.04
Sulphate	Sulfaver 4	mg/l	250	2.00	2.00
Manganese	Periodate oxidation	mg/l	0.4	0.70	1.00
Phosphate	PhosVer 3	mg/I	0.3	7.00	3.95
Aluminium	Aluminon method	mg/l	0.2	0.00	0.01
Cyanide	Pyridine- pyrazalone	mg/l	0.07	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00

MICROBIOLOGI	CAL ANALYSIS:		D	ATE OF ANALYSIS	: 30/03/2021
PARAMETER	TEST METHOD UNIT	UNIT	SPECIFICATION/	RESULTS	
			METHOD DETECTION LIMIT	Site Berekum	Plantation Blk A24 BK
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	<1.1
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	Absent

REMARKS: Both water samples as submitted to the laboratory did not meet the standards for Fluoride, Manganese and Phosphate. Fluoride, Manganese and Phosphate removal are recommended.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

REGIONAL W. Q. A. MANAGER Regional WQA Manager CHANA WATER CO. LTD. (Janet Atebiya)

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (, Managing Director), Mr. Joseph Obeng-Poku ,Mr. Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Prof. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr. Alexander K. B. Bonney, Mrs. Serena Kwakye-Mintah

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GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank

My Ref. No.:....





Brong Ahafo Region Post Office Box 88 Sunyani – B/A

8th April, 2021

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date; 30/02/2022
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community: Berekum	

PHYSICO-CHEMIC	CAL ANALYSIS:			DATE OF ANAL	YSIS: 30/03/2021
PARAMETER	TEST METHOD	METHOD	GHANA STANDARD	RESULTS	
		DETECTION LIMIT/UNITS	SPECIFICATION	Blk B46 Berekum	Blk B11 Berekum
Temperature		°C	÷	30.40	30.30
рН	Electrometric	-	6.5-8.5	7.30	6.80
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00
Colour	Platinum- cobalt	Pt.Co	0-15	5.00	5.00
Turbidity	Nephelometric	NTU	5	0.00	0.00
Conductivity	Electrometric	µ₅/cm	-	243.00	338.00
Total Dissolved Solids	Electrometric	mg/l	1000	88.00	173.00
Total Hardness	Titrimetric	mg/l	500	255.00	377.00
Calcium Hardness	Titrimetric	mg/l	-	96.00	30.00
Magnesium Hardness	Titrimetric	mg/l	-	159.00	347.00
Alkalinity	Titrimetric	mg/l	-	250.00	193.00
Chloride	Argentometric titration	mg/l	250	18.00	18.00
Nitrite	Diazotization	mg/l	3.0	0.02	0.01

0.80 50 mg/l Cadmium Nitrate reduction 0.00 1.5 mg/l Nessler Ammonia(Nitro gen) 1.38 1.5 mg/l Spands Fluoride 0.15 0.3 mg/l FerroVer Iron 4.00 250 mg/l Sulfaver 4 Sulphate

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Manganese	Periodate	mg/l	0.4	1.40	
	oxidation			6.50	6.02
Phosphate	PhosVer 3	mg/l	0.3		0.00
Aluminium	Aluminon method	mg/l	0.2	0.00	
Cyanide	Pyridine- pyrazalone	mg/l	0.07	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00

0.70

0.00

3.24

0.10

4.00

1.10

1.40

	CAL ANALVETS		D	ATE OF ANALYS	IS: 30/03/2021
MICROBIOLOGI	CAL ANALYSIS:		SPECIFICATION/	RESULTS	
PARAMETER TEST METHO	TEST METHOD	UNIT	METHOD DETECTION LIMIT	Blk B46 Berekum	Blk B11 Berekum
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	<1.1
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	Absent

REMARKS: Blk B11 Berekum, did not meet the standards for Fluoride, both samples did not meet the standards for Manganese and Phosphate. Fluoride removal for Blk B11 Berekum, and Manganese and Phosphate removal of both water samples are recommended.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

REGIONAL W. G. A. MANAGER GHANA WATER CO. LTD. Regional WQA Manager SUNYANI BRONG AHAFO

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Prof. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.AlexanderK. B. Bonney, Mrs.Serena Kwakye-Mintah Registered Office: 28th February Road, (Near Independence Square) Telephone: 233-0302-666781-7 Fax: 233-0302-665552 Telegrams: DIRWAT Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh



GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank Ghana Commercial Bank



Brong Ahafo Region Post Office Box 88 Sunyani – B/A

8th April, 2021

My Ref. No.:....

Your Ref. No.:....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

CERTIFICATE	OF ANALYSIS Expiry date; 30/02/2022
Sample Description: Boreholes	
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community: Berekum	

		TEST	RESULTS		
	AL ANALVETS.			DATE OF ANAL	YSIS: 30/03/2021
PHYSICO-CHEMIC			GHANA STANDARD	RESULTS	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	SPECIFICATION	Site Akumadan	Head Office Sunyani
		°C	-	30.40	30.20
Temperature				6.00	7.00
рН	Electrometric	-	6.5-8.5		0.00
Residual free	Colorimetric	mg/l	0.0	0.00	0.00
chlorine Colour	Platinum- cobalt	Pt.Co	0-15	5.00	5.00
	Nephelometric	NTU	5	0.00	0.00
Turbidity			-	38.00	266.00
Conductivity	Electrometric	µ₅/cm		19.00	135.00
Total Dissolved Solids	Electrometric	mg/l	1000	19.00	
	Titrimetric	mg/l	500	135.00	63.00
Total Hardness Calcium	Titrimetric	mg/I	-	20.00	20.00
Hardness Magnesium Hardness	Titrimetric	mg/l	-	115.00	43.00
Alkalinity	Titrimetric	mg/l	-	16.00	55.00
Chloride	Argentometric titration	mg/l	250	7.00	23.00
Nitrite	Diazotization	mg/l	3.0	0.01	0.01

NALVETS

forests for the future

Nitrate	Cadmium	mg/l	50	1.50	1.70
	reduction	mg/l	1.5	0.00	0.00
Ammonia(Nitro gen)			1.5	0.36	3.65
Fluoride	Spands	mg/l	1.5		0.17
	FerroVer	mg/l	0.3	0.09	0.17
Iron	remover		250	4.00	53.00
Sulphate	Sulfaver 4	mg/l	250		1.00
Manganese	Periodate	mg/l	0.4	1.00	1.00
	oxidation			46.13	3.55
Phosphate	PhosVer 3	mg/l	0.3		0.00
Aluminium	Aluminon	mg/l	0.2	0.00	0.00
	method		0.00	0.00	
Cyanide	Pyridine- pyrazalone	mg/l	0.07		
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00

	CAL ANALYSIS:		D	ATE OF ANALYSIS:	30/03/2021
MICROBIOLOGI			SPECIFICATION/	RESULTS	
PARAMETER	TEST METHOD	UNIT	METHOD DETECTION LIMIT	Site Akumadan	Head Office Sunyani
Fecal coliform	Multiple tube	MPN Index/	<1.1	<1.1	<1.1
	fermentation	100mL			Absent
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	Absent

REMARKS: Site Akumadan did not meet the standards for pH, Head Office Sunyani did not meet the standards for Fluoride, both samples did not meet the standards for Manganese and Phosphate. pH correction is recommended for Site Akumadan, Fluoride removal is recommended for Head Office Sunyani, Manganese and Phosphate. PH correction is Phosphate removal are recommended for both water samples.

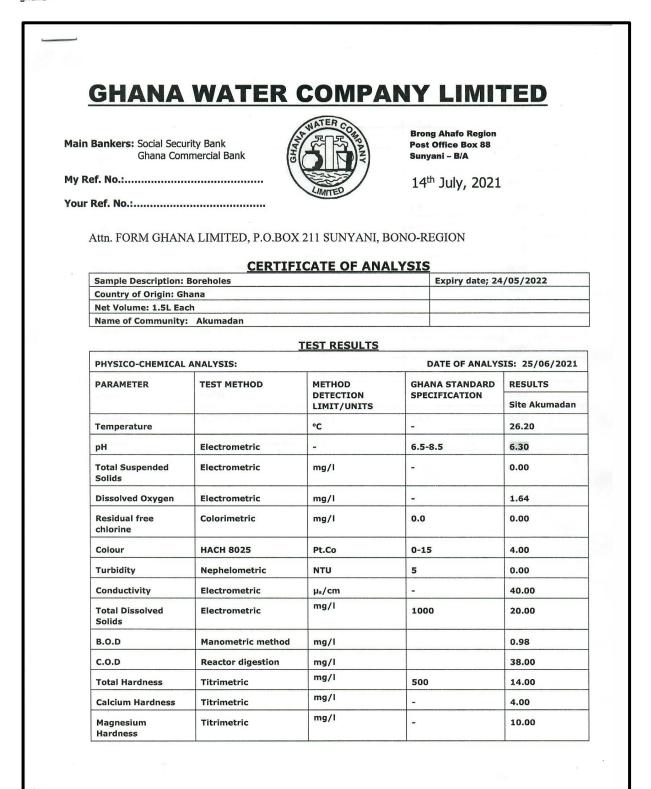
Note: These results are only applicable to the sample(s) submitted to the laboratory.

REGIONAL T. E.A. MANAGER Regional WQA Manager GHANA WATER CO. LTD. SUNYANI BRONG AHAFO

{Janet Atebiya}

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Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh





Alkalinity	Titrimetric	mg/l	-	14.00
Chloride	Argentometric titration	mg/l	250	48.00
Nitrite	HACH 10019	mg/l	3.0	0.00
Nitrate	HACH 8039	mg/l	50	2.80
Ammonia(Nitrogen)	HACH 8038	mg/l	1.5	0.11
Fluoride	HACH 8029	mg/l	1.5	0.33
Calcium	Titrimetric	mg/l		1.60
Magnessium	Titrimetric	Mg/I	-	2.43
Iron	HACH 8008	mg/l	0.3	0.00
Sulphate	HACH 8051	mg/l	250	0.00
Sulphide	HACH 8131	mg/l	-	0.02
Manganese	HACH 8034	mg/l	0.4	0.30
Phosphate	HACH 8190	mg/l	0.3	3.73
Aluminium	HACH 8012	mg/l	0.2	0.00
Copper	HACH 8026	mg/l	-	0.03
Cyanide	HACH 8027	mg/l	0.07	0.00
Arsenic	2822800 (EZ arsenic)	mg/l	0.01	0.00



MICROBIOLOG	ICAL ANALYSIS:		DATE C	OF ANALYSIS	5: 25/06/20
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD	RESULT	S
			DETECTION LIMIT	Site Akı	umadan
Fecal coliform	Indole Test	MPN Index/ 100Ml	<1.1	8.0	
E. Coli	Membrane Filtration	CFU/100ml	0.0	11.0	
Total Coliform	Membrane Filtration	CFU/100ml	0.0	5.0	
Asst. WQA Off {Andrew N. Sa of Directors: Hon Al tichael Ayesu, Naaba	ficer Idique} Iexander k. Afenyo-M a Sigri Gewong, Hon. ze-Johnson,Mr.Alexan Registered Oj	larkin (Chairman) , In Kwame Twumasi Am nderK.B. Bonney, Mrs ffice: 28 th February R	ibmitted to the laboratory. g. Dr.Clifford Braimah (. Managi porfo, Mr. Clement Alosebuno Kab .Serena Kwakye-Mintah oad, (Near Independence Square)	oa, Prof. Forste	Mr.Joseph Obei er Kum-Ankame
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GRAN	IA WAT	ER CO	DMPAN	Y LIN	IITED
Bankers: Socia Ghar	al Security Bank na Commercial Bank	AND	125 3	Brong Ahafo Re Post Office Box Sunyani – B/A	
ef. No.:				14 th July, 2	.021
Ref. No.:					
Attn. FORM C	HANA LIMITED,	P.O.BOX 211	SUNYANI, BON	O-REGION	
	and a second	CERTIFICAT	TE OF ANALYS		to: 24/05/2022
Sample Descri Country of Orig	ption: Boreholes gin: Ghana			Expiry da	te; 24/05/2022
Net Volume: 1					
Name of Comn	nunity: Asubima				
(181.)		TEST	RESULTS		12,20
PHYSICO-CHE	MICAL ANALYSIS:	R107		DATE OF AN	ALYSIS: 25/06/202
PARAMETER	TEST METHOD	METHOD	GHANA	RESULTS	
the select	NACH OS BR	DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Asubima Upstream	Asubima Downstream
Temperature	MACH 50.2	°C		26.30	26.30
рН	Electrometric	-		8.50	7.30
Total Suspended Solids	Electrometric	Mg/l		89.00	50.00
Dissolved Oxygen	Electrometric	Mg/I		6.70	5.78
B.O.D	Colorimetric	mg/l		39.00	41.00
C.O.D	HACH 8025	mg/l		126.00	130.00
Residual free chlorine	Nephelometric	mg/l		0.00	0.00
Colour	Electrometric	Pt.Co		225.00	190.00
Turbidity	Electrometric	NTU		97.00	72.00
Conductivity	Manometric method	µ₅/cm		66.00	50.00
Total Dissolved Solids	Reactor digestion	mg/l		34.00	26.00
Total	Titrimetric	mg/l		30.00	14.00



Calcium Hardness	Titrimetric	mg/I		20.00	12.00
Magnesium Hardness	Titrimetric	mg/l		10.00	2.00
Alkalinity	Titrimetric	mg/l	and the second second	26.00	16.00
Chloride	Argentometric titration	mg/l		26.00	26.00
Nitrite	HACH 10019	mg/l		33.00	15.00
Nitrate	HACH 8039	mg/l	6.0	16.30	9.00
Ammonia(Ni trogen)	HACH 8038	mg/I	0.0	0.26	0.14
Fluoride	HACH 8029	mg/l		0.00	0.02
Calcium	Titrimetric	mg/l		8.00	4.80
Magnessium	Titrimetric	Mg/I		2.43	0.49
Iron	HACH 8008	mg/l		3.04	2.26
Sulphate	HACH 8051	mg/l		12.00	6.00
Sulphide	HACH 8131	mg/l		0.24	0.13
Manganese	HACH 8034	mg/l	The New Demon	4.30	2.50
Phosphate	HACH 8190	mg/l	to a Vest Indepe	9.66	6.78
Aluminium	HACH 8012	mg/l	in 10. E-melt is	1.05	0.18
Copper	HACH 8026	mg/l		0.76	0.40
Cyanide	HACH 8027	mg/l		0.03	0.02
Arsenic	2822800 (EZ arsenic)	mg/l		0.00	0.00

MICROBIOLOG	ICAL ANALYSIS:		1.55	DATE OF ANALY	YSIS: 25/06/20
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	
			METHOD DETECTION LIMIT	Asubima Upstream	Asubima Downstrea
Fecal coliform	Indole Test	MPN Index/ 100mL	<1.1	>8.0	>8.0
E. Coli	Membrane Filtration	CFU/100ml	0.0	574.0	678.0
Total Coliform	Membrane Filtration	CFU/100ml	0.0	912.0	714.0
lichael Ayesu, Naaba	dique} exander k. Afenyo-M. Sigri Gewong, Hon e-Johnson,Mr.Alexan Registered Of, Telephone: 2	Kwame Twumasi Am aderK.B. Bonney, Mr fice: 28 th February I 33-0302-666781-7	ng. Dr.Clifford Braimah (. porfo, Mr. Clement Aloseb s.Serena Kwakye-Mintah Road, (Near Independence Fax: 233-0302-663552 Te m.gh E-mail: info@g	vuno Kaba, Prof. Fo Square) elegrams: DIRWAT	orster Kum-Ankama
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n Bankers: Socia Ghan	al Security Bank na Commercial Bank	CHAN	125 2	Brong Ahafo Reg Post Office Box 8 Sunyani – B/A	
Ref. No.:			3 /	14 th July, 20	021
r Ref. No.:		LIM	ITED	11 2	/
r kei. No					
Attn FORM C	HANA LIMITED,	P.O.BOX 211	SUNYANI. BONG)-REGION	
Aun I Order C	The Diverse ,	1.0.00.1.2.			
	<u></u>	CERTIFICAT	TE OF ANALYS		
	ption: Boreholes			Expiry date	e; 24/05/2022
Country of Orig					
Net Volume: 1.					
Name of Comm	nunity: Afrenso Broh	numa		2.01	3.20
		TEST	RESULTS		
PHYSICO-CHE	MICAL ANALYSIS:			DATE OF AN	ALYSIS: 25/06/2021
PARAMETER	TEST METHOD	METHOD	GHANA	RESULTS	
PARAMETER	TEST METHOD	DETECTION	STANDARD		
5.05893. 	-0471 (179)	LIMIT/UNITS	SPECIFICATION	Afrenso Brohuma Upstream	Afrenso Brohuma Downstream
Temperature		°C		26.30	26.32
pH	Electrometric	-		7.20	7.00
Total Suspended Solids	Electrometric	Mg/I	-	43.00	69.00
Dissolved Oxygen	Electrometric	Mg/I		6.00	7.10
B.O.D	Colorimetric	mg/l		23.00	17.00
C.O.D	HACH 8025	mg/l		71.00	55.00
Residual free chlorine		mg/l		0.00	0.00
Colour	Electrometric	Pt.Co		150.00	300.00
		NTU		63.00	85.00
Turbidity Conductivity	Electrometric Manometric method	μ _s /cm		61.00	58.00
Total Dissolved Solids	Reactor digestion	mg/l	-	31.00	30.00



Total	Titrimetric	mg/l	24.00	15.00
Hardness	Titrimetric	mg/l	20.00	8.00
Hardness Magnesium Hardness	Titrimetric	mg/l	4.00	7.00
Alkalinity	Titrimetric	mg/l	24.00	20.00
Chloride	Argentometric titration	mg/l	34.00	40.00
Nitrite	HACH 10019	mg/l	22.00	33.00
Nitrate	HACH 8039	mg/l	12.50	17.40
Ammonia(Ni trogen)	HACH 8038	mg/l	0.19	0.27
Fluoride	HACH 8029	mg/l	0.06	0.28
Calcium	Titrimetric	mg/l	8.00	3.20
Magnessium	Titrimetric	Mg/I	0.97	1.70
Iron	HACH 8008	mg/l	2.80	3.20
Sulphate	HACH 8051	mg/l	8.00	13.00
Sulphide	HACH 8131	mg/l	0.13	0.22
Manganese	HACH 8034	mg/l	2.80	3.60
Phosphate	HACH 8190	mg/l	8.96	10.17
Aluminium	HACH 8012	mg/l	0.68	0.41
Copper	HACH 8026	mg/l	0.45	0.09
Cyanide	HACH 8027	mg/l	0.02	0.03
Arsenic	2822800 (EZ arsenic)	mg/l	0.00	0.00



MICROBIOLOG	ICAL ANALYSIS:			DATE OF ANAL	YSIS: 25/06/202
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/	RESULTS	1313. 23/00/202
- ¹ , 5.,			METHOD DETECTION LIMIT	Asubima Upstream	Asubima Downstream
Fecal coliform	Indole Test	MPN Index/ 100mL	<1.1	>8.0	>8.0
E. Coli	Membrane Filtration	CFU/100ml	0.0	TNTC	803.0
Total Coliform	Membrane Filtration	CFU/100ml	0.0	504.0	302.0
{Andrew N. Sa	dique}				
of Directors: Hon Al ichael Ayesu , Naaba	lexander k. Afenyo-M I Sigri Gewong, Hon. :e-Johnson,Mr.Alexai Registered Oj Telephone: 2	Kwame Twumasi Am nderK.B. Bonney, Mr. fice: 28 th February K 233-0302-666781-7	ng. Dr. Clifford Braimah (. porfo, Mr. Clement Aloseb s.Serena Kwakye-Mintah toad, (Near Independence Fax: 233-0302-663552 Te ada E-mailt, info@aa	ouno Kaba, Prof. Fo Square) elegrams: DIRWAT	orster Kum-Ankama S
of Directors: Hon Al ichael Ayesu , Naaba	lexander k. Afenyo-M I Sigri Gewong, Hon. :e-Johnson,Mr.Alexai Registered Oj Telephone: 2	Kwame Twumasi Am nderK.B. Bonney, Mr. fice: 28 th February K 233-0302-666781-7	porfo, Mr. Clement Aloseb s.Serena Kwakye-Mintah load. (Near Independence .	ouno Kaba, Prof. Fo Square) elegrams: DIRWAT	orster Kum-Ankama S
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of Directors: Hon Al ichael Ayesu , Naaba n Maria Aba Lovelac	lexander k. Afenyo-M ı Sigri Gewong, Hon. te-Johnson,Mr.Alexan Registered Oj Telephone: 2 <u>Webs</u> i	Kwame Twumasi Am IderK.B. Bonney, Mr. Jice: 28 th February k 133-0302-666781-7 te: www.gwcl.co l	porfo, Mr. Clement Aloseb s.Serena Kwakye-Mintah Road, (Near Independence Fax: 233-0302-663552 Te	uno Kaba, Prof. Fo Square) elegrams: DIRWAT wcl.com.gh	orster Kum-Ankama S

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in B		l Security Bank a Commercial Bar	nk Ik	ATER COMBO		afo Region ce Box 88 - B/A	
Ref			14	LINATED	7	ıly, 2021	
ur R	ef. No.:						
A	ttn. FORM G	HANA LIMITE	D, P.O.BOX 2	11 SUNYANI, BC	NO-REGI	ON	
			CERTIFIC	ATE OF ANAL	YSIS		1.8.39
	Sample Descrip	otion: Boreholes			Ex	biry date; 24/05	/2022
	Country of Orig						
-	Net Volume: 1.				- C		no ministra de la com
	Name of Comm	unity: Berekum			2100		
			TE	ST RESULTS	- 11	1 en 100	2.2.45
1	PHYSICO-CHEN	MICAL ANALYSIS:			DATI	OF ANALYSIS:	25/06/202
	PARAMETER	TEST METHOD	METHOD	GHANA	RESULTS		
	and the second		DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Plantation		Plantatio
					BLK A24	BLK B11	B46
	Temperature		°C	-	27.80	27.70	27.90
	рН	Electrometric	-	6.5-8.5	6.50	7.00	7.50
	Total Suspended Solids	Electrometric	mg/l	-	2.00	2.00	2.00
	Dissolved Oxygen	Electrometric	Mg/I		1.0	1.40	0.98
	Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00
	Colour	HACH 8025	Pt.Co	0-15	3.00	3.00	3.00
	Turbidity	Nephelometric	NTU	5	0.00	0.00	0.00
	Conductivity	Electrometric	µ₅/cm	-	120.00	33.00	452.00
	Total Dissolved Solids	Electrometric	mg/l	1000	61.00	170.00	231.00
	B.O.D	Manometric method	mg/l	-	0.20	1.50	1.00
	C.O.D	Reactor digestion	mg/l		0.0	5.80	3.60



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Total Hardness	Titrimetric	mg/l	500	34.00	124.00	130.00
Calcium Hardness	Titrimetric	mg/l	-	60.00	36.00	72.00
Magnesium Hardness	Titrimetric	mg/l	-	34.00	88.00	58.00
Alkalinity	Titrimetric	mg/l	-	52.00	174.00	216.00
Chloride	Argentometric titration	mg/l	250	34.00	124.00	130.00
Nitrite	HACH 10019	mg/l	3.0	0.00	1.00	0.00
Nitrate	HACH 8039	mg/l	50	1.70	2.70	2.20
Ammonia(Ni trogen)	HACH 8038	mg/l	1.5	0.18	0.20	0.15
Fluoride	HACH 8029	mg/l	1.5	0.00	0.00	0.00
Calcium	Titrimetric	mg/l		24.00	14.40	28.80
Magnessium	Titrimetric	Mg/I	-	8.26	21.38	14.09
Iron	HACH 8008	mg/l	0.3	0.09	0.07	0.10
Sulphate	HACH 8051	mg/l	250	0.00	0.00	0.00
Sulphide	HACH 8131	mg/l	-	0.00	0.00	0.00
Manganese	HACH 8034	mg/l	0.4	0.70	0.50	1.10
Phosphate	HACH 8190	mg/l	0.3	4.99	8.38	6.08
Aluminium	HACH 8012	mg/l	0.2	0.63	0.27	0.74
Copper	HACH 8026	mg/l	-	0.02	0.05	0.04
Cyanide	HACH 8027	mg/l	0.07	0.01	0.00	0.01
Arsenic	2822800 (EZ	mg/l	0.01	0.00	0.00	0.00



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MICROBIOLO	GICAL ANALYS	IS:	1050 B	DATE OF	ANALYSIS: 2	5/06/2021
PARAMETER	TEST	UNIT	SPECIFICATION/	RESULTS	والمريد والمريد	
	METHOD	83. x	METHOD DETECTION LIMIT	Plantation BLK A24	Plantation BLK B11	Plantatio B46
Fecal coliform	Indole Test	MPN Index/ 100mL	<1.1	1.1	4.6	1.1
E. Coli	Membrane Filtration	CFU/100ml	0.0	5.0	18.0	8.0
Total Coliform	Membrane Filtration	CFU/100ml	0.0	3.0	12.0	23.0
chaol Avesu Na	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	man), Ing. Dr.Clifford Bra masi Amporfo, Mr. Clement Iney, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	oseph Obeng um-Ankama S
{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement ney, Mrs.Serena Kwakye-M bruary Road. (Near Indeper	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng un-Ankama .
{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng um-Ankama S
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{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng um-Ankama i
{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng um-Ankama 3
{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng um-Ankama S
{Andrew N.	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe none: 233-0302-666	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah ndence Square) 3552 Telegrams:	n, Prof. Forster Ki DIRWAT	loseph Obeng ım-Ankama :
{Andrew N. : of Directors: Hon fichael Ayesu , Nau m Maria Aba Love	Sadique} Alexander k. Afer tha Sigri Gewong, lace-Johnson,Mr. Registe Tolenk	Hon. Kwame Twu AlexanderK.B. Bon red Office: 28 th Fe. ione: 233-0302-666 Nebsite: www.g	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba fintah 3552 Telegrams: nfo@gwcl.com	, Proj. Porster Ki DIRWAT Lgh	im-Ankama ;
{Andrew N. : of Directors: Hon lichael Ayesu , Nau n Maria Aba Love	Sadique} Alexander k. Afeti tha Sigri Gewong, lace-Johnson,Mr. Registe Teleph	Hon. Kwame Twu AlexanderK.B. Bon read Office: 28 th Fe tone: 233-0302-666 Nebsite: www.g	masi Amporfo, Mr. Clement mey, Mrs.Serena Kwakye-M bruary Road, (Near Indeper 781-7 Fax: 233-0302-66.	Alosebuno Kaba lintah 3552 Telegrams: 3fo@gwcl.com	, Proj. Porster Ki DIRWAT .gh	Im-Ankama :

	WAIER	COMPA	NY LIMI	ГED
¢		WATER COL	Brong Ahafo Region	
n Bankers: Social Secu Ghana Con	urity Bank nmercial Bank		Post Office Box 88 Sunyani – B/A	
Ref. No.:		LIMITED	14 th July, 2021	
r Ref. No.:				
Attn. FORM GHAN	IA LIMITED, P.O.BOX	211 SUNYANI, B	ONO-REGION	
	<u>CERTIF</u>	CATE OF ANA	LYSIS	- No. of Long
Sample Description:	Boreholes		Expiry date; 24	/05/2022
Country of Origin: Gl Net Volume: 1.5L Ea				4.67
Name of Community	and the second			
		TEST RESULTS		
PHYSICO-CHEMICAL			DATE OF ANALYS	SIS: 25/06/202
PARAMETER	TEST METHOD	METHOD DETECTION	GHANA STANDARD SPECIFICATION	RESULTS
		LIMIT/UNITS		Site Berekum
Temperature		°C	-	27.80
рН	Electrometric	-	6.5-8.5	6.70
Total Suspended Solids	Electrometric	mg/l	-	2.0
Dissolved Oxygen	Electrometric	mg/l	-	4.20
Residual free chlorine	Colorimetric	mg/l	0.0	0.00
Colour	HACH 8025	Pt.Co	0-15	3.00
Turbidity	Nephelometric	NTU	5	0.00
Conductivity	Electrometric	µ₅/cm	-	195.00
Total Dissolved Solids	Electrometric	mg/l	1000	100.00
B.O.D 5-Day 20 °C	Manometric method	mg/l	-	1.56
C.O.D	Reactor digestion	mg/l	-	6.20
Total Hardness	Titrimetric	mg/l	500	54.00
Calcium Hardness	Titrimetric	mg/l	-	12.00
Magnesium Hardness	Titrimetric	mg/l	-	24.00

Alkalinity	Titrimetric	mg/l	-	74.00
Chloride	Argentometric titration	mg/l	250	76.00
Nitrite	HACH 10019	mg/l	3.0	0.00
Nitrate	HACH 8039	mg/l	50	3.40
Ammonia(Nitrogen)	HACH 8038	mg/l	1.5	0.22
Fluoride	HACH 8029	mg/l	1.5	0.00
Calcium	Titrimetric	mg/l	-	12.00
Magnessium	Titrimetric	Mg/I	-	5.83
Iron	HACH 8008	mg/l	0.3	0.06
Sulphate	HACH 8051	mg/l	250	0.00
Sulphide	HACH 8131	mg/l	in the second	0.02
Manganese	HACH 8034	mg/l	0.4	0.60
Phosphate	HACH 8190	mg/l	0.3	9.89
Aluminium	HACH 8012	mg/l	0.2	0.00
Copper	HACH 8026	mg/l		0.05
Cyanide	HACH 8027	mg/l	0.07	0.02
Arsenic	2822800 (EZ arsenic)	mg/l	0.01	0.00

MICROBIOLOG	ICAL ANALYSIS:			DATE OF	ANALYSIS	5: 25/06	/2
PARAMETER	TEST METHOD	UNIT	SPECIFICATIO		RESULT	s	_
			DETECTION L	IMIT	Site Ber	ekum	-
Fecal coliform	Indole Test	MPN Index/ 100mL	<1.1	i Pole	4.6		
E. Coli	Membrane Filtration	CFU/100ml	0.0		6.0		
Total Coliform	Membrane Filtration	CFU/100ml	0.0	11	14.0		-
lichael Ayesu , Naaba	dique} exander k. Afenyo-M Sigri Gewong, Hon. e-Johnson,Mr.Alexan Registered Oj Telephone: 2	Kwame Twumasi An nderK.B. Bonney, Mi fice: 28 th February 233-0302-666781-7	nporfo, Mr. Clement A rs.Serena Kwakye-Mi Road, (Near Independ Fax: 233-0302-663:	Alosebuno Kaba, intah dence Square) 552 Telegrams: D	Prof. Forste	Mr.Joseph er Kum-Ank	0 ka
{Andrew N. Sa of Directors: Hon An ichael Ayesu, Naaba	dique} exander k. Afenyo-M Sigri Gewong, Hon. e-Johnson,Mr.Alexan Registered Oj Telephone: 2	Kwame Twumasi An nderK.B. Bonney, Mi fice: 28 th February 233-0302-666781-7	porfo, Mr. Clement 2 rs.Serena Kwakye-Mi Road, (Near Independ	Alosebuno Kaba, intah dence Square) 552 Telegrams: D	Prof. Forste	Mr.Joseph er Kum-Ank	-O ta
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{Andrew N. Sa of Directors: Hon A. ichael Ayesu , Naaba n Maria Aba Lovelad	dique} exander k. Afenyo-M Sigri Gewong, Hon. e-Johnson,Mr.Alexan Registered OJ Telephone: 2 Websi	Kwame Twumasi An nderK.B. Bonney, Mi fice: 28 th February 133-0302-66781-7 ite: www.gwcl.co	porfo, Mr. Clement A s.Serena Kwakye-Mi Road, (Near Indepent Fax: 233-0302-663: m.gh E-mail: int	Alosebuno Kaba, intah dence Square) 552 Telegrams: D fo@gwcl.com.g	Prof. Forste IRWAT ph	r Kum-Ank	ke



Appendix 8: MSDS of chemicals

MSDS – Sunphosate 757SG

Wynca	WYNCA SUNSHINE AGRIC PRODUCTS & TRADING CO. LTD
	ADD: BLOCK 2A, PLOT NO.10, DADEBAN ROAD, NORTH INDUSTRIAL AREA, ACCRA, GHANA. P.O.BOX: CT1883 ACCRA
SUNSHINE®	FAX: 0302-221132 TEL: 0302-221132
	SUNPHOSATE GRANULAR 757SG
<u>P</u>	PRODUCT USAGE AND SAFETY PRECAUTIONARY MEASURES
WARNING	;
• Read	l label first before using product
PRECAUT	ION
AvoiWeaDo nDo n	tot eat, drink or smoke when handling the product. Id contact with eyes or skin r suitable protective clothing\keep product away from food, feed and drinks. Not contaminate any water body with left over spray solution to use empty containers, punch and destroy them. h hands, face and change clothes after use.
FIRST AID	•
If inIf on	medical aid immediately EYES, flush eyes with plenty of water for 15 minutes. SKIN, wash skin thoroughly with soap and plenty of water for 15 minutes. VALLOWED, immediately dilute by drinking milk or water.
ANTIDOTI	Ε
• No s	pecial antidote.
CAUTION	
• Safel	ly keep out of reach of children.
GENERAL	INFORMATION
abso • It is • SUN	PHOSATE-G is a systemic, non-selective foliar herbicide which when applied is rbed by the green parts of the plan. It translocates into the plant and kills it entirely. used in forestry, tree crops and the control of aquatic weeds. PHOSATE-G has no residual soil activity and it is used in "zero tillage" in maize uction.
DIRECTIO	N FOR USE
	y product on active growing weed. ot apply product if rain threatens



Wynca	WYNCA SUNSHINE AGRIC PRODUCTS & TRADING CO. LTD
	ADD: BLOCK 2A, PLOT NO.10, DADEBAN ROAD, NORTH INDUSTRIAL AREA, ACCRA, GHANA. P.O.BOX: CT1883 ACCRA
SUNSHINE®	FAX: 0302-221132 TEL: 0302-221132
• Spray EQUIPMEN	with knapsack or mounted boom sprayers.
10000ImperaDo noWater density	f application for annual grasses with the height of $30 \text{ cm} - \text{apply } 2.25 \text{ kg/ha}$ to cover m^2 , For perennial grasses – apply 3 kg/ha . For sedges and other difficult weeds e.g. ata sp etc. Apply 4 kg/ha . t enter field 7 hours after spray volume: Apply $450 - 600$ litres of water per hectare depending on the weed y. trapsack sprayers. Apply $50\text{ g} - 80$ g in $15 - 16$ litres of water.



MSDS – Glyphader

CHEMICAL PRO SUPPLIED BY : PRODUCT : CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC COMPOSITION/ Act GLY Oth	83-85 Bouleva 75013 Paris - TEL. +33 1 FAX. +33 1 Glyphosate Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P	INTERNATIONAL ard Vincent Auriol FRANCE 44 06 53 00 44 06 54 66 Granule (SG) 0 g/Kg a.e. = 757 g/Kg Ammonium onic ; Glycine derivative/ Herbicide	salt of Glyphosate	Page 1 /
SUPPLIED BY : PRODUCT : CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC COMPOSITION	SCPA SIVEX 83-85 Bouleva 75013 Paris - TEL. +33 1 FAX. +33 1 Glyphosate Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P DNYMS: IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	INTERNATIONAL ard Vincent Auriol FRANCE 44 06 53 00 44 06 54 66 Granule (SG) 0 g/Kg a.e. = 757 g/Kg Ammonium nic ; Glycine derivative/ Herbicide esphonomethyl) glycine	salt of Glyphosate	
SUPPLIED BY : PRODUCT : CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC COMPOSITION	SCPA SIVEX 83-85 Bouleva 75013 Paris - TEL. +33 1 FAX. +33 1 Glyphosate Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P DNYMS: IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	INTERNATIONAL ard Vincent Auriol FRANCE 44 06 53 00 44 06 54 66 Granule (SG) 0 g/Kg a.e. = 757 g/Kg Ammonium nic ; Glycine derivative/ Herbicide esphonomethyl) glycine	salt of Glyphosate	
PRODUCT : CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC CHEMICAL S	83-85 Bouleva 75013 Paris - TEL. +33 1 FAX. +33 1 Glyphosate Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P DNYMS: IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	ard Vincent Auriol FRANCE 44 06 53 00 44 06 54 66 Granule (SG) 0 g/Kg a.e. = 757 g/Kg Ammonium nic ; Glycine derivative/ Herbicide esphonomethyl) glycine	salt of Glyphosate	
CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC COMPOSITION	FAX. +33 1 Glyphosate IRE Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P INYMS: IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	44 06 54 66 Granule (SG) 0 g/Kg a.e. = 757 g/Kg Ammonium onic ; Glycine derivative/ Herbicide osphonomethyl) glycine	salt of Glyphosate	
CHEMICAL NATU CHEMICAL FAMIL FORMULA: CHEMICAL SYNC COMPOSITION	IRE Water Soluble Glyphosate 68 LY/USE: Aminophospho C ₃ H ₈ N O ₅ P INPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	0 g/Kg a.e. = 757 g/Kg Ammonium nic ; Glycine derivative/ Herbicide osphonomethyl) glycine	salt of Glyphosate	
	Glyphosate 68 Aminophospho C ₃ H ₈ N O ₅ P IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	0 g/Kg a.e. = 757 g/Kg Ammonium nic ; Glycine derivative/ Herbicide osphonomethyl) glycine	salt of Glyphosate	
FORMULA: CHEMICAL SYNC COMPOSITION Act GLY	C ₃ H ₈ N O ₅ P NYMS: IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	sphonomethyl) glycine		
	IUPAC: N-(pho INFORMATION ON INGREDIEN Ingredients ive Ingredient:	ITS		
Act GLY	Ingredients ive Ingredient:			
Act GLY Oth	Ingredients ive Ingredient:			
GLY Oth	ive Ingredient:	Content		
GLY Oth			CAS NO	
		m : 75.7 % w/w min	1071-83-6	
ingr	ter ingredients: factant and formulating edients. ium sulphite	24.3 % w/w 0.5 % w/w max		
300		0.0 // 1/1/1/1/1/		
EFFECTS OF ACU INGESTION: SKIN CONTACT:	TE EXPOSURE: Harmful if swallowed. M muscle weakness, and m May cause slight transie abdominal pain, decreasi	nt irritation. Overexposure by skin ed blood pressure, muscle weakne	dominal pain, decreased bl a absorption may cause nau ess, and muscle spasms.	usea, vomiting
INHALATION: EYE CONTACT:	respiratory irritation and s Causes severe eye irrita	may be moderately toxic. Vap symptoms similar to those from ing tion including corneal opacity and d mist can cause irritation.	estion.	
Skin exposure may	IONS AGGRAVATED: aggravate preexisting skin condi ay aggravate preexisting respira	itions. tory conditions.		
	ES OF EXPOSURE: bsorption. Inhalation. Oral.			
CHRONIC EFFECT No effect	S/CARCINOGENICITY:			
REPRODUCTIVE 1 No effect	TOXICITY:			
SENOTOXICITY: No				
TOXICOLOGICALI NA. DTHER: None known.	Y SYNERGISTIC MATERIALS			
. FIRST AID MEA	SURES			

Form forests for the future

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	Page 2 / 4
MATERIAL SAFET	T DATA SHEET
INGESTION:	Never give anything by mouth to an unconscious person. Get medical attention and show the product label.
SKIN:	In case of contact, remove contaminated clothing and wash skin thoroughly with soap and water.
INHALATION:	If inhaled, remove to fresh air and get medical attention or contact a Poison Control Centre.
EYES:	For eye contact, flush with plenty of water for at least 15 minutes. Get immediate medical attention.
NOTE TO PHYSICIAN:	Symptomatic treatment.

Date created : 15/05/07

5. FIRE FIGHTING MEASURES

FLASH POINT:	No object
CONDITIONS OF FLAMMABILITY:	No Flammable
FLAMMABLE LIMITS IN AIR - Upper (%)	NA.
FLAMMABLE LIMITS IN AIR - Lower (%):	NA.
AUTOIGNITION TEMPERATURE:	NA.
SENSITIVITY TO MECHANICAL IMPACT (Y/N):	NA.
SENSITIVITY TO STATIC DISCHARGE:	NA.
EXTINGUISHING MEDIA:	Dry powder, carbon dioxide, water or foam.
SPECIAL FIREFIGHTING PROCEDURES:	Special fire fighting procedures: Isolate fire area. Evacuate the employees and evacuate downwind.
	Avoid spreading of contaminated extinguishing agent in the environment. Minimize use of water to prevent environmental contamination. Do not breathe smoke, gases, or vapour generated. Keep fire exposed containers cool by spraying with water. Wear full protective
	Firefighters should wear self-contained breathing apparatus and full protective clothing when fighting chemical fires. Minimize and contain water runoff. Equipment should be thoroughly decontaminated after use.

6. ACCIDENTAL RELEASE MEASURES

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Use safety equipment and procedures appropriate to the size of the spill. Keep unnecessary people away. Avoid runoff to natural waters and sewers. Surround and absorb spills with inert material such as perlite, sawdust, clay granules, vermiculite, sand or dirt. Contain all affected material in a closed, labelled container for proper disposal. Isolate from other waste materials. Clean contaminated area such as hard surfaces with detergent and water, collecting cleaning solution for proper disposal. Large spills to soil or similar surfaces may necessitate removal of top soil.

Clean contaminated floors and objects thoroughly, observing environmental regulations.

Do not discharge into the drains/surface water/groundwater.

Keep people and animals away.

7. HANDLING AND STORAGE

- HANDLING: Avoid contact with the eyes, skin and clothing and avoid inhalation of product or spray mist. If in eyes, wash it immediately with water. After handling and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water.
- **STORAGE:** Store in the closed, original container in a dry, cool, well-ventilated area, out of direct sunlight. Store in locked room or place away from children, animals, food, animal feed, seed and fertilizers. Keep away from all ignition sources and protect from extreme heat and cold.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

-CROP PROTECTION DEPARTMENT

GLYPHADER [®] 75		Date created : 15/0	5/07
MATERIAL SAFETY DAT		Page 3	} /
ENGINEERING CONTROLS:		Use in a well ventilated area. General ventilation with a good sour make-up air recommended as minimum for indoor situations. Venti should be adequate to maintain air concentrations below exposure lim	ilati
RESPIRATORY PROTECTION EQ	UIPMENT:	Use an approved pesticide respirator if ventilation is not adequa exposure to sprays, mists or vapours is likely.	ate
PROTECTIVE GLOVES:		All types of chemical-resistant gloves for handling chemicals acceptable, provided that they can be cleaned. Rinse gloves b removal. Gloves are not required for applicator in enclosed tract airplane cockpit.	befo
EYE AND FACE PROTECTION:		Goggles or face shield when handling concentrate.	
OTHER PROTECTIVE EQUIPMEN	IT:	Long sleeved shirt, long pants, socks and shoes are minimum clothing. Coveralls or a chemical-resistant apron should also be worn open pouring from containers greater than 5L. Use other equip appropriate to specific situation.	wh
VENTILATION:		Use only in well ventilated area.	
9. PHYSICAL AND CHEMICAL PR	OPERTIES		
BOILING POINT: VAPOR PRESSURE: VAPOR DENSITY (air = 1): FREEZING POINT: MELTING POINT: PHYSICAL STATE: ODOUR: COLOUR: ODOR THRESHOLD (ppm): EVAPORATION RATE (butyl ace SPECIFIC GRAVITY (water = 1): DENSITY (20°C): pH: SOLUBILITY IN WATER (25°C): COEFFICIENT OF WATER/OIL D Note: Physical data are typica guaranteed analysis or a CO.STABILITY AND REACTIVITY STABILITY: HAZARDOUS POLYMERIZATION HAZARDOUS THERMAL DECOMPOSITION/COMBUSTION NCOMPATIBILITY (MATERIALS)	ISTRIBUTION: I values, but ma is a specification	> 190 °C 9 x 10 ⁻³ mPa (25°C) NA. NA. > 190 °C Slightly yellow to white granular Specific odour Slightly yellow to white NA NA. NA. NA. NA. NA. NA. NA. NA. NA.	
11. TOXICOLOGICAL INFORMAT ORAL LD50	Rat	4230 ma/kg	
DERMAL LD50: 4 HOURS INHALATION LC50: EYE IRRITATION: SKIN IRRITATION :	Rat Rat Rabbit Rabbit	> 5000 mg/kg > 5 mg/L Mild eye irritant Mild skin irritant	
SKIN SENSITIZATION : Note : Data are from laboratory	Guinea pig studies conduct	Not sensitizing	
12. ECOLOGICAL INFORMATION			
ECOTOXICOLOGICAL INFORMA			
		CROP PROTECTION DEPARTMENT	



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Date created : 15/05/07

Page

MATERIAL SAFETY DATA SHEET 96-HOUR LC50: Rainbow trout 86 mg/L 120 96-HOUR LC50: **Bluegill sunfish** mg/L 48-HOUR EC50: Daphnia magna 780 mg/L LD50: Bobwhite quail >3851 mg/kg ORAL LD50: Bees 100 µg/bee CONTACT LD50: 100 µg/bee Bees

Note : Data on Active Ingredient.

ENVIRONMENTAL FATE INFORMATION:

In mammals, following oral administration, glyphosate is very rapidly excreted unchanged and does not bioaccumulate. In plants, slowly metabolised to aminomethylphosphonic acid, which is the major plant metabolite. In soil (field), DT50 1-30 days, depending on edaphic and climatic conditions. In water, DT50 varies from a few to 91 days. Photodegradation in water occurs under natural conditions, DT50 33-77 days; no substantial photodegradation in soil was recorded over 31 days. In a lab. whole system with water and sediment, DT50 27-146 days (aerobic), 14-22 days (anaerobic). The major metabolite in soil and water is aminomethyl phosphonic acid.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Disposal should be made in accordance with federal, provincial and local regulations. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean up of spills.

Emptied container retains vapor and product residue. Observe all labelled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse container for any purpose. If applicable, return container in accordance with return program. If a recyclable container, dispose of at a container collection site. Contact local distributor, dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site, triple or pressure rinse the empty container adding rinsing to spray tank, and make container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements.

14. TRANSPORT INFORMATION

RAIL/ROAD SEA AIR	(RID/ADR): (IMDG): (ICAO/IATA):	9 9 9	
U.N. NUMBE	R:	3077	
DG CLASS:		NA.	
HAZCHEM C	ODE:	9	
PACKING G	ROUP:	III	

15. REGULATORY INFORMATION

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is give. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

16. OTHER INFORMATION

ADDITIONAL INFORMATION:

Abbreviations used throughout the MSDS are:

NA = Not available NAp = Not applicable N/E = None Established.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

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MSDS – Kalach 700 WSG

		Product Name: Kalach 700 WSG
Arysta L	ifeScience	Page 1 of 5
SECTION 1 - PRODUCT	& COMPANY IDENTIFICATION	
ARYSTA LifeScience So Co. Reg. No.: 2009/0197		Tel: 031 514 5600 Fax: 031 514 5611
7 Sunbury Office Park,		
Off Douglas Saunders D		
La Lucia Ridge, South A	Africa, 4019	e-mail: info@arysta.co.za Web address: arystalifescience.co.za
Substance:	glyphosate.	The address. alystamesoichec.co.ze
Product Name:	KALACH 700 WSG	
Product Use:	Herbicide	
Creation Date: Revision Date:	May 2009 October 13	
24 Hr Emergency Number In case of Poisoning:	r: 082 771 2712	
Poison Information Centre	082 446 8946	
Tygerberg Hospital:	(021) 931 6129	
Poison Emergency Enquirie	es (021) 689 5227	
In case of Spillage: HAZMAT:	0800 147 112	
SECTION 2 - COMPOSIT	ION / INFORMATION ON INGREDIENTS	
Common Name: Chemical Name:	Glyphosate N- (phosphonomethyl)glycine (IUPAC)	
CAS Nº.:	1071-83-6	
Chemical family:	Phosphanoglycine	
Chemical formula:	C ₃ H ₈ NO ₅ P	
Molecular weight:	169.1	
Use:	Herbicide for the control of a wide range of annu	al and perennial grasses and broadleaf weeds
Formulation:	glyphosate (glycine): 700 g a.e./kg (glyphosate sodium salt: 934 g/kg)	
		s carbon di-oxide gas (12.9%) that reduces inert mass. Mass
Sumboli	V.	
Symbol: Indication of danger:	Xn Harmful if swallowed	
ndication of danger:	Xn Harmful if swallowed R20/22, R 36, R 52, R 54	
Indication of danger: Risk Phrases:	Harmful if swallowed R20/22, R 36, R 52, R 54	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID	Harmful if swallowed R20/22, R 36, R 52, R 54	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class:	Harmful if swallowed R20/22, R 36, R 52, R 54	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin.	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact:	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	atering and redness of the eyes.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion:	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	atering and redness of the eyes.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic.	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide.	atering and redness of the eyes.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation:	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. : inhalation. on. Cause temporary mild discomfort such as w	atering and redness of the eyes.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation: Minimally toxic by inhalatior	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. : inhalation. on. Cause temporary mild discomfort such as w	atering and redness of the eyes.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation: Minimally toxic by inhalation SECTION 4 - FIRST AID I Symptoms of glyphosate po	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. : inhalation. on. Cause temporary mild discomfort such as w n.	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation: Minimally toxic by inhalation SECTION 4 - FIRST AID I Symptoms of glyphosate po Inhalation: Remove source of contan	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. inhalation. on. Cause temporary mild discomfort such as w n. MEASURES AND PRECAUTIONS oisoning include: headache, vomiting and diarrh mination, or move victim to fresh air. Keep a	
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation: Minimally toxic by inhalation SECTION 4 - FIRST AID I Symptoms of glyphosate point Inhalation: Remove source of contan	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. inhalation. on. Cause temporary mild discomfort such as w n. MEASURES AND PRECAUTIONS oisoning include: headache, vomiting and diarrh mination, or move victim to fresh air. Keep a	oea. affected person warm and at rest. Treat symptomatically and ersonnel. Get medical attention if effects persist.
Indication of danger: Risk Phrases: SECTION 3 - HAZARD ID Toxicity class: WHO Table 5;EPA III A low Likely routes of exposure Skin contact, ingestion and Skin: Non-irritating to skin. Eye contact: May cause mild eye irritatio Ingestion: Minimally toxic. Inhalation: Minimally toxic by inhalation SECTION 4 - FIRST AID I Symptoms of glyphosate po Inhalation: Remove source of contan	Harmful if swallowed R20/22, R 36, R 52, R 54 DENTIFICATION w toxicity herbicide. inhalation. on. Cause temporary mild discomfort such as w n. MEASURES AND PRECAUTIONS oisoning include: headache, vomiting and diarrh mination, or move victim to fresh air. Keep a n of oxygen should be performed by qualified pu	oea. affected person warm and at rest. Treat symptomatically and ersonnel. Get medical attention if effects persist.





Product Name: Kalach 700 WSG Page 2 of 5

Skin contact:

Move the victim to fresh air and remove all contaminated clothing, shoes and leather goods. Gently wipe off excess chemical. Wash affected skin areas gently and thoroughly with water and non-abrasive soap. Do not rub the skin. If irritation persists, seek medical advice. **Eve contact**:

Immediately flush the eyes with clean, gently flowing lukewarm water or saline solution for 20 minutes, holding the eyelid(s) open. If irritation persists, seek medical advice.

Ingestion:

Have victim rinse mouth thoroughly with water. Do not induce vomiting. Seek medical advice immediately showing container and label. Advice to physician:

There is no specific antidote. Treat symptomatically and supportively as and when required. Remove by gastric lavage and catharsis, but not if victim is unconscious. Give oxygen if respiration is depressed.

SECTION 5 - FIRE-FIGHTING MEASURES

Keep fire exposed containers cool by spraying with water.

Fire and explosion hazard:

Flash point: None. This material is not flammable.

Extinguishing agents:

Extinguish fires with carbon dioxide, dry powder, or alcohol-resistant foam. Water spray can be used for cooling of unaffected stock, but avoid water coming in contact with the product. Use as little water as possible. Use spray or fog. Solid stream may cause spreading. Contain water used for fire fighting for later disposal.

Fire fighting:

Remove spectators from surrounding area. Remove container from fire area if possible. Contain fire control agents for later disposal. Use a recommended extinguishing agent for the type of surrounding fire. Avoid inhaling hazardous vapours and fumes from burning materials. Keep upwind.

Personal protective equipment:

Fire may produce irritating or poisonous vapours (toxic fumes of carbon monoxide, phosphorous oxides and nitrogen oxides), mists or other products of combustion. Fire fighters and others that may be exposed should wear full protective clothing and self-contained breathing apparatus.

SECTION 6 - ACCIDENTAL RELEASE MEASURES (SPILLAGE)

Personal precautions:

Do not breathe in mist or fumes. Avoid contact with skin and eyes. For personal protection see Section 8.

Environmental precautions:

Do not allow entering drains or watercourses. Spillage or uncontrolled discharges into water courses (or public waters) to be reported immediately to the Police and to the Department of Water/Environmental Affairs.

Occupational spill:

Remove all sources of flames and sparks. Adsorb spillage onto sand, earth or any suitable adsorbent material. Transfer to a container for disposal. Wash the spillage area with water. Washings must be prevented from entering surface water drains. Do not flush spilled material into drains. Keep spectators away.

Containers:

Emptied containers retain material residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

SECTION 7 - HANDLING AND STORAGE REQUIREMENTS

Handling:

Avoid contact with eyes, prolonged contact with skin, and inhalation of spray and fumes. Handle product with caution. Use with adequate ventilation. Wash hands before eating, drinking, chewing gum, smoking or using the toilet. Remove clothing immediately if the herbicide gets inside. Then wash skin thoroughly using a non-abrasive soap and put on clean clothing. Operators should change and wash clothing after use. Do not apply directly to areas where surface water is present, or to intertidal areas below the mean high water mark. Water used to clean equipment must be disposed of correctly to avoid contamination.

Storage:

Store in its original, labelled and closed container in dry, cool, shaded, well-ventilated area, away from heat, sparks and other sources of ignition. Do not store with other pesticides, fertilizer, seeds, foodstuffs and water supplies. Store away from incompatible substances. Product is incompatible with galvanized steel or unlined mild steel. Keep out of reach of unauthorized persons, children and animals. Local regulations should be complied with.

MATERIAL SAFETY DATA SHEET

Issued by: Arysta Lifescience South Africa Phone: 031 514 5600 Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227



Product Name: Kalach 700 WSG Page 3 of 5 Arysta LifeScience SECTION 8 - EXPOSURE CONTROL/PERSONAL PROTECTION It is essential to provide adequate ventilation. The measures appropriate for a particular work site depend on how this material is used and on the extent of exposure. Ensure that control systems are properly designed and maintained. Comply with occupational safety, environmental, fire and other applicable regulations. **Exposure standards:** The ADI for Glyphosate is set a 0.3 mg/kg/day. The corresponding NOEL is set at 30 mg/kg/day. PERSONAL PROTECTIVE EQUIPMENT: In industrial situations, concentration values below the TWA value should be maintained. Values may be reduced by process modification, use of local exhaust ventilation, capturing substances at the source, or other methods. If you believe air borne concentrations of mists, dusts or vapours are high, you are advised to modify the process or environment to reduce the problem. Respirator: It is usually safe to use the product without a mask or respirator. If the product is used in dusty or confined conditions, a mask or respirator suitable for protection from dusts and mists of pesticides is adequate. Limitations of respirator use specified by the approving agency and the manufacturer must be observed. Clothing: Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance. Gloves: Employee must wear appropriate synthetic protective gloves to prevent contact with this substance. Eye protection: Wear safety goggles or face shield. Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain or appropriate alternative within the immediate work area for emergency use. SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES Appearance: Water Soluble Granules. Odour: White Bulk density: 0.65 ± 0.01 g/cm3 Solubility in water: Miscible Flash point: None. Does not flash. pH: 3.0→5.0 **Oxidizing properties:** Not oxidizing Corrosive to galvanized steel and mild steel. Corrosiveness: SECTION 10 - STABILITY AND REACTIVITY Stability: Stable under normal temperatures and pressures. Glyphosate reacts strongly (possibly violent exothermic reaction) with strong alkalis. Photodecomposition is negligible. Is stable to light and also stable up to 60 °C. Product is unlikely to spontaneously polymerise or decompose. Decompose only after heating to dryness followed by further heating. Glyphosate may be photolabile in natural waters, with calcium or other metal ions acting as catalysts for the process. Dilution stability: Stable in aqueous solutions at 20 °C. Storage stability: Stable for 2 years under normal warehouse conditions. Store at temperatures below 50 °C and above -15 °C. Stable to light. Partial crystallization may occur on prolonged storage below -15 °C. Incompatibility: Product is relatively stable in neutral, weakly acidic and weakly alkaline media, but reacts strongly (and possibly violently) with strong alkalis. Mixing with other products may reduce the activity of glyphosate. Incompatible with galvanized steel and unlined mild steel materials for storage Thermal decomposition: Toxic oxides of carbon, nitrogen and phosphorus are released when the product decomposes on heating. SECTION 11 - TOXICOLOGICAL INFORMATION Acute oral LD₅₀: 10740mg/kg in rats. Acute dermal LD₅₀: > 4000 mg/kg in rats. Inhalation: Technical: LC₅₀ (4 hours): > 12,2 mg/*l*. MATERIAL SAFETY DATA SHEET Issued by: Arysta Lifescience South Africa Phone: 031 514 5600 Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227



\frown		Product Name:	Kalach 700 WSG
Arysta	LifeScience		Page 4 of 5
Acute skin irritation: Not irritating to skin (rabbi	t). Not skin sensitizer.		
Acute eye irritation: Slightly irritating to eyes (r	rabbit).		
Carcinogenicity: Animal studies did not det		offacts	
Teratogenicity:			
Animal studies did not det Mutagenicity:			
Animal studies did not det Reproductivity:	tect any mutagenic eff	fects.	
		ir at very high doses. It is unlikely that glyphosate would produce effe	ects in humans.
SECTION 12 - ECOLOG	GICAL INFORMATION	N	
	sorbed to suspended	n estimated half-life of 47 days. Microbes are primarily responsible for organic and mineral matter in <u>water</u> , and broken down primarily by m	
Mobility:		ly absorbed to most soils. It does not leach appreciably, and has low	potential for runoff.
Accumulation: The product shows little o ECOTOXICOLOGY:	r no tendency to bioa	ccumulate and poses no long term threat to wildlife.	
Birds: Slightly toxic. LC ₅₀ (5-day diet):	Mallard duck:	> 4500 mg/kg diet	
	Bobwhite quail:	> 4500 mg/kg diet	
Fish: Not toxic. LC ₅₀ (96 hours):	Bluegill sunfish:	> 1000 mg/ℓ	
	Trout: Fathead minnows	> 1000 mg/ℓ 97 mg/ℓ	
Due to surfactant, GLYP Bees: Not toxic.			
LD ₅₀ oral & dermal:		> 0.1 mg/bee	
Daphnia: LC ₅₀ (48 hours):		930 mg/ℓ	
Earthworms: LC ₅₀ (14 days):	Eisenia foetida:	> 5000 mg/kg soil	
Other Beneficial organis No effect on carabid bee harmful to Bembidion lam	etles. Harmless to sl	ightly harmful to green lacewing, parasite species, mites/spiders a	nd insects. Moderately
SECTION 13 - DISPOSA	AL CONSIDERATION		
Never pour untreated was Do not contaminate rivers label instructions or chem non-crop, non-pasture are Container disposal: Emptied containers retain	ste or surplus produc s, dams or any other ically reprocessed, di- ea away from water so vapour and product r	ohibited. Waste resulting from the use of this product that cannot be ts into public sewers or where there is any danger of run-off or seep water sources with the product or used containers. If wastes cann spose of in a landfill approved for pesticide disposal or bury under at burces of homes. Dispose of in accordance with all applicable local a esidues. Observe all labelled safeguards until container is destroyed any other purpose but destroy it by perforation and flattening and bu	age into water systems. ot be used according to least 500 mm of soil in a nd state laws.
	on of food, feedstuffs,	drinking water and eating utensils.	
SECTION 14 - TRANSP	ORT INFORMATION		
UN NUMBER: 3077 Road Transport ADR/IRI Class: 9			
loound but America Lifes	alanaa Qayilla Africa	MATERIAL SAFETY DATA SHEET	Dhanay 024 544 5600
Issued by: Arysta Lifes Poison Information C		946; Tygerberg: (021) 931 6129; Poison Emergency Enqu	Phone: 031 514 5600 iry: (021) 689 5227

Form forests for the future

\frown	Product Name:	Kalach 700 WSG
۲ 📚	Arysta LifeScience	Page 5 of 5
Class: Packing group: Shipping name	 Environmentally hazardous substance, solid, N.O.S. (herbicide - glyphosate) sport IMDG/IMO: 9 III Environmentally hazardous substance, solid, N.O.S. (herbicide - glyphosate) 	
	Marine Bellutant	
Considered a	Marine Poliulani.	
SECTION 15 -	REGULATORY INFORMATION	
	REGULATORY INFORMATION	
SECTION 15 - Symbol: Indication:	REGULATORY INFORMATION N Environmentally dangerous substance.	
SECTION 15 - Symbol:	REGULATORY INFORMATION N Environmentally dangerous substance.	
SECTION 15 - Symbol: Indication: Risk phrases:	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes.	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36 R 52 R 52 R 54	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes. Harmful to aquatic organisms. Toxic to flora.	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36 R 52	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes. Harmful to aquatic organisms. Toxic to flora. s:	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36 R 52 R 54 Safety phrases	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes. Harmful to aquatic organisms. Toxic to flora. s: Keep out of reach children.	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36 R 52 R 52 R 54 Safety phrases S 2	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes. Harmful to aquatic organisms. Toxic to flora. S: Keep out of reach children. Avoid contact with skin and eyes.	
SECTION 15 - Symbol: Indication: Risk phrases: R20/22 R 36 R 52 R 52 R 54 Safety phrase: S 2 S 2425	REGULATORY INFORMATION N Environmentally dangerous substance. Harmful by inhalation or if swallowed Irritating to eyes. Harmful to aquatic organisms. Toxic to flora. s: Keep out of reach children.	ossible).

Packaging and Labelling:

Packed in 10, 15, 50, 100, 430, 500g sachets & 1 kg carton & 5, 10, 15, 20 and 25 kg paper bags or Carton with inner plastic sachet with outer plastic lining.and labelled according to South African regulations and guidelines.

Disclaimer:

The information on this sheet is not a specification; it does not guarantee specific properties. The information is intended to provide general guidance as to health and safety based upon our knowledge of the handling, storage use of the product. It is not applicable to unusual or non-standard uses of the product nor where instructions or recommendations are not followed.

All information is given in good faith but without guarantee in respect of accuracy, and no responsibility is accepted for errors and omissions or the consequence thereof.



MSDS – Clethodim



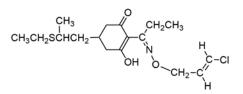
Material Safety Data Sheet

SECTION 1: PRODUCT INDENTIFICATION

Product name: Clethodim 55 g/L EC

Chemical name: (E, E) - (±)-2-[1-[[(3-chloro-2-propenyl) oxy] imino] propyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one

Structural formula:



CAS No.: 99129-21-2

Chemical class: Herbicide

SECTION 2: COMPOSITION AND INGREDIENT INFORMATION

Clethodim

55 g/L

SECTION 3: HEALTH HAZARD INFORMATION

Emergency overview: Harmful by inhalation. May cause lung damage if swallowed.

Routes of entry: Inhalation, ingestion, eye and skin contact.





SECTION 4: FIRST AID MEASURES

Ingestion: Rinse mouth. Give water to drink if patient is conscious. Do not induce vomiting. If vomiting occurs ensure patient can breathe, then give water to drink. Get medical attention.

Eyes: In case of eye contact, check for and remove any contact lenses. Immediately irrigate eyes with plenty of running water for at least 20 minutes, keeping eyelids open. Seek immediate medical attention.

Skin: If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes.

Inhalation: Immediately remove source of contamination or move victim to fresh air. If breathing has stopped, perform artificial respiration and administer oxygen. Keep person warm and at rest. Treat symptomatically and supportively as and when required. Seek medical advice immediately.

SECTION 5: FIRE AND EXPLOSION INFORMATION

Extinguishing media:

Suitable: Carbon dioxide, dry chemical, foam, water fog. Unsuitable: Water stream.

Special hazards in fire: Product is flammable. Combustion may release carbon dioxide, nitrogen oxides, and/or chlorine compounds.

Required special protective equipment for fire-fighters: Wear self contained breathing apparatus if in enclosed space.





SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency procedures: Wear protective equipment to prevent skin and eyes being affected. Evacuate unprotected and unnecessary personnel from area of spill. If material is leaking from a container, stop the leak only if this can be done safely. Prevent spillage entering drains or watercourse.

Methods for containment & cleanup: Vermiculite, Sand, Soil is a suitable absorbent, especially soils high in clay. Soil can be used to form bunds to contain spillage. Contaminated soil should be collected for disposal at a suitable landfill. Contaminated area and tools should be washed down with hypochlorite bleach. Personal protective equipment and clothing should be washed with soapy water.

SECTION 7: HANDLING AND STORAGE

Handling: Keep away from food, drink, and animal feedstuff. Keep out of reach of children. Wear suitable personal protective equipment when handling and spraying.

Storage: Store in the original container in a dry, cool, ventilated, locked area. Do not store in prolonged sunlight. Do not store with food, seed, or animal feedstuff.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: In the Workplace: Ensure ventilation is adequate. Keep containers closed when not in use. No special engineering controls are requirements. Product is used outdoors.





Personal protective equipment: When opening the container, preparing spray and using the prepared spray wear safety goggles, impervious gloves, cotton overalls buttoned to the neck and wrist, and boots.



SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Light yellow liquid

Odor: Characteristic

forests for the future

pH: 4.0 - 7.0

SECTION 10: STABILITY AND REACTIVITY INFORMATION

Stability: Stable under normal conditions of handling and storage.

Conditions to avoid: Very high or low temperatures.

Materials to avoid: Strong oxidising agents.

Hazardous decomposition products: Oxides of nitrogen and chlorine. Burning with limited oxygen may produce carbon monoxide.

SECTION 11: TOXICOLOGICAL INFORMATION

Oral: Acute oral LD₅₀ for rat >2000mg/kg

Dermal: Acute dermal LD₅₀ for rat >2000mg/kg

Inhalation: LC₅₀ (4h) for rat >4.0mg/l

Skin irritation: Moderate irritating (rabbit)





Eye irritation: Slightly irritating (rabbit)

Skin sensitization: Not a skin sensitizer

SECTION 12: ECOLOGICAL INFORMATION

For active ingredient

Birds: Oral LD₅₀ for bobwhite quail >2000 mg/kg. Dietary LC₅₀ for mallard ducks >6000 mg/kg.

Fish: LC₅₀ (96 h) for rainbow trout 67, bluegill sunfish >120 mg/l.

Daphnia: LC₅₀ (48 h) >120 mg/l; NOEC 60 mg/l.

Algae: EC₅₀ (5 d) for fresh-water algae 57.8 mg/l.

Bees: LD₅₀ (contact) >100 µg/bee.

Worms: LC₅₀ for worms 454 mg/kg soil; NOEL 316 mg/kg soil.

SECTION 13: DISPOSAL CONSIDERATIONS

Do not reuse product containers. Dispose of product containers, waste containers, and residues according to local, state, and federal health and environmental regulations.

SECTION 14: TRANSPORT INFORMATION

UN No.: 3082

Class: 9

Packing group: III





SECTION 15: REGULATORY INFORMATION

Risk phrases:

R20: Harmful by inhalation.R22: Harmful if swallowed.R65: Harmful-may cause lung damage if swallowed.

Safety phrases:

S20/21: When using do not eat or drink/smoke.S24/25: Avoid contact with skin/eyes.S29/35: Do not empty into drains/Dispose of material and container in a safe way.

SECTION 16: OTHER INFORMATION

The information contained in the Safety Data sheet is correct to the best of our knowledge at the date of issue. It is intended as a guide for the safe use, handling, disposal, storage and transportation and is not intended as a warranty or as a specification. The information relates only to the product specified and may not be suitable for combinations with other materials or in processes other than those specifically described herein. Buyer assumes all responsibility for safety and use not in accordance with the product label instructions.



CORTA[®] 480

	Page 1 / 5		
MATERIAL SAFETY DA	TA SHEET		
1. CHEMICAL PRODUCT AND C	OMPANY IDENTIFICATION		
SUPPLIED BY :	SCPA SIVEX INTERNATIONAL		
	83-85 Boulevard Vincent Auriol 75013 Paris - FRANCE		
	TEL. +33 1 44 06 53 00 FAX. +33 1 44 06 54 66		
ACTIVE INGREDIENT	Triclopyr		
FORMULATION	480 g/L		
CHEMICAL FAMILY/USE	Emulsifiable Concentrate (EC) Pyridine carboxylic acid / Herbicide selective, systemic, absorbed though roots and foliage		
FORMULA	C ₁₃ H ₁₆ Cl ₃ NO ₄		
CHEMICAL SYNONYMS	3, 5, 6-trichloro-2-pyridyloxyacetic acid		

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	Content (W/V)	CAS NO
Active Ingredient:		
TRICLOPYR sous forme acide (480 g/l) Eq. Triclopyr-2-butoxethyl ester (600 g/l)	48 % min	64700-56-7
Other ingredients:		
Emulsion agent Solvent (Xylene)	10 % max 42 % max	

3. HAZARDS IDENTIFICATION EMERGENCY OVERVIEW

EMERGENCY OVERVIEW:

WARNING-POISON. Keep out of reach of children. Avoid contact with skin, eyes and clothing. Do not inhale fumes. Severely irritating to eyes. May cause skin irritation. Harmful if absorbed through the skin. Harmful if swallowed or inhaled.

EFFECTS OF ACUTE EXPOSURE:

INGESTION: Harmful if swallowed. May cause nausea, vomiting, lung damage and abdominal pain.

SKIN CONTACT: Causes redness.

INHALATION: Cough. A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

EYE CONTACT: Causes redness and irritation.

MEDICAL CONDITIONS AGGRAVATED:

Skin exposure may aggravate preexisting skin conditions. Inhalation of mist may aggravate preexisting respiratory conditions.

PRINCIPLE ROUTES OF EXPOSURE: Skin absorption. Inhalation. Oral.

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. Occupational exposure to Triclopyr may occur through dermal contact with this compound at workplaces where Triclopyr is produced or used.

CHRONIC EFFECTS/CARCINOGENICITY:

There is no evidence that Triclopyr causes unscheduled DNA synthesis or acts as a mutagen. The carcinogenicity Peer Review Committee at the US EPA classified Triclopyr as a group D carcinogen, that is, not classifiable as to human carcinogenicity. Testing for cancer is not done on human subjects.

REPRODUCTIVE TOXICITY:

No data was found on the effects of Triclopyr on human reproduction or development. Regarding tests executed on animals, some changes occurred during pregnancy at 100 mg/kg/day in rabbits, and 300 mg/kg/day in rats. Triclopyr esters produced minor skeletal malformations in the offspring of rats.

CROP PROTECTION DEPARTMENT



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MATERIAL SAFET	Y DATA SHEET		
GENOTOXICITY:			
VO			
NA.	ROISTIC MATERIALS.		
OTHER:			
		human exposure cases have been reported.	
. FIRST AID MEASURES			
INGESTION:	Do not induce vomitin Do not induce vomitin an unconscious perso	g. Keep at rest. Obtain medical attention and if possible show the label. g unless directed by medical personnel. Never give anything by mouth to n.	
SKIN:	plenty of water. If sym	In case of contact, remove contaminated clothing and wash skin thoroughly with soap and plenty of water. If symptoms persist, call a physician. Wash clothes before re-use.	
INHALATION:	If inhaled, remove to Control Centre.	If inhaled, remove to fresh air and keep at rest. Get medical attention or contact a Poison	
EYES:	attention. If easy to do, remove	For eye contact, flush with large amount of water for at least 15 minutes. Get immediate medica attention. If easy to do, remove contact lenses. If there are persistent symptoms, medical attention should be obtained without delay.	
Activated charcoal is p most or all of these heri irritant actions of more sounds are present ann and electrolyte disturbar If large amount of ingesi of the ingestion, gastr ingested herbicides wa		erials other than this product may have occurred. probably effective in limiting irritant effects and reducing absorption of erbicides. Aluminium hydroxide antacids may be useful in neutralizing the re acidic agents. Sorbitol should be given to induce catharsis if bowel and if spontaneous diarrhea has not already commenced. Dehydratation ances may be severe enough to require oral or intravenous fluids. ested herbicides have been ingested and the patient is seen within an hour strointestinal decontamination should be considered. If the amount of was small, if effective emesis has already occurred, or if treatment is strivated charcoal and Sorbitol by mouth.	
5. FIRE FIGHTING MEASUF	RES		
FLASH POINT:		- Close cup: 65.5°C	
		- Open cup: 96.5°C Fire point: 103°C	
CONDITIONS OF FLAMMA	ABILITY:	Not Flammable	
FLAMMABLE LIMITS IN A	IR - Upper (%)	NA.	
FLAMMABLE LIMITS IN A	IR - Lower (%):	NA.	
AUTOIGNITION TEMPERATURE:		NA.	
SENSITIVITY TO MECHANICAL IMPACT (Y/N):		NA.	
SENSITIVITY TO STATIC DISCHARGE:		NA.	
EXTINGUISHING MEDIA:		Dry chemical, carbon dioxide, water fog or foam.	
SPECIAL FIREFIGHTING PROCEDURES:		Special fire fighting procedures: Isolate fire area. Evacuate the employees and evacuate downwind.	
		Avoid spreading of contaminated extinguishing agent in the environment. Minimize use of water to prevent environmental contamination. Do not breathe smoke, gases, or vapour generated. Keep fire exposed containers cool by spraying with water. Wear full protective	
		Fire fighters should wear self-contained breathing apparatus and full protective clothing when fighting chemical fires. Minimize and contain water runoff. Equipment should be thoroughly decontaminated after use.	

-CROP PROTECTION DEPARTMENT



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MATERIAL SAFETY DATA SHEET

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6. ACCIDENTAL RELEASE MEASURES

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Use safety equipment and procedures appropriate to the size of the spill. Keep unnecessary people away. Avoid runoff to natural waters and sewers. Surround and absorb spills with inert material such as perite, sawdust, clay granules, vermiculite, sand or dirt. Contain all affected material in a closed, labelled container for proper disposal. Isolate from other waste materials. Clean contaminated area such as hard surfaces with detergent and water, collecting cleaning solution for proper disposal. Large spills to soil or similar surfaces may necessitate removal of top soil. Clean contaminated floors and objects thoroughly, observing environmental regulations. Do not discharge into the drains/surface water/groundwater. Keep people and animals away. **7. HANDLING AND STORAGE**HANDLING: Avoid contact with the eyes, skin and clothing and avoid inhalation of product or spray mist. If in eyes, wash it immediately with soap and water. **STORAGE:** Store in the closed, original container in a dry, cool, well-ventilated area, keep way from direct sunlight. Store in locked room or place away from children, animals, food, animal feed, seed and fertilizers. Keep away from all ignition sources and protect from extreme heat and cold. Keep containers tightly closed. **EXPOSURE CONTROLS:**Use in a well ventilated area. General ventilation with a good source of make-up air recommended as minimum for indoor situations. Ventilation

	make-up air recommended as minimum for indoor situations. Ventilation should be adequate to maintain air concentrations below exposure limits.
RESPIRATORY PROTECTION EQUIPMENT:	Use an approved pesticide respirator if ventilation is not adequate or exposure to sprays, mists or vapours is likely. Short term : Filter apparatus, Filter A.
PROTECTIVE GLOVES:	All types of chemical-resistant gloves for handling chemicals are acceptable, provided that they can be cleaned. Rinse gloves before removal. Gloves are not required for applicator in enclosed tractor or airplane cockpit.
EYE AND FACE PROTECTION:	Goggles or face shield when handling concentrate. Chemical resistant goggles must be worn.
OTHER PROTECTIVE EQUIPMENT:	Long sleeved shirt, long pants, socks and shoes are minimum work clothing. Coveralls or a chemical-resistant apron should also be worn when open pouring from containers greater than 5L. Use other equipment appropriate to specific situation.
VENTILATION:	Use only in well ventilated area.

9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT:	Decomposes at 208°C		
VAPOR PRESSURE:	0.2 mPa		
VAPOR DENSITY (air = 1):	NA.		
FREEZING POINT:	NA.		
MELTING POINT:	150.5°C		
PHYSICAL STATE:	Liquid		
ODOUR:	Oil base paint		
COLOUR:	Amber		
ODOR THRESHOLD (ppm):	NA		
EVAPORATION RATE (butyl acetate = 1):	NA.		
SPECIFIC GRAVITY (water = 1):	1.046		
DENSITY (21°C):	1,85		
pH	6.2 ± 0.5		
SOLUBILITY IN WATER (25°C):	0.408 (purified) / 7.69 (pH 5) / 8.10 (pH 7) / 8.22 (pH 9)		
COEFFICIENT OF WATER/OIL DISTRIBUTION:	K _{ow} logP=0.42 (pH 5) ; -0.45 (pH 7) ; -0.96 (pH 9)		
Note: Physical data are typical values, but may vary from sample to sample. A typical value should not be construed as a			
guaranteed analysis or as a specification.			
10. STABILITY AND REACTIVITY	10. STABILITY AND REACTIVITY		

-CROP PROTECTION DEPARTMENT



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MATERIAL SAFETY DATA SHEET

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STABILITY:

HAZARDOUS POLYMERIZATION: HAZARDOUS THERMAL DECOMPOSITION/COMBUSTION PRODUCTS: INCOMPATIBILITY (MATERIALS TO AVOID): CONDITIONS TO AVOID: Stable under normal storage and handling conditions. Product will burn, keep away from heat and open flame. Not known to occur.

Carbon monoxide, nitrogen oxides, hydrogen chloride and phosgene may be formed if product is involved in fire. Acids, bases and strong oxidizers.

Heat and fire.

11. TOXICOLOGICAL INFORMATION

ORAL LD50	Rat	713	mg/kg	
DERMAL LD50:	lapin	> 2000	mg/kg	
4 HOURS INHALATION LC50:	Rat	>256	ppm	
EYE IRRITATION:	Rabbit	Slightly irritant		
SKIN IRRITATION :	Rabbit	Non irritant		
SKIN SENSITIZATION :	Guinea pig	Sensitizer		
Nata i Data franc David Chamie				

Note : Data from Dow Chemical Company

12. ECOLOGICAL INFORMATION

ECOTOXICO	DLOGICAL INFO	DRMATION:			
96-HOUR L	.C50:	Rainbow trout	117	mg/L	
48-HOUR E	C50:	Daphnia magna	133	mg/L	
LD50:		Mallard Duck	1698	mg/kg	
CONTACT	LD50:	Bees	> 100	µg/bee	
Note :	Data on Active I	ngredient.			

Note . Data of Active ingredie

CHEMICAL FATE INFORMATION:

In mammals, following oral administration, excretion is primarily via the urine as the unchanged compound. In plants, DT50 is 3-10 days. The main metabolite is 3,5,6-trichloro-2-methoxypyridine. In soil, fairly rapid degradation by microbial activity, with an average half-life of 46 days, depending on soil and climatic conditions. The major degradation product is 3,5,6-trichloro-2-pyridinol (which has a half life of 30-90 days), with a smaller amount of 3,5,6-trichloro-2-methoxypyridine. Koc : 59 ml/g; Kd : 87 (unaged samples), 225 (aged) ml/g.

Triclopyr is slowly absorbed through skin and is rapidly eliminated. It has very low potential to accumulate in man or to be absorbed through the skin in acutely toxic amount.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Disposal should be made in accordance with federal, provincial and local regulations. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean up of spills.

Emptied container retains vapor and product residue. Observe all labelled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse container for any purpose. If applicable, return container in accordance with return program. If a recyclable container, dispose of at a container collection site. Contact local distributor, dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site, triple or pressure rinse the empty container adding rinsing to spray tank, and make container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements.

14. TRANSPORT INFORMATION

(RID/ADR):	9
(IMDG):	9
(ICAO/IATA):	9
:	3082
	NA.
DDE:	9
OUP:	III
	(IMDG): (ICAO/IATA): :: DDE:

15. REGULATORY INFORMATION

-CROP PROTECTION DEPARTMENT





CORTA[®] 480

MATERIAL SAFETY DATA SHEET

Page 5 / 5

CORTA®: Registered Trademark of SSI

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is give. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

16. OTHER INFORMATION

REVISIONS:

The following has been revised since the last issue of this MSDS: New.

ADDITIONAL INFORMATION: Abbreviations used throughout the MSDS are:

NA = Not available NAp = Not applicable N/E = None Established.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

END OF MSDS

-CROP PROTECTION DEPARTMENT



Appendix 9: Fire certificate

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		A SERVICES		
	CHANA N	ATIONAL FIRE S	ERVICE	
			CASE OK	
	FIRE CI	ERTIF	ICATE	
	This	is to certify the	at B B	
house	number 11 BLOCK H SECTO	DR 17 of AKOMAOAN	ASH/R has bee	n issued
with F	ire Certificate for use as PO		?) FORM GHANA COMPA	NY
H.	aving upon inspection satis	LIMITED	equirement as Fire Saf	etv:
- Alaton		Means of Escape		En CE
	Туре	Number	Location A O D	
	a) MAIN EXIT b) GFN	<u>AOD</u> 5	A O D	
14674	c) <u>AP</u>	ATA .		
	A second s	Fighting Equipment	JE AS	
	Type a) CO2 (3/5KG)	Number	Location	
	b) <u>DP (6KG)</u>	1/64	EZATE .	
	c)	- <u>Sers</u> -		
Ref B		ant/Source of Water S	Supply	
NAPAR AN	HYDRANT		- NIL	
	ALTERNATIVE SOURC	E OF WATER	- BOREHOLE	
		Warning Device(s)		
	Type a) DS (B)	Number 5	Location	2n.8
	b) CPT	1	201 PA	
	c) <u>SDER</u> d)		<u>K y</u>	
AC21134F	THIS CERTIFICAT	E IS VALID FOR TW	ELVE MONTHS	
	Dated this.	TH day of JUNE	21	
	PROCESSION CONTRACTOR	general function for an and the	canitalinitemeanitiem	



Appendix 10: Corporate Social Responsibility



Plate 1: Six Unit classroom Block



Plate 2: Grading works at Akumadan Health Centre

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Plate 3: Grading exercise at Akumadan Health Centre

Appendix 11: OHS Training on HIV/AIDS



Plate 4: HIV/AIDS Sensitization
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Plate 5: HIV/AIDS screening of Form Ghana staff, Akumadan



Appendix 11: Sample of Stakeholders engagement

Stakeholders Meeting – 24th July, 2018

Attendance

See attached

Agenda;

- Feedback from last stakeholders meeting
- Form Ghana News
- Form Ghana External Grievance Redress Mechanism
- Fauna Inventory
- Commercial thinning
- Personnel Transport
- Update on Resettlement Action Plan
- Newly Acquired land
- Other matters

Minutes

The meeting commenced at 10:16 am with an opening prayer said by a representative from Joe Nkwanta. This was followed by introduction of members present. A welcome address was then delivered by Mr. Matthew Essuman

✤ Form Ghana News

Mathew Essuman (Plantation forester, Form Ghana Ltd). Matthew further began with Form Ghana news and mentioned briefly the progress of the company ever since its establishment in 2007; explaining that **3500hectares** of land have been developed. With this achievement, the forestry commission is still in documentation process of giving out new land to the company for development. Matthew emphasized that these achievement was as a result of the immense support of all the various stakeholders and he commended such collaborative support. Mathew then again explained that once the documentation process are done and these new lands are acquired by the company and after detail planning by the company, then plantation developments will start which

will also give opportunity for intercropping activities to the local farmers in all the fringe communities.

***** FORM GHANA External Grievance Redress Mechanism

Cosmos Zornah (HR) also spoke about the External Grievance Redress mechanism that have been introduced by FORM GHANA. Cosmos explained that this was to enable members of fringe communities and other stakeholders to channel their complaints or concerns to the company appropriately. Then Cosmos explained this will also enhance effective way of resolving concerns from these communities and other stakeholders. Cosmos further mentioned of the process and some of the staffs involved (HR and plantation manager) and that concerns/grievances may also be channeled through other staffs (supervisors, foremen and other management members).

* Fauna inventory

Ransford Nkuah (Monitoring supervisor) also spoke about bio study research on fauna in the plantation and the outcome of the research and the need for stakeholders to be in the known. Ransford explained that results from the research revealed that there were still some considerable amount of fauna population in the plantation. Results showed that 48 species of birds, 2 species of small mammals, 7 species of medium to large mammals and 1 bat species were found in both the teak plantation and buffer zone areas. Ransford further explained the bat species was labelled as near threatened and thus the need to protect these animals. Ransford therefore entreated all, especially members of fringe communities involve in bat hunting and poaching to desist from such illegal activities. Ransford spoke about priority biodiversity hotspots that was identified from the research to be the buffer zones where most of the fauna were found to be and thus their habitat. Ransford explained that hunting and poaching in these areas are prohibited by FORM GHANA and is an offence by the Wildlife laws and regulation of Ghana.

* Commercial thinning

Mr. Neil Crause (Harvesting/Plantation manager) mentioned of the ongoing harvesting operations in the company. Neil explained that harvesting operations will now become a permanent activity since most of the thinning done will be commercial. Neil further explained that harvesting has now began in 2008 plantations and thus will continue 2009, 2010 and 2011 plantations. Neil also mentioned of buyers for the products and stated that one have been found and thus constructing a saw mill for processing as well. Neil emphasized that harvesting operations will also create employment opportunities for members of the communities. Neil also explained that residue from harvesting will be collected as firewood and all interested persons will have to go through due process to collect firewood. Neil further entreated all to take necessary precautions as they pass by harvesting areas to ensure safety.

Personnel transport

Mr. Neil Crause started by saying that transport of our workers has gone through series of deliberations and has finally yielded results. Neil explained trucks will now be fixed with seats and seatbelts and a body built over the buckets to ensure more safety of workers. Neil explained that this process takes time and even showed pictures of three (3) finished trucks that is been used in FORM GHANA-Berekum. Neil mentioned that same trucks will be made available to FORM GHANA-Akumadan.

Resettlement Agreement Program (RAP)

Miss Evelyn Affreh (Environmental & Social Officer) and Mr. Francis Bilson-Ogoe (Plantation manager-Berekum) gave an update of the RAP, explaining that there are in all eight (8) people to be transported from Akumadan to Berekum. Evelyn mentioned that construction of temporary place of residents for (6 months) is still ongoing. Also mentioned that certain provisions such as 300hectares of farmland and a borehole drinking water have already been made available for them as well. The 6 months is to allow them put up their own permanent structures and allow for other re-settlers to be moved as well as explained by Mr. Ogoe.

* Other Matters

forests for the future

Chief Security Officer (CSO)-FORM GHANA spoke on security issues and explained that the company alone cannot do it but will also require the support of the communities and other stakeholders to help protect the plantation. CSO on the issues of bat hunting as mentioned earlier by Ransford, advised all leaders in the various communities to inform members of such illegalities, since it is an offence punishable by the laws of Ghana. CSO mentioned charcoal burning, palm wine tapping and chemical application in buffer zones in the plantation and thus the forest reserve are all prohibited by FORM GHANA and the laws of Ghana as well.

Matthew Essuman also added that we cannot meet as stakeholders and not talk about fire. He encourage all the stakeholders to continue educating their local communities on constructing proper fire belt before burning their farms. He also inform the local communities closer to our boundary to contact us for assistance in burning their farms especially during the dry season. He also tasked the Ghana national fire service staff to help strengthen the local fire volunteer squad in the various communities.

Questions, Answers and Suggestions

A rep from Mentukwa raised a concern on whether their farms in these newly acquired lands will be destroyed. Mathew explained that farmers with farms in these acquired areas will be giving a prior notice when development of those areas by the Company is due after which they must relocate from the said area. Matthew also added that the company also provides opportunities to the local farmers to participate in the company's intercropping system in such areas.

A representative from Offinso north District Assembly inquired of the company's SRA for the district and an update on the ablution facility. Evelyn explained that it is a gradual process in offering support to the community and FORM GHANA will provide the necessary support if the resources are available. Mathew further explained that FORM GHANA-Akumadan has also created employment for members of the communities and has majority of its workers from the local communities. On the ablution facility, Neil explained that, quotations and costing will have

to be made and submitted to company shareholders or board of directors for approval and that feedback will be communicated when approved.

A representative from Ghana National Fire Service also commended FORM GHANA on issues of fire safety on site and emphasized on certain by-laws governing fuel stations that needs to be complied with since there is an on-site fuel station at FORM GHANA-Akumadan. The National Fire Service will give the necessary advice to the company when necessary.

Mr. Mathew Essuman gave vote of thanks and a representative from Mentukwa moved the meeting to a closure which Collins Gyamfi, representative from Offinso-North district assembly seconded at exactly 12:47pm.

Below are some photos from the meeting;







Form forests for the future

1

Form Ghana Limited

Stakeholders Meeting Attendance List Date: 24/37418

#	Name	Community/Organization	Contact	Signature
1	Stephen Donana	Joe Misconter	0502230810	2.20
2	Panick Appiah	Meta	06394941	9552
Q.	Francis Feelby	Meta	054359553	35 22
4	Francis Depry	Amponsalcum	024602576	RIALL
-	Banua Gritteths	NKuben	024602576	
G	Jan Frinping	Joentranta	0246602576	
I.	John Xsampaha	Xmponsal com	020117820	H Charles
Q.	Raymond Sumors	Joe NKuentwa	014602576	Car . O
9	Seth Darko	GNFS	02493517-	H amilton
1	JOSEPH ADAHLANSA.	CHIEF SECULITY	6540114152	
0	Sy Wester M Maalador		7 02547 8365	
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12			1	IT PA
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21	AdongoAchbong		024864564	F
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13	Yeboah Augustine	2 Form Chang	0243390194	1 Att
24	Neil Crause	Jam Chien	OSGULLY ILLY	140
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261	Ransford Nkuch	- Form ahana H	10249147432	Confin
27	bahamadu saanam	a form Guana 1th	d 055067499	4 MARIO
28	Alhassen Joseph	Seve 80 Community	654481088	2-
29	Agyrmang Joseph	Form Chave. AV.	0542098295	Ama
30	Samson Salify	Afrensel Community	1	20
31	Kwane Tie.	mantukwe		
32	Kwadwo Appiah	manfilewa	0765183751	2
33	Mana Myamaa	MR fahene-Akupe	dan 05454110	18
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36	Africia Akwas	Form Ghang Dra		11/2 1
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27	F. Bilson - Oge	Form Ghana 150 - Berekum		- Kilon
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			Form Ghana Limited		
		Stakeh	olders Meeting Attendance List		
		C	ate: 24-07-2019	8	
#	Name Albersson 19.		Community/Organization	Contact	Signature
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-					
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Appendix 12: Samples of Training certificates



FORM Ghana Limited Training Certificate

First - Aid Training

Kondanboyele Janet has successfully completed training on the following subjects:

- Definition of first aid
- Definition of wound
- Types of wound
- Complications
- Management
- Content in first aid box

May 09, 2019.

Facilitator:

Baffoe Patricia

Plantations manager:



Facilitator:

Fo

gha

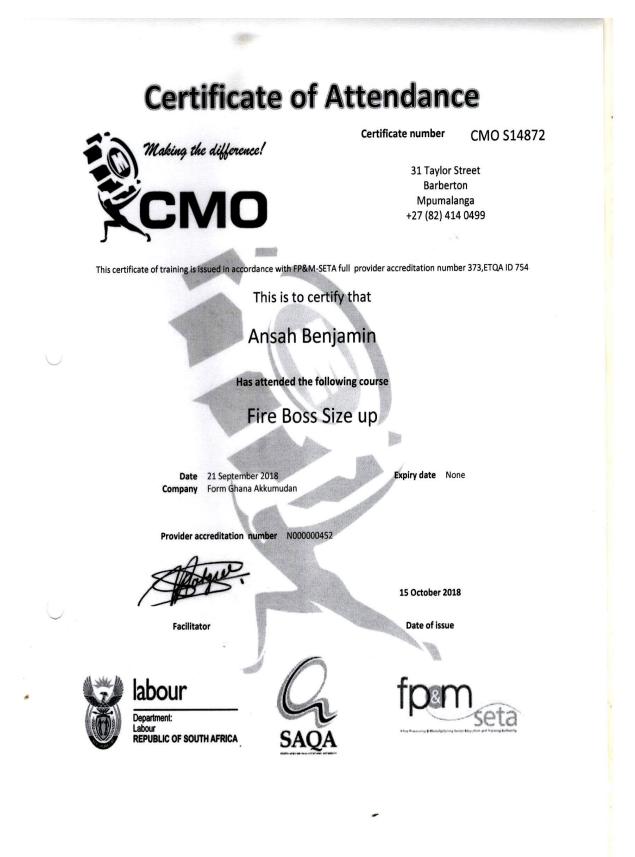
forests for the future

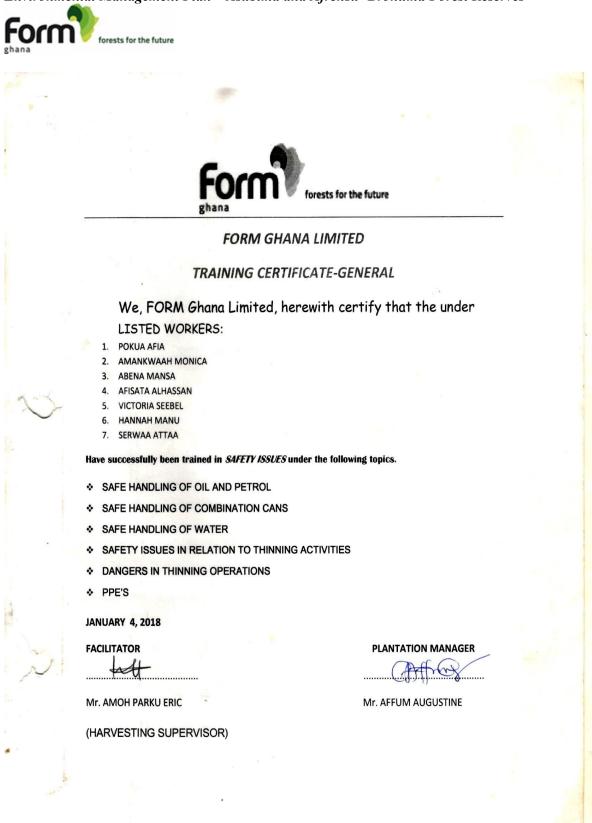
Plantation Manager:

Neil Crause

Amoh Parku Eric Harvesting Supervisor

Form forests for the future





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FORM Ghana Limited Training Certificate

Waste Management Training

We FORM GHANA, herewith certify the following having been trained in waste management;

1	Ngmenebon Felicia	Permanent
2	Boamah Charity	Permanent
3	Adwoa Achiaa	Permanent
4	Hawa Seidu	Permanent
5	Naabare John	Permanent
6	Yeboah Gifty	Permanent
7	Fati Mahama	Permanent
8	Felix Ngozi Blessing	Permanent
9	Afia Linda	Permanent
10	Joyce Oppong	Permanent
11	Cecilia Agyeiwaa	Permanent

Topics:

- Origin of Waste
- Types of Waste
- Waste storage and collection
- Means of disposal

Akumadan, 20th April, 2018

Facilitators:

Ransford Nkuah

Monitoring Supervisor





FORM Ghana Limited Training Certificate

First -Aid Training

Salifu Moses has successfully completed training on the following subjects:

Definition of first aid

Aims and objectives of first aid

Responsibilities of the first aider

Qualities of the first aider

Contents in first aid box

JUNE 17, 2020.

Facilitator:

Baffoe Patricia

Plantation Manager:

Essuman Matthew

-





FORM Ghana Limited Training Certificate

Waste Management Training

Miss. Faabalongna Naalozume has successfully completed training on the following subjects:

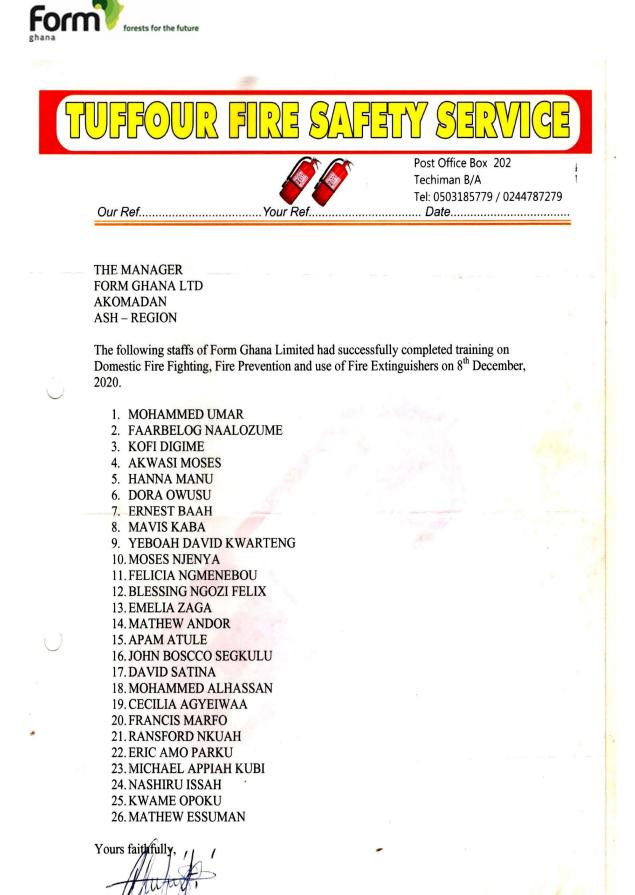
- Source of Waste
- Waste segregation
- Types of Waste
- Waste storage and collection
- Means of disposal

4th June, 2020.

Monitoring supervisor:

Form Ghana Management Sumian Mathews untation Mangger

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OPPONG GYAMFI JOHNSON (Director)



FACILITATOR

Mr. AMOH PARKU ERIC

(HARVESTING SUPERVISOR)

PLANTATION MANAGER

Mr. ESSUMAN MATTHEW





FORM GHANA LIMITED

TRAINING CERTIFICATE

We, FORM Ghana Limited, herewith certify that: *Mr. NANG ALBERT*

Has successfully been trained in *FIRE FIGHTING AND SAFETY* under the following topics.

- ✤ FIRE FIGHTING TECHNIQUES
- ♦ SAFETY IN FIRE FIGHTING
- ✤ DIRECT AND INDIRECT FIRE ATTACK
- * FIRE PREVENTIVE MEASURES
- ♦ DANGERS IN FIRE FIGHTING
- ✤ FIRE TOOLS AND PPE'S

Nov 16, 2020

FACILITATOR

Mr. AMOH PARKU ERIC

(HARVESTING SUPERVISOR)

PLANTATION MANAGER

Mr. ESSUMAN MATTHEW

11





Plate 6: Training on firefighting with beaters



Plate 7: Chainsaw training on tree felling



APPENDIX 14: Extract of Protocols

Protocol 01 Follow-up of legislation and international conventions

Protocol purpose

Form Ghana needs to be aware of all applicable legislation. This protocol describes the system implemented to collect relevant Ghanaian legislation and international conventions ratified by Ghana, and keep these texts up to date.

Keep Ghanaian legislation up to date

Changes in Ghanaian legislation are published in an official journal. The Finance and Administration Manager is responsible for checking the official journal for changes in legislation. A copy of any such notification is sent to the relevant person(s) within Form Ghana and the original articles are kept in the Form Ghana office. Also, regular contact with the Domestic Tax Revenue Division (DTRD) of the Ghana Revenue Authority (GRA)) and the Social Security & National Insurance Trust (SSNIT) in Ghana ensures that Form Ghana is up to date with updates in laws and regulations with regards to Tax & Pension issues respectively.

If there are changes in laws applicable to Form Ghana, the new texts are read carefully to check for possible conflicts with FSCTM (FSC-C044035) regulations. Changes in legislation may necessitate modification of the management protocols. In this case, senior management must be notified.

The laws applicable to Form Ghana are listed in Annex 2-15. The table is based on the work done by Client Earth in 2013. The relevance of each law for Form Ghana is indicated in the right column. Laws that are relevant in general are indicated with "relevant". If specific elements are relevant, they are specified. Laws that are not directly relevant for Form Ghana are indicated with "X".

Keep international conventions up to date

Changes in international conventions are not published in a centralized way. Form international will keep track of any changes in the conventions that are ratified by Ghana and apply to Form Ghana.

The relevant international conventions are mentioned in the Annex 1. This list will be updated regularly.

Archiving of texts and distribution

Legislative texts and conventions are kept in the office at Sunyani and maintained by the accountant, in hard- and softcopy. Hardcopies of relevant legislation are kept in the Plantation Managers' Office in Akumadan and Berekum.

Whenever a new regulation is found, it is added to the list (Annex to this protocol), and a message (with summary of the law), is sent by the Accountant to all relevant staff, including



reference to the full text. Records of these messages, including the addressees, (e.g. Emails) are kept in a separate file.

Protocol 04 Waste Management

Origin	Туре	Reduction	Disposal	Tracing
Workshop	Tyres		Are stored on site and collected by a private waste management company upon request.	Waybills
	Batteries (dry cell)	Use rechargeabl e batteries.	Are stored on site and collected by a private waste management company upon request.	Waybills
	Batteries (vehicle)		Are stored on site and collected by a private waste management company upon request.	Waybills
	Used oil	Recycled for treating wood against termites.	Are stored on site and sold out to used oil dealers.	Waybills
	Oil filters		Are stored on site and collected by a private waste management company upon request.	Waybills
Workshop, plantation	Used cables, wreckage and other metal waste (scrap)		Are stored on site and collected by a private waste management company upon request.	Waybills
Stores, nursery, plantation	Non- hazardous chemical waste (pesticides, paint etc.)		Are stored on site and collected by a private waste management company upon request.	Waybills
	Hazardous chemical waste		Are stored on site and collected by a private waste management company upon request.	Waybills
	Waste from harvest operations	Felling technique	Left in the forest.	
Office buildings	Fluorescent Light Bulbs	Best possible quality.	Are stored on site and collected by a private waste management company upon request.	Waybills
Stores (containers) , nursery	Plastic waste	Reusing containers, trays	Skip containers of a private waste management company	Waybills



(bags, trays)				
Base	Domestic waste	Awareness raising	Skip containers of a private waste management company	Waybills
First-aid post	Medical waste		Are stored on site and collected by a private waste management company upon request.	Waybills



Protocol 05 Responsible use of chemicals

Protocol purpose

Form Ghana's company policy is to minimize the use of pesticides and to avoid possible risks for the safety and health of the employees. This is also valid for situations in which dangerous or toxic material is used.

Use of weedicides and pesticides

Three types of chemicals are used by Form Ghana: herbicides, fungicides and insecticides. Form Ghana aims to use biodegradable products that affect only the target and leave no traces in the environment or in the food chain. All products are applied according to the instructions for usage. The use of chemicals is minimized and if there is a possibility to reduce or stop the use of chemicals over time, this will be done. The quantity to be used in the field is based on recommendations from the manufacturers and/or determined based on field studies performed by Form Ghana.

All products in use have been evaluated against the FSCTM (FSC-C044035) list of highly hazardous chemicals. The FSCTM (FSC-C044035) contact person of Form Ghana regularly reviews the chemicals in use to verify whether they still comply with FSCTM (FSC-C044035) standards.

Administration

There is an up-to-date MS data sheet of the used chemical products present at the sites, both at the stores and in the clinics. The name, directions for use and characteristics of each product are registered, as well as the used quantities of the products.

The employees working with the chemicals and their supervisors are aware of the directions for use of the products. It is the supervisor's duty to train the employees on relevant PPE and handling of the chemicals.

Storage of chemical products

Products are stored as described in Protocol 16: treatment of fuels, lubricants and toxins.

Protection of personnel

The use of Personal Protection Equipment (PPE) is mandatory for applicators of chemicals. Details are described in Protocol 10 (Personal protection).



Protocol 08 First aid procedures and emergency evacuations

Protocol purpose

This protocol describes the procedures for first aid training, usage and composition of the first aid kit and handling of accidents.

First Aid Training

Every year training in first aid is given to all relevant staff.

First aid kits

The first aid kits must always be available at the working site: one in every car and truck and one with each supervisor or foreman of every team in the field.

Contents of field first aid boxes must be checked weekly by the occupational health practitioner and completed when needed. The minimum contents for field first aid boxes are listed in table 1, and this list must also be included in the first aid box. The first aid boxes used in vehicles have the same contents with exclusion of the crêpe bandages. First aid boxes in vehicles are checked monthly. The operational health practitioner is responsible for the contents of the kit.

Medicine	Category	Minimum quantity
Gauze	Wound Dressing	3 pieces
Gauze Bandages	Wound Dressing	2 rolls
Crêpe Bandages	Wound Dressing	1 roll
Cotton Wool	Wound Dressing	3 pieces
Plaster	Wound Dressing	1roll
Scissors	Cutting Dressing Material	1
Surgical Blades	Wound Cleaning	2
Methylated Spirit	Disinfectant	half bottle
Iodine	Disinfectant	half bottle
Gentian Violet Solution	Disinfectant	half bottle
Disposable Gloves	For Safety When Treating Wounds	1 pair
Tri Silicate	Abdominal	1 blister
Paracetamol	Painkiller	1 blister

Table 1. Contents of the field first aid boxes.

Medicines at the dispensary

Medication and medical appliances are kept at the dispensary. Supplies should be adequate to treat ill people and to supply the first aid kits. The medicines available at the dispensary and the minimum quantities to remain available are listed in annex 2. The expiry dates are checked by the nurse every month.

Accident recording

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All work-related injuries, even those not requiring medical attention, must be reported and recorded by the operational health practitioner. A summary is presented to the Management every month, and an annual summary of these reports is presented in the Public Monitoring Report.

The operational health practitioner will present an analysis of accidents to the Management. This analysis includes:

- The cause of the accident
- Ways to prevent this in the future
- Actions required

Accident procedure

A vehicle is always available in the plantation or at the nursery to rapidly evacuate any injured or gravely ill person. Serious accidents are reported on the radio to alert the operational health practitioner.

A radio can be reached within 10 minutes and a person trained in first aid is present in each block where operations take place. Mobile phones work in most of the plantation area and function as a back-up system in case of emergency.

Wounded or otherwise hurt people that cannot be treated on site (accidents too grave, seizures, heart attacks etc.) are transported to the nearest hospital as soon as possible.

Form Ghana has an agreement with the Berekum Health Centre and the Holy Family Hospital in Berekum. This agreement assures treatment of Form Ghana workers in case of an emergency, so that there will be no delay due to formalities.

Nursery

When an accident occurs at the nursery, a foreman and a first-aider are immediately informed. The trained first-aider assesses whether the wounded person needs special hospital care. Firstaiders stabilise the wounded person.

The accident is reported to the dispensary. If necessary, the operational health practitioner makes arrangements to transport the victim to the Holy Family Hospital in Berekum. A first-aider accompanies the wounded person during the trip.

Plantation

When an accident occurs at the plantation, a foreman and a first-aider are immediately informed. When a first-aider or foreman is distant, these are urgently called. A trained first aider assesses whether the wounded person needs special hospital care. The accident is reported to the office where arrangements are made with the hospital, if necessary.

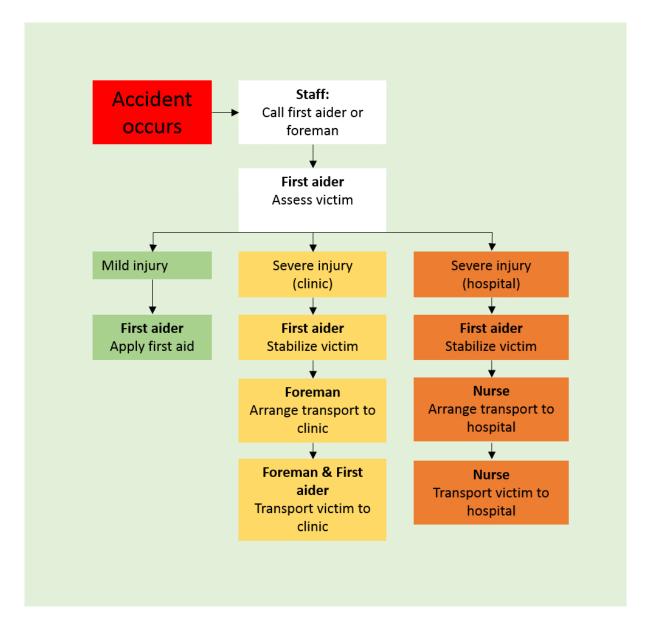


First aiders stabilise the wounded person, while the foreman arranges for transportation to the clinic. The first aider stays with the injured person.

Lesser injuries and sicknesses

People who cut themselves or do not feel well and need to be transferred to a doctor or hospital but not urgently can get a forwarding slip at the nursery dispensary. The nurse will issue a slip if he deems a visit to a doctor necessary. The slip is a guarantee for the doctor that the person in question is a Form Ghana employee. An example of such a slip is attached as annex 1.

A schematic representation of the Form Ghana accident procedure is presented below.







Protocol 09 Employee transport and vehicle and equipment policy and procedure Purpose

The aim of this policy is to ensure safety and effective maximum utilization of company's employees and fleet respectively.

1.1 Authority

The Managing Director is the rightful authorization of the usage of any company vehicle. In the absence of the Managing Director, the Forest Manager gives right authorization. Any other usage of Vehicle that does not belong to the company, but operates in the company environment has to be authorize by the Managing Director.

1.2 Responsibilities

The plantation managers, Supervisors, HR office. Fleet Management Officer, Driver Training Officer and drivers are to manage and review effectiveness of this policy. Again, they are to make sure that vehicles are in good state and employees transport systems are in accordance with the policy. The plantation manager is to ensure that, the usage of company vehicles is in respective with the right authorization.

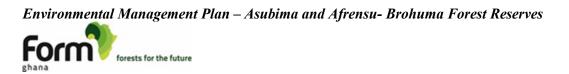
The Chief mechanics is to receive a weekly checklist from all driver operators at the end of the week and act accordingly. The mechanics is to repair and maintain all faulty vehicles and report to the plantation manager.

Only Employees with valid driver's license and company authority (Listed on company registry) are allowed to drive or operate company vehicle. Eligible employees are to observe all company vehicle forms and checklist.

2. VEHICLE UPKEEP AND MAINTENANCE

2.1 Daily check

- Driver to ensure that he/she has their valid driver's license on their person or in the vehicle.
- Each driver should inspect his vehicle on a daily basis before use to ensure the safety of its operation.
- Any faults are to be reported to the senior driver.
- The senior driver is to record all faults on the white board provided in the stores for each specific vehicle. The senior driver is to bring these faults



to the attention of the workshop engineer and to follow up on the progress of the work. The workshop engineer must resolve the faults recorded on the board ASAP.

- For serious faults influencing the safety of the vehicle's operation, the vehicle should be parked and repaired before use.
- If any parts are required this must be discussed between the storekeeper and the workshop engineer, these required parts must too be recorded on the board as that the storekeeper can ensure the parts are ordered if not on hand at the time.
- A job card must be created by the storekeeper for each job and signed off by management once the work has been completed.

2.2 Weekly check

- All vehicles are inspected weekly by the workshop engineer following a set checklist as a preventative measure and to solve any minor/major problems.
- The driver should be present during this inspection to assist the workshop engineer in identifying any problems.
- A specific checklist is elaborated for each type of vehicle (pick up, truck for labour transport, motorcycle, tractors, trailers and timber trucks).
- Vehicles that are not in the workshop do not have to return there for the weekly checks. This can be done in the field.

2.3 Monitoring and Evaluation

- Daily check of vehicle parts by drivers to maintain good condition of vehicles
- Quarterly spot check of vehicles
- Quarterly review of vehicle maintenance and any other reported cases
- Communicating outcome to concerned employees

2.4 Company Vehicle Checklists

There are various company vehicle checklists available at the mechanical workshop. Necessary information to check and maintain safety and efficient use of vehicles are in the forms. The checklists include;

- Daily Vehicle checklist
- Spot check list



- Rental vehicle check
- Fuel checklist

2.5 Service schedule

- There is a service schedule for all vehicles that is based on daily kilometres or hours, depending on the vehicle.
- From the schedule, a list of vehicles due to be serviced is issued on a monthly basis.

2.6 Tyres

- The Original Equipment Manufacturer recommended tyre sizes must be adhered to. (Eg. Toyota)
- Tyres must be replaced with at least 1 mm. tread left.
- For all trucks, tyres should be changed with about 2mm of tread left.
- The correct tyre pressures must be maintained at all times. (Under or over inflated tyres show accelerated wear and are significantly less safe than correctly inflated tyres).
- Tyre life should be monitored and appropriately managed.

2.7 Vehicle Security

- All vehicles must be kept secure at all times. Ensure that all the anti-theft devices fitted to all vehicles are at all times functional.
- The following security measures must apply when any vehicles is left unattended (without physical attendance):

During the day:

- (i) Lock the gear lock (if equipped)
- (ii) Lock the vehicle and arm the alarm (if equipped)
- (iii) Keep the ignition keys safe.

During the night – as for the day plus:

- (iv) Keep vehicles behind gates or booms that can be locked.
- (v) Store all vehicles in an appropriate lockable, and if possible, enclosed area.
- (vi) if Necessary, station a guard during the night.
- (vii) Park at designated areas in Berekum, Akumadan & Sunyani



3. SPECIFIC CONDITIONS FOR DRIVERS OF COMPANY VEHICLES AND EQUIPMENT

3.1 Personnel transport truck

- Trucks may carry a maximum number of passengers, as per DVLA registration details.
- Use side mirrors to ensure all workers are on the truck, before start driving off
- Park to the side of a road in the plantation
- Ensure the Motorola is switched on and respond when called

• The driver shall not allow people to ride on the roof of the vehicle, on a load on the vehicle, or on a trailer drawn by the vehicle. (LI2180 – clause 100)

• Chainsaws, chainsaw blades and tools shall be stored and transported in a box with a cover.

- Only persons with a valid driver's license are allowed to drive in a vehicle
- The vehicles are not to be used for private purposes

• Maximum speed is 50 km/h off the tarmac road and 40 km/h within the plantation. Adjust your driving speed according local conditions (e.g. visibility, approaching a curve, road surface)

• Drivers are compelled to wear sturdy shoes, provided according to P10 (Personal protection).

• Whenever the seats of a vehicle are equipped with seatbelts, it is compulsory to use them.

- The drivers of company vehicles are responsible for the technical good state of the vehicle and the conformity of the documents. Report and faults immediately.
- All vehicles and equipment should be cleaned at regular intervals, so as to portray a professional and neat image at all times.

• The drivers of company vehicles are responsible for the presence of a first-aid kit in the vehicle.

• The drivers are responsible for the respect of all regulations stated in this protocol and applicable legislation, especially the requirements from the LI 2180 Road Traffic Regulations, 2012 that apply to the driver.

• The drivers shall not hold, use or operate a cellular or mobile telephone (other than a two-way radio), whilst driving the vehicle. (LI2180 – clause 107)

• Operational managers (plantation managers, foresters, supervisors and team leaders) will be held accountable if they were aware of driver misconduct or any procedures not being followed and no disciplinary action were taken.

Form forests for the future

3.2 Tractor and power tillers

• Tractors and power tillers are used only for tasks they are designed for.

• The management may decide to use them for other uses (e.g. transport of wounded persons).

• Nobody is allowed to sit on the mud guards of any vehicle or equipment.

3.3 Motorcycles

- The use of a crash helmet is compulsory (also for passengers).
- Luggage is carried and fixed in a safe way and the motorcycles can carry maximum one (1) passenger.

3.4 Cars / pick-ups / Mini Bus

• Employees in the back of a pick-up may never sit on the rim of the body but only sit (not stand) in the inside of the bin, and can only get off when the vehicle has come to a complete stand-still.

• Pick-ups can carry a maximum of 10 persons.

• No driving allowed on Main roads between 18H00 and 05H00 except with direct approval by Managing Director

• Only Form Ghana employees may be allowed on the vehicle except by approval of Managers

3.5 Cars / Pickups allocated to senior management

• No driving allowed on Main roads between 18H00 and 05H00 except with direct approval by Managing Director

• Individual is responsible for the vehicle

• Individual (Senior manager) is personally responsible for any non-Form Ghana employees carried as passengers

• With prior approval from Managing Director, the allocated vehicle can be used for private use. (However, the individual will be responsible for any travelling cost – Fuel, Driver, Toll etc)

4. SPESIFIC CONDITIONS FOR RENTAL TRUCKS

- If necessary, the company may rent a vehicle with authorization from the Managing Director. A contract letter is served and the vehicle will be laid off as agreed in the letter.
- Before any rental vehicle operators or drivers start operating, they should have a valid driver's license and successfully pass the vehicle check for rented cars.
- Maintenance of hired vehicles are not the responsibilities of the company

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• In case of any damage of rental cars and hence cannot operate within the agreed contract, owners of rental cars must find an alternate immediately or otherwise their contract will be terminated with the company



Protocol 10 Personal protection

Protocol purpose

Safety is of the utmost importance to Form Ghana. To ensure that everybody works in a safe manner in a safe environment three approaches are used:

- Use of individual protective gear
- Training of personnel in the safe use of equipment and in safe working techniques (see protocol 11)
- Regular safety assessment of the workplace

The use of protective equipment is based on the ILO Standard 'Health and Safety in Forestry Work'. This can be modified due to local conditions.

Risk assessment

A risk assessment of the company is described in the table below. This risk assessment is reviewed every year and updated if necessary. If there is a significant change in the workplaces, the risk assessment is adjusted instantly. Risks related to harvesting operations are assessed prior to harvesting, as part of the Operational Plan (see P25 Harvesting).

Activity / site	Risks	Preventive measures	ILO prescribed PPE ²	Deviations (if any)
Manual planting ³	People working in the plantation may be bitten by snakes or other dangerous animals. People working in the plantation may harm their feet wearing improper footwear.	Wellington boots	Safety boots or shoes	Wellington boots provide better protection, as the lower part of the leg is also protected
Manual weeding	People working	Sufficient		
(with smooth- edged tools) ⁴	with cutlasses may hurt themselves and others.	spacing between cutters (minimum 6 metres)		

² ILO code of practice Safety and health in forestry work (1998) Table 1 Personal protective equipment (PPE) appropriate for forestry operations

³ ILO prescribes gloves when planting spiny seedlings or chemically treated plants, but Form Ghana is not planting spiny seedlings or chemically treated plants

⁴ ILO prescribes goggles for this activity, but interviews and medical records do not provide evidence for a risk here, while sweat and humidity might increase the risk as it will reduce visibility and comfort when using goggles.



	People working in the plantation may be bitten by snakes. People working in the plantation may harm their feet wearing improper footwear.	Wellington boots	Safety boots or shoes	Wellington boots provide more protection of the lower leg, where there is the highest risks of cuts and snake bites.
	Splinters and thorns may hurt hands The hand not holding the cutlass might be hit with the cutlass	Instruction on the use of a cutlass when weeding in order to protect hands	Gloves	Gloves do not stop or slow down a cut with a cutlass Gloves are felt to be uncomfortabl e when hands are used to work with a cutlass Gloves may reduce grip on the tool handle
Weeding / cleaning / singling with a chainsaw	Peopleworkingwithchainsawsmayhurtthemselvesandotherswiththechainsaw or falling	Sufficient spacing between operators (minimum 2 tree lengths)		
	wood.	Chain-saw boots	Chain-saw boots with protective guarding at front vamp and instep	
		Safety trousers	Safety trousers	
		Close-fitting clothing with high visibility vest	Close- fitting clothing	
		Gloves with cut- resistant material	Gloves (with cut- resistant material	



		Safety helmet	incorporate d in the back of the left hand) Safety	
		equipped with visor and ear muffs	helmet	
			Goggles	The visor on the helmet protects the eyes. Goggles will reduce visibility and comfort.
		Safety helmet equipped with visor and ear muffs	Visor (mesh)	
		Safety helmet equipped with visor and ear muffs	Ear muffs	
Pruning with hand tools	People pruning may hurt themselves and others.	Sufficient spacing between workers (minimum 9 metres)		
	People working in the plantation may be bitten by snakes. People working in the plantation may harm their feet wearing improper footwear.	Wellington boots	Safety boots or shoes when falling branches are likely to cause injury	cause injury, but to protect feet from snake bites etc. wellington boots are prescribed
	Splinters and thorns may hurt hands	-	Gloves	Pruning is normally done in stands with limited undergrowth, and teak does not have



Falling branches might hit the head of the worker	Safety helmet when pruning to a height exceeding 5m	Safety helmet when pruning to a height exceeding 2.5m	thorns. Therefore, the risk of splinters and thorns is negligible. Gloves are felt to be uncomfortabl e for hands that are used to work with a smooth handle of the pruning saw. Gloves may reduce grip on the tool handle Pruning at a lower height is done from a certain angle, which implies that the worker is
			not standing under the falling branch. When pruning at higher pruning heights the angle from which the worker is working is reduced, and also the impact of a falling branch will be more severe.



	Dust and splinters may hurt the eyes when pruning to a certain height	Goggles when pruning from 5m and higher	Goggles	Pruning at a lower height is done from a certain angle, which implies that the worker is not standing under the branch that is pruned. Splinters and dust will therefore not hurt the eyes. When pruning at higher pruning heights the angle from which the worker is working is reduced, and as a consequence dust and splinters might hurt
Chemical weeding	People that work with chemicals may get the chemicals on their skin or on their own clothes.	Cotton overall buttoned to the neck and wrist for all applicators of weedicides and pesticides except Mankar operators. Mankar operators must wear long sleeves, long pants, socks, boots and gloves (optional: goggles and nose mask).	with those specified for the particular	the eyes.



	People that work with chemicals may inhale the toxic agents.	Face mask for all applicators of chemicals, except Mankar operators.	
	People mixing the chemicals may get the chemicals on their hands.	People mixing chemicals must wear impermeable gloves, in addition to PPE for chemical operators.	
Fire fighting	Fire fighters are exposed to heat radiation and sparks Fire fighters may slip-off during fire fighting	Fire fighters must wear heat resistant clothing and hand gloves (cotton). Head mask (Balaclava) and goggle ⁴ Safety boots	
	Overexertion that can results in injury	Rest period for fire fighters	
	Fire fighters may be dehydrated	Fire fighters must drink clean water frequently to replace water loss due to dehydration.	
Manual road works (cracking of rocks)	People working with tools (e.g. pick axes) may hurt themselves and others.	Sufficient spacing between workers (minimum 6m)	
	People may drop heavy materials such as rocks on their feet.	Safety shoes	



	Road material (e.g. rocks) might hurt hands	Gloves	
	Flying rock particles might hurt the eyes	Goggles	
Workshop	People working in the workshop may drop heavy materials on their feet.	Safety shoes	
	People working in the workshop may have to work with harmful liquids that can damage clothes or skin	Rubber gloves	
	People working in the workshop may get flying particles in their eyes while working with the portable grinding machine or other equipment	Eye and face protection (Face shields/Safety glasses)	
	People welding may get burned while welding	Welding apron, industrial gloves	
	People working with fuel and lubricants may be hurt by frequent exposure to these substances.	Training	
	People working in the workshop may damage their hands while working with machines and repairing equipment	Gloves	



	People working in the workshop may suffer a hearing impairment after working with noisy engines and the portable grinding machine. People working in the workshop may be exposed to smoke	Ear protection (Earmuff/earplug s) Nose Mask	
Electricals Construction works	People/person working on electricity/electrica ls may be exposed to electrical shock, falling, burning People may slip	Insulated gloves, sturdy leather shoe, helmet, eye protection (safety glasses), safety belt, overall Safety shoes	
(masonry/carpentr y)	and/or drop heavy material on their feet. People may hurt their hands by sharp objects or tools. People may be exposed to	Gloves Safety helmet	
	potentially falling objects People may suffer a hearing impairment after working with noisy engines	Ear protection (Earmuff/earplug s)	
	Flying particles from construction materials can hurt the eyes.	Eye protection (goggles)	
Nursery	People working in the nursery may be exposed to toxins sprayed to kill weeds / insects	Spraying time schedule	



People working in	Wellington boots	
the nursery may		
hurt their feet		
wearing improper		
footwear		

*** General plantation work requires wellington boots as PPE



Personal Protection equipment

Personnel employed at Form Ghana receive personal protection equipment (PPE) according to their task. For applicators of chemicals, the recommended PPE is based on the recommendations in the MS Data Sheets for the applied chemicals. The use of this equipment on the job is compulsory. All senior personnel are responsible for the appropriate use of safety equipment.

Personnel receives the PPE when the work is to be done, and renewal of the PPE is done when needed. The state of the equipment has to be observed by senior personnel, and it is their responsibility that only PPE is issued that is in a good condition.

Intermediate replacement can only take place when presenting the old equipment. In case of loss the employee will compensate the company (pay for the equipment). Issuance is registered by the storekeeper.

In the case of Wellington boots, the following conditions apply:

- Each employee will be issued with one pair of boots, twice per year.
- If the boots are damaged or lost before the next pair is issued, the employee will be responsible to replace the boots.
- No employee will be allowed to be at the workplace without a serviceable pair of boots.
- After the first pair issued, contract teams will receive a new pair of boots after each 6 months worked.

Training & Sensitization

The Plantation Manager of Form Ghana Ltd. is responsible for the instruction of each new employee on the use and care of the PPE issued to him/her (see P 11: training of personnel). Training is refreshed annually. The plantation manager has the right to delegate part of his training and sensitization work on PPE's to workers' delegates.

The Plantation Manager is also responsible for the provision of the equipment to the new employee and for the correct use of the equipment. He/she will regularly check if workers wear the equipment issued to them and is entitled to sanction workers that do not wear the equipment issued to them. The sanctions are stipulated in the internal regulations.

The foremen/supervisors are responsible to ensure that the people they lead have and use the proper equipment.



Protocol 13 Monitoring

6 Water quality

Water quality is monitored by Form Ghana to assess the effect of the various stages of plantation establishment on the rivers and streams in the plantation. The quality of the water is expected to improve due to the restoration of buffer zones and reduction of erosion on the plantation surface. As part of Form Ghana's commitment towards FSCTM (FSC-C044035). Form Ghana should be able to proof that water quality is not degrading due to plantation establishment FSCTM (FSC-C044035) Requirement 10.6.3: Plantation activities shall not degrade water quality, and impact negatively on local hydrology).

Form Ghana will measure water quality 2 times a year: once during the dry season, once in the rainy season (after rainfall). This frequency is chosen because rainfall has a strong effect on water characteristics because of influx of sediment. Measurements on one catchment should be completed in 1 day to make sure differences between water entering and water exiting the plantation are not due to differences between days.

The measurements are done at strategic points where water enters the plantation and at the point where it exits plantation boundaries again, to assess the changes in water quality on plantation site only. Water monitoring is done in the morning and GPS handhelds are used to mark the sampling locations.

The following parameters are measured:

- pH
- Temperature
- Total Dissolved Solids (TDS)
- Conductivity
- Turbidity

These are measured with a multi-parameter meter (pH, temperature, TDS and conductivity) and a turbidity tube.

Two members of the Form Ghana monitoring team will do the measurements at a set number of locations in the plantation. At each location, they will take a series of 6 measurements with the multi-parameter probe and the turbidity tube by measuring every 5 min for 30 min. Measurements are completed 1 day in for each catchment, meaning one day for Asubima, one day for Afrensu-Brohuma and one day for Tain.

The average values of the series of measurements are calculated. Averages can be compared for upstream and downstream results and over time. Results in the dry season and in the wet season can be compared but should not be mixed.

In addition to this system, samples will be analysed in the lab for their chemical composition, to assess relevant components such as Glyphosate, which is used for weed control.



Water consumption monitoring

Quarterly report on quantity of water consumption, borehole water quality and height of water table (Ghana Water Resource Authority)

Pump ID	Location	Capacity	Totalvolumepumped(peryear)	Action time
Ground FOS	Site Berekum	2Hp	m3	Daily
Ground FOS	BII Berekum	1 Hps	m3	Daily
Ground FOS	B46 Berekum	1.5Hp	m3	
Xtra	Site Akumadan	2Hp	m3	Daily
Saer	Site irrigation Akumadan	30Hp	m3	Daily

Borehole water quality and water table height

- Bore hole water quality (see water quality) (quarterly; January, April, July, October)
- Water table (quarterly; January, April, July, October) Read water table depth at meter



Protocol 14 Nursery Management and Propagation

1. Teak production

1.1 Stump production

The land is prepared for stump beds by ploughing. If needed, either a mixture of cow dung and chicken manure (3:1) (1m³ per 200m²) or artificial fertilizer can be applied. Seed beds of 1mx10m are constructed 20cm above ground level with a slight incline to facilitate drainage. The distance between the sowing lines is 10cm. The beds are sprayed with a Glyphosate-based herbicide to combat weeds. Compost, manure or fertilizer should be added to replenish the soil nutrients throughout the growing season.

After 3 years of stump production, the beds should be left to 'rest' for one or more seasons to replenish the soil nutrients. In the fallow season, a leguminous cover crop or green manure (e.g. cow peas during) should be planted on the beds.





Stump bed preparation

Stump production area

1. Sowing and germination Only fresh seed from the current harvesting year is used. Seeds are soaked in water for at least two full days before planting. The seeds are pre-treated with insecticide.

Seeds are sown along sowing lines of 10m length and 10cm distance (at 15cm x 7cm), or in a low density of ca. 100 per m^2 . This balanced density reduces competition for water, light and nutrients and improves seedling growth. Teak seeds are sown directly in the prepared bed in the beginning of July. The seeds are pushed slightly into the ground, so that they are stuck but not covered. The seeds are only slightly covered with fine soil. The bottom of the seed should not be deeper than 10 mm.



Sowing seeds along lines



Germinating seeds

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Seeds germinate between 15-105 days after sowing.

During the germination period the beds are irrigated. During the seed germination and seedling establishment period, watering is essential. In dry-spell periods, seed beds must be watered to maintain both soil moisture and air humidity. The watering is checked daily, to ensure sufficient water and to avoid over watering, which can lead to diseases.

In November and December, the seedlings are watered according to a watering schedule. This schedule is variable depending on the weather conditions. Watering is progressively decreased to 2 times a week and finally stopped completely from mid-February to stump harvest in April for hardening off. The exact schedule is determined by the nursery supervisor, based on several factors such as sowing date, rains etc.

1. Seed germination beds

Remaining teak seeds are strewn on germination beds to provide seedlings for beating up in the nursery. This is done immediately in areas of low germination. The germination beds have raised edges to help contain moisture. They are located in full sun light because teak requires to be fully exposed to the sun for germination. The germination beds are watered daily. In a $10m^2$ bed, 20kg seed can be broadcasted.

Young seedlings can be transplanted if germination success is not high enough or if seeds germinate irregularly. Transplanting is done in October-November, not in December or January. Watering before and after transplanting is crucial in this phase.



Germination beds



Germinated seeds

2. Weeding and maintenance

The stump beds are first weeded 3-4 weeks after sowing, when weeds hinder germination and growth. Weeding is done manually between the rows, loosening the compact soil. Stump beds are weeded on average six times before harvest. Weeds should never be allowed to compete with the teak seedlings. Sometimes - after heavy rainfall - beds have to be slightly reconstructed.

Termite attacks are handled with insecticides that have been approved by FSCTM (FSC-C044035). The stump production site should be free of debris and other flammable material at all times to prevent fires and insect attacks. Beds are sprayed several times with fungicides,



approved by FSCTM (FSC-C044035), against damping off disease. Beds are inspected daily to see if any disease is present. If found the disease is treated immediately.

Leaf pruning is done as soon as the leaves of dominant plants cover smaller plants and areas that are still germinating.

3. Monitoring seedling development

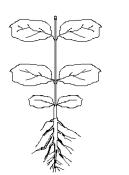
The number of teak seedlings is monitored 5 times a year by the monitoring supervisor / manager in week 6, 16 and 40 after sowing. Monitoring plots are established in the stump beds $(1m^2/1000m^2)$.

Germination beds are checked daily for pests, weeds and water availability.

4. Stump harvesting

Stumps are harvested after 8-9 months (April). Beds are harvested systematically. This means whole beds are harvested and then prepared for resowing. The seedlings are pulled out by hand. In case the soil is dry and hard, a pick can be used to loosen the soil before pulling out the seedlings. Care should be taken not to damage the roots. Seedlings should be cut into stumps immediately, not allowing for the leaves to dry out before trimming them.

The stem is cut off 3-5cm above the root collar, leaving one or two pairs of buds for sprouting. Lateral roots are all cut off close to the taproot. The main taproot is cut off at a length of ca. 15cm with a sharp cutlass, secateurs or pruning knife.



Seedling and stump



Stumps

Stumps can be stored in sacks in a cool place for a maximum of 2 weeks, if watered daily. The stumps should be covered with palm leaves or grasses to protect them from direct sunlight. Water is sprayed on the stumps during hot and dry periods. Out-going stock of the stump production is registered. Provenance is recorded on every sack and provenances are kept together during planting.





Digging out seedlings



Preparing stumps

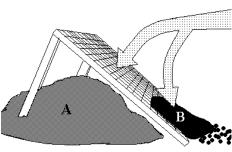
2. Production of indigenous seedlings

Indigenous seedlings are produced in polybags of 10cm x 16cm or other, depending on the species, with 8-10 aeration holes for drainage. A polybag with seedling weighs ca. 600gr.

1. **Potting mixture**

The potting mixture consists of 75% loamy topsoil or black soil, 20% sand, 4% decomposed cow manure and 1% chicken manure. A good potting mixture consists of both coarse and fine particles to provide adequate but not excessive air spaces. It contains enough organic matter and nutrients and has a pH between 4.5 and 6.5.

Black soil or loamy topsoil should be sieved before use. The different components are mixed with a concrete mixer. The substrate-components are obtained in December/January for the following year and stored in the soil storage shed.



Sieving soil



Mixing soil components

The poly bags must be filled completely in order to keep the pot open for watering. 1000 poly bags can be filled by hand per man-day. The soil must be moistened if dry before filling the polybag. The pots are placed tightly in beds with a wooden frame to support each other.





Filling polybags

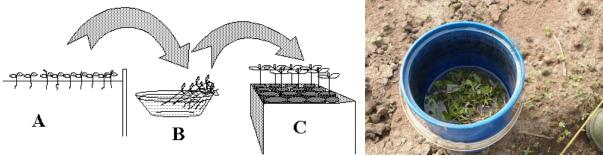
Filling instructions

2. Germination beds

Only fresh seed from the current harvesting year is used. Pre-treatment of the seeds with insecticide is done if needed. Seeds with an average germination rate <80% should not be sown in polybags but in germination beds. After broadcasting the seeds, the soil is moistened and covered with palm leaves. Germinated small plants are pricked out when the tap root emerges but before secondary roots are formed, and carefully transplanted into polybags.

The seed beds should be watered the night and one hour before pricking them out, so that water penetrates to the bottom of the seedbed. On hot and sunny days, pricking out should be done in the early morning or/and late afternoon.

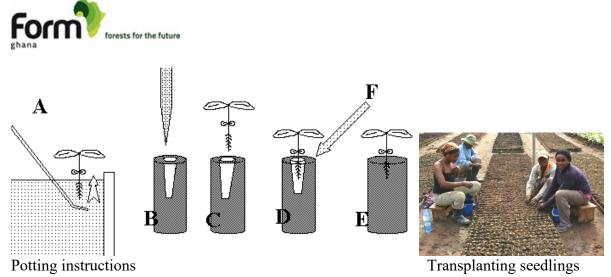
Pricking out is done with the help of a dibber. Seedlings are lifted by their cotyledons or lower leaves, not by the stem. Any seedling that appears sick or deformed should be discarded. As soon as a little plant is taken out it is put in a bucket of water, to prevent drying during the process. Transplanted seedlings should be kept in a shaded



Pricking out

Germs in bucket

A sufficiently deep hole is made in the poly bags with a stick. Seedlings are planted in the middle of the poly bags. The soil around the roots is packed carefully so that no air pockets are left around the roots. Seedlings should be lifted upwards after placing them in the hole, to straighten out roots; roots should not curl upwards. Long and branched roots are clipped to ensure they are pointing downwards. Transplanted seedlings should be watered immediately and again when they wilt.



3. Irrigation

Plants should be watered when needed, based on turgidity of the leaves. If watering is necessary it should be done in the early morning or late afternoon. Water should be directed to the soil, not to the leaves. The water should properly penetrate the soil.

If the soil is covered by moss or algae, seedlings are overwatered. Overwatering weakens plants, making them more susceptible to fungus attacks and other diseases. Watering and shading should be reduced.

Four weeks before planting out, watering of the seedlings should be reduced. On the day before transporting and planting out, seedlings should be watered well. Seedlings are transported early in the morning or late in the afternoon to avoid drying out during transport.

4. Shade and hardening off

Pricked out seedlings in polybags require heavy shading for a period of 2-3 weeks (e.g. double shade nets with 60% shade intensity, or palm fronds). Depending on the species, shading is then reduced by 30%. In week 5, shade nets are removed completely and watering is reduced for hardening-off.



Seedlings under shade nets



Hardening-off, shade nets are removed

5. Weeding & root pruning

Weeding starts two weeks after pricking out. The polybags are weeded. Frequency depends on the intensity of weed growth.



Polybags are checked weekly after 5 weeks for extensive root growth and pruned if necessary. This must be checked every month.

Root pruning is part of the hardening-off process of the young seedling before planting.

The polypots are filled to the brim at all times to prevent the bags from folding at the top, which stops water from entering the polypot. If soil is taken out with weeding practices, it will be refilled. This is checked regularly.

Leaf pruning is done when plants shade out smaller plants of non-germinated pots. Plants are pruned when they grow bigger than twice the height of the poly-pot. Leaf-pruning of teak seedlings is done to open space for suppressed seedlings to grow and develop.

5. Packing and transportation

The plants are watered at least one day before transportation. Seedlings are best transported early morning or late afternoon, when it's cool outside. During transportation, the polybags are placed tightly in the trucks to keep them in place and prevent damage. When plants are transported over a long distance, the trailer should be covered.



Protocol 15 Technical Performance in the Plantation

Terrain preparation

Terrain preparation before planting consists of demarcation, land clearing, construction of baselines and pegging. The process takes place between January and April.

Demarcation and terrain inventory

The terrain is divided in 128ha compartments by the Forestry Commission. The forestry map is digitalized, and the corners of the compartments are marked. The coordinates of these corners are uploaded on a GPS handheld device. With this device, quadrant poles are placed on the corners of the compartments in the field. Quadrant poles are 2.5m high and the top is painted red.

During demarcation, the terrain is inventoried. Soil depth is determined using a soil auger. Characteristics of the terrain are recorded, such as remnant forest, streams, slope, vegetation, rocky outcrops, protected tree species, swamps and teak plantations. These features are mapped with the GPS.

Terrain preparation

The land is cleared, weeded and sprayed with Glyphosate-based herbicides and/or other weedicides that are not on the FSCTM (FSC-C044035) list of highly hazardous chemicals, using Knapsack/Mankar sprayers. The approach depends on former land use, teak plantation, savannah vegetation or farmland, as is outlined below.

Baselines and pegging

The 128 ha compartments are divided in two 64 ha blocks. Blocks are divided into 1 ha units, see figure 2.1. Each 1 ha unit is marked by corner poles with a white top. This means that at the corner of each block, both a red and a white pole are placed. In between the hectare poles are pegs at 3 m intervals to indicate the place where trees are to be planted. The border lines of each 1 ha unit are called "base lines".

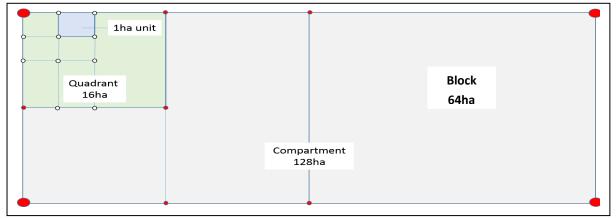


Figure 2.1. Division of terrain in compartment (grey), blocks and 1 ha units (blue). The red dots represent the quadrant poles. Large red dots indicate the quadrant poles at the



compartment corners, placed with GPS during demarcation. White dots are the 1ha unit corner poles.

Starting from one of the compartment corners poles that were placed during demarcation, a 100 m long rope is laid out in the direction of the next corner pole, using a compass. The rope has knots tied at 3 m intervals. At each knot, a peg is placed in the ground. A hectare pole is placed at the end of the rope to demarcate each 1 ha unit. This is repeated until the next compartment corner is reached. Once the outlines of the 128 ha compartments are pegged, the new quadrant poles can serve as the starting point for the baselines of the other 1 ha units.

Due to irregular terrain and measurement inaccuracy the compartment corner is likely not to coincide with the end of the rope. Regardless of this measuring mistake, the new baseline will start from the next corner pole. This way the 'mistake' is limited to the end of one compartment and cannot increase over multiple compartments.

Roads of 4 m wide are constructed around each 64 Ha block. Therefore, the first peg is placed two meters from the corner pole.



Protocol 16 Storage of fuel lubricants and toxins

Protocol purpose

This protocol describes procedures for the purchase, storage and distribution of all fuels and chemicals used by Form Ghana.

Storage of fuels and lubricants

The filling station is located in a shed that is well aired, has a roof and an impermeable floor and thresholds that are high enough to contain the stored volume. The filling station is equipped with fire extinguishers and a sand bucket and shovel.

Diesel is stored in the tanker-trailer, parked in the filling station. The filling station is locked afterhours. Petrol, mixed petrol (for the chainsaws) and lubricants are stored in the lockable compartment of the filling station. Petrol is stored in drums or containers, mixed petrol in canisters.

The brand, type, volume and source of all diesel, petrol and lubricants are registered. The fuel clerk registers purchased volumes and usage.

Storage of chemicals

Chemicals are stored separately from oils, fuels and lubricants in a secured and watertight place. In case the packaging is damaged, the product should not drain off in the environment. The storage room is locked and opened only by the storekeeper. Only authorised personnel may have access to the chemical products. A sheet indicating how to mix the chemicals, as well as appropriate PPE and measuring equipment is kept in the storage place.

Persons taking chemicals out of the storage room have to sign off in the register. The brand, type, volume and source of all chemicals are registered. The storekeeper registers purchased volumes and usage.

A copy of the Material Safety Data Sheet (MSDS) of each product is kept with the product at stores as well as at the clinic.

Transport of fuels and lubricants

Fuel is collected at the order of Form Ghana management only. Lubricants are collected in drums or in plastic containers. Petrol is collected in drums and loaded on a pick-up. Diesel is collected with the tanker-trailer at the fuel station in Akumadan. Speed limit for vehicles transporting fuel is 20km/hr.

For transportation of diesel, the fire extinguisher is hooked off the tanker and placed in the vehicle. The following is checked:

• The vehicle is operational (brakes, coolant, lights etc.)



- The tanker-trailer is operational (tyres, warning sign rear)?
- The tanker-trailer is hooked correctly to the vehicle
- The tanker top and tap are closed
- The fire extinguisher is present and operational

The following prohibitions apply:

- No passengers are allowed on top of the tanker-trailer
- Smoking is prohibited near the tanker-trailer and/or while driving the vehicle

Firefighting procedures for transport and storage of fuels are specified in Protocol 21: Fire prevention and fire-fighting.

Environmental protection / spills

In case of a minor leakage of fuels, lubricants or chemicals the spillage is soaked up with sawdust until the floor is dry. The saturated sawdust is disposed off into the refuse container.

In case of a major leakage of diesel from the tanker trailer, the diesel is removed with hand pumps and stored in empty drums. The remaining diesel is soaked up with sawdust and disposed off into the refuse container.



Protocol 24 Road construction and maintenance

Protocol purpose

Form Ghana makes use of their road network for different purposes:

- 1. For the transport of workers and equipment to the field and back
- 2. For the rapid movement of the firefighting units to battle wildfires within and around the plantation premises
- 3. For the efficient evacuation of harvested timber

Gravel deposits

Laterite gravel is used for road construction and maintenance. Deposits of laterite gravel in the area are identified and recorded. Gravel deposits are selected by Form Ghana management based on their importance related to the location, quantity and quality. The selected sites are cleared. Topsoil is shoved aside for future use.

Demarcation of New Road Networks

The centreline of the road is marked and pegged. This is done in a sensible way, taking into account all the characteristics of the landscape and working with the terrain. The road is then constructed two meters on each side of the pegged line.

All the vegetation is removed from the pegged area, including shrubs, plantains, fruit trees and other bush. Stumps and large roots are removed. Ant hills and termite mounts are removed to ground level.

Preparing the roads in full dry season means working with very dry and loose material once cut by the grader blade. The created profile can then not be compacted enough and will be spread out again by the passing of vehicles. It is therefore strongly advised to work on a moist road, just after **step 1: Scraping and levelling** and before **step 2: profile and drainage.**

Road construction

The TLB or motor or towed grader is used to make the road profile if the soil is flat and soft; sandy or clayey, without deep gravelled laterite. A bulldozer can be used if the terrain is rough (rocky and compacted laterite) for clearing, grubbing, and right-of-way timber removal.

The roads are constructed following steps. Each step is 1 performed in run of the machine, go and return. The steps are described below.

Step 1. Scraping and levelling

The roots of the weeded vegetation are scraped off and shoved aside with a TLB or a motor or towed grader. The ground is levelled over the entire width of the road. This is done in two runs: go and return. One person is in front of the machine to check for stumps or rocks.



Position of the blade:

- Tilt: 0 ° (flat),
- Horizontal angle: 60-75°

Step 2: Profiling

Drainage channels, or side drains, are constructed on each side of the road, with a TLB or grader (figure 1). They are 20-30cm deep, measured from the top of the road deck, and 50cm wide. The soil from the drainage channels is brought to the middle of the road.

Position of the blade:

- Tilt: Max. 15°
- Horizontal angle: 60-75°
- The right-side edge of the blade must stick out of the alignment between the rear tractor tire and the rear grader tire

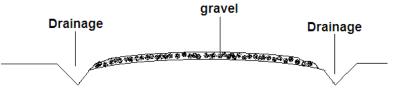


Figure 1. Road construction with drainage.

Step 3: Finishing profile

After construction of the drainage channels, the soil from the channels is levelled with a grader. Grader levels off in a convex profile the soil brought up towards the middle of the road from the gutters, thus completing the surface of the road.

If the original soil of the deck or the soil dug up from the gutters consists of material that is susceptible to erosion (loose sand) or muddy when wet, a layer of laterite with gravel and at least 10-15 cm thick, may be applied on the deck before finishing the profile to stabilize the deck.

Step 4: Drainage

Mitre drains serve to lead rainwater off the road and prevent erosion of the road deck. The number of mitre drains is related to the length and/or steepness of the slope. Mitre drains shall never lead directly into running streams in order not to increase turbidity, harming aquatic life and degrading quality for human use.

Mitre drains are constructed by the motor grader with outlets opening done manually. However, in case of towed grader for road works, drains are made manually because the towed trailer is not suitable for entering the bush, farm or plantation and reversing. The positions of the mitre



drains are marked by pegging and then dug with pick axes and shovels. Roots are cut with a cutlass. The mitre drains are as deep as the side drains and lead into the undergrowth under an angle of 45° of the road, taken downhill.

If there is a bank uphill of the road, it is not possible to make a mitre drain. In this case, a cross drain is constructed across the road in an oblique angle towards the gutter on the downhill side.

Cross drains are dug at an angle and not straight across the road in order to spare the vehicles passing on the road, and reduce vehicle maintenance. For a road of 4m width, a cross drain is built from one side of the road to a point 11m away on the other side of the road, using an 11m long rope.

Road maintenance

Road Surface

Surface maintenance of roads are done with motor or towed grader. The scheduling for blading varies and depends on the climate, traffic as well as required level of serviceability. Regravelling is also done with the use of TLB, grader and Tipper truck depending on the traffic and maintenance programme.

Potholes and drains

During the rainy season, potholes are filled according to the following procedure. First, the rainwater is drained from them, then the wet mud is removed completely and then the hole is filled with dry laterite gravel or crushed anthill. This is done manually or with a TLB. Boulders are not used to fill the holes because they will deepen the hole when vehicles drive over them.

All side drains and mitre drains are cleared from silt and debris, so that water can be drained from the road without obstructions.

Profile and gutters

Whenever a stretch of road shows signs of wear by hollow tracks caused by passing vehicles or furrows caused by erosion, the towed grader smooths off the surface. It starts with the blade on the right side in the drainage channel, under a horizontal angle of 60-75° with a tilt of 15°, clearing it down to its original depth and depositing the silt or laterite from the gutter back on the road deck, restoring the original profile.

In the peak of the rainy season, the roads are not touched as this causes more damage than good.

Road side vegetation

All the vegetation hanging over the side drains or casting shade on the road is removed because it reduces visibility in bends of the road and it prevents the road deck to dry in the sun.



Bridge construction

Bridges are allowed to cross the buffer zone along the water courses but should not obstruct the natural water coarse and have a minimum impact on the vegetation along the water (Figures 2 and 3).

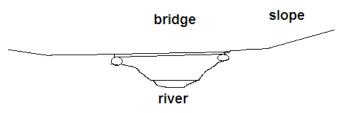


Figure 2. Bridge construction on slopes

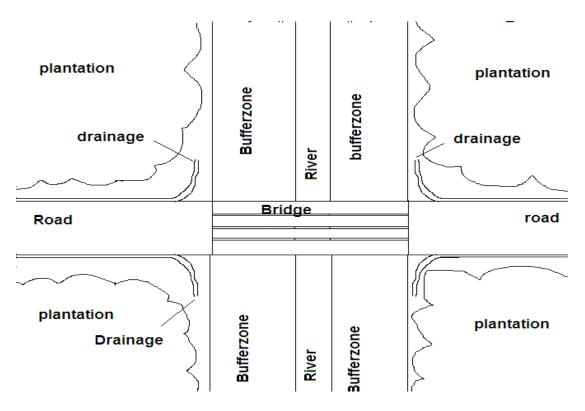


Figure 3. Bridge construction in bufferzone.

Road signs

Signs indicating bridges and roads are placed at areas where bridges are located. Signs indicating sharp curves and sandy areas are also placed 100m away from sharp curves and sandy areas to guide first time users of the roads.



Protocol 21 Bushfire prevention and firefighting

Protocol purpose

The plantations of Form Ghana are situated in a landscape with savannah characteristics. Grass species such as Elephant grass, Guinea grass and Spear grass, that grow up to 5m tall, cover most of the area. This vast area of combustible material easily catches fire in the dry season (November-March), either naturally or human-induced. Due to a strong desert wind from the North (harmattan), these fires can spread extremely fast. Fire-fighting and fire prevention are therefore a major part of Form Ghana's operations. Proper instructions and appropriate firefighting tools are crucial to prevent the plantations from burning and to stop bush fires before they reach the plantations.

Fire prevention

Prevention of fires entering the plantation is done in 3 ways: educating people, monitoring activities and creating fire breaks. The procedures are described below.

Education

Risks of fire in the plantation are discussed with local communities and intercroppers through the following media:

- Stakeholders meetings
- Intercroppers meetings
- Visits to fringe communities and neighbours

Monitoring

Form Ghana security guards monitor all activities that take place in and around the plantation. Rapid response fire teams are stationed at strategic areas within the plantation and one backup rapid response team patrols the plantation and guards look out over the terrain from the permanently manned watch towers. In addition to the manned towers a camera system has been installed to monitor and send signal to the operations room on site for further action. They enforce a no-fire rule in plantation, identify high risk areas and notify management in case of fire outbreaks. All observed fires are recorded and analysed as described in Protocol 13: Monitoring, and in the monitoring plan.

Fire breaks

The purpose of firebreaks is to stop or slow down fires. In addition to natural firebreaks such as rivers and indigenous forest, three types of man-made firebreaks are constructed: defensive, external and internal fire breaks.



Defensive fire breaks:

In high risk areas, access roads and fire breaks are constructed to ensure access and slow fires that threaten the plantations. In case of fires, these zones are used to facilitate back burns.

External firebreak:

A 40-meter-wide belt is constructed around all planted areas/external boundaries of planted areas. This belt is cleared of any combustible material through weeding and clearing, early burning and ploughed in some cases. Chemical weeding is done throughout the year to keep the external breaks clean.

Internal firebreaks:

Under planted trees - There are different internal fire belts constructed as part of fuel load management strategies. A 30-meter belt is constructed along some plantation roads to serve as a blocking line to facilitate back burns of fires which could not be attacked directly. Again a 10-meter belt is constructed along all plantation roads, 5 meters on each side of the road. This area is cleared of all combustible material except planted trees by weeding and clearing.

Fire fightinging the plantation

Once a fire is close to or inside the plantation, a number of measures are in place to fight it.

Fire Detection Systems

There are two fire detection system (camera detection and manned towers) currently in Tain II plantations. These systems work concurrently.

Electronic detection system

Three (3) electronic fire towers are stationed at different strategic locations (B44, Labour Camp and A20) in the plantation to serve the purposes of weather reporting, fire detection and dispatch of fire teams. Towers with the cameras detect fires and send signals to the operation room. The operations room reports the fire location to the fire boss for further action. *In case the Fire Boss is not reached, the operators will dispatch the Rapid Response Team (RRT) on duty.* First arrival team at the fire must report back to the operations room.

Manned Fire Towers

The security guards in the fire towers detect smoke or fire and report size and compass direction to the operations room via radio communication. In the operations room the location of the fire can be determined at a very exact level on a fire map (annex 1) if all fire-towers report their directions.

Training

All Form Ghana employees that are involved with fire-fighting are trained in fire-fighting practices before the start of the dry season. Training is done by Form Ghana Management and supervisors. The training includes the procedure in case of fire, risks and safety and use of



equipment. The Berekum Fire Service Department provides an annual training in the use of fire extinguishers.

Fire teams and equipment

Fire teams consist:

- A fire boss who coordinates all the activities of the fire teams.
- Rapid response teams who are the first to respond to fires.
- Flank teams who support the rapid response teams in firefighting.
- There are other support staff who assist the fire teams.

There are 5 rapid response teams; 3 teams on duty and 2 on stand-by. Each team consists of 7 people with a Bakkie-Sakkie (pick-up with water tank and hose) and 4 Knapsack sprayers. The teams work from 10:00 to 22:00 from Sunday to Saturday. Each team patrol a different part of the plantation.

In addition to the RRTs there are three flank teams; 1 team on duty and 2 on stand-by. Each team consists of 33 people including team leader and driver with a set of equipment. All the security guards on duty are also part of the team. Fire-team compositions are finalized before the start of the dry season.

Equipment

4 fire-fighting units (pick up with Bakkie-Sakkie)

3 trucks for the transportation of workers (flank teams)

2 1 Fireboxes with flashlights, fire map, list of emergency numbers, first aid box, firelighters and other firefighting tools at the stores.

Water supply system

There are two water supply systems: Static water points and mobile water suppy system. The static water points are designated locations in the plantations (Annex 1) where water

tankers can refill.

The mobile water supply consists of:

- 4 pickups with 400 litre capacity each
- 2 trucks (Tipper and Rhino) with 6000-liter capacity each
- 1 Canter truck with 3000-liter capacity
- Water knapsacks with 20-liter capacity

Each of the fire units has a checklist which is checked daily by the fire teams.



Communication

There is a Motorola radio system present in all the fire towers (fixed station), at site and in all vehicles. Hand-held Motorola's are carried by key personnel. In case of fire, the fire towers alert the operations room. The operations room reports the fire location to the fire boss for further action. *In case the Fire Boss is not reached, the operators will dispatch the RRT on duty.* First arrival team at the fire must report back to the operations room.

Fire fighting at permanent site

Fire extinguishers are installed at designated locations at permanent site. Fire is extinguished by trained Form Ghana personnel. If a fire cannot be extinguished by Form Ghana personnel, the Fire Brigade in Berekum must be warned. For each fire, the Chief Security makes an accident report and transmits this to the management.

Fire fighting in the filling station

In case of fire, alarm is raised by the first person to discover it by ringing the kitchen bell. Security personnel, trained in fire-fighting, is alarmed. Power to the fuel pump should be switched off immediately. The fuel clerk and all workshop personnel are also trained to use the fire-extinguisher.

Fire fighters use the fire-extinguishers to extinguish the fire. Untrained personnel use shovels to spread sand over the fire.

If the fire is larger than $1m^2$, only trained fire fighters are allowed to approach the fire. All other persons remain at a safe distance from the fire. The nurse and a pick-up with driver are standby for treatment and/or transportation of injured personnel to the hospital.



Protocol 23 First aid envenomation and rabies Protocol purpose

There is a serious risk of encountering venomous snakes, scorpions and centipedes while working in the nursery and in the plantation areas. Rabid animals also form a serious threat to the workers. People may be bitten or stung by either venomous or rabid animals, causing serious or less serious damage to their health.

Form Ghana has several measures in place to minimize this risk. This protocol describes the preventative measures as well as procedures in case of an emergency. The venomous and rabid animals that can be encountered at Form Ghana are listed and described below.

For the first aid and for the extended medical treatment it is of utmost importance that the animal having caused the envenomation is identified as accurately as possible. Antivenin should only be administered by a medical officer as the physical reactions to the antivenin may be very violent and even life-threatening.

Emergency procedures

The following procedure is followed if a person has been **bitten or stung by a venomous or rabid animal**:

- 1. A foreman and a first-aider are immediately informed.
- 2. The first-aider stabilises the victim, following the instructions in this protocol.
- The incident is reported to the nurse. He/she arranges transportation to the hospital. It has to be ascertained that an artificial respirator is available.
- 4. The nurse informs management of the situation.
- 5. The victim is transported to clinic or hospital. A first-aider accompanies the victim during the trip to stabilize, monitor and soothe the victim and put his/her mind at ease.
- 6. The first aider informs the medical personnel exactly about the circumstances of the incident and the physical and mental symptoms of the victim.

Envenomation and bite incidents are administered according to the first aid protocol (Protocol 8).

Every year, a training in first aid with envenomation by snakes and insects is given to all permanent workers.



A person with a snake bite must be taken to hospital immediately and should not be kept at the clinic or allowed to proceed home.

The following procedure is followed if a person has had **venom from a spitting cobra in the** eye:⁵

- 1. Expect severe local pain to occur instantly. The eye will probably begin to water and there may be ulceration of the cornea (figure 1).
- 2. Treat the same as for a chemical injury to the eyes: irrigate the eye(s) with generous volumes of fluid for at least 10 minutes. The types of fluids that are acceptable include CLEAN water, milk, and even urine.
- 3. Reassure the patient. Fear can simply make things worse and cause the patient to panic.
- 4. Provide painkillers to ease the pain. If you have paracetamol, this is a good painkiller to use.
- 5. See a doctor as soon as possible. The attacked eye or eyes will need to be examined to see if there is any damage, such as corneal abrasion. There may also be a need for the ingestion of antibiotics for a few days to calm any possible bacterial infection.

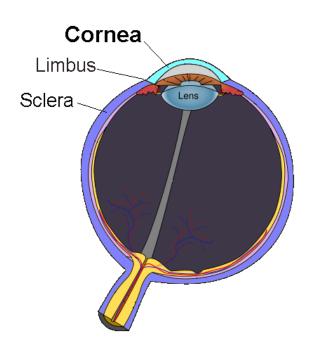


Figure 1. Schematic diagram of the human eye, showing the location of the Cornea. The Cornea is the transparent front part of the eye that covers the iris, pupil, and anterior chamber.

⁵ Source : http://www.wikihow.com/Remove-Spitting-Cobra-Venom-from-Eyes



Snakes

Both Berekum and Akumadan lie at the transition zones between evergreen forest, semideciduous forest and woodlands. In this zone, 13 venomous snake species can be identified that may be dangerous to humans (see table 1)

Family	Species (common name)	Species (scientific name)
Colubridae	Boomslang	Dispholidus typus
	Slender Burrowing Asp	Atractaspis aterrima
	Dahomey Burrowing Asp	Atractaspis dahomeyensis
	Blanding's Tree snake	Toxicodryas blandingii
	Herald snake	Crotaphopeltis hotamboeia
Elapidae	Western Green Mamba	Dendroaspis viridis
	Forest Cobra	Naja melanoleuca
	Black-necked Spitting Cobra	Naja nigricollis
Viperidae	Puff Adder	Bitis arietans
	Gaboon Viper	Bitis gabonica
	Western Bush Viper	Atheris chlorechis
	West African Carpet Viper	Echis ocellatus
	West African Night Adder	Causus maculatus

Table 1. Snake species that occur in Form Ghana plantations

Preventative measures

In the plantation, all workers should wear adequate footwear (e.g. Wellingtons or safety boots) and always check the ground before sitting down. Security guards keeping chickens should install the chick coop away from their housing facility. People should not sleep on the bare ground, climb in trees with foliage, throw a club into a fruit tree for fruit collection or stick your hand in a hole in the ground. Workers should not go off on their own trying to hunt rats in anthills.

In the nursery site, the yard around the houses should be kept clean from scrub, leaf litter, piles of firewood, rubbish and termite mounds as the snakes are likely to house in them. Branches of trees and bushes should be cleared from the walls because snakes can use them as a means to enter the house. Also, the yard should be kept clean of rubbish, maize and food scraps to avoid mice and rats from colonizing the area. They can attract snakes as an easy source of food. Taps should not be left dripping because snakes may be attracted to the water.

When encountering a snake, move backwards slowly until you are out of its reach. Give the snake the chance to escape. Never tease a snake, play with it, or pick up a supposedly dead snake. Some snakes can sham death but bite when picked up. Snakes rarely attack without feeling threatened.



Identification

If a snake is longer than 2m it is likely to be venomous. Below are some characteristics of specific venomous snakes or snake types.

Boomslang

- Longer than 1.20m with a grey or green body (also: mamba or cobra)
- Inflating the front part of the body

Viper

- Conspicuous bars, rings or chevrons
- Fat-bodied, lying quietly when approached
- Head shaped like an ace of spades or a triangle
- Small, mostly green and/or yellow and black body with broad head and thin neck in trees or bushes (tree viper)
- Rectangular or triangular markings on the back and/or sides
- Forms C-shaped coils, rubbing its scales together and making a sizzling noise when approached (carpet viper)

Cobra

- Dark bars or blotches on the underside of its neck (cobra)
- Spreading the hood or flattening the neck and raising the front part of the body (also: night adder)
- Longer than 1.20m with a grey or green body (also: mamba or boomslang)

Burrowing asp

- Small black body with very small eyes and no obvious neck

Symptoms

General: Local pain, swelling and (progressing) discoloration, tenderness of regional lymph nodes (armpit or groin), an hour or more after the bite. Vipers' bites cause swelling. Mambas and cobras cause drooping eyelids, facial paralysis, and tightness across the chest.

First aid

Inform the nurse of the incident. The nurse will inform the nearest hospital with snake-bite experience of the arrival of the victim. In case of a cobra or mamba bite, artificial respiration may be necessary. This should be available at the hospital. The nurse will arrange immediate transport to that hospital. When transport is arranged, the nurse will inform management of the situation to enable monitoring of procedures and assistance and guidance where possible and needed.



A person with a snake bite must be taken to hospital immediately and should not be kept at the clinic or allowed to proceed home.

In the field, make the victim lay down immediately. Keep him/her quiet and reassure him/her that 95% of the snakebites are not fatal. Keep talking to the victim if you notice that his/her attention is fading. Immobilize the bitten limb with a pressure bandage and apply a splint (stick or board). Start the bandaging from the bite site upwards. Elevate the bitten limb. Administer a pain-killing drug (**No Aspirin**). Sucking out the wound can be useful, especially with bites from Cobras and Mambas, but only by someone who has no wound in his mouth.

Take notes of the circumstance of the incident: time, location, symptoms, snake characteristics, fang punctures. If the snake is dead, bring it to the Medical Officer for identification.

Don't make cuts. Some venoms have a strong anticoagulant effect and the wound may continue to bleed seriously. Don't apply a tourniquet or massage or rub the bite. Don't put ice on the bite. Don't use traditional medicine or give the victim alcoholic drinks.

Scorpions

No information can be found on scorpion species in Ghana, with the exception of the Emperor Scorpion (*Pandinus imperator*). The sting is painful and deserves medical treatment.

Preventative measures

In the plantation, all workers should wear adequate footwear (e.g. Wellingtons or safety boots) and always check the ground before sitting down. People should not sleep on the bare ground. Workers should not go off on their own trying to hunt rats in anthills.

Identification

The Giant Scorpion of West and Central Arica is black and up to 20cm long. The tail with sting is about 10cm long. The two large pincers are used to catch prey or predators and hold them while the scorpion stings. When moving, the pincers are bent and the tail is bent over its body with the sting forward, ready to strike.

Symptoms

The venom of the Giant scorpion consists of a neurotoxin to paralyse its prey and an enzyme inhibitor to pre-digest the tissues of its prey. This venom causes an immediate pain and swelling on the site, comparable to a bee's sting.

First Aid

To reduce the swelling and the pain, an ice pack can be placed on the site of the sting and antihistamine tablets should be administered.



Centipedes

The only venomous centipede in the region is the Giant Centipede (*Scolopendra subspinipes*). Bites from the Giant Centipede are very painful and can cause severe swelling, weakness or fever. Its venom is a histamine type, like bee venom. Some people are allergic to this poison and will need urgent attention after a bite in order not to suffer from an anaphylactic shock.

Preventative measures

In the plantation, all workers should wear adequate footwear (e.g. Wellingtons or safety boots) and always check the ground before sitting down. People should not sleep on the bare ground.

Identification

The Larger Centipede is grey to brown and has a flattened body with 18-20 pairs of legs and clearly visible fangs. It can be up to 15cm long. It moves swaying from side to side in a rather fast and nervous pace.

Symptoms

The bite site shows a V-shaped mark, caused by the fangs. The wound is haemorrhagic, meaning that it bleeds profoundly. Sharp pains occur at the bite site, local swelling, redness, painful lymph nodes in the region of the bitten limb, possible local ulceration.

First Aid

Reassurance of the victim, pain relief with an ice pack and analgesics (**No Aspirin**), Antihistamines (if an allergic reaction occurs) in tablets and a Tetanus toxoid vaccination. If the bite becomes infected and necrotic, a broad-spectre antibiotic should be administered.

Bees and wasps

Preventative measures

Bees and wasps only tend to be aggressive when one gets too close to their hive or nest. Solitary bees and wasps are no threat as long as they are left alone.

When encountering a bees' or wasps' nest, or when hearing the loud buzzing of a group of bees or wasps, one should withdraw quietly and choose one's way far around the nest. Swarming bees or wasps should at all times be avoided.

The sting of a honey bee releases a pheromone that prompts other bees nearby to attack. It is therefore important to get quickly away from the bees to avoid more stings.

Identification

Bees and wasps are encountered all over the country, both wild colonies and those kept in hives.

Wasps (with a black and yellow striped body) are far more aggressive, also when flying alone.

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Symptoms

The venom of bees and wasps, Apitoxin, is a mixture of proteins and contains melittin and histamine. If people are allergic, the venom may trigger an anaphylactic reaction, which can be life threatening. An allergic reaction to bee stings shows by rapid swelling, dizziness and difficulty with breathing.

The symptoms of a sting are an immediate sharp pain, rapid swelling of the region and severe persistent itching, that can last up to a week. Multiple stings may cause an anaphylactic shock, which can become fatal.

First Aid

Remove the sting(s) immediately by scraping over the bite site with an object with a hard edge (e.g., a knife). Don't press the sting with your fingers, as more poison will be pushed into the body of the victim. Use cold compresses or ice packs to cool the bite. If the victim shows allergic reactions, send him/her to hospital immediately. Don't give aspirin.

In case of severe allergic reactions, a medical officer may choose to administer an antihistamine injection, adrenaline and Epinephrine, against an anaphylactic shock.

Rabid animals

Many animals can be infected with rabies and transfer the disease through bites or scratches. Dogs are the principal vector of the disease but cats, bush animals, herbivores, rats and bats are also high-risk species.

Preventative measures

Try to stay clear of any dog or cat that shows 'rabid' behaviour, as described below. A rabid animal should be killed as soon as possible, preferably with a gun. Never touch a suspected rabid animal, dead or alive, as the skin and especially the saliva are highly infectious. Dead animals with foam around their muzzle are most likely rabid.

Identification

Rabid animals can behave aggressively, fearless, or even idiotic. Domestic animals can be strangely afraid, foaming or drooling muzzle. A clear sign of rabies is "Hydrophobia", an excessive fear of water.

Symptoms

Early symptoms are malaise, headache and fever, progressing to acute pains, violent movements, uncontrolled excitement, depression and hydrophobia. The final stage of the disease is characterised by mania, lethargy, coma and leads to death by suffocation.

Victims usually get sick about 1-2 months after infection. Death invariably occurs two to ten days after the first symptoms.

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First Aid

People that have been bitten by a suspect animal should be brought to the hospital immediately and treated with anti-rabies vaccines. The infection by this viral disease is always fatal, if not treated with a prophylaxis before the first symptoms appear.



Protocol 25 Harvesting

Harvesting Operations

At Form Ghana the various harvesting operations can be broken down into three separate operations namely the first, second and third thinning. During all thinning operations the felling of trees that are non teak species growing amongst the teak is permitted. This is provided that the DBH of the non teak species tree is smaller than 20cm and that the crown of the tree is of such a nature that it will not cause any damage to the surrounding teak when being felled. Should these parameters not be present the non teak species tree should not be felled. Below is a description of the various thinning methods used by Form Ghana.

First thinning: The first thinning is a selective thinning. The trees are marked in accordance to specifications highlighted in Protocol 15.

In terms of harvesting this operation can be classified as a non-commercial harvest where the trees that are marked will be felled to waste. In terms of operational planning the harvesting plan is necessary to ensure that all relevant block information is at hand and that the necessary risk assessment has been done, to ensure a safe operation. The planning map will comprise of little detail as no timber will be extracted and felling direction is not specified. However, the felling sequence should allow for space to be opened in the tree canopy and the next tree should be felled into this space thus minimizing damage to the residual trees and reducing hang ups that could lead to decreased productivity.

Second thinning: The second thinning is a combination of row and selective thinning. The second thinning can be classified as a commercial thinning thus the felled timber would need to be extracted for processing into various products. Every eighth row of trees will be marked for removal and then the inter rows between every eighth row will be selectively thinned. The removal of the eighth row is to facilitate extraction and to help eliminate damage to the remaining stand of trees.

Here the planning map will be more complex as the timber will be extracted. Due to the use of the eighth row as an extraction route/skidding trail, the directional felling of the four rows of trees to either side of the skidding trail will be felled at an angle between 10 and 45 degrees relative to the skid trail. The but-ends should be facing the skid trail, which creates a fishbone felling pattern as indicated in figure 1 below. Rows one and two should utilise a smaller angle and rows three and four should utilise a greater angle, however still maintaining the range between 10 and 45 degrees. The trees felled in the eighth row should be felled as close as possible to being parallel with the skid trail. The trees must be felled in such a manner that the butt ends of the trees face the direction of extraction (face towards the landing). The skid trails should be kept free of felled trees and branches.



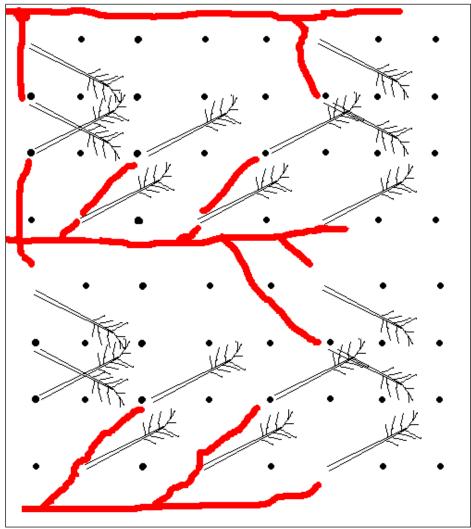


Figure 1.1. Fishbone felling pattern.

Once the tree has been felled the tree must be de-branched and topped to prepare the tree length for extraction. This will help to reduce damage to remaining trees and prevent the build-up of harvesting slash on the landing thus reducing congestion and providing a safer work environment.

Third (and successive) thinning: The third and sometimes successive thinnings will be selective thinnings of the inter rows between the eighth rows that were opened in the second thinning. These thinnings are also classified as a commercial thinning thus the timber would be extracted to roadside for further processing into various products.

Here the eighth row that was opened in the second thinning will again be used as an extraction route/skidding trail. The felling pattern will be the same as described in the second thinning.



Protocol 27 Information on contagious diseases

Protocol purpose

This protocol is to assist FG in the information of people on contagious diseases. The information is tailored to the workforce, to regular and to occasional visitors to FG and to people wanting to visit FG while coming from an area where there is a contagious infection.

Avoidance of problems with contagious diseases at FG is done by informing the people, training medical staff to recognize and act when a contagious disease is observed and by avoiding visits from people who may spread contagious diseases.

Educating the work force

Infectious diseases are diseases that people can get from other people. The spread of most of such diseases can be avoided by proper behaviour. This protocol treats the most common or most serious diseases that can be avoided. The protocol treats these diseases according to the way in which they can be avoided.

Diseases to be avoided by vaccination

There are many diseases that can be prevented by vaccinations, for instance Yellow Fever, Diphtheria, Polio, Meningitis, Typhoid, Tetanus and Hepatitis (A and B). Vaccinations should be obtained and repeated according to the protection they offer. Hepatitis will provide lifelong protection after a series has been completed.

Diseases that can be avoided by sleeping under a mosquito net

Diseases like Malaria and Dengue fever can mostly be avoided by sleeping under a mosquito net. Use a net over every bed and make sure to patch up any holes as they appear. Treatment of the nets with an insecticide can help its effectiveness. When going outside of the house at night wear a repellent and longs sleeves and pants to avoid getting stung.

Diseases that can be avoided by hygiene

Some diseases are spread by contact between humans or between humans and animals. Some of these diseases are relatively harmless like flue. Some others like Ebola are very serious. These diseases are: Ebola, Tuberculosis and Cholera. These diseases can be avoided by avoiding contact with people that are sick. Wash your hands regularly. Do not touch people that are sick. Avoid eating animals such as monkeys and bats. Drink purified water. Seek medical attention.

Sexually transmitted diseases

Diseases like HIV/AIDS, but also Chlamydia and Herpes or Syphilis can be contracted by having unprotected sex with people that are infected with these diseases. As you cannot see if a person is sick until very late during their disease it is important to always use condoms when having sex with persons of whom you do not know their test results. It is important to get tested.

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Training of medical staff to recognize and act when a contagious disease is observed

Medical staff of FG have to make sure they stay up to date with the recognition and actions to be taken when contagious diseases are observed. To do this they have to stay in contact with Ghana Health authorities and assure they receive updates every month. When training is available for specific subjects they have to discuss with management and sign up for the training when granted the approval. Materials that may be needed when new information is available on the identification and acting on diseases can be bought after management approved it. Medical staff has to ensure that workers that are found ill with a contagious disease are taken to hospital without getting into contact with other workers. When this has occurred, they have to make sure all the workers that may have come into contact with the person in question are properly briefed on the measures they have to take in order to minimize the risk of falling ill.

Visitors from outside the company

Visitors coming to FG have to be aware of the diseases that are present in the area. FG will send all new visitors a short briefing note which states the diseases that are present in the area. The visitor is then responsible for ensuring to take the prophylaxis and vaccinations needed to avoid falling ill.

Disease	Medication
Malaria	Prophylaxis (Malarone)
Dengue Fever	X
Yellow Fever	Vaccination (compulsory for visitor from outside Ghana)
Typhoid	Vaccination
Hepatitis A	Vaccination
Hepatitis B	Vaccination
Meningitis	Vaccination
Polio	Vaccination
Diphtheria	Vaccination
Tetanus	Vaccination
Cholera	X
HIV/AIDS	X

The diseases on which a visitor will be briefed are:

Visitors are warned that these diseases may be present at sites they visit. They need to inform themselves carefully on how to avoid these diseases. Visitors are strongly advised to get the vaccinations stated above and should have the prophylactic medication for malaria and take it. Malaria is very prevalent in Ghana and someone not taking medication is almost sure to contract it. Concerning HIV/ AIDS the visitor is informed that HIV is present in the area and that care should be taken when visiting hospitals and when having intercourse.



Visitors are invited to present a form with the basic medical information (blood type, medication used, insurance policy) as well as contact information in case of emergency.

Visitors from areas where there is a contagious disease

Visitors coming to Ghana should indicate which countries they have visited prior to their visit to FG. If one of those countries has a problem with a serious and contagious disease the visitor should wait until the incubation period is over, before visiting FG.



Protocol 29 Integrated pest management

Document purpose

This procedure describes how to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Pest Identification

Pests (e.g. insects, mammals, fungi, bacteria) are usually observed during ongoing field operations, site patrols or during monitoring activities (e.g. PSP monitoring). Once a pest is observed, it is identified by experts. Bacteria and fungi are identified through sample analysis in a lab. When identified, information is gathered on the pest, using scientific research, experience from other companies and monitoring results (see section Monitoring).

Based on this information, measures are developed to combat the pest, and to prevent future occurrence.

Pest Prevention

The best pest management is prevention. Strong, healthy trees are generally more resistant to pests, so prevention of pests is for a large part done through improving tree health and vigour. A number of generic measures is listed below:

- Proper species selection and composition. Species growing under good site conditions are healthier and consequently more resistant to pests. This applies in particular to recently harvested sites with a certain level of disease pressure.
- Weeding of young planting, since a high weed pressure competes with young trees reducing their vigour and pest resistance. Additionally, weeds and other undergrowth may attract pests.
- Activities which damage the trees (e.g. thinning, pruning) are performed in the dry season to prevent infestation with fungi.
- Fertilization might be a viable way to improve tree vigour and pest resistance, whereas the fertilization regime depends on a site's initial soil composition (nutrients and pH).
- Proper thinning improves tree growth, positively affecting vigour and pest resistance of the trees.

If a pest is identified, specific preventive measures will be developed to prevent spreading of that pest, based on collected information. These measures are then incorporated in company management procedures.



Pest Control

In addition to preventive measures, it may be necessary to develop ways to further control the pest, or even to eradicate it completely. This depends on the severity of the pest, the rate of dispersion, and the efficacy of the preventive measures.

For all pest control, non-chemical methods are preferred. The use of chemicals (e.g. pesticides, fungicides) is considered only if non-chemical methods are not available or not effective. Equipment used for chemical application is well-maintained and regularly calibrated to minimize excessive application and waste of chemicals. No chemicals are used that are classified as 'highly hazardous' by FSCTM (FSC-C044035) unless no other option is feasible. In that case, Form Ghana will apply for a derogation.

Monitoring

The occurrence of the pest is monitored in order to determine the severance (level of damage, abundance), the dispersion (location(s)) and the pest population development. Based on monitoring results, and on severity of the pest (level of damage, dispersion, abundance), the company decides upon management action.

Records are kept of the monitoring activities. These records are used to (1) evaluate the efficacy of prevention and control methods; (2) identify areas vulnerable to pests; and (3) monitor pest population development.

Training

Workers involved in the monitoring and control of pests are trained by Form Ghana and/or Form International.



Protocol 28 Community development Purpose of the Protocol

Form Ghana believes that investing in local communities is very important and this is as such incorporated in the company's Corporate Social Responsibility policy. Communities are important stakeholders in the area and play a key role in the company's operations.

This needs however be balanced with the economic interests of Form Ghana, as well as a fair distribution of benefits among the different surrounding communities. This protocol outlines Form Ghana's approach for the support of future community development activities, as well as the strategy to manage expectations arising from the surrounding communities.

General approach

Form Ghana believes that investing in local communities is very important. The communities should benefit from the presence of a large economic actor. Available funds for such projects are however limited. All available funds are put to the establishment of the plantations which will be the economic motor for the area. This will however raise expectations of the communities that need to be managed in order to enable further sustainable development as a company and to avoid frictions between the company and the communities or among individual communities.

Of course, the communities do already benefit from the presence of the company as the main employer in the region. Roads close to the plantations are rehabilitated and maintained and thereby improve connectivity of all fringing communities. And with harvesting a Benefit Share is paid of which the communities are also beneficiary. But Form Ghana wants to go a step further as part of the Corporate Social Responsibility policy, which means that more will be done if the situation allows for it.

The assistance from Form Ghana to community development will have two bases. One is through direct support by the company, while the other is through indirect funding from benefit sharing. These different approaches are explained below.

Benefit sharing

Every time timber is harvested, Form Ghana pays a percentage of the Standing Tree Value to the Forestry Commission by means of benefit sharing. The benefit sharing is a certain amount of the standing tree value (STV), which varies per Forest Reserve. The standing tree value is an amount per tree that depends on the diameter of the tree. As trees age and have a larger diameter, the standing tree value becomes higher.

The benefit sharing is payable to the Forestry Commission, who then is responsible for distributing it to the Traditional landowners (chiefs), the communities and to the Forestry commission. The funds for the communities are paid to the District Council. The District



Council is then responsible for the allocation of funds to community development activities. Form Ghana has no role in the identification or development of activities to fund.

The role of Form Ghana in this process consists of actually paying the dues and communicating the amounts paid to the stakeholders, so they know what to expect and are able to follow-up on it. This information is shared in the stakeholder meetings, and also included on the company information brochure which is annually updated and distributed.

Development of community projects

The company is an important factor in the area with long-term presence, and therefore has the opportunity to develop community development projects on solid, stakeholder-based grounds. The process for project development is outlined in the following sections.

Through contact with stakeholders during meetings and individual contact, ideas for projects reach the company.

These ideas are evaluated in management meetings, where specifically the following elements are evaluated:

- Does the project idea fit in the company's priorities for community development (the company has a strong preference for projects relating to health and hygiene (water, ablution, sensitisation);
- Does the company's budget allow for realization of this project idea;
- Does the project idea correspond with the principle of equal distribution of benefits to the surrounding communities?

If the company deems a suggestion a good idea, it is then presented during a stakeholder meeting to see if there is broader support for the idea. If during a stakeholder meeting it becomes clear that the proposal is supported in the community, Form Ghana will do a costing of the activity and also identify the parts that a community can arrange (in case of a building for instance, arrange sand and gravel from a local source, arrange a suitable site and arrange labour). The proposed process will take some time, but it is a good way to make sure that ideas are funded that have broad support and are feasible.

The process is described in the flow-chart below:

