

# **POLIAMBA LIMITED (Part of the NBPOL Group)**

## **WATER MANAGEMENT PLAN**

Issue 3

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**Record of Revision**

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0	15 <sup>th</sup> October 2011	Full documentation	All	Issue 1
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## **1. Introduction**

This Water Management Plan (WMP) is written to achieve best water management practices and promote continual improvement in the management of water resources by Poliamba Ltd (hereafter Poliamba). The WMP is written in compliance to RSPO Criterion 4.3 and 4.4 and its indicators (see Appendix 1) and incorporates all legal requirements to extract and discharge water in PNG (see Appendix 2). The WMP strives to provide of high quality water for consumption by humans and during the industrial process and appropriate post process treatment and discharge into the environment. The WMP defines our water utilization targets, provides guidelines to achieve the required targets and assigns responsibilities to implement, monitor and report that the water management plan is being adhered to. The WMP will be revised annually to incorporate changing policy directives and appropriate technologies as a means to continual improvement.

## **2. Objectives**

The purpose of the water management plan is to ensure that Poliamba's water utilization:

- Complies with RSPO & legal requirements in Papua New Guinea
- Takes into account of the efficiency of use and renewability of sources.
- Ensures that the use of water does not result in adverse impacts on other users.
- Avoids contamination of surface and ground water through run-off of soil, nutrients or chemicals, or as a result of inadequate disposal of waste, including POME
- Appropriate treatment of mill effluent and regular monitoring of discharge quality, which should be in compliance with national regulations.

## **3. Targets**

The targets which Poliamba will achieve are set by the limits described in our water extraction and discharge permits. Performance is monitored monthly (by company), quarterly (by independent party) and reported annually to CEPA (formally DEC). Targets are expressed as quantity and quality of water extracted and discharged. Targets which are not achieved will be addressed through reducing consumption, increasing limits and improving treatment.

## **4. Extraction**

The overall targets of water to be extracted are set by the parameter limits described within our DEC water permit. The following table summarizes these targets which we must monitor monthly and report annually to CEPA.

**Table 1: Water extraction targets**

Source	Parameter	Maximum Permissible Limit	Permit #
Fileba Creek	m <sup>3</sup>	240,000 m <sup>3</sup> /yr	WE-L2B(210)
Extraction point 1 (Kameriba Creek)	m <sup>3</sup>	60,480 m <sup>3</sup> /yr	WE-L2B(185)
Extraction points 2- 9,11,13-15	m <sup>3</sup>	43,200 m <sup>3</sup> /yr	WE-L2B(185)
Extraction point 10,12,	m <sup>3</sup>	25,920 m <sup>3</sup> /yr	WE-L2B(185)
Fileba Creek/Kameriba Creek	Base flow	Not below 10% of mean level	WE-L2B(210)/ WE-L2B(185)
Source	Parameter	Highest desirable – max. permissible level	Permit #
All extraction	E. Coli	None	WE-L2B(210)/ WE-L2B(185)
All extraction	Total Coliform	<3 coliform org/100ml if E. Coli absent	WE-L2B(210)/ WE-L2B(185)
All extraction	Colour	5 - 50	WE-L2B(210)/ WE-L2B(185)
All extraction	Odour/Taste	Unobjectionable	WE-L2B(210)/ WE-L2B(185)
All extraction	Turbidity	5 - 25 Units	WE-L2B(210)/ WE-L2B(185)
All extraction	Total suspended solids	500 - 1,500 mg/L	WE-L2B(210)/ WE-L2B(185)

## 5. Discharge

The overall parameter targets of water to be discharged are set by parameter limits described within our DEC water permit. The following table summarizes these targets which we must monitor monthly and report annually to CEPA.

**Table 2: Water discharge targets**

Destination	Parameter	Limit	Permit #
Discharge point 1 (domestic waste water)			
Domestic waste water	m <sup>3</sup>	5,000 m <sup>3</sup>	WD-L2B (249)
Discharge point 2 (POME)	m <sup>3</sup>	151,200 m <sup>3</sup>	WD-L2B (249)

Discharge point 1	Coliform	≤ 200 faecal coliform/100ml	WD-L2B (249)
Discharge point 1	Dissolve oxygen	> 6.0 mg/l (>80-90% saturation)	WD-L2B (249)
Discharge point 1	Total suspended solids	< 10% change from mean season values	WD-L2B (249)
Discharge point 2	Dissolve oxygen	> 6.0 mg/l (>80-90% saturation)	WD-L2B (249)
Discharge point 2	Total suspended solids	< 10% change from mean season values	WD-L2B (249)
Discharge point 2	Oil & Grease	None noticeable as visible film or detectable by odour	WD-L2B (249)

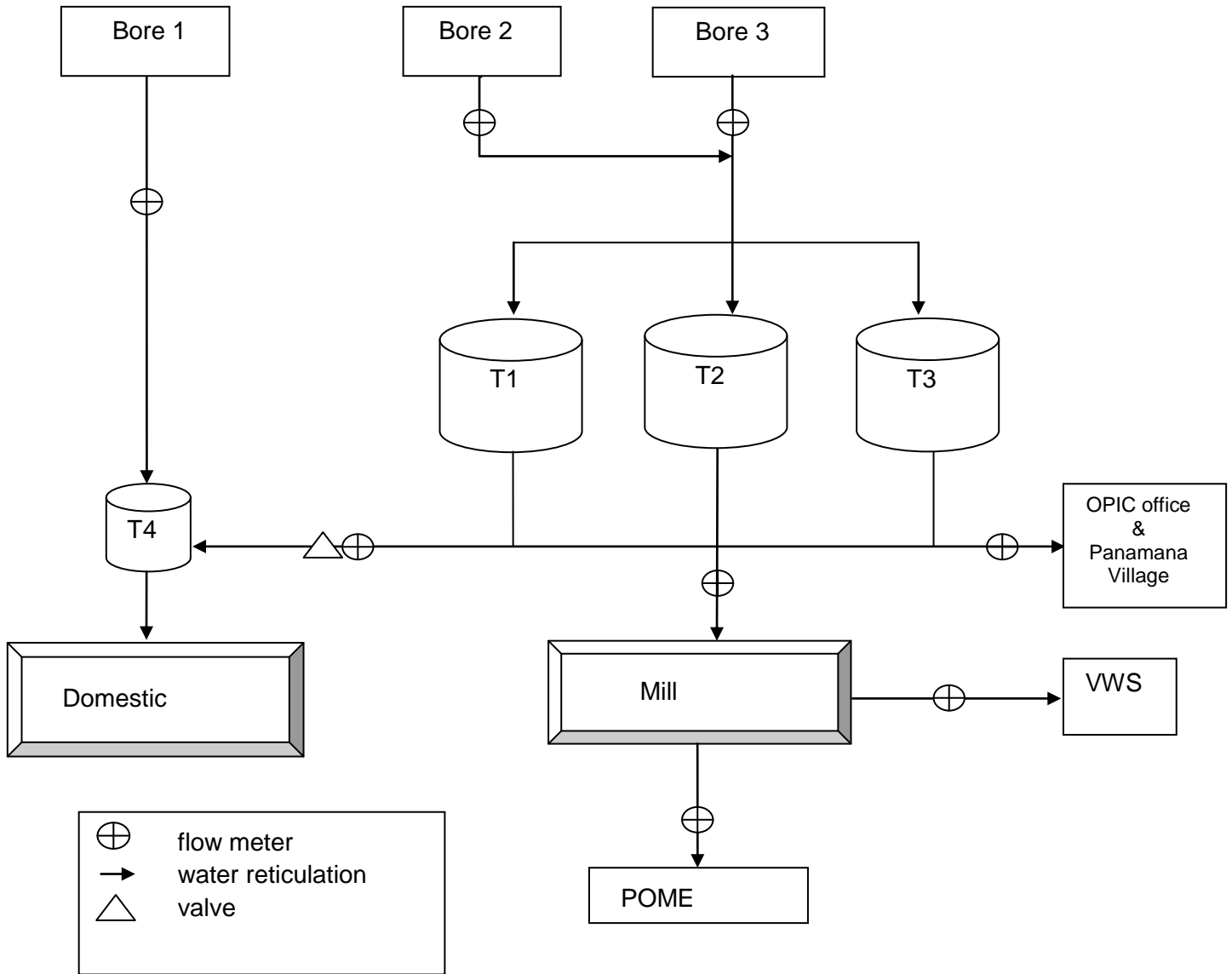
## 6. Mill Water Management Plan

According to permit number WE-L2B (185), the Mill water is licensed to source (146,880 m<sup>3</sup> per annum) from bores 3, 4, 5 which are extraction points 10, 11 and 12 respectively. These bore holes are fitted with 4kW, 11kW and 11kW pumps which pump the water 2.5 kilometres to three tanks from which the water is distributed to for both Mill and domestic use.

## 7. Extraction & distribution

Currently there is no filter system being utilized to treat the water being pumped to the Mill and domestic supplies in Lakurumau. The diagram below describes the water pumping, storage and reticulation system currently in place.

**Figure 1: Water extraction, distribution and discharge at Lakurumau**



Measurement of extraction and discharge rates requires flow meters to be installed and operational at the locations indicated in the diagram.

## 8. Mill Waste Water Treatment

The mill utilizes heat, water and pressure to extract oil from the palm nut mesocarp. With the exception of additives utilized to treat water for the mill, wastes consist entirely of organic substances which can be broken down by biological processes in the mill ponds. In 2014 the mill reported using 11,594m<sup>3</sup> of water, of which 2,893m<sup>3</sup> was used for processing and 8,701m<sup>3</sup>



was used by the demin plant. The following table describes intake, processes sources and waste water treatment currently utilized in the mill.

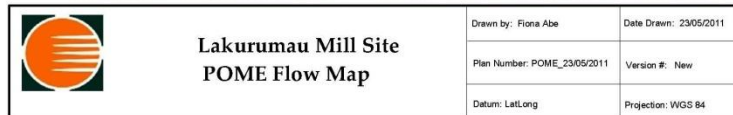
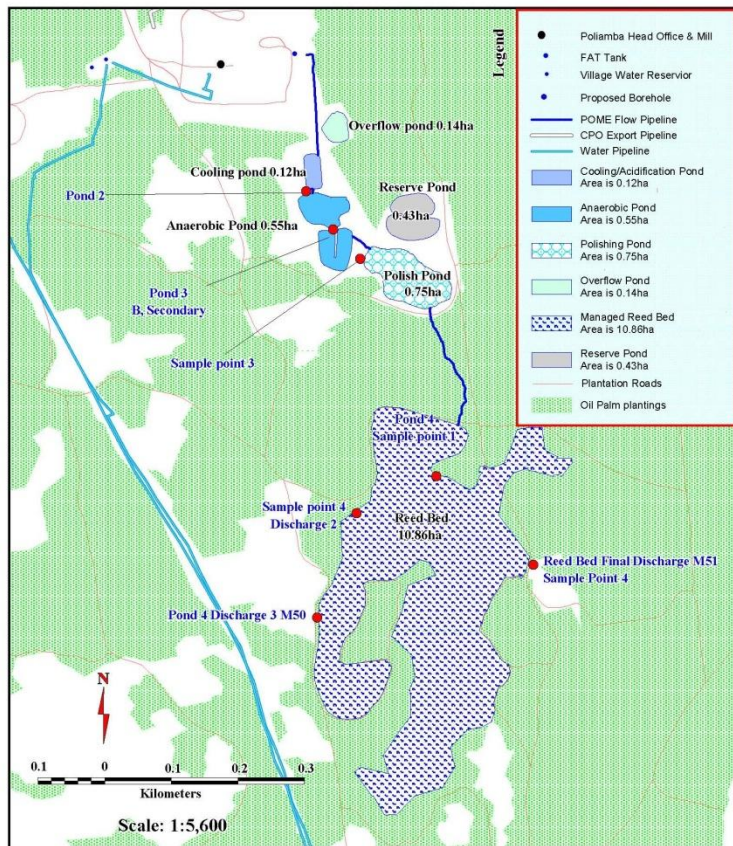
**Table 3: Effluent streams originating in the mill and workshop**

<b>Intake</b>	<b>Process</b>	<b>Strength</b>	<b>Oil Recovery</b>	<b>Water treatment</b>
Boiler	Sterilizer condensate	High	Oil trap low grade oil	Mill ponds
Process	Leaks from pipelines, storage vessels, processing equipment and oil transfer fittings, etc	High	Oil trap low grade oil	Mill ponds
Boiler	Clarification sludge water	Medium		
Boiler	Hydro cyclone effluent water	Medium		
Process	Workshop & fuel storage areas	Medium	Oil-water separator	
Process	Spillage clean up, general cleaning	Low	None	Oil water separator, field drainage
Process	Sanitary effluent; i.e. toilet, bathrooms	High	None	Septic tank
Process	Decanter cake	Low	None	Diluted and disposed into Pond 1
Process	EFB		None	Returned to field

## 9. Mill Ponds

Poliamba utilizes a four stage pond system before discharging palm oil mill effluent onto a reed bed from where it seeps into the ground water vertically, laterally through a cave system and into the air through evapotranspiration. The reed bed total surface area is 10.08ha, with three discharge points which are alternatively utilized to allow for equal filling of the reed bed. Pond 1 and 2 are entirely anaerobic, resulting in high biogas production (60% methane; 30% CO<sub>2</sub>). The optimum substrate to nutrient ratio (BOD: N: P) for aerobic treatment of 100: 5:1 is

normally not given in the raw POME. But anaerobic micro-organisms need only a nutrient ratio of at 100:1.3:0.3, which can be achieved for POME. In fact there is normally a surplus of nutrient in POME available for anaerobic treatment. Because anaerobic treatment mainly reduces the carbonaceous material in the effluent the subsequent aerobic treatment will have no deficiency of N or P but may have a deficiency of carbonaceous substrate. This is provided by the reed bed into which POME is discharged.



## 10. Mill Water Quality Monitoring

Monitoring of the correct quantity and quality of water extraction and discharge is the responsibility of the mill laboratory under the direct supervision of the Mill Manager with a reporting responsibility towards data requirements as defined by the

Sustainability Manager. Water testing guides correct treatment of water for use within the mill and for human consumption. Regular testing of water discharged is carried out as per CEPA discharge permit. Water testing parameters and monitoring frequency are summarized in Appendix 2.

## 11. Overall Mill Water Management Program

The following tables summarize the overall maintenance, inspection and improvements responsibility of the Mill Water Management Program.

**Table 4: Maintenance schedule and responsibility**

Type of Maintenance	Maintenance Frequency	Responsible
Water quality testing	Quarterly	Mill Manager
Bore hole cleaning (Chemical)	As Needed	Mill Manager
Bore pumps	As Needed	Mill Manager
Flow meters	Monthly	Mill Manager
Water pipeline/ cocks	Depending on pipe conditions	Mill Manager
Storage tank cleaning	Quarterly	Mill Manager
Water treatment system	Monthly	Mill Manager
Internal water pipes	Monthly	Mill Manager

**Table 5: Inspection schedule and responsibility**

Type of Inspection	Inspection Frequency	Responsible
Licenses and permits	Biannual	Sustainability Manager
Water quality testing	Quarterly	Sustainability Manager
Bore hole inspection	Monthly	Sustainability Manager
Flow meters	Monthly	Sustainability Manager
Storage tank inspection	Monthly	Sustainability Manager
Water pipe lines	Monthly	Sustainability Manager

**Table 6: Mill Water Improvement Program**

Issue	Problem	Solution	Resp	Date
Tank 1, 2, 3, 4	Dirty, leaking, valves broken	Drain, clean, repair	MM	Commenced & continuing
Bore sampling points	Bore # 3 need sampling tap	Install tap	MM	completed
Volume Water Extracted	Flow meters readings reported monthly to Sustainability	Ensure all installed, working, monthly readings reported	MM	ongoing
Volume of industrial waste water discharged into	Flow meters readings reported monthly to Sustainability	Ensure all installed, working, monthly readings reported	MM/CM/SM	ongoing

pond and process waste water behind stores				
Effluent Discharge BOD Results (Int.& Ext.)	Only Mill pond being sampled, need Process water discharge as well	Start sampling outflow of process water behind Lab	MM	Commenced and continuing
Mill Ponds	Improvement plan developed from recommendations	Expert inspected ponds & gave recommendations	MM	2016

## 12. Field Water Management Plan

The main sources of water usage and pollution incurred by field operations have to do with our agricultural activity and water utilized by our employees.

### Watershed Management

The Field Department manages over 7921.96 ha of leased land with watersheds into pristine coral reef ecosystems in the world. Average annual rainfalls of 3.5m of rainfall imply that this land receives over 252 million m<sup>3</sup> of water per year. Interventions which impact catchment water quality include the management our planted area, residential areas, unplanted areas and roads.

**Table 7: Land uses in Poliamba**

Land Use	Hectares
Planted area	5664.85
Compounds, key infrastructure & ponds	122.10
Nursery	19.43
Undeveloped ( Inclusive of Conservation)	1825.49
Roads	290.1
Total	7921.97

Chemical inputs, fertilizers and pesticides, are significant and the following measures are used to control use of pesticide and run off of

### Pesticide spraying

RSPO bans prophylactic spraying. i.e. no chemicals will be sprayed in the nursery on a calendar basis. Spraying will only be carried out as a result of survey results that show a specific pest level that is above economic levels and cannot be controlled by other methods. Sexava attacks in the field are reported to the OPRA and they make recommendations for

control. No methamidophos applications in PNG are permitted without prior approval from OPRA.

### Fertilizer

Fertilizer application rate is controlled by periodic soil and leaf sample analysis. Application is directly onto the soil around base of trees and beneficial cover crops are used between trees to minimize runoff. Buffer zones of three rows of trees around permanent streams are respected.

### Erosion control

Erosion control on planted lands varies according to age of plantation and slope<sup>1</sup>. Furthermore watershed protection guidelines according to RSPO standards are upheld such as buffer zones. The following table summarizes all control measures applied in the field to manage the watershed.

**Table 8: Control measures per watershed area**

Watershed area	Control measure
Slopes 9-25 degrees	Cover crop
Slopes above 25 degrees	No new or replanting
Radius of major lakes	100m
Either side of permanent rivers and streams	Class 1-50m Class 2-10m
Either side of small streams	No new or replanting within 10 meters
High tide mark from sea shore sea shore	No new or replanting within 50 meters
Swamps	Protected

### Controlling Pollution in Estates

Each estate office produces contaminated water by mixing agrochemicals and fertilizers, dispatching fuel for transport and sanitary waste. The following table summarizes pollution sources and control measures utilized to minimize waste into environment:

**Table 9: Control measures per pollution source**

Pollution Source	Pollution Control
Chemical mixing	Chemical soak away pit
Generators	Waste interceptor traps
Bowser and fuel shed	Waste interceptor traps
Sanitary waste; toilets, bathrooms	Septic tanks and drain pits

<sup>1</sup> measures are described in the Field Handbook

### 13. Overall Field Water Management Program

The following tables summarize the overall maintenance, inspection and improvements responsibility of the Field Water Management Program.

**Table 10: Maintenance schedule and responsibility**

Type of Maintenance	Maintenance Frequency	Responsible
Bore hole cleaning (Chemical)	As Needed	Field Manager
Bore pumps	As Needed	Field Manager
Flow meters	Monthly	Field Manager
Water pipeline/ cocks	As Needed	Field Manager
Storage tank cleaning	Quarterly	Field Manager
Water treatment system	Monthly	Field Manager
Internal water pipes	Monthly	Field Manager

**Table 11: Inspection schedule and responsibility**

Type of Inspection	Inspection Frequency	Responsible
Licenses and permits	Annual	Sustainability Manager
Water quality testing	Quarterly	Sustainability Manager
Bore hole inspection	Monthly	Sustainability Manager
Flow meters	Monthly	Sustainability Manager
Storage tank inspection	Monthly	Sustainability Manager
Water pipe lines	Monthly	Sustainability Manager

### 14. Human consumption Water Management Plan

Poliamba provides housing for over 2,000 employees and dependants who use a large amount of water derived from bore holes, rain water, rivers and streams. The variety of sources results in a lack of control over quality of water to be ingested and a lack of control of pollution points.

#### **Water extraction**

The sources of water for human consumption are borehole, rain from and roof catchment. All licenses are maintained and water sourced is tested against parameters described in the Environmental Permit. Problems of utilizing bore hole water are far outweighed the problems of relying on rain and stream/river water, which range from unreliability of sources (quantity and quality) to direct pollution of the source (rivers and streams). In the long term Poliamba will strive to rely entirely on bore hole water and control all of its water discharge points accordingly.

## Water discharge and control of pollution

Human consumption of water at Poliamba has the following control measures.

**Table 12: Sources and Control of Water Pollution**

Pollution Source	Pollution Control
Septic tanks	Soakage pits
Pit toilets	Soakage pits
Sanitary waste; toilets, bathrooms	Soakage pits
Streams and rivers	None

## 15. Overall Drinking Water Management Program

The following tables summarize the overall maintenance, inspection and improvements responsibility of the Field Water Management Program.

**Table 13: Maintenance schedule and responsibility**

Type of Maintenance	Maintenance Frequency	Responsible
Bore hole cleaning (Chemical)	As Needed	Field Manager/Mill Manager
Bore pumps	As Needed	Field Manager/Mill Manager
Flow meters	Monthly	Field Manager/Mill Manager
Water pipeline/ cocks	As Needed	Field Manager/Mill Manager
Storage tank cleaning	Quarterly	Field Manager/Mill Manager
Internal water pipes	Monthly	Field Manager/Mill Manager

**Table 14: Inspection schedule and responsibility**

Type of Inspection	Inspection Frequency	Responsible
Licenses and permits	Biannual	Sustainability Manager
Water quality testing	Quarterly	Sustainability Manager
Storage tank inspection	Monthly	Sustainability Manager
Water pipe lines	Monthly	Sustainability Manager

**Table 15: Improvement Program**

Type of Improvement	Target Date	Responsible
Provide adequate storage/person in compounds	2011	Field Manager
Increase catchment where possible to all tanks	2011	Field Manager
Monitor water at Lamerika Estate Compound	2012	Sustainability Manager
Develop a long term housing plan to include access to water	2013 (ongoing)	General Manager

## 16. Water Quality Monitoring Program

The water monitoring program is done in compliance to our Environmental Permits. It measures our environmental performance for the duration of the permit. Poliamba has three environmental permits consisting of two extraction permits and one discharge permit as summarized below.

**Table 16: Summary of Environmental Permits**

Permit	Type	Activity	Expiry
WE-L2B-185	Water Extraction	Level 2B (Sub-category 9.5)	31 <sup>st</sup> Dec 2053
WE-L2B-210	Water Extraction	Level 2B (Sub-category 9.5)	12 <sup>th</sup> Feb 2021
WD-L2B-249	Water Discharge	Level 2B (Sub-category 9.5)	31 <sup>st</sup> Dec 2053

Measurements and reporting is done against the parameters specified in these permits as they pertain to maintaining ecological flows (volume) and Public Health Water Quality Standards. The following tables summarize these parameters and frequency of reporting required for both our Water Extraction and Discharge permits.



**Table 17: Parameters for Monitoring Water Extraction Permits**

	Variable	Qualification	Frequency
Monitoring	Litres of water	Don't reduce source more than 10% below mean level (surface water)	Monthly
	E Coli (per 100ml)	0	Quarterly
	Total Coliform (per 100ml)	<3 Coliform organisms per 100ml if E. Coli is absent	Quarterly
	Colour	5-50	Quarterly
	Odour	Unobjectionable	Quarterly
	Taste	Unobjectionable	Quarterly
	Turbidity	5-25 Units	Quarterly
	Total Suspended Solids	500-1500mg/L	Quarterly
	Variable		Frequency
Reporting	Raw data (cert. Labs)		Annual
	Interpretation of raw data		Annual
	Records of volume of water extracted		Annual
	Observations on ecological effects of the water extraction on the water course		Annual
	Status of compliance with conditions of this permit		Annual

**Table 18: Parameters for Monitoring Water Discharge WD-L2B**

	Variable	Qualification	Frequency
Monitoring as per approved Environmental Monitoring & Management Plan and Waste Management Plan; minimal requirements	Litres of domestic waste water discharged (pt 1)	5000m <sup>3</sup> /year	
	Litres of industrial water discharged (pt 2)	151,200m <sup>3</sup> /year	Monthly
	Discharge of (pt 1) domestic waste water does not cause surface waters to exceed	<= 200 faecal coliform/100ml	Quarterly
		Dissolved Oxygen >6.0mg/L (80-90% saturation)	Quarterly
		Total suspended solids < 10% change from background mean seasonal values	Quarterly
		Oil & Grease none noticeable as visible film or detectable by odour	Quarterly



	Discharge of (pt 2) industrial waste water does not cause surface waters to exceed:	Dissolved Oxygen >6.0mg/L (80-90% saturation)	Quarterly
		Total suspended solids < 10% change from background mean seasonal values	Quarterly
		Oil & Grease none noticeable as visible film or detectable by odour	Quarterly
Reporting	Raw data (cert. Labs)		Annual
	Interpretation of raw data		Annual
	Incidence of non-compliance and reasons		Annual
	Status of compliance with Waste Management Plan and other conditions of this permit		Annual

## 17. Appendix 1

### Criterion 4.3

Practices minimise and control erosion and degradation of soils.

#### Indicators:

- 4.3.1        **Major**        Maps of fragile soils shall be available.
- 4.3.2                       A management strategy shall be in place for planting on slopes above a certain limit.
- 4.3.3                       A road maintenance plan shall be in place.
- 4.3.4        **Major**        Subsidence of peat soils should be minimised and monitored, a documented water and ground cover management programme shall be in place.
- 4.3.5                       Drainability assessments shall be required prior to replanting on peat to determine the long-term viability of the necessary drainage for oil palm growing.
- 4.3.6                       A management strategy should be in place for fragile and problem soils (e.g. sandy, low organic matter, acid sulphate soils)

### Criterion 4.4

Practices maintain the quality and availability of surface and ground water.

#### Indicators:

- 4.4.1                       An implemented Water Management Plan shall be in place
- 4.4.2        **Major**        Protection of water courses and wetlands, including maintaining and restoring appropriate riparian and other buffer zones (refer to national best practice and national guidelines) shall be demonstrated.
- 4.4.3                       Appropriate treatment of mill effluent to required levels and regular monitoring of discharge quality, especially Biochemical Oxygen Demand (BOD), shall be in compliance with national regulations (Criteria 2.1 and 5.6).
- 4.4.4                       Mill water use per tonne of Fresh Fruit Bunches (FFB) (see Criterion 5.6) shall be monitored.

## 18. Appendix 2

### Current DEC Extraction and Discharge Permit Checklist

#### Extraction Permits WE-L2B – 185 & 210

	Variable	Qualification	Frequency	Compliance status (2014)
Monitoring	Litres of water	Don't reduce source more than 10% below mean level (surface water)	Monthly	Completed monthly
	E. Coli (per 100ml)	0	Quarterly	Completed quarterly
	Total Coliform (per 100ml)	<3 Coliform organisms per 100ml if E. Coli is absent	Quarterly	Completed quarterly
	Colour	5-50	Quarterly	Completed quarterly
	Odour	Unobjectionable	Quarterly	Completed quarterly
	Taste	Unobjectionable	Quarterly	Completed quarterly
	Turbidity	5 Units	Quarterly	Completed quarterly
	Total Suspended Solids	500-1500mg/L	Quarterly	Completed quarterly
Reporting	Raw data (cert. Labs)		Annual	Completed annually
	Interpretation of raw data		Annual	Completed annually
	Records of volume of water extracted		Annual	Completed annually
	Observations on ecological effects of the water extraction on the water course		Annual	Completed annually
	Status of compliance with conditions of this permit		Annual	Completed annually

Water Discharge WD-L2B (all significant pollution points)

	Variable	Qualification	Frequency	Compliance Status (2014)
Monitoring as per approved Environmental Monitoring Plan and Waste Management Program; minimal requirements	Litres of domestic waste water discharged (pt 1)	5000m <sup>3</sup> /year		
	Litres of industrial water discharged (pt 2)	151,200m <sup>3</sup> /year	Monthly	Completed monthly
	Discharge of (pt 1) domestic waste water does not cause surface waters to exceed	<= 200 faecal coliform/100ml	Quarterly	Will be completed quarterly in 2015
		Dissolved Oxygen >6.0mg/L (80-90% saturation)	Quarterly	Completed quarterly
		Total suspended solids < 10% change from background mean seasonal values	Quarterly	Completed quarterly
		Oil & Grease none noticeable as visible film or detectable by odour	Quarterly	Completed quarterly
	Discharge of (pt 2) industrial waste water does not cause surface waters to exceed	Dissolved Oxygen >6.0mg/L (80-90% saturation)	Quarterly	Completed quarterly
		Total suspended solids < 10% change from background mean seasonal values	Quarterly	Completed quarterly
		Oil & Grease none noticeable as visible film or detectable by odour	Quarterly	Completed quarterly
Reporting	Raw data (cert. Labs)		Annual	Completed annually
	Interpretation of raw data		Annual	Completed annually
	Incidence of non-compliance and reasons		Annual	Completed annually
	Status of compliance with Waste Management Plan and other conditions of this permit		Annual	Completed annually