

2023

ANNUAL ENVIRONMENTAL PERFORMANCE Report

**MOMASE LARGE SCALE INTEGRATED
AGRICULTURE PROJECT**

Pacific Elite Investment Limited



PACIFIC ELITE INVESTMENT LIMITED

Lot 12, Section 505, Wewak Hills
Wewak, East Sepik Province
PO Box 567 Waigani, NCD
Papua New Guinea

09 April 2024

THE MANAGING DIRECTOR

Conservation & Environment Protection Authority
PO Box 6601, BOROKO
National Capital District

SUBJECT: **SUBMISSION OF 2023 ANNUAL ENVIRONMENTAL PERFORMANCE
REPORT FOR MOMASE LARGE-SCALE INTEGRATED PROJECT**

Respectfully, we are enclosing three (3) copies of the **2023 Environmental Performance Report** for the Momase Large-Scale Integrated Project (TP No. FCA 11-03). This project spans across Turubu, Sausso, and Angroram LLGs, situated in Wewak, Yangoru Saussia, and Angroram Districts, respectively, within East Sepik Province, Papua New Guinea.

We trust that this report offers valuable insights into our environmental practices and adherence to our Environmental permit and Environmental Management Plan, as stipulated by the Environmental Act 2000.

Should you have any inquiries or require further details, please feel free to reach out to us via email at gepng.spd2023@gmail.com. Your feedback is highly appreciated, and we eagerly anticipate any suggestions you may have for enhancing our environmental performance.

Thank you for your attention to this matter. We are steadfast in our commitment to environmental stewardship and the pursuit of a sustainable future.

Hoping for your kind consideration and earnest approval on this matter.

Respectfully yours,

RAYMOND TU
Manager



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PROJECT FACT SHEET

PROJECT/CONCESSION AREA :	MOMASE LARGE-SCALE INTEGRATED AGRICULTURE PROJECT (MLSIAP)
FOREST CLEARING AUTHORITY :	NO. 11-03
PERMIT HOLDER :	PACIFIC ELITE INVESTMENT LIMITED
LOCATION :	Turubu LLG of Wewak District, Angoram LLG of Angoram District, and Sausso LLG of Yangoru-Saussia District, all of East Sepik Province, Papua New Guinea
GROSS AREA :	105,400 HECTARES
SUITABLE AREA :	90,000 HECTARES
ENVIRONMENTAL PERMIT (EP) :	WD-L3 (196) / WE-L3 (150)
DATE ISSUED :	December 5, 2008
AMALGAMATED (EP) :	EP-L3 (806)
AMALGAMATED DATE :	November 19, 2021
TERM OF PERMIT :	25 Years



MLSIAP Project Location

INTRODUCTION

In the heart of Papua New Guinea's East Sepik Province lies a vast area of land teeming with potential – the **Momase Large Scale Integrated Agriculture Project (MLSIA)**. Nestled approximately 25 kilometers from the bustling town of Wewak, this ambitious initiative is poised to reshape the agricultural landscape of the region.

Spanning over 105,400 hectares of diverse terrain, the project site encompasses lush forests, sprawling grasslands, and fertile soils waiting to be cultivated. But this isn't just about exploiting the land for profit; it's a carefully orchestrated endeavor that harmonizes development with environmental conservation.



At its core, the Momase Large Scale Integrated Agriculture Project revolves around the cultivation of oil palm, a lucrative crop with myriad industrial applications. Over 90,000 hectares of the project area have been earmarked for the establishment of expansive oil palm plantations, a testament to the scale of ambition driving this endeavor.

Yet, what sets the MLSIA project apart is its holistic approach to development. Recognizing the intricate interplay between economic prosperity and ecological sustainability, the project aims to strike a delicate balance between agricultural expansion and forest preservation.

However, achieving such equilibrium requires meticulous planning and vigilant monitoring. Thus, as the project unfolds, a commitment to transparency and accountability is paramount. Hence, the **Annual Environmental Performance Report for 2023** serves as a testament to the project's unwavering dedication to environmental stewardship.

Within the pages of this report lie insights into the project's progress, challenges encountered, and measures taken to mitigate environmental impact. It serves not only as a regulatory requirement but also as a testament to the project's ethos – a testament to the conviction that progress need not come at the expense of nature.

Furthermore, like any developmental undertaking, waste products are expected to be produced during implementation and operation. The project site in particular and the surrounding area as a whole would experience significant and irreversible environmental deterioration if these wastes are not handled and managed properly. The majority of the wastes generated by the mill and plant sites will end up in the adjacent tributaries of the Sepik River, a vital economic resource



for the East Sepik Province, if they are not properly and thoroughly managed. Without appropriate sustainable waste management and disposal procedures, it will have a significant impact on the quality of the air, land, and water, and these wastes may also pose risks to the health and safety of those in the project area as well as those outside of it.

Pacific Elite Investment Limited (PEIL) remains committed to its legal obligations under the Environment Act 2000 to the annual reporting process and will continue to provide key environmental monitoring, measurement information, and data to key stakeholders on an annual basis. PEIL strives to maintain a high level of environmental management for the longer-term sustainability and profitability of the business and the environment in which it operates.

To comply with the environmental permit approval conditions issued to the PEIL under the Environment Act 2000, this environmental performance report has been prepared in compliance with the legal requirements. It is formatted under the guidelines established by the Conservation and Environment Protection Authority (CEPA) for Annual Environment Performance Reporting.

This report details the company's overall performance from January 1st to December 31st, 2023, with an emphasis on achieving sustainably managed oil palm plantations. This includes the production of crude palm oil, tree salvaging, and timber processing operations, all of which integrate the concepts of sustainable development into our regular business operations.

Our foremost priority revolves around consistently enhancing our environmental performance. This commitment stems from our overarching business goals, striving to attain predefined targets, and adhering to legal mandates and regulations, including various environmental permit stipulations. We aim to operate our business in a manner that is both efficient and environmentally sustainable over the long haul.

PROJECT OBJECTIVES

The objectives of the report are to:

- Evaluate the environmental impact of agricultural activities conducted under the project, including land use changes, water usage, soil health, biodiversity, and air quality,
- Ensure compliance with environmental regulations and standards set forth by CEPA-issued environment permit approval conditions and the CEPA-approved EMP (Legal Compliance),
- Identify emerging environmental risks and challenges associated with project activities and propose mitigation measures to address them,
- Track key environmental indicators such as water quality, soil erosion, deforestation, water waste discharge, waste disposal, and wildlife populations to gauge the project's impact on the environment,
- Assess the effectiveness of environmental management practices implemented within the project to minimize negative environmental impacts and promote sustainability,
- Integrate environmental considerations into long-term project planning to ensure the sustainability of agricultural practices and environmental resources for future generations, and
- Pacific Elite Investment Limited's overall environmental performance concerning other environmental initiatives shall be thoroughly undertaken by the company.

By fulfilling these objectives, the annual environmental performance report can provide valuable insights into the environmental impact of the Momase Large Scale Integrated Agriculture Project and support informed decision-making to promote environmental sustainability and resilience.

I. ENVIRONMENTAL PERFORMANCE

The Momase Large-Scale Integrated Agriculture Project, implemented under the support of Pacific Elite Investment Limited (PEIL), stands as a beacon of innovation and initiated a wider scope of sustainable agro-industrial development, embodies PEIL's commitment to harnessing agricultural potential while ensuring environmental responsibility. Situated amidst the lush landscapes of the East Sepik Province, the project aims to integrate modern agricultural techniques with traditional wisdom, fostering economic growth, security, and environmental sustainability.



The project has been guided by the principles of environmental conservation and community engagement. Through strategic partnerships with local stakeholders, government agencies, and environmental organizations, the project has sought to strike a delicate balance between agricultural productivity and ecological preservation.

Throughout the past year, the Project has made significant strides in enhancing environmental performance across various fronts. From agriculture and tree planting initiatives to soil conservation efforts, the project has demonstrated a steadfast commitment to safeguarding natural ecosystems and biodiversity.

Moreover, the MLSIA Project has prioritized community involvement and capacity building, empowering local farmers with knowledge and skills to adopt sustainable agricultural practices. By fostering a culture of environmental stewardship and resilience, the project aims to create lasting benefits for present and future generations.

As we delve into the Annual Environmental Performance Report for CY 2023, it is with a sense of pride and responsibility that we reflect upon the achievements and challenges encountered along the way. Through transparent assessment and open dialogue, we strive to uphold the highest standards of environmental accountability and pave the way for a greener, more prosperous future in the region and beyond.

A. Water Extraction

This report details the company's overall performance from January 1st to December 31st, 2023, with an emphasis on achieving sustainably managed oil palm plantations. This includes the production of crude palm oil, tree salvaging, and timber processing operations, all of which integrate the concepts of sustainable development into our regular business operations.

Last December 5, 2008, the project was granted Environmental Permits to Discharge Waste {WD-L3-(196)} and extract water {(WE-L3 (150))} with approval to commence on January 2, 2009. Hereafter, the company applied to amend the Environment Permits (EPs) to discharge waste and extract waters which were granted last 19th of November 2021 and under the transformation of the Department of Environment and Conservation (DEC) into Conservation and Environment Protection Authority (CEPA), the Environmental Permit Number changed to {EP-L3-(806)} which combines the two EPs.



Table 1. Summary of Water sampling extraction under PEIL for the year 2023.

Water Extraction Point	SOURCE	LOCATION & COORDINATES	USAGE
WSE - 01	Sepik River	Plywood Plant (KPL) Easting: 808 230 Northing: 9 537 951	Industrial & Domestic
WSE - 02	Urr-u Creek (Pongi)	Oil Palm Mill-SPOL Easting: 801 748 Northing: 9 542 754	Industrial & Domestic
WSE - 03	Pond	Turubu Township Easting: 806 659 Northing: 9 566 472	Domestic/Workshop
WSE - 04	Pond	Kenyare Compound Easting: 808 846 Northing: 9 572 491	Domestic/Workshop
WSE - 05	Mawit Creek (Brinangat)	Mawit basecamp Easting: 807 251 Northing: 9 586 246	Domestic/Workshop
WSE - 06	Urr-u Creek (Pongi)	Ibap Nursery Easting: 810 073 Northing: 9 561 011	Nursery Irrigation

Note: NARI Chemistry Lab Water Quality Sampling Analysis Result (See Appendix 6)

Currently, we comply with our water extraction limits. It has also ensured that all operations are carried out more sustainably and any unnecessary water wastage in both the operations and accommodation villages is strictly controlled. There is also ongoing water management and control usage awareness undertaken

in all our residential villages. We have maintained and want to keep our annual water uptake and usage within the allowable legal limits as much as possible.



WATER RESERVOIR POND & EXTRACTION POINT

1. Water Quality Monitoring – Drinking Water

The water requirement in the camp for domestic and industrial purposes will be supplied both through rainwater and surface water from different creeks/streams and ponds located nearby. Water abstraction from rivers, creeks, ponds, and surface water will be conducted with the use of a water pump (diesel-driven) throughout the year only on an as-needed basis. Because the Project Area has several high monthly rainfalls, the camp's water supply needs will be mainly addressed through the water tanks established to collect rainwater. Turubu Township, and Mundo-mundo estate rainwater were collected for domestic use consumption.

During the dry period, water will be taken from the constructed reservoir near the creek, river, and pond and supplied to the camp through a water motor pump (diesel-driven). Water will be stored in the centralized huge (15m³ - capacity) water tank mounted in the platform so that the water will flow freely to respective faucets using gravitational force. The water pump will automatically shut off once the desired water level in the tank is attained. In this way, fuel, and oil consumption of the motor is minimized.



On the other hand, water requirements for the Imap nursery and palm oil mill will be supplied from the water abstracted from Urr-u Creek (Pongi). Again, a centralized huge (20m³ - capacity) water tank will be installed using the same principle as the one used in the camp during the dry season.



With the increasingly severe pollution of drinking water resources, people's awareness of the protection of drinking water gradually strengthened, and management departments increased the intensity of water resource detection.

Amid the fourth quarter of the previous year, a significant decision rippled through the corridors of management: the relocation of staff and employees residing in Mawit Main Camp to Kanduanum. This decision, while abrupt, was rooted in a pragmatic rationale. In light of these challenges, management recognized the need for a more sustainable solution.

Kanduanum, situated on firmer ground and boasting more robust facilities, emerged as the logical choice for relocation. Its proximity to essential resources and infrastructure made it an ideal candidate to accommodate the displaced staff and employees from Mawit Camp. Additionally, Kanduanum offered a more secure and stable environment, mitigating the risks associated with continued residence in Mawit Camp.

Ultimately, the decision to transfer the staff and employees from Mawit Camp to Kanduanum was a strategic move aimed at ensuring the continued productivity and welfare of the workforce. As the transition unfolded, it became evident that this decision would not only safeguard the interests of the individuals involved but also pave the way for future growth and development. For now, Mawit Main Camp is no longer exists and was not also included in this report (Domestic Use).

Table 2. Summary of Water Sampling for Domestic Use

WATER EXTRACTION	SOURCE	LOCATION	COORDINATES
WSDU - 01	Deep well	Oil Palm Mill (SPOL)	Easting: 803 202 Northing: 9 543 654
WSDU - 02	Sepik River (Treated)	Plywood Mill (KPL)	Easting: 807 717 Northing: 9 538 473
WSDU - 03	Deep Well	Plywood Mill (KPL)	Easting: 807 636 Northing: 9 538 454
WSDU - 04	Deep Well & Rainwater	Mundo-Mundo Estate	Easting: 808 531 Northing: 9 553 986
WSDU - 05	Rainwater	Turubu Township	Easting: 806 883 Northing: 9 567 372

Note: NARI Chemistry Lab Water Quality Sampling Analysis (See Appendix 6)

a. Domestic Water

Water for domestic use is obtained from both surface and underground water sources. We periodically check and monitor all PEIL private water sources for water sampling to make sure the quality of our drinking water is within the legal limitations outlined in our Environmental Permits - Water Extraction and in compliance with the PNG Public Health (Drinking) Water Quality Standards. Every source of abstraction has a different set of water samples taken. As of right now, PEIL analyzes every water sample through the NARI Chemistry Lab.



Table 3. Water Quality Criteria – Non – Disinfected Water Supplies.

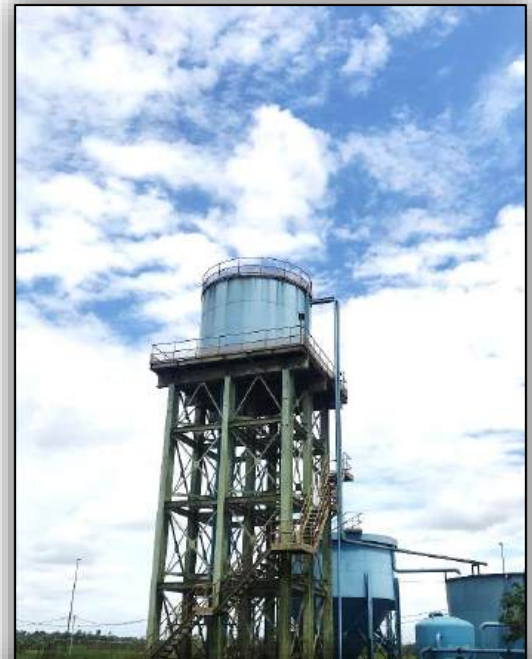
Parameters	Highest Desirable Level	Maximum Permissible Level	Sampling Frequency
Microbiological			
E. coli (per 100 ml)		None	Monthly
Total Coliform (per 100 ml)		<3*	Monthly
Physical			
Color	5	50	Monthly
Turbidity	5 units	25 units	Monthly
Total Suspended Solids	500 mg/L	1,500 mg/l	Monthly

Our Environmental Permit requires monthly sampling of all domestic water sources, However, Oil Palm Mill (SPOL), Turubu Township, and Plywood Mill (KPL) water extraction for domestic use are from Urr-u Creek, Deep well, Sepik River, and Mawit Creek (Brinangat). SPOL- Oil Palm Mill, Turubu Township, and Plywood Mill (KPL) water treatment shall be applied before usage. The treated water tank is also installed for water storage. An additional advantage of storing water is that the water quality improves over time. If water is stored for one day over 50 percent of the bacteria will die. Suspended solids, which can contain pathogens, will often settle out during storage. By pouring the clear water out carefully, the settled solids can be separated from the water.

Consequently, to ensure and fulfill the requirements stipulated in our Environmental Permit. We have to identify some parameters for water analysis this is to be done to make sure that the water used for drinking is safe and potable drinking water for everyone. **Appendix 6** Lists all the water quality test results and parameters analyzed.

To further enhance and improve domestic water quality for consumption, the company has embarked on the installation of Water treatment systems for all its domestic water systems located in Plywood Plant (KPL), Kanduanum Village, Angoram District, East Sepik. The system ensures all water sourced from underground passes through the filtration and disinfection system to sanitize the microbiological bacteria and remove other impurities before supplying to the employees by applying these chemical mixtures such as Soda ash, Poly-Aluminum Chloride (PAC), and Polymer. PEIL ensures that the quality of the sourced water that enters for domestic use is safe for drinking and cooking.

Furthermore, the water that enters the treatment plant is most often either surface water or groundwater. Surface water typically requires more treatment and filtration than ground water because lakes, rivers, and streams contain more sediment (sand, clay, silt, and other soil particles), germs, chemicals, and toxins than groundwater.



Some water supplies may contain specific chemicals (such as nitrates), or toxins (such as those made by cyanobacteria). Specialized methods to control or remove these contaminants can also be part of water treatment.



TOWNSHIP WATER TANKS



MUNDO-MUNDO FIELD STAFF
& LABORER WATER TANKS



SPOL STAFF WATER TANKS



MUNDO-MUNDO STAFF
QUARTERS WATER TANKS

B. Waste Discharge

Multiple discharge points for both domestic and industrial wastewater originating from our operations have been authorized within our consolidated environmental permit. Compliance at these discharge points is regularly ensured through thorough checks of the environmental permit conditions, the approved waste management plan, and the Environmental Management Plan (EMP).

Table 4. Summary of water sampling for PEIL water discharges.

WATER DISCHARGE	SOURCE	LOCATION	COORDINATES
WSD - 01	Sepik River	Plywood Mill (KPL)	Easting: 808 158 Northing: 9 537 943
WSD - 02	Urr-u creek	Oil Palm Mill (SPOL)	Easting: 801 766 Northing: 9 542 785
WSD 03	Nagam River	Oil Palm Mill (SPOL)	Easting: 803 532 Northing: 9 541 636
WSD – 04	Urr-u creek	Ibap Nursery	Easting: 810 094 Northing: 9 560 995
WSD - 05	Wangay Creek	Mundo-mundo junction Kambrendo	Easting: 811 831 Northing: 9 557 720
WSWW	Pond (Mill Effluent)	Oil Palm Mill (SPOL)	Easting: 802 952 Northing: 9 542 934

NOTE: NARI Chemistry Lab Water Quality Sampling Analysis (See Appendix 6)



Location of Water Discharge: Near SPOL.
Water Source: Urr-u Creek



Location of Water Discharge:
Plywood Mill (KPL)
Water Source: Sepik River

1. Palm Oil Mill Effluent (POME) Monitoring

The palm oil mill effluents from the operating mill (SPOL) which is located in Mundo-mundo Village, Angoram District, East Sepik Province are diverted to a series of treatment ponds for treatment before discharge. After undergoing anaerobic and aerobic treatment processes, the effluents from the final pond are then transported via underground pipes to a series of holding ponds located within the company plantation for further treatment and later discharged into the plantation through a series of dug-out trenches within the plantation. There is no direct discharge of effluent to the environment.



SPOL - Palm oil mill management commonly applies conventional biological treatments of anaerobic or facultative digestion. The anaerobic and facultative ponds rely on bacteria to break down the organic matter into simple end products of methane, carbon dioxide, hydrogen sulfide, and water. This system consists of a series of ponds connected and each pond has its purpose. However, this biological treatment system needs proper maintenance and monitoring; increasing the labor requirement and cost. This is due to the processes relying solely on microorganisms to break down the pollutants. The microorganisms are very sensitive to the surrounding temperature and pH and thus extra care has to be taken to ensure a conducive environment for the microorganism to develop well. This treatment also required a large treatment area with a long treatment period (80 to 120 days). Moreover, biological treatment also generates vast amounts of biogas, which is corrosive and odorous. This biogas contains methane, carbon dioxide, and trace amounts of hydrogen sulfide. These gases are corrosive and dangerous. Moreover, methane gas is more potent and a fire hazard.

Furthermore, effluent and sludge generated in the SPOL - Oil Palm Mill operation comprised of wastewater (washing of FFB & cooking fruits), pulp,

and residual oil will be directed to the series of ponds (Cooling pond, acidification pond, anaerobic pond, aerobic pond, facultative pond and finally, the settling pond) constructed by the company. The size of the pond will depend on the volume of waste and the number of days that these wastes will stay in the pond during the treatment process.

The company ensures that all effluent samples collected at each respective discharge point, the following parameters as summarized in Table 5 below are analyzed against set criteria. See Appendix 3. *Wastewater Data (POME) Analysis*.

Table 5. Effluent Quality Criteria for Treated Palm Oil Mill Effluent (POME) Discharge.

Parameters	Land Application	Discharge to Surface Water
pH	5 - 9	5 - 9
Biological Oxygen Demand	4,000	100
Total Solids	3,000	1,500
Suspended Solids	1,000	500
Oil & Grease	50	50

Units in mg/L except pH

On the other hand, oil palm mill effluents are also treated and discharged via land application into the plantation. As such we ensure all parameters stipulated in the permit are within its legal requirements for land application. To – date



and as indicated in Appendix 3. *Wastewater Data (POME) Analysis*. Our wastewater analysis readings are well below the legal and Environmental Waste Discharge Permit requirements.

Other parameters such as Oil and Grease and Suspended Solids are also monitored and results are also shown in Appendix 3. *Wastewater Data (POME) Analysis*.

In the event of any non-compliance with our Environmental Permit – Waste Discharge parameters, an investigation is conducted, and respective site Managers are informed to ensure corrective measures are taken to correct such non-conformities. Any significant non-compliance well beyond the company's control is reported to management and CEPA is informed.

To date, all POME discharges at respective Environmental Impact Points to land are and have been well below the legal permit discharge limits as contained in the Environmental Permit.

**SEPIK OIL PALM MILL (Mill Effluent) located in Mundo-mundo, Angroram District, East Sepik Province
(BIRDS EYES VIEW)**



We undertake ongoing monitoring of the waste streams generated from our operations

- Palm Oil Mill Effluent (POME) discharges from its milling process
- Water quality criteria for all treated POME Discharges (POME wastewater)
- Smoke emissions from mill boilers (smoke density meter is under its procurement phase)

To monitor and assure compliance, the company makes sure that accurate data is gathered and reported each month. Internal monitoring obligations of the organization include the analysis and periodic reporting of all data collected from the various waste streams at various discharge sites.

Any non-compliance with legal and regulatory requirements is checked and reports are sent to respective sections/departments for investigations and to take appropriate corrective actions.

2. Oil Palm Mill (Oil Interceptor)

An oil interceptor, also known as an oil separator or oil trap, is a device used in oil palm mills to separate oil from water during the milling process. In the context of oil palm milling, an oil interceptor is typically employed to capture and remove oil that may be present in the wastewater generated from various stages of palm oil production.



The oil interceptor works on the principle of gravity separation, where the mixture of oil and water enters the interceptor, allowing the oil to rise to the surface due to its lower density, while the water settles at the bottom. The separated oil is then collected and can be recycled or processed further, while the treated water is discharged or reused in the milling process.



Oil interceptors play a crucial role in environmental management and compliance in oil palm mills by preventing oil contamination of water bodies and ensuring that wastewater discharged from the mill meets regulatory standards for oil content. Proper maintenance and operation of oil interceptors are essential to ensure effective oil-

water separation and minimize environmental impact.

Oil interceptors play several important roles in oil palm mills:



Environmental Protection

- Oil interceptors help prevent oil contamination of water bodies by removing oil from wastewater before it is discharged. This is crucial for protecting aquatic ecosystems and complying with environmental regulations.



Compliance

- Many jurisdictions have regulations regarding the allowable oil content in wastewater discharged from industrial facilities like oil palm mills. Oil interceptors help mills meet these regulatory requirements by effectively removing oil from wastewater.



Resource Recovery

- The oil separated by the interceptor can often be recycled or processed further, providing an opportunity for resource recovery and reducing waste.



Efficient Treatment

- By removing oil from wastewater, oil interceptors improve the efficiency of downstream wastewater treatment processes. This can reduce the load on treatment systems and improve overall treatment performance.



Operational Efficiency

- Properly functioning oil interceptors help maintain the smooth operation of oil palm mills by preventing oil buildup in drainage systems, which can cause blockages and operational disruptions.

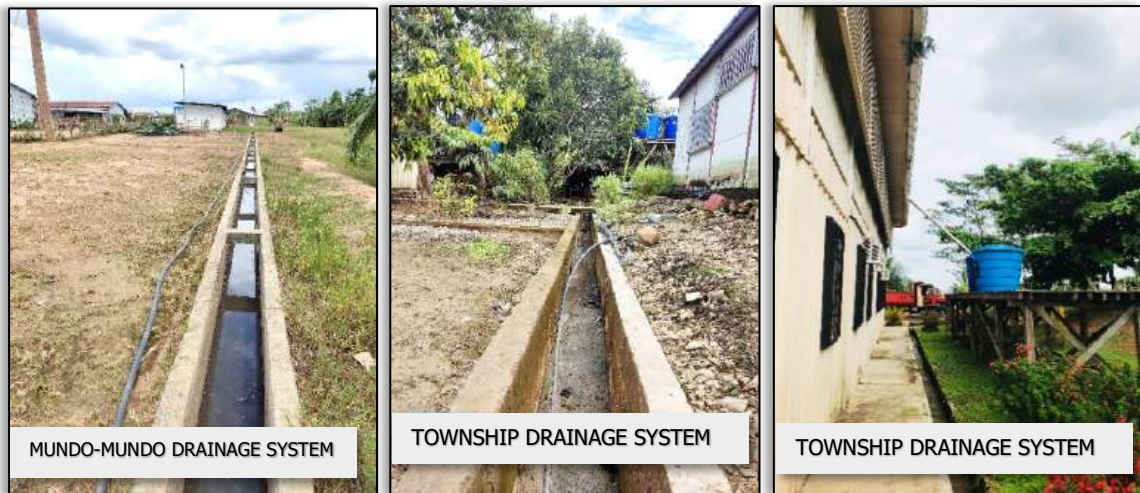
3. Water Drainage



Drainage water management practices can target agronomic goals, environmental (water quality) goals, or both. The drainage outlet can be set at or close to the soil surface between growing seasons to recharge the water table, thereby temporarily retaining contaminated water in the soil profile where it will be subjected to attenuating and nitrate-transforming processes. In addition, it is possible to raise the outlet after planting to help increase water availability to shallow plant roots and to raise or

lower it throughout the growing season in response to weather conditions. In some soils, water may even be added during very dry periods to reduce crop loss from drought, and this practice is termed sub-irrigation. However, the drain spacing for sub-irrigation has to be half the recommended value for drainage for the addition of water to be very effective.

On the other hand, proper drainage systems for estate and base camp sites shall be thoroughly constructed to prevent the accumulation of stagnant water, which can become a breeding ground for disease-carrying mosquitoes and other pests. By providing efficient wastewater disposal, drainage systems contribute to improved sanitation, reducing the risk of waterborne illnesses and promoting the overall safety of people living inside the estate and base camps and community well-being as well.



4. Sewage

Nestled within the sprawling expanse of the plantation, a network of facilities hummed with activity. Amidst the rhythmic rustle of palm fronds, workers tended to the vital infrastructure that supported the cultivation of this lucrative crop. Among these facilities, sewage and septic toilet tanks played a crucial role, often overlooked but essential for the sustainable growth of the plantation.

As the plantation flourished, accommodating a growing workforce and infrastructure, the issue of waste management loomed large. The sheer scale of operations demanded efficient solutions to handle human waste effectively while minimizing environmental impact. Herein lay the significance of sewage and septic toilet tanks.



Unlike conventional sewage systems, which could be impractical and costly to implement across vast plantations, septic tanks offered a decentralized and cost-effective alternative. Strategically placed throughout the estate, these underground chambers served as efficient waste disposal units, harnessing natural processes to break down organic matter.

The importance of these tanks extended beyond mere waste management. In the delicate ecosystem of the oil palm plantation, proper sanitation was paramount to prevent contamination of soil and water sources. Septic tanks provided a reliable means of containing and treating human waste, safeguarding the environmental integrity of the plantation.

Moreover, the presence of well-maintained sewage and septic systems contributed to the overall well-being of the plantation community. By promoting hygiene and sanitation standards, these facilities helped reduce the risk of waterborne diseases, ensuring the health and productivity of workers.

In the broader context of sustainable development, the role of sewage and septic toilet tanks in oil palm plantations underscored the importance of integrating environmental stewardship with economic prosperity. Through efficient waste management practices, plantations could minimize their ecological footprint while maximizing yields, thus fostering a harmonious relationship between agriculture and the environment.

Table 6. List of water tanks and septic tanks locations and coordinates within PEIL. (Please see the attached Map)

TOWNSHIP COMPOUND			
STN	EASTING	NORTHING	REMARKS
1	806 910	9 567 807	WATER TANK
2	806 918	9 567 797	SEPTIC TANK
3	806 928	9 567 787	WATER TANK
4	806 946	9 567 765	WATER TANK
5	806 955	9 567 756	SEPTIC TANK
6	806 965	9 567 745	WATER TANK
7	806 908	9 567 464	WATER TANK
8	806 932	9 567 392	WATER TANK
9	806 954	9 567 393	SEPTIC TANK
10	806 894	9 567 393	SEPTIC TANK
11	806 885	9 567 381	WATER TANK
12	806 883	9 567 372	WATER TANK
13	806 903	9 567 348	WATER TANK
14	806 914	9 567 351	WATER TANK
15	806 917	9 567 347	SEPTIC TANK

ANNUAL ENVIRONMENTAL PERFORMANCE REPORT

Momase Large-Scale Integrated Agriculture Project

TOWNSHIP COMPOUND			
STN	EASTING	NORTHING	REMARKS
16	806 895	9 567 331	SEPTIC TANK
17	806 869	9 567 310	SEPTIC TANK
18	806 830	9 567 336	WATER TANK
19	806 835	9 567 341	SEPTIC TANK
20	806 848	9 567 352	SEPTIC TANK
21	806 858	9 567 360	SEPTIC TANK
22	806 872	9 567 372	SEPTIC TANK
23	806 857	9 567 349	WATER TANK
24	806 868	9 567 339	WATER TANK
25	806 878	9 567 326	WATER TANK
26	807 161	9 567 364	WATER TANK
27	806 810	9 567 060	WATER TANK
28	806 819	9 567 050	SEPTIC TANK
29	806 838	9 567 042	WATER TANK
30	806 846	9 567 018	WATER TANK
31	806 855	9 567 007	SEPTIC TANK
32	806 864	9 566 995	WATER TANK
33	806 714	9 566 449	PUMP HOUSE
34	806 659	9 566 472	WATER POND
35	806 811	9 567 521	WATER TANK
36	806 904	9 567 465	SEPTIC TANK

SPOL OIL MILL PLANT			
STN	EASTING	NORTHING	REMARKS
1	803 160	9 543 643	SEPTIC TANK
2	803 202	9 543 654	DEEPWELL
3	803 229	9 543 618	SEPTIC TANK
4	803 332	9 543 479	SEPTIC TANK
5	803 328	9 543 445	SEPTIC TANK
6	803 367	9 543 431	SEPTIC TANK
7	803 386	9 543 429	SEPTIC TANK
8	803 388	9 543 468	DEEPWELL
9	803 170	9 543 341	SEPTIC TANK

ANNUAL ENVIRONMENTAL PERFORMANCE REPORT

Momase Large-Scale Integrated Agriculture Project

SPOL OIL MILL PLANT			
STN	EASTING	NORTHING	REMARKS
10	803 153	9 543 629	WATER TANK
11	803 387	9 543 458	WATER TANK
12	803 511	9 543 956	WATER TANK
13	803 172	9 543 391	OVERHEAD WATER TANK
14	803 160	9 543 399	TREATED WATER TANK
15	803 450	9 543 910	SEPTIC TANK
16	803 465	9 543 921	SEPTIC TANK
17	803 478	9 543 931	SEPTIC TANK

KENYARE COMPOUND			
STN	EASTING	NORTHING	REMARKS
1	808 790	9 573 015	SEPTIC TANK
2	808 783	9 572 978	SEPTIC TANK
3	808 826	9 572 984	SEPTIC TANK
4	808 844	9 572 982	SEPTIC TANK
5	808 828	9 572 962	SEPTIC TANK
6	808 840	9 572 961	SEPTIC TANK
7	808 837	9 572 935	SEPTIC TANK
8	808 823	9 572 937	SEPTIC TANK
9	808 662	9 572 887	SEPTIC TANK
10	808 637	9 572 871	SEPTIC TANK
11	808 590	9 572 837	SEPTIC TANK
12	808 838	9 572 830	SEPTIC TANK
13	808 835	9 572 538	POND 1
14	808 846	9 572 491	POND 2
15	808 841	9 572 513	PUMP HOUSE
16	808 922	9 572 965	WATER TANK
17	808 893	9 572 864	WORKSHOP

ANNUAL ENVIRONMENTAL PERFORMANCE REPORT

Momase Large-Scale Integrated Agriculture Project

IBAP NURSERY			
STN	EASTING	NORTHING	REMARKS
1	810 099	9 561 025	WATER PUMP
2	810 083	9 561 007	WATER POND
	810 073	9 561 011	EXTRACTION
	810 094	9 560 995	DISCHARGE
	810,222.67	9,561,096.70	PUMP HOUSE

KUKUSANG PLYWOOD LIMITED			
STN	EASTING	NORTHING	REMARKS
1	807 513	9 538 290	SEPTIC TANK
2	807 535	9 538 275	WATER TANK
3	807 548	9 538 317	WATER TANK
4	807 557	9 538 310	SEPTIC TANK
5	807 586	9 538 278	SEPTIC TANK
6	807 558	9 538 387	SEPTIC TANK
7	807 561	9 538 390	SEPTIC TANK
8	807 570	9 538 374	WATER TANK
9	807 582	9 538 362	SEPTIC TANK
10	807 589	9 538 363	SEPTIC TANK
11	807 591	9 538 452	WATER TANK
12	807 604	9 538 451	SEPTIC TANK
13	807 640	9 538 406	SEPTIC TANK
14	807 636	9 538 454	DEEPWELL
15	807 649	9 538 440	SEPTIC TANK
16	807 667	9 538 421	SEPTIC TANK
17	807 674	9 538 413	WATER TANK
18	807 631	9 538 496	SEPTIC TANK
19	807 687	9 538 498	WATER TANK
20	807 712	9 538 488	SEPTIC TANK
21	807 717	9 538 473	WATER TANK
22	807 725	9 538 466	SEPTIC TANK
23	807 655	9 538 203	WATER TANK
24	807 665	9 538 204	SEPTIC TANK
25	807 583	9 538 281	WATER TANK

ANNUAL ENVIRONMENTAL PERFORMANCE REPORT

Momase Large-Scale Integrated Agriculture Project

KUKUSANG PLYWOOD LIMITED			
STN	EASTING	NORTHING	REMARKS
26	807 400	9 538 452	WATER TANK
27	807 412	9 538 447	SEPTIC TANK
28	807 441	9 538 414	SEPTIC TANK
29	807 444	9 538 409	WATER TANK
30	807 849	9 538 135	WATER TANK
31	807 854	9 538 151	WATER TANK
32	807 876	9 538 170	WATER TANK
33	807 904	9 538 184	WATER TANK
34	807 756	9 538 291	WATER TREATMENT TANK

C. Energy usage



The company (SPOL) aspires to aggressively conserve energy and to progressively reduce reliance on non-renewable (diesel fuel) energy towards the use of renewable energy sources, and reduce greenhouse gas emissions.

We use waste products from the mill such as fiber and endocarp (kernel & shell) to generate power for use in the (boiler 1) milling process. The mesocarp fiber and endocarp (kernel & shell) generated during the de-pericarping, and stripping process will be fed as fuel to the boiler furnace.

About 80% of the energy produced is from renewable resources (turbines). SPOL ensures that we focus on energy efficiency (management) improvements in the mills. Hence, most electricity is generated by renewable energy sources to drive our mill turbines thus decreasing dependence on diesel fuel. Some of the excessive energy generated is also fed into the grid for domestic consumption in the company housing and residential areas thus further reducing its dependency on the use of diesel fuels. (Please see the attached Appendix 4. Energy Generation).



GENERATOR (DIESEL DRIVEN)



TOWNSHIP ELECTRIC POWER SUPPLY



TOWNSHIP GENERATOR SET HOUSE



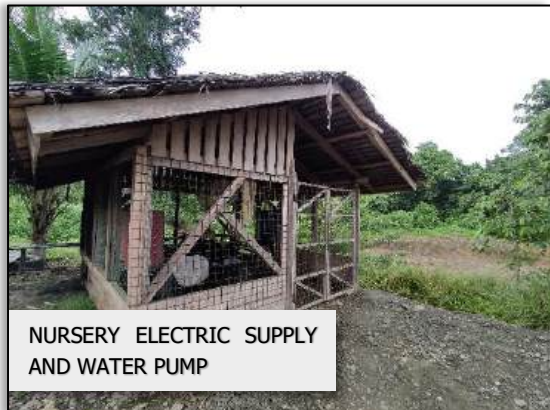
MUNDO-MUNDO GENERATOR
POWER SUPPLY



KPL ELECTRIC POWER SUPPLY



KENYARE ELECTRIC POWER SUPPLY



NURSERY ELECTRIC SUPPLY
AND WATER PUMP



The company's Plywood Plant (KPL) daily operation also uses a diesel-driven generator set, a crucial component that ensures uninterrupted power supply to sustain various production processes. Traditionally, the use of diesel-driven generators has raised environmental concerns due to emissions of pollutants such as nitrogen oxides (NO_x), sulfur oxides (SO_x), particulate matter (PM), and carbon dioxide (CO₂). However, in recent years, the plywood industry has made significant strides toward mitigating these environmental impacts by adopting environmentally friendly practices in genset usage.

One key approach to enhancing the environmental performance of diesel-driven generators in plywood plants is the integration of advanced emission control technologies. These technologies include diesel particulate filters (DPF), selective catalytic reduction (SCR) systems, and exhaust gas recirculation (EGR), among others. By incorporating these technologies, diesel-driven generators can significantly reduce emissions of harmful pollutants, thus improving air quality both within the plant premises and in the surrounding environment.



Moreover, plywood plant (KPL) is increasingly exploring alternative fuels and renewable energy sources to power their operations, further minimizing their environmental footprint. This may involve the utilization of biodiesel derived from sustainable sources or the integration of renewable energy technologies such as solar photovoltaic (PV) systems or biomass boilers. By diversifying their energy sources and reducing reliance on fossil fuels, plywood plants can

contribute to a more sustainable energy landscape while mitigating the environmental impact associated with diesel genset usage.

In addition to technological advancements, KPL Plywood Plant is also implementing best practices in genset maintenance and operation to optimize fuel efficiency and minimize emissions. Regular maintenance checks, efficient load management, and proper tuning of diesel-driven generators are essential steps in ensuring that they operate at peak performance while minimizing their environmental footprint.

Overall, the use of diesel-driven generators in plywood plants can be made environmentally friendly through the adoption of advanced emission control technologies, utilization of alternative fuels, and integration of renewable energy sources. By embracing these sustainable practices, the plywood industry can reduce its environmental impact while maintaining reliable and efficient operations to meet the global demand for wood products.

D. Solid Wastes

1. Industrial Solid waste

As part of the company's waste management and resource reuse and recycle strategy some waste management strategies are used. All solid wastes generated from the mill operations (Kernel, Fiber, and EFB) are as per our Environmental Permits – Waste Discharge.

The following wastes are generated from milling operations:

- ☐ Empty Fruit Bunch (EFB)
- ☐ Kernel Shell
- ☐ Fiber
- ☐ Boiler Ash
- ☐ Other Industrial Wastes

The total quantity of waste generated and classified under each of the different waste streams above are listed in Appendix 2 Oil Palm Mill (FFB Processing - Solid Waste Generation) of these reports.



Fiber is stored on-site for use at the mill boiler for steam generation



EFB is ready for application into the field for mulching.

Empty Fruit Bunches (EFB), including Decanter Cake, are weighted and later applied into the field to serve as mulching.

Boiler ash is stored and later taken to the composting site for manual decomposition.

Scrap metals, used machinery, and equipment parts are stored and reused as spare parts. Once unusable they are stored at the lay-down area and later salvaged by scrap metal buyers.

Contaminated hydrocarbon wastes (contaminated sawdust, rugs, filters, batteries, etc.) are taken to the landfill site and disposed of into the hydrocarbons and workshop waste pit.

Empty Chemical and pesticide containers are triple-rinsed and reused. All damaged and unusable ones are punctured and disposed of in the pesticide waste pit at the landfill site.

All our domestic household wastes generated from the company employee housing villages are segregated (store and garden), placed in bins, regularly collected weighed at the weighbridge, and disposed of into the designated domestic waste pits located at each of the estates. There is a central landfill site located within every estate where several pits have been constructed for the different waste streams generated from the company operations. The Turubu Township, Mundo-Mundo, and Kenyare estates are located further away and have their own smaller landfills for waste disposal.



MUNDO-MUNDO WASTE DISPOSAL SITE



Solid waste segregation in KPL (Staff Quarters)



E. Machinery maintenance workshop and fuel storage



The maintenance workshop is operated in compliance with the CEPA Code of Practice for Vehicle/Machinery Workshops and Petroleum (Hydrocarbons) Storage/Usage Site (DEC, 1997). Workshop area flooring and drainage include oil water interceptors to improve the clarity of wash water before release into the local drainage. The waste products are handled as prescribed in the Waste Management Plan and described above. Fuel is currently stored in drums

inside a satisfactory bonded and sheltered shed. Oil Palm Mill and Plywood Plant Depot for fuel storage are being installed and constructed.

FUEL DEPOT



MUNDO-MUNDO FUEL DEPOT



KENYARE FUEL DEPOT

WORKSHOP FACILITIES



KENYARE WORKSHOP



SPOL WORKSHOP



SPOL WORKSHOP

II. ENVIRONMENTAL MANAGEMENT INITIATIVES

A. Buffer Zone Management

In many of the conservation programs and projects, zoning principles are applied to allow protection to be combined with human use, whereby important areas (often conservation areas and/or core zones are surrounded by so-called buffer zones.

According to the PNG Logging Code of Practice, rivers that are less than 5 meters wide must have a 10-meter buffer zone on either



side, while rivers that are wider than 5 meters must have a 50-meter buffer zone. After marking is complete, GPS is used to map the buffer zone areas, and the tree planting activity program is then conducted.

Table 7: Buffer Zones Establishment.

ESTATES	LENGTH (km)	BUFFER ZONE MARKING
Oil Palm Mill-SPOL	17.37	March 2017
Ibap Nursery	7.63	April 2017
Mundo-mundo Estate	4.02	May 2017
Turubu Township	4.64	June 2017
Kenyare Compound	6.45	July 2017
Mawit Basecamp	4.83	August 2017
Poimbit Nursery	11.25	January 2018
Poimbit Estate	1.82	February 2018

PEIL has identified all buffer zones as High Conservation Value areas. The riparian buffer zones are established along streams and creeks that flow through all SPOL plantations. These areas have been left untouched as much as possible by natural vegetation allowed to regenerate including the planting of native tree species, flowering plants, fruit trees, and bamboo.

There are various policies implemented and put into place by the employer to further improve and safeguard watercourses, streams, and creeks operating inside the company establishments. The environmental, biodiversity, zero-burning, and buffer zone policies are a few examples of the policies. According to these laws, the company prohibits the burning of vegetation within any buffer zones as well as unlawful fishing, gardening, and hunting.



Oil Palm Mill-SPOL Buffer Zone
(Birds eye view)



Mundo-Mundo Estate Buffer Zone
(Birds eye view)



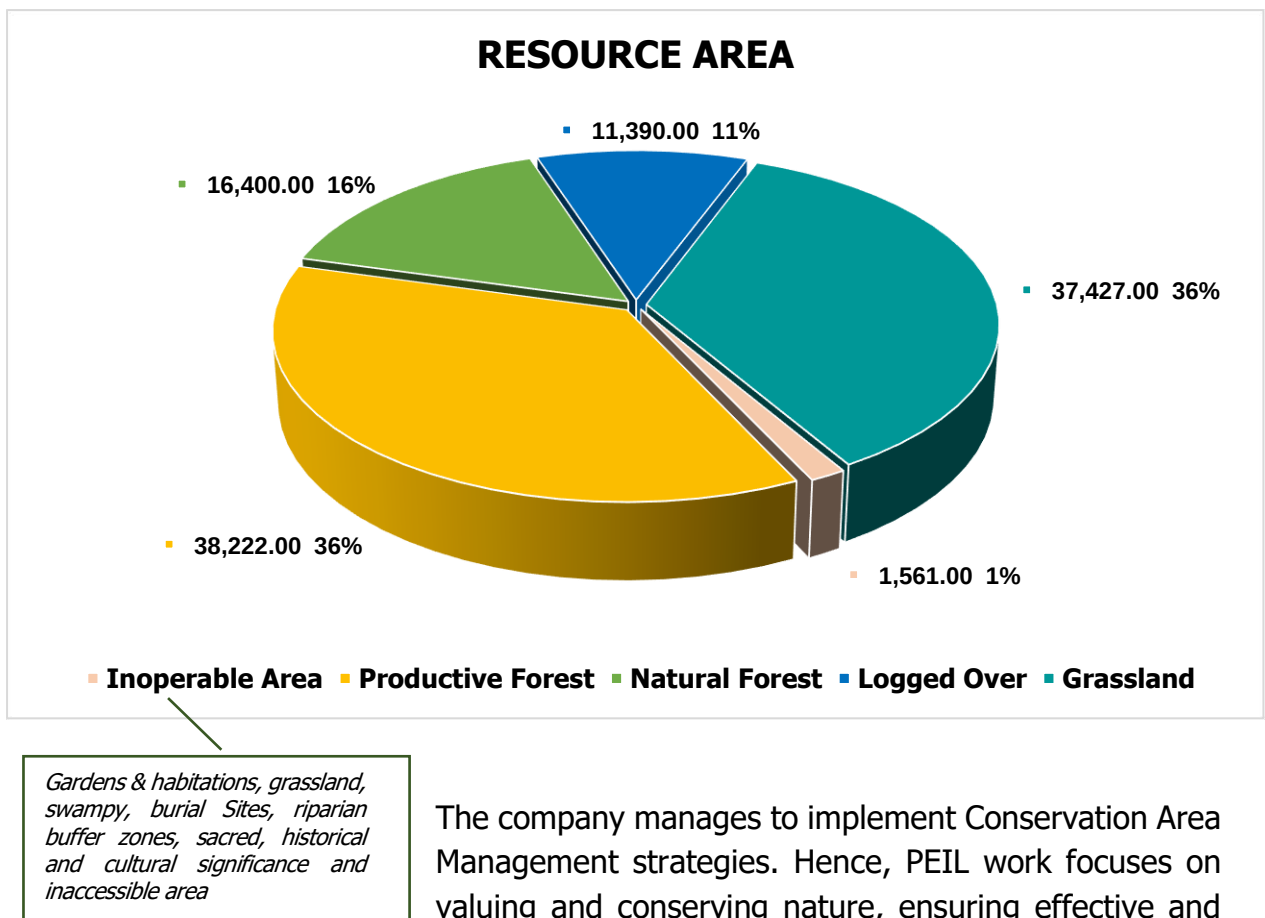
Turubu Township - Parua Buffer Zone (Birds eye view)

Buffer zones are seen as important tools in both conserving areas of ecological importance and addressing development objectives. Although the company has been tough in promoting awareness of illegal gardening and cutting of native and endangered species along rivers and creeks, there have been some setback experiences whereby intruders have entered and cut trees which is a challenge that we are trying to take control of. The management will continuously give support and extend some effort in promoting some mitigating measures to ensure buffer zone management will be thoroughly implemented.



B. Conservation Area Management

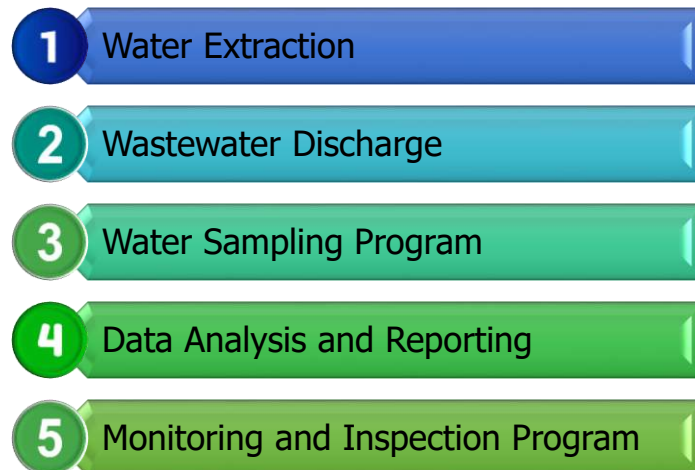
We have also set aside a few natural areas across our operations as reserves which we view to be areas of significance and have high conservation value that we intend to protect and conserve. These conservation areas include gardens and habitations, swampy, burial sites, riparian buffer zones, sacred places, historical and cultural significance, and inaccessible areas.



The company manages to implement Conservation Area Management strategies. Hence, PEIL work focuses on valuing and conserving nature, ensuring effective and equitable governance of its use, and deploying nature-based solutions to global challenges in climate, and for sustainable development.

C. Water Management Plan

A Water Management Plan is developed to ensure all water extraction usage and discharges and within set limits and standards required. The plan captures all aspects of our water extraction, water quality monitoring criteria, and ongoing site inspections and audits. The following key areas are captured in the plan and regularly reviewed as required:



The primary purpose of the water management plan is to ensure best practices are in place to maintain the quality and availability of surface and groundwater, including wastewater discharge. And to ensure that all water abstracted, used, and wastewater discharges are monitored and in compliance with regulatory requirements.

Regular (monthly/quarterly) water sampling is undertaken for all domestic consumption, effluent wastewater discharge, and for all rivers and creeks.

Results of all drinking water quality and wastewater discharges are presented in the various sections of this report. (See Appendix 6. *Lists all the water quality test results and parameters analyzed*).

D. Waste Management Plan

Wastes are always generated in any developmental activity. The types of wastes and waste by-products that will be engendered during the mill site ground preparation, construction, and operation of the Palm Oil Mill are described lucidly in the succeeding sections.

The description will also cover sources from which these wastes emanated/originated and how they will be treated/mitigated, handled, stored, reused or recycled, managed, and at the end, disposed of at the designated waste disposal sites.

The developer is well aware of and will take into account when and how all the wastes will be generated, and will take appropriate remedial measures to treat, manage, reduce or minimize, and store these wastes according to their quantities and toxicity levels before disposing them at the appropriately designated disposal sites.

The environment management program comprises the following components, to wit:

- ❑ Identification of sources and types of waste;
- ❑ Identification of specific waste products;
- ❑ Waste control, containment, and minimization action
- ❑ Waste storage and treatment method;
- ❑ Waste handling and transportation method;
- ❑ Final waste disposal method;
- ❑ Collection and disposal frequency; and
- ❑ Responsible personnel to do the tasks.

Appendix 7 shows the *Waste Management Plan Details Matrix*. It identifies the environmental issues, the waste products/emissions, the possible sources, and the environmental management options to be implemented to mitigate adverse impacts.

WASTE:

Various wastes are generated as by-products from different activities, such as wastes produced from the ground preparation of the mill site and plantation site preparation, and construction and operation of the palm oil mill, plywood plant and sawmill. To manage these wastes, PEIL, and the Contractor will use mitigation methods and techniques (strategies/ mechanisms) to purposely minimize and control these wastes. Excessive and toxic wastes will be appropriately treated into simplicity and also to reduce their toxicity levels by separating and retaining toxic elements and compounds from mixtures (effluents), and disposed of at recommended disposal sites. Other recyclable wastes will be reused, while hazardous wastes will be safely handled away before their elimination. Non-biodegradable wastes (e.g. plastic litter) will either be incinerated (burned) or, buried to avoid accidental contaminations, and prevented from being transported into water courses during downpours resulting in pollution, causing injuries, or becoming threats/risks to lives. Those wastes to be buried in this case are garbage waste and putrefied wastes including broken glass and metals.

The executives of the company have been involved in timber-related operations, oil palm plantation development, and palm oil mill & timber downstream processing operations outside and inside the country for many years and are well aware of the different types of waste that are usually

generated. Therefore, PEIL will always find appropriate ways and means and continue to take remedial measures, to manage, treat (those wastes that warrant treatment), and simplify (especially raw biodegradable wastes such as sewerage) before disposing them into the environment

1. NATURE OF SPECIFIC WASTE

Determination of the waste products and identification of their nature generated from all phases of the project operation is a vital component of any waste management program. The nature of specific waste is generally classified into Biodegradable, Non-biodegradable, and Toxic waste. Waste Classification is the important first step and is very relevant in finding and implementing appropriate waste treatment and disposal methods.

Appendix 8: *Shows the Nature of the Specific Waste Products Matrix.*

a) Biodegradable Waste – These are the wastes that will be able to decompose by bacteria (aerobic or un-aerobic), fungi, and other biological means. The residues of decomposition mustn't be harmful or toxic to living organisms and man. These wastes, if fully decomposed, are good soil amelioration materials that will improve their physical and chemical properties. However, this specific waste might render negative environmental effects (e.g. foul odor) if not properly managed.

Most organic wastes such as papers, wood debris, empty oil palm bunches, sludge, discarded food, food preparation-related wastes, and others are a few examples of so-called biodegradable wastes.

b) Non-biodegradable Waste – This type of waste has the nature of not being decomposed by biological means. Specific examples are scrap iron, junk machinery/parts, cables, wires, containers (bottles, plastic, glass, and metal), and polyethylene bags.

c) Toxic Waste – This specific waste is commonly the product of industrial or commercial processes, which is capable of causing injuries or possible death to micro and macro living organisms or harm to human health when exposed, ingested, or inhaled. The waste includes fuel/oil spillage, used oils and lubricants, paints, chemicals for timber treatments, discarded batteries, and contaminated storm waters, among others.

2. METHODS OF WASTE TREATMENT AND DISPOSAL

PEIL employed three methods of Waste Management to handle the waste products derived from the various operational activities such as mill/plant & plantation site ground preparation, Staff and Workers Accommodation, Palm Oil Mill/timber processing plant Construction, and Operation. The waste treatment methods that were applied include incineration, surface dumping, wastewater aerobics and anaerobic settling ponds, and landfills. However, before the disposition of the different solid waste into the collection bin, the company implemented a solid waste segregation strategy. At the source, PEIL provided two kinds of collection bins or rubbish collection areas, one for biodegradable and another one for non-biodegradable wastes for domestic and workshop wastes.

a) Incineration Method – This method is simply burning all combustible waste materials such as plastic bags/wrappers, cardboard, scratch papers, wood debris (off-cuts, sawdust), used tires & tubes, and other solid combustible waste materials in a designated incineration site.

The incineration site was established far from the housing and other support facilities, villages, and watercourses after considering other factors such as the wind direction, ground slope, and accessibility.

The incineration site was constructed approximately 100 meters or more away from the quarters and very far from any villages. It has an area of about 120m².

b) Surface Dumping Method – Wastes products such as soil debris, rocks debris, uncontaminated containers (drums, etc.), metal scraps/junk machinery, and parts were properly disposed of in the designated open surface dumping site.

All surface dumping sites were established in a distant place away from the village, housing, and other support facilities as well as watercourses. It is also located in a secured and relatively flat area where water-logging is avoided.

The surface dumping area is 10 meters in width and 10 meters in length or 100m² in area which was established adjacent to the incineration site.

c) Pond Method – Effluent and sludge generated in the Palm Oil Mill operation comprised of wastewater (washing of FFB and cooking of fruits), pulp, and residual oil were directed to the series of ponds (a total of 10 units) (cooling pond, acidification pond, anaerobic pond, aerobic pond, facultative pond & finally, the settling pond) were constructed by the company. The size of the pond depends on the volume of waste and the number of days that these wastes will stay in the pond during the treatment process.

At the moment, the company has established a 45tonne/hour capacity upgradable to a 60tonne/hour oil palm mill. Therefore, the effective waste-holding capacities of the pond to be constructed will range from 10,800m³ to 18,000m³.

d) Landfill Method – Human waste disposal is based on the landfill method after the septic tanks are full. Toilets and septic tanks are constructed as storage of all human wastes such as feces and excreta and wastes that flow in the kitchen sinks. The staff houses and workers' quarter have their respective built-in toilets and septic tanks for that purpose, hence not indicated as separate buildings.

Several conditions were satisfied during the establishment of the landfills, as follows:

- ✓ The area is impermeable to prevent the leaking/seeping of liquid waste into nearby watercourses (rivers, streams, and creeks);
- ✓ It is at least 100 meters from maximum water inundation and at least 1 meter above maximum groundwater height;
- ✓ It is not readily flooded during the wet season and heavy rain; and
- ✓ The year-round wind direction is away from the inhabitants of the nearby camps and villages.

3. POTENTIAL WASTE SOURCES

The activities associated with the Momase Large-scale Integrated Agriculture Project operations have the potential to generate waste as follows:

- ☐ Tree salvaging wastes
- ☐ Plantation site preparation
- ☐ Ground preparation for the mill/plant site;
- ☐ Construction of Palm Oil Mill & timber processing plants;
- ☐ Base camp/transit camps operations (staff and workers housing facilities and other support facilities);
- ☐ Jetty/wharf areas;
- ☐ Workshops and generator facilities;
- ☐ Fuel depots and lubricant storage facilities;
- ☐ Palm oil extraction and processing plant operations;
- ☐ Timber Downstream Processing Operations and
- ☐ Landfill, Incineration, and Surface Dumping sites.

The wastes that are generated from these activities consist of solid waste, liquid waste, gaseous emission, noise emission, and odor emission. These wastes are further classified into Biodegradable, Non-biodegradable, or Toxic.

Natural components such as sediments, silts, and other earthly materials with organic matter are other forms of environmental contaminants. Rainfall runoff containing sediments is a significant source of waste within the projects' operations. Such materials may enter the different water body networks when their foundations or natural environmental settings have been disturbed so that their inert bonding is forcefully loosened or broken up. The quantity of sediments in rainfall-runoff per year is directly proportional to the amount of annual rainfall of the project site, the timing of the implementation of different projects' activities, and the strategies employed in the control of sedimentation.

Sedimentation and siltation of any given water body are one of the basic natural causes which often account for severe impacts upon the environment particularly on aquatic/marine organisms, as well as human beings living in any part of a given downstream where landslides and heavy erosion occurred. For instance, too much siltation and high

concentration of suspended solids affect the gills of the fish, and absorbing too much heat from sunlight will result in increased water temperature and oxidation, eventually resulting in a reduction of fish's food sources.

The company and its contractor are well aware of these things and avoid as much as possible too much extensive disturbance with the natural environmental settings so that massive soil erosions which contribute to the heavy sedimentation and pollution of any type of water bodies are avoided. Hence, proper timing shall be adopted in the conduct of tree salvaging operation, ground preparation for the mill/plant sites, and access road network.

To minimize further contamination due to soil erosion, a drainage system will be built properly to divert and channel the water surface runoff during heavy rain to vegetated portions to avoid overland flows and flooding, thereby reducing the severity or degree of erosion.

Wastes generated from the palm oil mill & timber processing plants construction and operation can also be categorized as Domestic (non-industrial) Wastes and Industrial Wastes depending on their sources and characteristics.

a. Domestic Wastes. Domestic wastes mainly refer to sludge, kitchen waste, refusal, and putrefied waste (mostly food scrap), textiles, plastic litter, glass/bottles, papers, discarded furniture & cartons/cardboards, personal hygiene/grooming empty containers, empty cans, lubricants, laundry & kitchen washed-water, storm waters, cleaners, pesticides, and sewerage.

These domestic wastes, except for sewerage and washed waters, will be separated and collected in wet and dry garbage bins and segregated into biodegradable or non-biodegradable or recyclable, respectively, before handling and transportation to recommended disposal sites. The wet garbage and fast biodegradable will be dumped or buried in pits away from the water courses and residential areas while the dry garbage shall be disposed at the dump sites or incinerated away from populations.

As for sewerage, latrines (toilet pits) for the employees will be respectively dug at sites well away from watercourses at higher

grounds where the water table is not too close to the surface to avoid contamination of the underground waters. As soon as the pits have been filled-up (full) with sewerage, they will be covered with soil, and dig a new pit for use. These latrines will be fortified and covered well to avoid flooding and prevent pests such as flies, cockroaches, mosquitoes, and other pathogenic/vector organisms to breed and thrive in these pits.

Also, septic systems will be put in place for use and de-sludge whenever they have been filled-up. The de-sludge materials will be transported away and disposed of in the landfill site.

- b. Industrial Wastes.** Industrial wastes are the by-products and refuse generated from tree salvaging and log pond operations, workshops, fuel depots and lubricants storage facilities, generator set facilities, palm oil mill and timber processing plants, vehicles, heavy equipment, and machinery.

These wastes include fuel, oil, and lubricants spillage; waste and used fuel, oil, and lubricants; used fuel and oil filters; solvents; toxins; chemical mixture/solutions; pesticides/insecticides; storm waters; industrial washed-waters; paint residues; discarded equipment and parts; cleaners; sewerage; empty fruit bunches, palm kernel shells, mesocarp fibers, sawdust; trimmings/wood off-cuts; slabs; discarded bolts & nuts; used welding rods; iron rods & scrap metals; batteries; empty drum & other containers; tires & tubes; and wires & cables.

Those wastes in the liquid state or as mixtures and solutions will be properly channeled through the use of pipes and drainage systems into either sewerage treatment ponds (as for sewerage) or septic systems, and also separate septic systems for the toxic wastes alone. All toxic wastes such as oils, fuels, treated chemical solutions, cleaners, paint residues, contaminated storm waters, lubricants, and other industrial wastewater will be properly contained and, channeled into separate septic tanks to be collected there for recycling, reuse, or randomly removed off in a recommended manner to avoid seepage and accidental pollution.

Appendix 9. Shows the Waste Management Program. It identifies the sources and the types of waste; the specific waste products; the waste control, and containment. And minimization strategies; waste

storage and treatment methods; waste handling and transportation; the final waste disposal method; the waste collection and disposal frequency; and the responsible personnel for the waste management implementation.

E. Agrochemicals Management

Agrochemicals {pesticides, hydrogels, plant growth regulators (fertilizers), etc.} have played a pivotal role in the past in increasing agricultural productivity and production, and in protecting and preserving human and animal food, feed, health, and belongings.

The company awareness program plays a vital part in the health of a progressive society. Both the positive as well as negative effects of chemicals must be known. In particular, awareness of the shelf and field lives of chemicals, their quality, use spectrum, disposal, decontamination, handling of accidental poisoning cases, various antidotes, etc. is paramount.



PEIL Fertilizer Storage



PEIL Chemical Storage



All agrochemicals are pre-mixed at the central chemical storage and taken out into the plantations. No chemical applications are undertaken during rainy conditions.



In the intricate dance of palm oil production, chemicals played a vital role. From fertilizers that nourished the soil to herbicides that kept weeds at bay, and pesticides that protected the delicate palm trees from pests, a myriad of substances were employed to ensure optimal growth and yield. However, the handling and storage of these chemicals were not to be taken lightly.

Within the sprawling compound of the oil palm mill, a dedicated storage facility stood sentinel, its walls adorned with warning signs and safety protocols. This facility was meticulously organized, with each chemical stored under strict guidelines and safety standards.

Ventilation systems hummed softly, ensuring that noxious fumes were swiftly dispersed, while spill containment measures stood ready to spring into action at a moment's notice.

The importance of proper chemical storage extended beyond mere regulatory compliance – it was a matter of environmental stewardship and community well-being. Any mishap or negligence could spell disaster, contaminating soil, and waterways, and jeopardizing the health of both workers and nearby communities.

As the sun dipped low on the horizon, casting a golden hue over the plantation, the diligent workers of the oil palm mill went about their tasks, their efforts underpinned by the assurance that the chemicals essential to their trade were stored safely and securely. In this intricate ecosystem of agriculture and industry, the importance of chemical storage in the oil palm mill and plantation could not be overstated – it was the guardian of both prosperity and sustainability.



PEIL Chemical Room



PEIL Waste Storage

Wash Area in the Chemical Storage

In the relentless battle against pests and diseases that threaten the livelihood of the plantation, hygiene reigns supreme. Contaminated tools can serve as vectors



for the spread of pathogens, jeopardizing the entire crop. Thus, the wash area serves as the frontline defense, where every tool is meticulously scrubbed, disinfected, and inspected for signs of wear.

However, the wash area's significance extends beyond the realm of pest management. In the quest for optimal yield and quality, precision is paramount. Each action, no matter how seemingly mundane, carries implications for the health and productivity of the palm trees. By maintaining a clean and organized wash area, plantation managers instill a culture of discipline and attention to detail among their workforce, ensuring that every task is executed with the utmost care and precision.

F. Erosion Control Management Plan

When building, amending, or altering property in any way, soil erosion control is an extremely important practice that can improve land investments in various ways.

Not only is soil erosion control important to maintain the health of local and global waterways, but proper control can also sustain and improve crop yields, reduce drainage costs, retain nutrients when applied, and reduce hazards of eroding soil.



Our operations are located in areas that are flat as well as hilly/mountainous and prone to heavy rainfall and erosion.

The objective of our Soil Erosion Management Plan is to identify and manage prone areas, take remedial measures to prevent and minimize erosion and monitor these areas regularly for signs of soil erosion. We have categorized all erosion-prone areas to comply with the requirements of the PNG logging code of practice, thus no planting on slopes of more than 25 degrees is carried out.

Table 8: Slope Gradients and Elevation.

Slopes	Percentage	Description
2 – 6 degrees	4 – 10	Platforms required in some places
6 – 12 degrees	10 – 20	Platforms optional
12 – 20 degrees	20 – 40	Platforms required
20 – 25 degrees	40 – 50	Terracing required
>25 degrees	>50	No planting Oil Palm

PEIL shall undertake preventive measures to avoid and minimize soil erosion and sedimentation to the opened/denuded areas, steep slopes, and side-cut portions due to road construction and plantation development. It should be kept stable by conserving and protecting the vegetation by replanting with suitable tree species and cover crops (e.g. *Mucuna spp.*, *Pueraria spp.*, and *Calopogonium spp.*)

We have a monitoring program in place for continuous checks on cover crops, frond stacking/aligning, and slope terracing to minimize erosion.



Tetraced Area (Mucuna cover crop)



Tetraced Area
(Mucuna cover crop)

III. CONCLUSION

The conclusion of the report highlights PEIL's dedication to sustainable development, aligning with its Environmental Policy by emphasizing pollution prevention, ongoing enhancement, and adherence to legal requirements as fundamental to its operations.

In reviewing the company's environmental performance for 2022 and 2023, it is evident that PEIL has diligently met its legal and regulatory obligations, as outlined in its Environmental Permit and EMP sanctioned by the Conservation and Environment Protection Authority (CEPA).

While most sites maintained water extraction and waste discharge within permissible limits, there remains a commitment to further enhance compliance where needed. Challenges in water sampling and analysis, attributed to logistical delays, have been acknowledged, prompting proactive measures such as the acquisition and installation of new equipment to streamline processes.

PEIL's role as a significant contributor to the sustainable palm oil market underscores its dedication to minimizing adverse impacts and fostering environmental preservation. Moving forward, the company pledges to continue advancing its performance and collaborate with industry peers, stakeholders, and regulatory bodies to ensure the long-term sustainability of the sector.

IV. WASTE MANAGEMENT PROGRAM

A. Waste Management Program Component

The waste management program comprises eight components such as:

- ☐ Identification of Sources and Types of Waste
- ☐ Identification of Specific Waste Products
- ☐ Waste Control, Containment, and Minimization Action
- ☐ Waste Storage and Treatment Method
- ☐ Waste Handling and Transportation Methods
- ☐ Final Waste Disposal Method
- ☐ Collection and Disposal Frequency
- ☐ Responsible Personnel

Appendix 7. Shows the detailed waste management program.

B. Waste Management for the specific Environmental Issues

The project particularly identifies environmental issues generated from different phases of operation of the timber processing plant and other support/related activities, which are necessary to address in a waste management plan.

The following environmental issues are:

- ❑ **Air Related Issues-** these are waste gaseous emissions from fuel spillage, the product of incomplete combustion, dust, and particulate.
- ❑ **Water Borne Pollutants** - these are wastewater containing oil, fuel, solvents, wash water from the workshop, timber processing plants, kiln dryers, boiler plant, and other processing plants, suspended solids such as dirt, soil, solid waste deposits, and contaminated stormwater.
- ❑ **Liquid Waste Issues** - These are waste lube oil, fuel, hydraulic oils, chemical spillage, and other hydrocarbon products.
- ❑ **Solid Waste Issues** - these are logs, lumber, empty fruit bunches, palm fibers, palm kernel shells, broken mechanical parts, packaging from parts and equipment, tires, fan belts, other rubber parts, discarded batteries, contaminated absorbents, and filtered wastes.
- ❑ **Noise Pollution** - This is a noise emission coming particularly from the sawmill, boiler plant, and workshop operations.

C. Methods of Waste Disposal and Treatment

The Company will employ four methods of waste management to handle the waste products derived from all phases of the palm oil mill & timber processing operation. The methods include incineration, landfill disposal, surface dumping, and waste recycling.

1. Incineration Method

This method is simply burning all combustible waste materials such as cardboard, scratch papers, and others in a designated area. The incineration site must be established far from the housing facility, office, villages, and watercourses after considering other factors such as the wind direction, slope of the ground, and accessibility.

2. Landfill Method

This method is mainly disposing of all waste products such as contaminated soils, sediments, petro-chemical (oil, grease/lubricant, and fuel), aid post wastes (bandages, medicine bottles, and others) bottles, glasses, cans,

batteries, plastic wrappers, and domestic wastes (kitchen and household waste) in a proper landfill site far from the worker's housing facilities, villages, and watercourses. In this method of disposal, the decomposing dumped waste materials are preferably covered with soil to prevent the emission of foul odor and to keep them from insects (mosquitoes, flies, etc.) as well as scavenger animals such as rats and dogs which are considered as a disease vector. Human waste disposal is also based on the landfill method by constructing a landfill for toilets and septic tanks as storage of all human waste such as feces and excreta. The landfill site must be located one or two kilometers from the housing facilities, offices, villages, and watercourses. Several conditions should be considered when establishing landfills, viz:

- ❑ It is impermeable to prevent the leaking/sipping of liquid waste to nearby watercourses (rivers, streams, and creeks);
- ❑ It is at least 100m from maximum inundation by water and at least 1m above maximum groundwater height;
- ❑ It is not easily flooded during the wet season and heavy rain; and
- ❑ It is not favorable to wind direction toward inhabitants of the nearby village and housing facility.

Two landfill sites will be established, i.e. one for each biodegradable and non-biodegradable waste material which should be separately sorted and dumped accordingly.

3. Surface Dumping

Waste products such as soil debris, rock debris, uncontaminated containers (drums, etc.), tires, and metal scraps/junk machinery and parts are properly disposed of in an open designated surface dumping site. All surface dumping sites must be established in a distant area from the villages, workers' housing facilities, and watercourses. If necessary, it should be located in a secured and elevated area where waterlogging does not occur.

Table 9. PEIL list of disposal sites.

Disposal Sites	Qty.	Dimension	Location
Landfill	2	5m x 5m x 2m	Approximately two kilometers away from the industrial site
Surface Dumping Area	1	10m x 30m	Approximately two kilometers away from the industrial site
Incineration Site	1	10 x 20m x 1m	Approximately two kilometers away from the industrial site
Proposed Concrete Bund for Chemical Storage Area	1	20m x 20 m x 0.5 m	Approximately 300 meters away from the river.

4. Waste Recycling Method

The project is designed to fully utilize all wood waste products generated from all phases of the timber processing operation and solid wastes in palm oil extraction. All waste products will be used as fuel for the boiler plant to generate electricity for the Oil Palm Mill plant power (**refer to Appendix 5**). The objective of the project is to attain optimum utilization of wood waste products.

D. Emergency Action Measures

Non-routine incidents like fuel and oil spillage and damage to the area are highly considered in this waste management plan. Since this type of incident demands priority, Emergency Action Measures (EAM) are developed to control or contain the possible damage.

NON-ROUTINE INCIDENTS	REMEDIAL/CONTINGENCY MEASURES	RESPONSIBLE PERSONNEL
Fuel and oil Spillage	Provide temporary containers (empty drums) beneath all outlets/faucets and check valves of the fuel depot and oil container to prevent and/or minimize spillage.	Coordinated effort among the Workshop Supervisor, EMO, Sawmill/plywood plant, palm oil mill Manager.

NON-ROUTINE INCIDENTS	REMEDIAL/CONTINGENCY MEASURES	RESPONSIBLE PERSONNEL
	In case of spillage (fuel and oil), dilution and detoxification must be done with water to reduce the risk of fire and toxicity, and to control the degradation of water quality, damage to freshwater life, and contamination of soil.	Spearheaded by EMO
	If possible, manually collect spillage of fuel and oil using a container or using a suction pump. Immediately make a pit and direct the flow of spills to it as a temporary storage while the manual collection has to be continued and fully undertaken. Another alternative is, if the spill is not much, cover it with sawdust so that it will be absorbed thus preventing the flow to the nearby river, stream, and other body of water or the infiltration of the spills into the soil and into the underground water table which connect to the nearby watercourse. The spill might damage the freshwater life and its habitat. However, the sawdust must be hauled immediately and used for fuel in the boiler plant.	Spearheaded by EMO
Fuel and oil Spillage	Always check all depot pipelines, faucets, and valves to ensure the operational condition of the facility.	Spearheaded by EMO
	Concrete bunding for fuel and oil storage shall be provided to contain spillage. Store large quantities of fuel at a main depot. The concept is to easily handle any spillage occurrence in a confined area away from any protected site and watercourse.	Sawmill/plywood plant & palm oil mill Manager
Fire Occurrence	Provide fire extinguishers at strategic locations in all fire-prone areas such as workshops, offices, kitchens, boiler plants, sawmill/plywood plants, mill site, and other areas.	Sawmill/plywood plant & palm oil mill Manager and EMO
	Orient and train workmen on what to do in case of a fire incident in all identified fire-prone areas by using fire extinguishers and other firefighting devices.	EMO

NON-ROUTINE INCIDENTS	REMEDIAL/CONTINGENCY MEASURES	RESPONSIBLE PERSONNEL
	If possible, provide a ready water tank to be used in case of a fire incident.	Sawmill Manager

NON-ROUTINE INCIDENTS	REMEDIAL/CONTINGENCY MEASURES	RESPONSIBLE PERSONNEL
Disturbance and of Damage Protected Watercourse	Strictly comply with the establishment of the 50-m buffer zone in the protected watercourse.	EMO
	Conduct seminar orientation for all concerned sawmill workers relative to the protection of the environment particularly on the identified site.	EMO in coordination with the Sawmill/plywood plant & palm oil mill Manager
	If the damage is done, immediately evaluate the damage in coordination with the Landowners or representative to resolve the problem. After evaluation, implement a rehabilitation program.	EMO and Sawmill/plywood plant & palm oil mill Manager
Factory Accident like Physical injuries, and other work-related incidents	Orient all factory workers relative to a safe working attitude. Emphasize the importance of safety in all areas of operation.	EMO or Safety Officer
	Provide a Medical Doctor at the project site to immediately avoid any work-related accident.	Sawmill/plywood plant & palm oil mill Manager

E. Personnel and Staff Support

The Company shall employ an Environmental Management Officer (EMO) who will handle the implementation of the WMP and other related environmental requirements imposed by the government.

1. Training and Staff Welfare

The management will be responsible for providing all preventive and precautionary health measures to safeguard the health and safety of every employee working on the plantation and in the mill facility. Workers and staff are given the necessary safety equipment, supplies, and first aid for their

protection while at work. Employees will receive appropriate instruction to guarantee their safety and give them the tools they need for the job. Before starting the actual work on any new task, the company always gives the personnel assigned to it on-the-job training through practical demonstration. Before being given tasks to do alone, recruits receive hands-on training from more experienced personnel.

V. COMMITMENTS

Pacific Elite Investment Limited (PEIL), along with its contractor, was resolute in maintaining strict control and execution of the Waste Management Plan (WMP) under the Environmental Laws of Papua New Guinea. Collaborating closely with the Conservation and Environmental Protection Authority (CEPA), their primary aim was to uphold environmental quality and prevent pollution.

Believing firmly that any large-scale development must align with environmental protection and conservation, the company was committed to safeguarding the natural environment. PEIL pledged to preserve environmental quality consistently, taking corrective action in areas where alterations had been made. Their paramount goal was to protect and nurture the natural environment, ensuring the preservation of its diverse species, breathtaking landscapes, and scenic beauty for both present and future generations to enjoy.

Central to their approach was the concept of development harmonizing with environmental conservation, embedded within PEIL's sustainability endeavors. The company vowed to integrate conservation programs into its operations, striving for sustainable development.

To translate these aspirations into reality and effectively achieve their objectives, PEIL intended to enlist the expertise of an environmental specialist/officer. This individual would be responsible for overseeing environmental monitoring, assessment, and the implementation of the Environment Management Plan. Additionally, they would ensure compliance with environmental regulations imposed by relevant authorities such as the Department of Agriculture and Livestock, PNG Forest Authority, and CEPA.

Extraction and Discharge Point

APPENDIX 1

Momase Large Scale Integrated Agriculture Project

Pacific Elite Investment Limited

APPENDIX 1.A

EXTRACTION POINT

EP#	SOURCE	WATER USE	LOCATION/SITE	COORDINATES		Ave Monthly (cu.m.)	Yearly (M3) (cu.m.)
				Northing	Easting		
1	Sepik River	Industrial & Domestic use	Plywood Mill - (KPL)	9 537 951	808 230	5,515.00	66,180.00
2	Urr-u Creek (Pongi)	Industrial Use	Oil Palm Mill-SPOL	9 542 754	801 748	4,985.25	59,823.00
3	Pond	Domestic Use	Turubu Township-Parua	9 566 472	806 659	92.79	1,113.48
4	Pond	Domestic Use	Kenyare Compound	9 572 491	808 846	45.18	542.16
5	Mawit Creek (Brinangat)	Domestic Use	Mawit Basecamp	9 586 246	807 251	25.15	301.80
6	Urr-u Creek (Pongi)	Irrigation Use	Ibap Nursery	9 561 011	801 073	13.20	158.40

DISCHARGE POINT

DP#	WASTE	NATURE OF WASTE	SOURCE	LOCATION/SITE	COORDINATES		Monthly (cu.m.)	Yearly (M3) (cu.m.)
					Northing	Easting		
1	Industrial Waste water	All waste containing waste oil film/hydrocarbons inclusive of run-off	Sepik River	Plywood Mill - (KPL)	9 537 943	808 158	4,585.10	55,021.20
2	Due to plantation development	Waste water from the plantation is discharge into the environment	Urr-u Creek (Pongi)	Oil Palm Mill - SPOL	9 542 754	801 748	750.12	9,001.44
3	Due to plantation development	Waste water from the plantation is discharge into the environment	Nagam River	Oil Palm Mill - SPOL	9 541 636	803 532	924.59	11,095.08
4	Due to plantation development	Waste water from the plantation is discharge into the environment	Urr-u Creek	Ibap Nursery	9 560 995	810 094	13.44	161.28
5	Due to plantation development	Waste water from the plantation is discharge into the environment	Wangay Creek	Mundo-mundo junction Kambrendo	9 557 720	811 831	419.45	5,033.40
6	Treated Mill Effluent (POME)	Waste water from the mill is discharged into the environment	Pond	Oil Palm Mill - SPOL	9 542 934	802 952	2,965.00	35,580.00

Oil Palm Mill- FFB Processing *Solid Waste Generation*

APPENDIX 2

Oil Palm Mill (FFB Processing - Solid Waste Generation)

	PARTICULARS	QTY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	ENERGY INPUT	Mt													
	FFB Processed	Mt	6,821.40	5,965.15	7,308.16	6,023.95	6,522.82	4,748.61	2,812.99	4,074.82	6,807.00	9,389.75	9,684.48	7,799.17	77,958.30
	Fiber (16%)	Mt	1,091.42	954.42	1,169.31	963.83	1,043.65	759.78	450.08	651.97	1,089.12	1,502.36	1,549.52	1,247.87	12,473.33
	Shell (4%)	Mt	272.86	238.61	292.33	240.96	260.91	189.94	112.52	162.99	272.28	375.59	387.38	311.97	3,118.33
	Empty Fruit Bunch (23%)	Mt	1,568.92	1,371.98	1,680.88	1,385.51	1,500.25	1,092.18	646.99	937.21	1,565.61	2,159.64	2,227.43	1,793.81	17,930.41
	Impurities (sand & etc) (1%)	Mt	68.21	59.65	73.08	60.24	65.23	47.49	28.13	40.75	68.07	93.90	96.84	77.99	779.58
	TOTAL	Mt	9,822.82	8,589.82	10,523.75	8,674.49	9,392.86	6,838.00	4,050.71	5,867.74	9,802.08	13,521.24	13,945.65	11,230.80	112,259.95

(POME) ANALYSIS

Waste Water Data

APPENDIX 3

Pacific Elite Investment Limited

APPENDIX 3

WASTE WATER DATA (POME) ANALYSIS

[illegible]

Energy Generation

APPENDIX 4

Momase Large Scale Integrated Agriculture Project

Pacific Elite Investment Limited

ENERGY GENERATION

APPENDIX 4

LOCATION	UNIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			TOTAL	REMARKS
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC		
Oil Palm Mill (SPOL)		449,500	406,000	449,500	435,000	449,500	435,000	449,500	449,500	435,000	449,500	435,000	449,500	5,292,500	
Genset 1 (200 kw)	ltrs	170,500	154,000	170,500	165,000	170,500	165,000	170,500	170,500	165,000	170,500	165,000	170,500	2,007,500	
Genset 2 (400 kw)	ltrs	139,500	126,000	139,500	135,000	139,500	135,000	139,500	139,500	135,000	139,500	135,000	139,500	1,642,500	
Genset 3 (400 kw)	ltrs	139,500	126,000	139,500	135,000	139,500	135,000	139,500	139,500	135,000	139,500	135,000	139,500	1,642,500	
Plywood Mill - (KPL)		325,500	294,000	325,500	315,000	325,500	315,000	325,500	325,500	315,000	325,500	315,000	325,500	2,555,000	
Genset 1	ltrs	108,500	98,000	108,500	105,000	108,500	105,000	108,500	108,500	105,000	108,500	105,000	108,500	1,277,500	
Genset 2	ltrs	108,500	98,000	108,500	105,000	108,500	105,000	108,500	108,500	105,000	108,500	105,000	108,500	1,277,500	
Genset 3	ltrs	108,500	98,000	108,500	105,000	108,500	105,000	108,500	108,500	105,000	108,500	105,000	108,500	1,277,500	
Genset 4	ltrs	-	-	-	-	-	-	-	-	-	-	-	-	-	Under maintenance
Electricity Generated by Genset - diesel driven (Non-renewable energy)															
Turubu Township-Parua		6,231	5,544	5,952	5,940	6,107	5,670	6,169	6,138	5,850	5,952	5,940	6,386	71,879	
Genset 1 (Day)	ltrs	4,123	3,668	4,030	3,930	4,092	3,870	4,092	4,030	3,960	3,968	3,990	4,216	47,969	(12 hrs)
Genset 2 (Night)	ltrs	2,108	1,876	1,922	2,010	2,015	1,800	2,077	2,108	1,890	1,984	1,950	2,170	23,910	(12 hrs)
Ibap Nursery		4,030	3,640	4,030	3,900	4,030	3,900	4,340	4,340	4,200	4,340	4,200	4,340	49,290	
Genset 1	ltrs	4,030	3,640	4,030	3,900	4,030	3,900	4,340	4,340	4,200	4,340	4,200	4,340	49,290	For water pump
Mundo-mundo Estate		6,045	5,400	6,510	5,550	6,200	6,300	5,425	6,045	5,550	6,200	5,700	6,510	71,435	
Genset 1	ltrs	6,045	5,400	6,510	5,550	6,200	6,300	5,425	6,045	5,550	6,200	5,700	6,510	71,435	(20 hrs)
Kenyare Compound		2,790	3,300	3,100	3,000	2,945	3,000	3,100	3,720	3,600	3,720	3,600	3,720	39,595	
Genset 1	ltrs	2,790	3,300	3,100	3,000	2,945	3,000	3,100	3,720	3,600	3,720	3,600	3,720	39,595	(20 hrs)

PROJECT WASTE *Management*

APPENDIX 5

Momase Large Scale Integrated Agriculture Project

Pacific Elite Investment Limited

PROJECT WASTE MANAGEMENT

APPENDIX 5

LOCATION	UNIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			TOTAL	REMARKS
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC		
Oil Palm Mill (SPOL)															
Paper	kg	5.25	9.01	6.22	10.23	5.25	8.40	3.55	7.45	5.95	3.44	7.32	5.89	77.96	
Metal	kg	30.44	25.20	38.10	10.15	-	15.20	20.63	20.14	22.80	25.45	29.10	26.20	263.41	
Glass	kg	5.45	3.90	5.00	-	7.45	9.50	4.20	2.25	1.12	4.10	-	4.45	47.42	
Organic waste	kg	21.44	20.15	10.25	15.25	23.58	21.47	20.49	24.87	21.23	22.87	23.45	21.15	246.20	
Hazardous waste	kg	19.11	18.79	11.29	23.57	12.49	19.23	21.45	16.45	23.10	21.50	10.12	12.39	209.49	
Plywood Plant (KPL)															
Paper	kg	4.25	6.14	5.45	4.63	4.87	10.45	3.22	4.55	3.10	6.80	5.79	5.81	65.06	
Metal	kg	21.15	25.74	24.1	-	10.45	20.21	-	22.39	20.26	23.45	16.54	21.22	205.51	
Glass	kg	5.87	5.4	-	5.88	3.69	5.88	-	2.51	-	5.43	2.59	-	37.25	
Organic waste	kg	6.55	11.10	1.50	-	5.87	6.45	5.88	10.14	10.25	6.10	6.25	-	70.09	
Hazardous waste	kg	13.10	10.84	-	7.89	10.05	6.78	10.47	6.80	7.55	14.20	10.45	5.44	103.57	
Ibap Nursery															
Organic waste	kg	11.23	10.25	10.00	9.95	8.55	8.50	10.43	10.23	11.90	10.75	10.45	10.65	122.89	
Hazardous waste	kg	13.55	12.40	8.50	8.40	5.11	6.45	7.15	8.49	6.65	5.44	5.75	7.46	95.35	
Mundo-mundo Estate															
Paper	kg	4.55	6.49	4.25	5.41	6.53	3.90	4.35	7.14	5.95	4.56	6.75	5.55	65.43	
Metal	kg	7.15	10.45	6.55	8.25	5.19	-	4.55	-	7.43	10.25	9.65	8.35	77.82	
Glass	kg	6.25	4.15	4.48	-	-	8.65	5.41	6.89	-	10.15	7.35	6.85	60.18	
Organic waste	kg	15.25	11.71	10.96	11.37	8.66	10.23	11.89	6.45	8.95	10.74	8.54	12.35	127.10	
Hazardous waste	kg	4.65	2.22	-	6.84	4.73	9.55	-	6.15	10.85	-	8.20	4.95	58.14	

PROJECT WASTE MANAGEMENT

APPENDIX 5

LOCATION	UNIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			TOTAL	REMARKS
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC		
Turubu Township-Parua															
Paper	kg	6.54	5.41	5.25	4.10	5.80	4.30	2.25	3.85	4.10	3.55	3.80	4.25	53.20	
Metal	kg	10.45	6.80	7.25	5.20	5.68	-	9.15	5.90	2.95	-	4.85	5.44	63.67	
Glass	kg	4.80	5.50	4.86	-	7.10	3.25	4.50	6.15	3.57	5.88	3.19	4.20	53.00	
Organic waste	kg	5.55	3.41	7.45	5.44	-	3.25	6.89	8.45	4.25	7.20	5.45	6.80	64.14	
Hazardous waste	kg	8.99	6.48	6.50	4.80	8.10	4.98	8.78	4.85	6.80	8.55	5.10	4.75	78.68	
Kenyare Compound															
Paper	kg	3.45	2.65	1.20	-	3.80	4.99	3.87	2.65	3.10	5.75	3.90	6.15	41.51	
Metal	kg	2.50	1.20	3.80	5.45	2.50	6.99	6.87	9.15	5.45	7.88	6.45	8.15	66.39	
Glass	kg	3.55	5.40	5.80	6.25	8.16	5.45	5.79	6.39	1.60	6.85	5.95	8.33	69.52	
Organic waste	kg	4.85	6.20	4.55	8.45	4.98	5.79	5.89	7.36	8.33	4.95	3.25	7.45	72.05	

WATER QUALITY SAMPLING

Analysis Result

APPENDIX 6

WATER QUALITY ANALYSIS RESULT

Parameter: **E.COLI ANALYSIS (Microbiological)**

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-01	Sepik River Plywood Plant (KPL)	Industrial	(cfu/100ml)	0	<1	<1	<1	0	0	<1	<1	2	0	TNTC	<1	<1	☐ Improve Sanitation and Sewage Systems: Ensure proper maintenance and functioning of sewage treatment plants to prevent untreated sewage from entering water bodies. ☐ Agricultural Best Practices: Implement agricultural best management practices (BMPs) to reduce the runoff of manure and agricultural chemicals into water sources. ☐ Watershed Management: Implement watershed management programs to control runoff and reduce erosion, which can carry E. coli from land into water bodies. ☐ Septic System Maintenance: Regularly inspect and maintain septic systems to prevent leaks or failures that can contaminate groundwater and nearby water bodies. ☐ Water Quality Monitoring: Regularly test water sources for E. coli and other contaminants, especially in areas at higher risk of contamination. ☐ Disinfection Treatment: In cases where E. coli levels are consistently high, consider using disinfection methods such as chlorination, UV treatment, or ozone treatment to kill or inactivate the bacteria. ☐ Filtration: Use appropriate filtration systems, such as sand or membrane filters, to remove E. coli from drinking water sources. ☐ Stormwater Management: Design and implement effective stormwater management systems to reduce runoff and filter contaminants from stormwater before it reaches water bodies.
WSE-03	Pond Turubu Township-Parua	Industrial	(cfu/100ml)	0	2	<1	3	0	<1	0	LNS	0	TNTC	<1	<1	<1	
WSE-04	Pond Kenyare Compound	Domestic & Irrigation	(cfu/100ml)	0	<1	1	0	<1	<1	0	LNS	0	<1	1	LNS	LNS	
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	(cfu/100ml)	0	8	1	<1	<1	<1	0	0	1	0	0	LNS	LNS	
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	(cfu/100ml)	0	10	<1	<1	LNS	0	<1	5	0	<1	0	LNS	LNS	
WSWW	Pond Oil Palm Mill-SPOL	Mill Effluent	(cfu/100ml)	0	<1	0	1	0	<1	<1	TNTC	3	<1	5	1	<1	
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic	(cfu/100ml)	0	3	<1	<1	0	0	1	0	0	3	TNTC	0	<1	
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic	(cfu/100ml)	0	<1	<1	0	<1	0	<1	0	0	0	3	0	<1	
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic	(cfu/100ml)	0	<1	0	0	<1	0	<1	1	0	0	0	0	<1	
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic	(cfu/100ml)	0	40	5	TNTC	0	0	0	<1	<1	0	<1	LNS	LNS	
WSDU-05	Rainwater Turubu Township-Parua	Domestic	(cfu/100ml)	0	<1	<1	1	0	0	0	<1	<1	<1	1	0	<1	

Legend:

Not Analysed **NA**

Too numerous to count **TNTC**

Location not sampled **LNS**

WATER QUALITY ANALYSIS RESULT

Parameter: **TOTAL COLIFORM ANALYSIS (Microbiological)**

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-01	Sepik River Plywood Plant (KPL)	Industrial	(cfu/100ml)	3	1	<1	LNS	15	<1	LNS	TNTC	20	15	0	0	TNTC	❑ Regular Water Quality Testing: For domestic use (such as drinking and cooking)- Conduct regular water quality testing to monitor the levels of total coliform bacteria. Frequent testing helps detect contamination issues promptly ❑ Maintain Proper Sanitary Practices: Ensure that sewage systems, septic tanks, and wastewater treatment facilities are well-maintained and functioning correctly. Leaks or overflows from these systems can introduce coliform bacteria into the environment ❑ Chlorination or Disinfection: Use chlorine or other disinfection methods to treat the water supply. This can effectively kill coliform bacteria and other pathogens. Proper dosage and contact time are crucial for effective disinfection. ❑ Filtration: Implement filtration systems, such as sand or membrane filters, to remove particulate matter and bacteria from the water. ❑ Boiling Water: Boiling water for at least one minute can kill coliform bacteria and make the water safe for consumption during emergencies. This is a short-term solution. ❑ Regular Maintenance and Monitoring: Continuously monitor and maintain water treatment and distribution systems to ensure that they are operating correctly. Regularly clean and disinfect storage tanks and pipes. ❑ Compliance with Regulations: Ensure compliance with local, state, and national regulations regarding water quality and treatment. These regulations often set specific standards for coliform bacteria levels in drinking water.
WSE-03	Pond Turubu Township-Parua	Industrial	(cfu/100ml)	3	<1	5	<1	TNTC	TNTC	<1	0	LNS	0	10	1	0	
WSE-04	Pond Kenmare Compound	Domestic & Irrigation	(cfu/100ml)	3	3	10	18	<2	TNTC	LNS	<1	<1	0	5	LNS	LNS	
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	(cfu/100ml)	3	<1	12	TNTC	TNTC	10	1	<1	<1	15	LNS	LNS	LNS	
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	(cfu/100ml)	3	TNTC	10	3	<2	1	0	15	5	0	<1	LNS	LNS	
WSWW	Pond Oil Palm Mill-SPOL	Mill Effluent	(cfu/100ml)	3	3	<1	TNTC	TNTC	<2	0	<1	1	10	TNTC	15	0	
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic	(cfu/100ml)	3	1	5	1	3	0	LNS	TNTC	<2	1	<1	<1	<1	
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic	(cfu/100ml)	3	<1	<1	TNTC	3	1	10	TNTC	1	1	LNS	<2	1	
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic	(cfu/100ml)	3	0	<2	LNS	0	3	LNS	<1	0	3	1	10	LNS	
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic	(cfu/100ml)	3	<1	<1	LNS	10	15	TNTC	3	0	<1	<1	0	TNTC	
WSDU-05	Rainwater Turubu Township-Parua	Domestic	(cfu/100ml)	3	0	1	10	5	3	LNS	TNTC	0	<1	<1	LNS	25	

Legend:

Not Analysed

NA

Too numerous to count

TNTC

Location not sampled

LNS

WATER QUALITY ANALYSIS RESULT

Parameter: **TOTAL SUSPENDE SOLID (Physical)**

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-01	Sepik River Plywood Plant (KPL)	Industrial	mg/L	1500	102	50	100	110	20	150	100	145	180	LNS	150	159	☐Erosion and Sediment Control: Implement erosion control measures, such as erosion control blankets, silt fences, and vegetative buffers, in construction sites, agricultural fields, and areas prone to erosion. ☐Sediment Basins and Ponds: Construct sediment basins or ponds to trap sediment and allow it to settle before water is discharged into natural water bodies. ☐Riparian Buffers: Create and maintain riparian (streamside) buffers with native vegetation to filter runoff and reduce TSS before it enters water bodies. ☐Conservation Tillage: Adopt conservation tillage practices in agriculture to minimize soil disturbance and reduce soil erosion. ☐Soil Stabilization: Apply soil stabilizers like vegetation, geotextiles, and mulch to prevent soil erosion and sediment runoff. ☐Sediment Control Regulations: Enforce and strengthen regulations that limit TSS discharges from industrial facilities and construction sites. ☐Water Quality Monitoring: Regularly monitor water quality to assess TSS levels and identify areas with elevated TSS concentrations.
WSE-02	Urr-u Creek (Pongi) Oil Palm Mill-SPOL	Industrial	mg/L	1500	96	50	33	80	50	63	48	51	66	72	110	TNTC	
WSE-03	Pond Turubu Township-Parua	Domestic & Workshop	mg/L	1500	35	44	50	LNS	30	25	LNS	30	75	61	70	TNTC	
WSE-04	Pond Kenyare Compound	Domestic & Irrigation	mg/L	1500	7	5	11	0	0	LNS	21	25	0	LNS	0	23	
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	mg/L	1500	1	<1	0	0	1	0	<1	<1	0	0	LNS	LNS	
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	mg/L	1500	49	30	25	15	22	50	LNS	45	31	LNS	LNS	LNS	
WSD-01	Sepik River Plywood Plant (KPL)	Industrial discharge	mg/L	1500	29	10	12	LNS	0	18	33	<1	10	LNS	TNTC	50	
WSD-02	Urr-U Creek Oil Palm Mill-SPOL	Industrial discharge	mg/L	1500	95	80	TNTC	50	48	34	30	47	30	51	LNS	LNS	
WSD-03	Nagam River Oil Palm Mill-SPOL	Industrial discharge	mg/L	1500	42	82	94	TNTC	50	LNS	37	40	LNS	75	105	90	
WSD-04	Urr-u Creek Ibap Nursery	Plantation development	mg/L	1500	46	38	10	54	0	<1	25	37	44	TNTC	<1	<1	
WSD-05	Wangay Creek Mundo-mundo junction Kambrendo	Plantation development	mg/L	1500	512	450	200	TNTC	108	330	150	95	TNTC	480	305	180	
WSWW	Pond Oil Palm Mill-SPOL	Mill Effluent	mg/L	1500	12	10	13	15	11	10	17	12	8	18	14	10	
WSC-02	Yemogu Creek (Morang Creek)	Plantation development	mg/L	1500	12	5	18	0	<1	<1	<1	10	21	11	5	LNS	
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic Use	mg/L	1500	3	0	<1	5	0	0	<1	<1	<1	<1	LNS	LNS	
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic Use	mg/L	1500	5	10	0	<1	<1	<1	17	22	6	12	20	11	
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic Use	mg/L	1500	9	4	<1	<1	0	5	16	20	27	0	10	14	
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic Use	mg/L	1500	4	<1	<1	<1	8	TNTC	5	0	3	TNTC	0	LNS	
WSDU-05	Rainwater Turubu Township-Parua	Domestic Use	mg/L	1500	6	15	TNTC	21	<1	<1	TNTC	10	18	16	0	9	

Legend:

Not Analysed **NA**

Too numerous to count **TNTC**

Location not sampled **LNS**

WATER QUALITY ANALYSIS RESULT

Parameter: **POTENTIAL OF HYDROGEN (pH)**

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-01	Sepik River Plywood Plant (KPL)	Industrial	pH	5-9	7.57	7.25	7.30	7.50	7.18	7.25	7.15	7.26	7.20	7.18	7.22	7.28	Chemical Treatment: Acid Injection: Inject acids, such as sulfuric acid or hydrochloric acid, into the water to lower pH. This method is commonly used in industrial processes and municipal water treatment plants. Aeration: Carbon Dioxide Aeration: Bubble carbon dioxide (CO2) gas through the water to increase carbonic acid content, which naturally lowers pH. This method is suitable for smaller systems or natural water bodies. Use of pH Buffers: Add pH buffers or stabilizers to the water to resist changes in pH. These buffers can help maintain pH within a desired range. Ion Exchange: Implement ion exchange processes, such as using zeolites or ion exchange resins, to remove alkaline ions like bicarbonates and carbonates. Dilution: Mix the high-pH water with water of lower pH to achieve the desired pH level. Dilution can be a practical approach when the source water is naturally alkaline. Vegetative Buffers: Plant vegetation along water bodies to absorb excess nutrients and organic matter that may contribute to high pH levels. Liming: In some cases, applying agricultural lime (calcium carbonate) to acidic waters can help raise pH levels. However, this is generally done to prevent water from becoming too acidic. Alkalinity Reduction: Implement processes to reduce the water's alkalinity, which can help control high pH levels. This may involve chemical addition or biological treatments. Natural Treatment Systems: Construct or restore wetlands and other natural treatment systems that can help regulate pH levels through biological processes. Regular Monitoring: Continuously monitor pH levels in water sources to detect changes and implement corrective measures promptly.
WSE-02	Urr-u Creek (Pongi) Oil Palm Mill-SPOL	Industrial	pH	5-9	7.22	7.15	7.20	7.19	7.26	7.11	7.90	7.31	7.22	7.18	7.21	7.27	
WSE-03	Pond Turubu Township-Parua	Domestic & Workshop	pH	5-9	6.55	7.19	7.25	7.05	7.10	7.20	7.15	7.08	0.00	0.00	0.00	7.14	
WSE-04	Pond Kenyare Compound	Domestic & Irrigation	pH	5-9	7.59	8.10	8.15	8.05	8.00	8.10	8.19	8.15	8.06	8.10	8.09	8.04	
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	pH	5-9	7.53	7.80	7.25	7.54	7.46	7.87	7.25	7.05	7.40	7.55	7.60	7.89	
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	pH	5-9	7.38	7.51	7.23	7.33	7.58	7.65	7.70	7.71	7.53	7.69	7.41	7.74	
WSD-01	Sepik River Plywood Plant (KPL)	Industrial discharge	pH	5-9	7.07	7.21	7.30	7.09	7.45	7.50	7.23	7.12	7.30	7.25	7.45	7.33	
WSD-02	Urr-U Creek Oil Palm Mill-SPOL	Industrial discharge	pH	5-9	6.91	7.55	7.15	7.47	7.23	7.42	7.65	7.40	7.23	7.10	7.80	7.83	
WSD-03	Nagam River Oil Palm Mill-SPOL	Industrial discharge	pH	5-9	7.29	7.10	7.43	7.11	7.32	7.40	7.18	7.13	7.25	7.36	7.22	7.28	
WSD-04	Urr-u Creek Ibap Nursery	Plantation development	pH	5-9	7.26	7.15	7.23	7.10	7.38	7.20	7.25	7.23	7.18	7.24	7.15	7.27	
WSD-05	Wangay Creek Mundo-mundo junction Kambrendo	Plantation development	pH	5-9	6.98	7.10	6.80	7.18	7.13	7.03	6.90	7.35	6.92	7.11	7.21	7.05	
WSC-02	Yemogu Creek Water sample - control	Domestic Use	pH	5-9	7.42	7.35	7.15	7.34	7.22	7.10	7.16	7.19	7.33	7.12	7.30	7.15	
WSWW	Pond Oil Palm Mill-SPOL	Mill Effluent	pH	5-9	9.00	8.95	9.88	8.90	7.98	8.00	8.27	8.53	8.54	9.00	8.40	8.90	
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic Use	pH	5-9	6.82	6.45	7.10	6.22	6.31	6.58	6.46	6.84	6.75	6.60	6.71	6.82	
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic Use	pH	5-9	7.66	7.51	7.44	7.28	7.57	7.38	7.25	7.65	7.51	7.62	7.30	7.45	
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic Use	pH	5-9	7.60	7.54	7.47	7.30	7.61	8.00	7.65	7.77	7.61	7.43	7.53	7.61	
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic Use	pH	5-9	7.06	6.92	7.15	7.24	7.00	7.18	7.10	7.33	7.12	7.01	6.85	7.05	
WSDU-05	Rainwater Turubu Township-Parua	Domestic Use	pH	5-9	6.06	6.11	5.97	6.18	6.10	6.04	6.19	7.01	5.90	6.21	6.13	6.08	

Legend:

Not Analysed

NA

Too numerous to count

TNTC

Location not sampled

LNS

WATER QUALITY ANALYSIS RESULT

Parameter: COLOUR (Physical)

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-01	Sepik River Plywood Plant (KPL)	Industrial/ Domestic	Hazens	50	20	<30	15	LNS	<10	>30	25	>30	>30	>30	LNS	>30	Chemical & Filtration
WSE-02	Urr-u Creek (Pongi) Oil Palm Mill-SPOL	Industrial	Hazens	50	>30	<10	20	0	>30	25	20	0	20	>30	0	>30	Chemical & Filtration
WSE-03	Pond Turubu Township-Parua	Domestic & Workshop	Hazens	50	>30	<20	0	0	10	15	15	<30	<30	<30	<30	0	Settling, Chemical & Filtration
WSE-04	Pond Kenmare Compound	Domestic & Irrigation	Hazens	50	7.5	10	0	<30	20	<30	<30	<30	<30	LNS	LNS	LNS	Settling using pond
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	Hazens	50	10	<20	<20	15	<30	<30	<30	0	20	LNS	LNS	LNS	Settling using tanks
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	Hazens	50	25	0	30	<30	<30	<30	15	0	25	10	>32	<30	Settling using pond
WSD-01	Sepik River Plywood Plant (KPL)	Industrial discharge	Hazens	50	10	0	LNS	LNS	LNS	>30	>20	LNS	LNS	LNS	>32	>30	Settling
WSD-02	Urr-U Creek Oil Palm Mill-SPOL	Industrial discharge	Hazens	50	>30	>30	>25	>31	LNS	30	>25	>28	LNS	>28	>35	>30	Settling thru series of ponds & facilitate evaporation. No direct discharge to water ways.
WSD-03	Nagam River Oil Palm Mill-SPOL	Industrial discharge	Hazens	50	30	20	>33	>25	>25	25	>20	>20	0	>35	LNS	LNS	Settling thru series of ponds & facilitate evaporation. No direct discharge to water ways.
WSD-04	Urr-u Creek Ibap Nursery	Plantation development	Hazens	50	20	<25	<25	<15	10	30	20	<15	0	<30	30	<30	Mulching & terracing application
WSD-05	Wangay Creek Mundo-mundo junction Kambrendo	Plantation development	Hazens	50	>30	20	0	>25	>33	LNS	>20	>31	LNS	LNS	>30	>30	Mulching & terracing application
WSC-02	Yemogu Creek Water sample - control	Domestic Use	Hazens	50	>30	10	>33	30	<15	<15	25	10	30	<30	LNS	LNS	No need to apply
WSWW	Pond Oil Palm Mill-SPOL	Mill Effluent	Hazens	50	>30	<30	25	15	<30	<30	<30	<30	20	30	<10	<10	Settling using pond
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic Use	Hazens	50	<2.5	<3.5	<2.5	<2.5	0	<2	<2	5	10	<15	10	0	No need to apply
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic Use	Hazens	50	<2.5	0	<5	<5	<3.5	5	<2.5	<2.5	<2.5	<2.5	<2.5	5>	No need to apply
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic Use	Hazens	50	<2.5	2	1	<2.5	0	<3	2.5	<2.5	2	0	1	<2.5	No need to apply
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic Use	Hazens	50	<2.5	2	<5	0	<2.5	<2.5	<2.5	0	1	2.5	LNS	LNS	Settling using tanks
WSDU-05	Rainwater Turubu Township-Parua	Domestic Use	Hazens	50	<2.5	2.5	5	<2.5	<2.5	0	1	<2.5	<2.5	<2.5	<2.5	LNS	Settling using tanks

Legend:

Not Analysed

NA

Too numerous to count

TNTC

Location not sampled

LNS

WATER QUALITY ANALYSIS RESULT (Drinking water)

Parameter: **MERCURY (Microbiological)**

CODE	LOCATION	USES	UWM	MAX LIMIT	First Quarter			Second Quarter			Third Quarter			Fourth Quarter			CONTROL MEASURE
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
WSE-03	Pond Turubu Township-Parua	Industrial	mg/L	0.0002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	❑ Source Control: Preventing mercury from entering water bodies in the first place is the most effective strategy. This involves regulations and practices to limit mercury emissions from industrial processes, mining operations, and other sources. Efforts may include installing pollution control technologies, implementing best management practices, and enforcing environmental regulations. ❑ Wastewater Treatment: Treatment of industrial and municipal wastewater can remove mercury before it is discharged into water bodies. Various treatment methods such as coagulation/floculation, sedimentation, filtration, activated carbon adsorption, and advanced oxidation processes can be used to remove mercury from water effectively. ❑ Mercury Removal Technologies: Advanced treatment technologies specifically designed to remove mercury from water are available. These include ion exchange, membrane filtration, chemical precipitation, and electrochemical methods. These technologies can be implemented in water treatment plants, particularly in areas with significant mercury contamination. ❑ Phytoremediation: Certain plants can absorb and accumulate mercury from water and soil. Phytoremediation involves using these plants, such as water hyacinth and certain types of algae, to naturally remove mercury from contaminated water bodies. ❑ Sediment Remediation: Mercury tends to accumulate in sediments over time, posing a long-term risk to aquatic ecosystems. Remediation techniques such as dredging, capping, and in situ treatment can be employed to reduce mercury levels in sediments and minimize its release into the water column. ❑ Monitoring and Assessment: Monitoring water bodies for mercury contamination is essential for early detection and effective management. Monitoring programs help identify sources of mercury pollution, assess its impacts on ecosystems and human health, and evaluate the effectiveness of control measures. ❑ Public Education and Awareness: Educating the public about the risks of mercury contamination and promoting responsible disposal of mercury-containing products (such as fluorescent bulbs, batteries, and thermometers) can help prevent mercury from entering the environment and water bodies.
WSE-04	Pond Kenyare Compound	Domestic & Irrigation	mg/L	0.0002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.0002	<0.001	
WSE-05	Mawit Creek (Brinangat) Mawit Basecamp	Domestic & Workshop	mg/L	0.0002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	
WSE-06	Urr-u Creek (Pongi) Ibap Nursery	Nursery Irrigation	mg/L	0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.0002	<0.001	0.001	<0.001	
WSDU-01	Deep well Oil Palm Mill-SPOL	Domestic Use	mg/L	0.0002	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	
WSDU-02	Sepik River (Treated) KPL (Veneer/Plywood Mill)	Domestic Use	mg/L	0.0002	<0.001	0.001	0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	
WSDU-03	Deep well KPL (Veneer/Plywood Mill)	Domestic Use	mg/L	0.0002	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	
WSDU-04	Deepwell & Rainwater Mundo-mundo Estate	Domestic Use	mg/L	0.0002	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	
WSDU-05	Rainwater Turubu Township-Parua	Domestic Use	mg/L	0.0002	<0.001	0.001	0.001	0.001	0.001	<0.001	0.001	0.0002	<0.001	<0.001	0.0002	0.001	

Legend: Not Analysed NA Too numerous to count TNTC Location not sampled LNS

WASTE MANAGEMENT PLAN

Details Matrix

APPENDIX 7

WASTE MANAGEMENT PLAN DETAILS MATRIX

Identified Environmental Issues	Waste Products/ Emissions	Potential Sources	Environmental Management Option
Air Related Issues	Smoke emissions from equipment in site clearing and earthworks, hauling of FFB, loading/unloading, boiler, & those under repair at the workshop and generator.	Heavy equipment, generator, & boiler for steam generation of the mill.	☐ Use of gas masks by equipment operators and workshop mechanics. ☐ Dispersion by installing building roof vents for exhaust gas and other odorous smell to escape.
	Emissions from accidental spillage	Fuel tank & fuel depot	☐ Prevention by good housekeeping and adequate spill control and clean/disposal procedures.
Water Borne Pollutants	Oily waste water	Workshop/mill	☐ Installation of drainage system to direct wastes toward interceptor traps and filters to separate oil from the water. ☐ Use absorbent materials (e.g. sawdust) to clean up hydrocarbon spills.
	Wash water	Workshop/mill floors	☐ Construct water pond/basin for wash water or install drainage system to conduct wastes toward designated pond/basin more or less 50 meters away from any river.
	Contaminated storm water with dirt, soil and others.	Workshop, fuel depot and lubricant storage.	☐ Construct drainage system with solids trap made of wire mesh/screen and separate suspended solids before directing the same towards the vegetation.
	Bilge water	Ships/barges	☐ Collect bilge water in empty containers and bury them in secured waste pit away from watercourses.
Liquid Waste Issues	Waste oil, fuel and other hydrocarbon products	Workshop	☐ Store engine oil, gear oil and other related products in a secured bunded storage area particularly far away from any watercourses.
			☐ Dispose of waste oil, fuel and other hydrocarbon products into designated bunded waste pit far away from any watercourses.
			☐ No disposal of waste fuel and oil into storm water drainage and watercourses.
			☐ As much as possible, recycle waste oil and fuel.
			☐ Provide safety-working paraphernalia to workers.

WASTE MANAGEMENT PLAN DETAILS MATRIX

Identified Environmental Issues	Waste Products/ Emissions	Potential Sources	Environmental Management Option
	Effluent	Palm Oil Mill	☐ Dispose waste water on the properly built series of ponds (waste water treatment facility) ☐ Daily inspections of the mill waste water collection chambers and conduits. ☐ Seriously follow the Protection Maintenance Schedule to avoid uncontrollable leak.
	Domestic wastewater	Kitchen, toilets, offices and other support and related facilities.	☐ Employ landfill disposal method – construct landfill or septic tanks where all domestic waste is drained.
Solid Waste Issues	Vegetative debris such as fallen trees, and other vegetation, broken limbs, barks and leaves.	Palm Oil Mill Site ground preparation.	☐ Dispose of and burn them at the incineration site. Use the salvageable woody parts as firewood for cooking.
	Excess soil/overburden soil	Palm Oil Mill Site ground preparation.	☐ Haul the soil debris into the designated dumping area for future use.
	Timber off-cuts and scrap metals (G.I. sheets), nails, excess cement & others.	Infrastructure construction site (mill & camp site)	☐ Haul and bury the waste products at the designated surface dumping area.
	Empty Fruit Bunch (EFB), pulp, sludge & shell	Palm Oil Mill.	☐ Feed to the boiler or as mulch on the plantation; or ☐ Dispose of and burn them at the incineration site.
	Domestic solid waste (empty cans and tins, food wrappers, and discards, and other household wastes)	Household, offices and other related facilities.	☐ Provide rubbish bins as temporary waste containers and properly dispose to designated landfill area. Collect salvageable materials for sale.
	Ballast	Jetty area	☐ Reuse as much as possible the same ballast for stabilizing the ship/barge.
	Broken mechanical parts, used tires, fan belts, discarded batteries and junk metals.	Workshop	☐ Dispose of into a designated surface dumping area with fence while waiting for recycling.
	Contaminated absorbents and filtered waste	Workshop	☐ Bury at the surface dumping site.

WASTE MANAGEMENT PLAN DETAILS MATRIX

Identified Environmental Issues	Waste Products/ Emissions	Potential Sources	Environmental Management Option
	Empty drums and other fuel and lubricant containers.	Fuel depot & lubricant storage and workshop	☐ Place and arrange properly all empty drums in a designated area for future use. Empty drums can be used as garbage bins or water container or temporary container for fuel and oil spillage.
Noise Pollution	Noise Pollution	Workshop, generators, heavy equipment, and sawmill & veneer plants.	☐ Locate housing units/facilities far away from the workshop. ☐ Provide safety earmuffs to workers during work.

NATURE OF SPECIFIC WASTE *Products Matrix*

APPENDIX 8

NATURE OF SPECIFIC WASTE PRODUCTS MATRIX

Sources	Biodegradable	Non-biodegradable	Toxic
Housing Units, Offices and Other Related Support Facilities:			
Construction	Timber Off-cuts	Litter of metal scrap (G.I. Sheets), nails, excess cement, etc.	
Operation	Solid household and domestic wastes such as carton packs, food discards, and paper. Sludge (human wastes such as feces and excreta from the toilets), domestic wastewater from kitchen, bath and laundry room and toilets. Uncontaminated storm water	Solid household and office wastes such as soft drink cans, empty bottles, plastic, cellophane containers and others.	
Jetty	Uncontaminated storm water	Ballast and Bilge Water	
Motor Workshop/Generator House	Uncontaminated storm water	Junk machinery & parts, scrap metal, cable wires, tires & others	Contaminated storm water, used fuel & oil, fuel & oil spillage, and discarded batteries.
Fuel Depot/Lubricant Storage		Empty drums and other fuel and lubricant container.	Fuel & oil spillage, and Contaminated storm water
Palm Oil Mill:			
Site Preparation & Construction	Vegetative debris such as fallen trees and other vegetation, broken limbs, barks & leaves. Excess soil	Scrap metals and plastics	Fuel and oil spillage
Operation	Empty Fruit Bunch (EFB), pulp, sludge & shell. Uncontaminated storm water	Scrap metals and plastics	Fuel and Oil spillage Contaminated water during washing of mill flooring.

WASTE MANAGEMENT *Program*

APPENDIX 9

WASTE MANAGEMENT PROGRAM

Sources and Types of Waste	Specific Waste Products	Waste Control, Containment and Minimization	Waste Storage and Treatment Method	Waste Handling and Transportation	Final Waste Disposal Method	Collection and disposal Frequency	Responsible Personnel
1. HOUSING AND OTHER SUPPORT FACILITIES							
Construction:							
a. Biodegradable							
Solid Waste	Timber off-cuts	Haul the timber off-cuts to the designated incineration site for burning.	Stockpile timber off-cuts in the temporary area away from the nearby river before hauling to the incineration site.	Transport all collected timber off-cuts using dump trucks and bucket loader to the incineration site.	Burn all timber off-cuts at the incineration site.	Daily	Head Carpenter/ Camp & Mill Managers
b. Non-biodegradable							
Solid Waste	Scrap metals (G.I. Sheets, etc.), nails, excess cement and others.	Strictly enforce no littering of any forms of scrap metals, plastics and other wastes. Find an area for temporary storage and ensure to arrange properly.	Place waste in a temporary dumping area which cannot obstruct the movement of workers and machine.	Haul all wastes to the designated dumping site using bucket loader and dump truck.	Dump all wastes into a designated dumping site at least 100m away from any watercourse and at least 1m above maximum level of ground water table.	Daily	Head Carpenter/ Camp and Mill Managers
Operation:							
a. Biodegradable							
Solid Waste	Carton packs, newspaper, scratch papers, empty detergent packs and food discards.	Separate all combustible wastes from the non-combustible wastes and place them in the provided bins as temporary storage before hauling and disposing of into the designated disposal sites. Strict enforcement of no littering of rubbish.	Place all wastes in the garbage bins and cover securely. Be sure to dispose them within 12 hours.	Transport all wastes to the incineration and surface dumping sites using dump truck together with the bins.	Burn all combustible wastes, and dispose of other wastes particularly food discards into the landfill site and cover with soil (at least 20cm. thick). After burning, bury the ash in the waste pits.	Once a week – every Saturday except the food discards which will be dispose within 12 hours.	Environmental Specialist/Camp & Mill Manager
		Place food discards in a secured and close container so as to keep away from the dogs, rats and other scavengers. Dispose of them within 12 hours to avoid malodor in the kitchen.					
b. Non-biodegradable							
Solid Waste	Soft drink empty cans, empty bottles, plastic containers and others.	Separate the combustible wastes from non combustible materials and place in a temporary container before final disposal to the designated disposal sites away from any watercourses.	Place all waste in the temporary bins and cover them to keep away from mosquitoes, flies and other disease vectors.	Haul all waste to the designated surface dumping site together with the rubbish bins using truck or loader.	Dump into the designated surface dumping site.	Once a week – every Saturday	Environmental Specialist/Camp Manager
2. JETTY AREA							
a. Biodegradable							
Liquid Waste	Uncontaminated storm water	Install good drainage within the perimeter of the jetty area.	Discharge through the drainage system directed towards the vegetation so as to reduce siltation and sedimentation effect to the nearby watercourse.	Discharge through the drainage system directed towards the vegetation so as to reduce siltation and sedimentation effect to the nearby watercourse.	Discharge to adequately vegetated areas.	NA	Camp & Mill Managers
b. Non-biodegradable							
Solid Waste	Ballast (mixture of coarse and fine aggregate as weight for stabilizing ship)	While cleaning the ship, place the ballast in a designated area. Re-use as much as possible the same ballast as weight for stabilizing ship.	Use the ballast again for stabilizing the ship.	NA	NA	As the need arises	Ship Captain

WASTE MANAGEMENT PROGRAM

Sources and Types of Waste	Specific Waste Products	Waste Control, Containment and Minimization	Waste Storage and Treatment Method	Waste Handling and Transportation	Final Waste Disposal Method	Collection and disposal Frequency	Responsible Personnel
c. Toxic							
Liquid Waste	Bilge water (contaminated water with fuel and oil)	Collect the bilge water in empty containers by pumping and dispose of in a designated pit far away from any watercourses.	Put the contaminated water into the empty drum while waiting for disposal to the designated pit.	Haul the waste using the dump truck and loader.	Dump into the designated pit.	As the need arises	Ship Captain
3. MOTOR WORKSHOP/ GENERATOR HOUSE							
a. Biodegradable							
Liquid Waste	Uncontaminated storm water	Install good drainage within the perimeter of the motor workshop/generator house directed away from the watercourse to minimize the siltation and sedimentation effect to the river system.	Direct storm water to the drainage system.	Direct storm water to the drainage system.	Direct storm water to the drainage system which flow towards the adequately vegetated area.		Workshop Supervisor/ Camp & Mill Managers
b. Non-biodegradable							
Solid Waste	Junk machinery parts, scrap metals, cable wires, tires and tube.	Strictly enforce no littering of any forms of scrap metals and other workshop wastes. Find an area for temporary storage and ensure to arrange properly.	Place waste in a temporary dumping area within the motor workshop, preferably at the back.	Haul all wastes to the designated dumping site using loader and dump truck.	Dump all wastes into a designated dumping site at least 100m away from any watercourse and at least 1m above maximum level of ground water table.	Once a month – every Monday	Workshop Supervisor/ Camp & Mill Managers
c. Toxic							
Liquid Waste	Contaminated used water	Provide drainage directed towards the designated wastewater pond/settling basin.	Drain the contaminated storm water into the settling basin/water pond so as not to pollute the nearby rivers and other water body.	Drain the contaminated storm water through the drainage system to the settling basin/ water pond.	Store in the settling basin/water pond.		Workshop Supervisor/ Camp & Mill Managers
Solid Waste	Used fuel & oil and fuel & oil spillage during repair.	Provide separate container for used fuel/oil, and spillage of fuel and oil as temporary storage. Impose zero spillage in the workshop.	Place in the temporary storage or containers.	Transfer the container filled with oil/fuel spillage using truck into the designated store house.	Keep the collected fuel and oil spillage in the fuel and oil storage house for future use. While the used fuel will be transported and disposed of into the designated landfill site far away from any watercourses or burned. Used oil will be keep properly and recycle as lubricant for chainsaw chains.	Once a month – every Saturday	Workshop Supervisor/ Camp & Mill Managers
	Discarded batteries	Find an area at the back of the generator house for a temporary storage area (fenced) and dispose to the designated dumping area.	Place all discarded batteries in a temporary dumping site with fence.	Haul all discarded batteries using truck into the designated dumping area.	Dump all discarded batteries in a designated landfill and cover with soil (at least 20cm thickness).	Once a month – every Monday	Workshop Supervisor/ Camp & Mill Managers
4. FUEL DEPOT & LUBRICANT							
a. Non-Biodegradable							
Solid Waste	Empty drums and other fuel and lubricant containers	Place and arrange properly all empty drums in the designated area. Reuse the empty drums as garbage can, temporary bins and etc.	Place wastes in a temporary environmentally safe area.	Haul empty drums and other wastes using truck to the designated dumping area.	Place and arrange all wastes in a designated area which is restricted to any unauthorized person.	Once a month	Workshop Supervisor/ Camp & Mill Managers

WASTE MANAGEMENT PROGRAM

Sources and Types of Waste	Specific Waste Products	Waste Control, Containment and Minimization	Waste Storage and Treatment Method	Waste Handling and Transportation	Final Waste Disposal Method	Collection and disposal Frequency	Responsible Personnel
b. Toxic							
Liquid Waste	Fuel and oil spillage	Construct a concrete bund where the fuel and oil depot is installed to contain cases of fuel and oil spillage. Check periodically any leaking of hose/pipeline of depot including the pipeline from the pumping station. Immediately repair and replace damaged hose and pipeline. Take extra care in refueling machinery. Provide bin as a temporary container beneath the refueling point of the depot.	Collect and transfer the oil and fuel spillage in a sealed container.	Transport the container with spillage in a safe area preferably in the oil and fuel storage house with fence.	Keep the oil and fuel spillage in the storage area for future use like for cleaning machinery during repair.	Once a week – every Friday	Workshop Supervisor/ Camp & Mill Managers
5. PALM OIL MILL							
Site Preparation:							
a. Biodegradable							
Solid Waste							
	Vegetative debris such as fallen trees and other vegetation, broken limbs, barks & leaves.	Trim the fallen trees and cut them into fuel wood sizes. Stockpile vegetative debris in the environmentally safe area while waiting hauling to the designated surface dumping site.	Stockpile the unusable parts of the fallen trees in a temporary area away from the nearby river before hauling to the incineration site. Stockpile the fuelwood for future use.	Transport all vegetative wastes to the incineration site using dump truck and bucket loader.	Burn the vegetative debris at the incineration site. Let the workers get their fuelwood for their own use.	Daily	Plant Supervisors/Mill Manager
	Excess soil	Haul the excess soil into the designated dumping area.	Stockpile the excess soil in a temporary area before hauling to the designated dumping area.	Transport the excess soil to the designated dumping area using dump truck and bucket loader	Use the excess soil to fill up low-lying or depressed areas within the logpond area.	Daily	Plant Supervisors/Mill Manager
	Scrap metal and plastic	Prohibit littering of scrap metal, plastics and other wastes around the industry compound. Collect and haul periodically all types of wastes and dump in the designated dumping site.	Place all scrap metal, plastics and other solid waste in a temporary dumping area.	Transport all the collected scrap, plastics and other solid wastes using dump trucks and bucket loader to the surface dumping site.	Disposed all solid wastes to the surface dumping site.	Daily	Plant Supervisors/Mill Manager
b. Toxic							
Liquid Waste	Fuel and oil spillage	Check the possible leaking of fuel from any clearing or leveling machinery used in the site preparation and immediately fix the leaking fuel tank. Provide ready temporary container in case of fuel and oil spillage.	Place fuel and oil spillage in a temporary container.	Transport all collected fuel and oil spillage using dump trucks and loader to the temporary storage site.	Recycle the collected fuel spillage to wash machinery parts and mechanics' hands during repair and maintenance. Recycle collected oil spillage also to lubricate saw chain.	As the need arises	Plant Supervisors/Mill Manager
Operation:							
a. Biodegradable							
Solid Waste	Empty Fruit Bunch (EFB), pulp, sludge & Shell.	Properly maintain conveyors and collection boxes and cart. Daily hauling of wastes to prevent over stocking.	Place all solid wastes in a temporary dumping area before hauling to the incineration site or feed to the boiler.	Transport all solid wastes to the incineration site or boiler using dump truck and loader.	Burn all solid wastes at the incineration site or feed to boiler. Some EFBs, pulps & sludge will be recycle as mulch for the plantation.	Daily	Plant Supervisors/Mill Manager

WASTE MANAGEMENT PROGRAM

Sources and Types of Waste	Specific Waste Products	Waste Control, Containment and Minimization	Waste Storage and Treatment Method	Waste Handling and Transportation	Final Waste Disposal Method	Collection and disposal Frequency	Responsible Personnel
Liquid Waste	Effluent	Proper maintenance and inspection of conduits from the effluent collection chambers going to the cooling pond and other ponds structures.	EFB, pulps and sludge can be good mulching materials for the plantation.	Using appropriate conduits.	Discharge to waterways.	As the need arises	Plant Supervisors/Mill Manager
	Uncontaminated storm water	Construct proper drainage to avoid flooding the mill flooring.	Directly channel to the constructed wastes treatment ponds.	Direct storm water to the drainage system.	Direct water to the drainage system towards adequately vegetated area.	As the need arises	Plant Supervisors/Mill Manager
			Direct storm water to the drainage				
b. Non-biodegradable							
Solid Waste	Scrap metal and plastic	Prohibit littering of scrap metal, plastics and other wastes around the mill and around the industry perimeter. Provide bin for temporary storage.	Place all scrap metal, plastics and other solid waste in a temporary dumping area.	Transport all the collected scrap, plastics and other solid wastes using dump trucks and bucket loader to the surface dumping site.	Disposed all solid wastes to the surface dumping site.	Once a week (every Saturday)	Plant Supervisors/Mill Manager
c. Toxic							
Liquid Waste	Fuel and Oil spillage	Check the possible leaking of fuel from machinery used in the unloading of FFB & loading of solid wastes, and then immediately fix the leaking fuel tank. Provide ready temporary container in case of fuel and oil spillage.	Place fuel and oil spillage in a temporary container.	Transport the container filled with oil/fuel spills into a secured place preferably with fence to avoid contact with men and animals.	Place in a designated area with fence.	As the need arises	Plant Supervisors/Mill Manager
			Construct an oil-water separator system and maintain regularly.	Collect the trapped fuel film and transport them to the designated incineration site using dump truck and loader.	Burn them in the approved incineration site.	As the need arises	Plant Supervisors/Mill Manager

PERFORMANCE STATUS *of each*

PERMIT CONDITION

Performance status of each permit condition

The implementation and conformance status for each condition under the environment permit {EP-L3 (806)} with respect to the permit Holder is describe in Table below.

No	Permit Condition	Implementation Status	Compliance Status
General			
1	The Permit Holder shall carry out works in accordance with the plans and specifications in the environment permit applications for both the Oil Palm Development and Processing.	All activities and works are carried out as per Environmental Permit.	Compliant
2	In the event of an inconsistency between the environment permit application and a condition of this permit, the condition will apply.	Environment permit application and a condition of this permit is acknowledged and observed	Compliant
Biodiversity Off-Set			
3	The Developer shall commit to develop and implement a biodiversity offsets program consistent with applicable	This will have to be developed with CEPA over time when the relevant regulations are ready for implementation. In the meantime, land use changes within the project area, since the start of the project, can be shown with time-series satellite imagery.	Not applicable yet
	Regulations which shall include:		
	(a) A Biodiversity Offsets Plan;		
	(b) A robust scientific procedure for the measurement of the area of vegetation converted to a different land use and the area of vegetation degraded on an annual basis;		
	(c) A commitment to protect an area of land and/ or water determined by the CEPA in accordance with its National Protected Area Priorities and using fees generated under the Biodiversity Offsets Plan.		
4	The Developer should be aware that any failure to meet any Conditions of this Permit or requirement of an Environment Management Plan will result in penalties imposed.	This is noted.	Compliant
Spatial Data			
5	The Permit Holder shall submit to DEC within three (3) months from the date of amendment of this permit spatial data in digital form at 1:100,000 Map Scale which displays the boundary of the permit indicating Momase Integrated Agro-Forestry Project Area, existing infrastructure and existing discharge and extraction points. A digital elevation model at 5m resolution and streamlines is also required.	A hardcopy of the requested spatial data/Map was attached in the submitted 2022 Annual Environmental Performance (AEP) Report.	Compliant
6	The spatial data is required to be submitted in the following format(s): Software format: ArcGis or Mapinfo; Datum WGS84; un-projected (Latitude/Longitude) format.		
Biological Data			
7	The Permit Holder shall conduct biological surveys on the aquatic and terrestrial flora and fauna species within the premises based on the Permit Holder's Five (5) Year Forest Clearing Plans and submit Biological Reports for each segment of the project area define by the Five (5) Year Forest Clearing Plan to the Director for his approval prior to commencement of works within that segment.	Already included in the submitted Environmental Management Plan.	Compliant

No	Permit Condition	Implementation Status	Compliance Status
Works			
<u>Buffer Zone</u>			
8	The Permit Holder shall maintain buffer zones on each side of permanent or semi-permanent watercourses in accordance with the <i>PNG Logging Code of Practice</i> whilst carrying out works associated with the logging operation.	Buffer zones have been provided and are being maintained along all watercourse within the project area as per the PNG Logging Code of Practice.	Compliant
<u>Prohibited Activities</u>			
9	The Permit Holder shall ensure no works is allowed within 100 meters of cultural sites (if any) as these sites should be served as reserve sites for cultural purposes.	This is noted and will taken	Compliant
10	The Permit Holder shall ensure that no works are carried out within the buffer zone reserved along watercourses.	This is noted as per the PNG Logging Code of Practice	Compliant
<u>Erosion Control</u>			
11	The Permit Holder shall design and apply appropriate measures to prevent soil erosion and minimize discharge of sediment into watercourses. The measures shall include but not limited to use of cutoff drains, velocity control techniques, sediment traps, ground cover (natural, e.g. grass growing and artificial, e.g. plastic sheets), sedimentation pond, limited vegetation clearing, etc.	Erosion control measures include construction of 3.6m to 4.3m terraces with stop bunds at slopes $\geq 12^\circ$ and planting platforms at other locations in addition to installation of flow retardation structure and planting of <i>Mucuna bracteate</i> leguminous groundcover. Removed fronds were also stacked perpendicular to the ground slope.	Compliant
<u>Bund</u>			
12	The Permit Holder shall construct bunds around the fuel storage tanks, workshops and sawmill plan within the premises using the appropriate bund specifications in the Australian Standards-AS 1940.	Fuel is stored in depot and/or gallons drums house in a bunded and sheltered shed (please see photo on page 25.	Compliant
Waste Treatment Facilities			
<u>Septic Tank</u>			
13	The Permit Holder shall construct septic tanks with soak-away trenches for treatment and disposal of domestic wastewater from Mawit and Mundomundo Base Camps. The septic tanks shall be established not less than 100m from any nearest surface water.	The septic tank system had been constructed and properly installed (pls. see the attached map).	Compliant
<u>Landfill</u>			
14	The Permit Holder shall construct domestic and industrial landfills at Mawit and Mundomundo Base Camps and any other locations within the premises for the disposal of domestic and industrial wastes, respectively. The landfills must be constructed not less than 100m from the nearest watercourse and designed to comply with the minimum environmental requirements in the DEC Environmental Code of Practice for Sanitary Landfill Sites.	Segregated and appropriately sign-posted landfills have been constructed.	Compliant

No	Permit Condition	Implementation Status	Compliance Status
<u>Cut-Off Drains</u>			
15	The Permit Holder shall construct cut-off drains around the fuel storage area, workshop, and timber processing plants for diverting oil-contaminated wastewater.	The cut-off drains around the fuel storage area, workshop, and sawmill plants have been constructed.	Compliant
<u>Oil-water Separator</u>			
16	The Permit Holder shall install triple interceptor traps in the cut-off drains referred to in Condition 15, for separation of oil-film from wastewater emanating from all workshops, fuel storage areas and timber processing plants established with the premises. The oil-water separator shall be designed to comply with the minimum environmental specifications in the DEC Environmental Code of Practice for Vehicle/Machinery Workshops and Petroleum (Hydrocarbons) Storage/Resale/Usage Site, DEC, 1997	An oil separator with triple interceptor traps has been installed.	Compliant
<u>Incinerator</u>			
17	All hazardous wastes such as biomedical waste and oily rags are to be disposed of safely and securely off the premises. If the offsite disposal is not reasonably practicable then the Permit Holder shall install an appropriate incinerator for treatment before disposal into the environment.	The incineration site will be constructed approximately 100m or more away from the mill and quarters and must be very far from any villages. Included in the approved EMP.	Compliant
<u>Mill Effluent Treatment Ponds</u>			
18	The Permit Holder shall construct a series of treatment ponds including aerobic and anaerobic ponds for treatment of the "palm oil mill effluent" from Palm Oil Mill prior to discharge to the environment.	The series of treatment ponds including aerobic and anaerobic ponds for treatment of the "palm oil mill effluent" from Palm Oil Mill have been constructed, implemented and monitored (pls. see photos on page 15.	Compliant
19	The Permit Holder shall construct appropriate anaerobic and aerobic ponds for the treatment of POME prior to discharge into the environment.		
Operation			
<u>Logging/Log Salvaging Operations</u>			
20	The Permit Holder shall observe the relevant requirements in the PNG Logging Code of Practice whilst carrying out logging operations within the premises.	This is noted and properly observed	Compliant
<u>Oil Palm Plantation</u>			
21	The Permit Holder shall ensure that fertilizers are only applied during dry season to prevent runoff and the application should NOT be conducted under windy conditions or upwind from the buffer zones.	This requirement has been incorporated into the company's standard operating procedure for fertilizer application	Compliant
22	The Permit Holder shall ensure that storage sheds for fertilizers and pesticides are built on a well-drained site, and with due regard to relevant environment, health and safety requirements (e.g., bund requirements, ventilation, etc.).	The storage facility is well ventilated and satisfactory drained.	Compliant
23	The Permit Holder shall ensure that pesticides and fertilizers are applied with due consideration of human health and the environment and at a distance not less than 10 meters from the edge of the buffer zones.	Fertilizer and pesticides are applied well away from buffer zone areas.	Compliant

No	Permit Condition	Implementation Status	Compliance Status
24	No empty pesticide and fertilizer containers or spray equipment shall be washed directly in watercourses or in areas where chemical residues can enter watercourses through rainfall runoff.	No agrichemical containers are washed in the local watercourse. Fertilizer bags are collected and used for mulching and as waste bags.	Compliant
25	Chemical substances including fertilizers should not be overstocked in order to avoid possible damage to stock and the resulting disposal issue including accidental discharge of chemical substances into the environment through rainfall runoff.	Stock management of the current required chemicals and fertilizers is done according to demand and storage capacity to avoid over-stocking and accidental release into the environment. This approach was maintained throughout the operation.	Compliant
<i>Palm Oil Processing</i>			
26	The Permit Holder shall observe the relevant requirements in the <i>Environmental Code of Practice for Papua New Guinea Oil Palm Processing Industry, DEC, 2013</i> .	Oil Palm Mill was constructed and operated in accordance with the Environmental Code of Practice for PNG Palm Oil Processing Industry, DEC 2013.	Compliant
27	The Permit Holder shall ensure that all the Empty Fruit Bunches (EFB) generated at the mill are pressed, fiberised as fuel for renewal energy in the boiler.	Empty Fruit Bunches (EFB) generated at the Palm Oil mill are pressed and fiberised as fuel for renewal energy in the boiler and have been included in the design. Some were used as mulching in the oil palm plantation.	Compliant
<i>Small-scale Timber Processing</i>			
28	The Permit Holder shall establish sawmill plants at a number of locations within the premises for the processing of the timber in small scale.	Sawmill Plant construction has been delayed. Currently, it is in its construction & equipment/ machineries procurement stage.	Partially compliant.
29	The Permit Holder shall ensure sawmill plant shall be established 100m away from the nearest water source to avoid contamination of the water course.	The sawmill plant is now located more than 100m away from the nearest water source (Sepik River).	Compliant
30	The Permit Holder shall ensure that the operation of small-scale timber processing is done on a bunded concrete surface.	This requirement has been included in the company's construction design for small-scale timber processing.	Not yet compliant. Included in the design
<i>Waste Treatment Facilities</i>			
31	The Permit Holder shall carry out routine inspection and maintenance of septic tanks (<i>Condition 13</i>), landfills (<i>Condition 14</i>) cut-off drains (<i>Condition 15</i>), oil-water separators (<i>Condition 16</i>), incinerator (<i>Condition 17</i>), effluent treatment ponds (<i>Condition 18</i>), in order to maintain the treatment efficiency of these waste treatment facilities.	All facilities are routinely inspected and maintained and the same will be done to any new facility added to the operation	Compliant

No	Permit Condition	Implementation Status	Compliance Status
32	The Permit Holder shall ensure that leachates from domestic wastewater effluent should not flow out onto the land surface from the soak-away trenches after it is discharged from the septic tanks.	The soak away pits are installed at the maximum design volume so diffusion towards the land surface is unlikely.	Compliant
	Erosion Control		
33	The Permit Holder shall take all reasonable measures, whilst undertaking the logging operation within the premises to ensure that - (a) soil erosion and discharge of sediment into any surface water is minimized, and (b) the natural direction of flow of surface waters within the premises is not altered, and (c) the flow rate of surface waters within the premises is not altered due to obstruction by logs or other forest/log debris or wastes.	Sediment traps are used where appropriate to reduce the entry of sediment into the watercourses and the natural direction and flow rate of water courses within the premises has not been affected and re-directed to fully vegetated areas of the buffer zones.	Compliant
	Rehabilitation		
34	The Permit Holder shall undertake progressive landform rehabilitation during the logging operation, including soil conservation and rehabilitation of disperse soil, stockpiles, quarry extraction sites, etc.	Progressive site rehabilitation and revegetation work is being undertaken where required. Log landings are cultivated to encourage the immediate growth of endemic and pioneer tree species.	Compliant
35	The Permit Holder shall undertake progressive re-vegetation work at construction sites including the camp site, access road, quarry extraction sites, etc.		
	Storage of Hazardous Substances		
36	All hazardous substances (chemicals, reagents, wood preservatives, etc.) that are used within the premises shall be safely stored in accordance with the manufacturer's recommendations.	All hazardous substances (chemicals, reagents, wood preservatives, etc.) are properly stored and safety measures were fully observed as per manufacturer's recommendations.	Compliant
	Workshop & Fuel Storage		
37	The Permit Holder shall manage the workshop and fuel storage areas in accordance with the minimum environmental requirements in the DEC <i>Environmental Code of Practice for Vehicle/Machinery Workshops and Petroleum (Hydrocarbons) Storage/Resale/Usage Site, DEC, 1997</i> .	Machinery workshops and fuel storage facilities within the premises are being managed in accordance requirements in the DEC Environmental Code of Practice for Vehicle/Machinery Workshops and Petroleum (Hydrocarbons) Storage/Resale/Usage Site, DEC, 1997.	Compliant
Waste Management			
	Aerial Emission		
38	The Permit Holder shall employ appropriate control measures to minimize air emissions from the premises (boiler stacks, steam from vents, diesel gen-set exhaust and fugitive emissions).	Appropriate control measures are being used to minimize aerial emissions from the premises including (boiler stacks, steam from vents, diesel gen-set exhaust and fugitive emissions).	Compliant
39	The Permit holder shall employ appropriate control measures to minimize offensive odour within the premises.		

No	Permit Condition	Implementation Status	Compliance Status
40	The Permit Holder shall minimize airborne emission of particulate matter (soot) and black smoke from the emission stack at the processing mills through the use of appropriate pollution control equipments to ensure that on a daily basis, emissions of black smoke from boiler stacks remain better than Ringelman 2 for periods exceeding 80 per cent of total boiler operating time.	This aspect has been included in the design of the Oil palm mill which is yet to be established. Appropriate smoke measuring device is on the process of procurement.	Not yet applicable
	Noise		
41	The Permit Holder shall ensure that noise levels generated within the premises are minimized through the use of appropriate noise control measures.	Noise abatement measures including construction of sound barriers, scheduling of operating hours, and attenuation of vehicle and equipment engines, have been implemented. Applicable control measures during mill construction were installed and observed during mill operation.	Compliant
	Solid Waste		
42	The Permit Holder shall dispose of all domestic and industrial solid wastes from the premises in the sanitary landfills referred to in <i>Condition 14</i> .	All appropriate solid waste management measures are in place in accordance with approved EP.	Compliant
43	The Permit Holder shall not place solid or liquid waste (excluding mill effluent discharged through land irrigation) in a manner where it could easily enter surface water through rainfall runoff.	Oil Palm Mill solid waste management measure is included in the planning and construction phase.	Compliant
44	The Permit holder shall not place any solid or liquid waste in a manner where it could easily be dispersed to other areas and cause contamination within and/or outside the premises through rainfall runoff.	Solid or liquid waste mitigating measure is to be in place to avoid any contamination within and/or outside the premises through rainfall runoff. Already stipulated in the approved EMP.	Compliant
45	The Permit Holder shall ensure that the Empty Fruit Bunches (EFB) generated at the mills are utilized as mulch / compost in the oil palm fields.	Included in the AEP Report.	Compliant
	<u>Solid Mill Waste (decanter cake)</u>		
46	The Permit Holder shall ensure that the solid mill wastes (decanter cake) is used as a form of fertilizer within its oil palm plantations and not disposed of into the environment.	To use solid mill wastes (decanter cake) as fertilizer, the management is in the planning stage.	Not yet applicable
	Rainfall Runoff		
47	The Permit Holder shall ensure that storm water runoff from the locations near the Anaerobic (methane capture) and Aerobic ponds are not contaminated with POME.	Boundary drains have been constructed along the perimeter of the Aerobic pond area to prevent contamination.	Compliant
48	The Permit Holder shall segregate storm water runoff from the locations where machinery and fuel are stored in order to avoid cross-contamination of the rainwater.	Stormwater runoff from the workshop and fuel storage is directed through an oil-water separator.	Compliant

No	Permit Condition	Implementation Status	Compliance Status					
	Waste Oil							
49	The Permit Holder shall ensure that waste oil (fuel and lubricants) are reused and/or disposed of securely and responsibly.	Waste oil (fuel and lubricants) disposal and reuse included in the design.	Compliant					
50	The Permit Holder shall ensure that the floors at the workshop and sawmill are free of fuel residues and wood treatment chemicals prior to any floor-washing activity.	The floor at the workshop and fuel storage areas are cleaned prior to any floor washing activity.	Compliant					
51	All wastewater containing oil film (including contaminated rainfall runoff) shall be directed to oil-water separators referred to in <i>Condition 16</i> for removal of oil film prior to discharge.	All wastewater containing oil film (including contaminated rainfall runoff) is directed to the oil-water separator for removal of the oil-film prior to discharge.	Compliant					
52	The oil film from the oil-water separators must be skimmed off and stored in a used-oil container for reuse and/or disposal in the industrial landfill or through incineration referred ta <i>Condition 17</i> .	Oil film from the oil water separator is skimmed off and stored in a used oil container for reuse.	Compliant					
	Domestic Wastewater							
53	All domestic wastewater from the Mawit and Mundomundo Base Camps shall be directed to the septic tanks referred to in <i>Condifion 13</i> for treatment prior to discharge.	All domestic wastewater from the premises is directed into septic tanks and then to soak-away trenches	Compliant					
Waste Discharge								
	Domestic Wastewater							
54	The discharge of treated domestic wastewater at Discharge Points (1), (3), (4) shall occur at the rates specified in Table 1 below		The domestic wastewater discharges from the estate, township, and base camps as all rainfall runoff is captured by the perimeter drainage where wastewater discharge goes into small nearby water ways. Monthly monitoring is being conducted.	Compliant				
	Table 1 - Permitted Discharge Rates for Treated Domestic Wastewater							
	Discription	Discharge Rate						
		Litres per hour			Hours per day	Days per month	Month per Year	Annual Discharge Volume
	Discharge Point (1)	303.01			24	30	12	2,618 m³/yr.
	Discharge Point (3)	33.23			24	30	12	287 m³/yr.
	Discharge Point (4)	298.38			24	30	12	2,578 m³/yr.
	Total Annual Discharge Volume					5,483 m³/yr.		

No	Permit Condition	Implementation Status	Compliance Status																																									
Industrial Wastewater																																												
55	The discharge of treated industrial wastewater within the premises at Discharge Points (2) and (5) shall occur at the rates specified in Table 2, below. Table 2 - Permitted Discharge Rates for Treated Industrial Wastewater <table><tr><th rowspan="2">Discription</th><th colspan="5">Discharge Rate</th></tr><tr><th>Litres per hour</th><th>Hours per day</th><th>Days per month</th><th>Month per Year</th><th>Annual Discharge Volume</th></tr><tr><td>Discharge Point (2)</td><td>266.94</td><td>10</td><td>30</td><td>12</td><td>961 m³/yr.</td></tr><tr><td>Discharge Point (5)</td><td>166.94</td><td>10</td><td>30</td><td>12</td><td>601 m³/yr.</td></tr><tr><td>Discharge Point (5)</td><td>30,000</td><td>16</td><td>30</td><td>9</td><td>129,600 m³/yr.</td></tr><tr><td></td><td colspan="4">Total Industrial (workshop wastewater) Discharge Volume</td><td>1,562 m³/yr.</td></tr><tr><td></td><td colspan="4">Total Industrial (POME) Discharge Volume</td><td>129,600 m³/yr.</td></tr></table>	Discription	Discharge Rate					Litres per hour	Hours per day	Days per month	Month per Year	Annual Discharge Volume	Discharge Point (2)	266.94	10	30	12	961 m³/yr.	Discharge Point (5)	166.94	10	30	12	601 m³/yr.	Discharge Point (5)	30,000	16	30	9	129,600 m³/yr.		Total Industrial (workshop wastewater) Discharge Volume				1,562 m³/yr.		Total Industrial (POME) Discharge Volume				129,600 m³/yr.	There is no indication of treated industrial wastewater contamination from the currently operating Mill and plant. The POME is managed as per the Environmental Code of Practice for Papua New Guinea Palm Oil Processing Industry, DEC 2013.	Compliant
Discription	Discharge Rate																																											
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	Total Industrial (POME) Discharge Volume				129,600 m³/yr.																																							
56	The discharge of treated domestic and industrial wastewater at Discharge Points (1), (2), (3), (4) and (5) shall not cause the water quality within Mawit Creek and Nagam River or any surface water within the premises to exceed the water quality criteria in Table 3, below Table 2 - Fresh Water Quality Criteria <table><tr><th>Parameters</th><th>Water Quality Criteria</th></tr><tr><td>*Faecal Coliform</td><td>≤ 200 faecal coliform/100ml</td></tr><tr><td>Dissolve Oxygen</td><td>> 6.0 mg/L (>80-90% saturation)</td></tr><tr><td>Total Suspended Solids</td><td>< 10% change from background mean seasonal values</td></tr><tr><td>Oil & Grease</td><td>None noticeable as visible film or detectable by odour</td></tr></table> <i>* Criteria based on not fewer less than five samples taken over not more than a 30 day period, in which the median value of the faecal coliform bacteria content of the surface water shall not exceed 200 per 100 ml</i>	Parameters	Water Quality Criteria	*Faecal Coliform	≤ 200 faecal coliform/100ml	Dissolve Oxygen	> 6.0 mg/L (>80-90% saturation)	Total Suspended Solids	< 10% change from background mean seasonal values	Oil & Grease	None noticeable as visible film or detectable by odour	The discharge of treated domestic and industrial wastewater have been monitored and included in the AEP Report.	Compliant																															
Parameters	Water Quality Criteria																																											
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Dissolve Oxygen	> 6.0 mg/L (>80-90% saturation)																																											
Total Suspended Solids	< 10% change from background mean seasonal values																																											
Oil & Grease	None noticeable as visible film or detectable by odour																																											
Water Extraction																																												
57	The Permit Holder shall ensure that extraction of water from Mawit and Urr-u Creeks do not exceed the base flow of the surface water.	Included in the Annual Environmental Performance Report.	Compliant																																									
58	The extraction of water at Extraction Points (1), (2) and (3) shall occur at the rates specified in Table 4, below. Creeks <table><tr><th rowspan="2">Discription</th><th colspan="5">Extraction Rate</th></tr><tr><th>Litres per hour</th><th>Hours per day</th><th>Days per month</th><th>Month per Year</th><th>Annual Discharge Volume</th></tr><tr><td>Extraction Point (1)</td><td>104.75</td><td>24</td><td>30</td><td>12</td><td>905 m³/yr.</td></tr><tr><td>Extraction Point (2)</td><td>83.33</td><td>24</td><td>30</td><td>12</td><td>720 m³/yr.</td></tr><tr><td>Extraction Point (3)</td><td>13,441</td><td>24</td><td>30</td><td>9</td><td>116,133 m³/yr.</td></tr><tr><td></td><td colspan="4">Total Annual Extraction Volume</td><td>117,758 m³/yr.</td></tr></table>	Discription		Extraction Rate					Litres per hour	Hours per day	Days per month	Month per Year	Annual Discharge Volume	Extraction Point (1)	104.75	24	30	12	905 m³/yr.	Extraction Point (2)	83.33	24	30	12	720 m³/yr.	Extraction Point (3)	13,441	24	30	9	116,133 m³/yr.		Total Annual Extraction Volume				117,758 m³/yr.							
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No	Permit Condition	Implementation Status	Compliance Status																																	
59	The Permit Holder shall ensure that the quality of the surface water complies with Public Health (Drinking) Water Quality Standards in Table 5, if the water is used for domestic consumption. Table 5 - Water Quality Criteria for Non-disinfected Water Supplies <table><tr><th>PARAMETERS</th><th>HIGHEST DESIRABLE LEVEL</th><th>MAXIMUM PERMISSIBLE LEVEL</th></tr><tr><td colspan="3">Microbiological</td></tr><tr><td>E. Coli (per 100 ml)</td><td></td><td>None</td></tr><tr><td>Total Coliform (per 100ml)</td><td></td><td><3*</td></tr><tr><td colspan="3">Physical</td></tr><tr><td>Color</td><td>5</td><td>50</td></tr><tr><td>Odor</td><td>Unobjectionable</td><td>Unobjectionable</td></tr><tr><td>Taste</td><td>Unobjectionable</td><td>Unobjectionable</td></tr><tr><td>Turbidity</td><td>5 Units</td><td>25 Units</td></tr><tr><td>Total Solids</td><td>500 mg/L</td><td>1,500 mg/L</td></tr><tr><td colspan="3"> <u>NOTE</u> * Less than three Coliform organism per 100 ml E. Coli is absent <u>SOURCE</u> Schedule 2, Public Health (Drinking Water) Regulation - Prepared for inclusion as at 1/1/1985 </td></tr></table>	PARAMETERS	HIGHEST DESIRABLE LEVEL	MAXIMUM PERMISSIBLE LEVEL	Microbiological			E. Coli (per 100 ml)		None	Total Coliform (per 100ml)		<3*	Physical			Color	5	50	Odor	Unobjectionable	Unobjectionable	Taste	Unobjectionable	Unobjectionable	Turbidity	5 Units	25 Units	Total Solids	500 mg/L	1,500 mg/L	<u>NOTE</u> * Less than three Coliform organism per 100 ml E. Coli is absent <u>SOURCE</u> Schedule 2, Public Health (Drinking Water) Regulation - Prepared for inclusion as at 1/1/1985			Included in the Annual Environmental Performance Report.	Compliant
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Environment Management Plan																																				
60	The Permit Holder shall submit its Environment Management within three (3) months from the date of amendment of this permit to the Director for Approval. The EMP should cover waste streams produced through this development of this project, waste management strategies, management and monitoring programmes of all phases of development and all levels of impacts and their mitigation measures.	The Environment Management Plan will be updated if there are new facilities constructed and installed, plantation improvement facilities, and additional management and monitoring programs being implemented, respectively.	Compliant																																	
61	The Permit Holder shall undertake monitoring of the waste discharges during the logging/log salvaging operation, oil palm development phase and palm oil processing phase. The monitoring shall cover all levels of impacts on environmental quality (water, air and land) including noise emission and the measures taken to minimize the impacts.	Monitoring activities were undertaken and results are presented in the Annual Environmental Performance Report.	Compliant																																	
62	The Permit Holder shall conduct its environmental monitoring programs in accordance with the approved EMP. The monitoring programs should also cover monitoring requirements under this permit.	These plans are components of the approved Environment Management Plan.	Compliant																																	

No	Permit Condition	Implementation Status	Compliance Status												
	Water Quality														
63	The Permit Holder shall conduct monthly Water Quality Monitoring in relation to parameters specified in Table 3 and 5 and conduct an inspection to determine effects of wastewater discharge and the ecological effects (if any) of the water extraction activity on Mawit Creek, Urr-u Creek, Kimange (Uyenyo) and Nagam River and any other surface water that exist with the premises and report the results (including records of volume of water extracted) in its Environmental Performance Report. The monitoring program shall be carried out accordance with the requirements in Table 6 and with respect to the parameters in Table 3 and 5 above. Table 6 - Fresh Water Quality Monitoring Program <table><tr><th>Sampling Location</th><th>Description</th><th>Frequency</th></tr><tr><td colspan="3">Domestic Wastewater</td></tr><tr><td>A Location 50m upstream of Discharge Points (1), (3), (4), (5) of (Mawit Creek, and Nagam River)</td><td>Control Site. Assess background water quality of Mawit Creek and Nagam River prior to contact with domestic wastewater</td><td>Monthly</td></tr><tr><td>A location 50m downstream of Discharge Points (2), (4), (5), (6)</td><td>Sampling Site. Assess effects of domestic & industrial wastewater quality after discharge.</td><td>Monthly</td></tr></table>	Sampling Location	Description	Frequency	Domestic Wastewater			A Location 50m upstream of Discharge Points (1), (3), (4), (5) of (Mawit Creek, and Nagam River)	Control Site. Assess background water quality of Mawit Creek and Nagam River prior to contact with domestic wastewater	Monthly	A location 50m downstream of Discharge Points (2), (4), (5), (6)	Sampling Site. Assess effects of domestic & industrial wastewater quality after discharge.	Monthly	The monthly Water Quality Monitoring is being conducted and considered as stipulated the approved EMP and also included in the AEP Report.	Compliant
Sampling Location	Description	Frequency													
Domestic Wastewater															
A Location 50m upstream of Discharge Points (1), (3), (4), (5) of (Mawit Creek, and Nagam River)	Control Site. Assess background water quality of Mawit Creek and Nagam River prior to contact with domestic wastewater	Monthly													
A location 50m downstream of Discharge Points (2), (4), (5), (6)	Sampling Site. Assess effects of domestic & industrial wastewater quality after discharge.	Monthly													
64	The Permit Holder shall carry out monthly monitoring on the flow rate of Mawit, Kimange (Uyenyo) and Urr-u Creeks to ensure that the water extraction rate does not reduce the volume of the surface water below the "base flow". An assessment of the ecological effects should be conducted where the flow rate of the surface water is 10% higher than the base flow.	Monthly monitoring is being conducted to ensure the water extraction rate does not reduce the volume of the surface water below the "base flow", considering the occurrence of a heavy longer rainy season in the area.	Compliant												
Reporting															
65	The Permit Holder shall submit an Environmental Performance Report to the Director at the end of each calendar year. The report shall include but not limited to - <table><tr><td>(a) raw data (analysis by certified laboratories) from the effluent and water quality monitoring programs,</td></tr><tr><td>(b) interpretation of raw data,</td></tr><tr><td>(c) incidence of non-compliance and reasons, and</td></tr><tr><td>(d) status of compliance with the Waste Management Plan and other conditions of this permit.</td></tr></table>	(a) raw data (analysis by certified laboratories) from the effluent and water quality monitoring programs,	(b) interpretation of raw data,	(c) incidence of non-compliance and reasons, and	(d) status of compliance with the Waste Management Plan and other conditions of this permit.	Despite the delay in the construction of the sawmill plant, Environmental Management and monitoring proceeded across all other operational aspects in according with permit conditions and the approved EMP.	Compliant								
(a) raw data (analysis by certified laboratories) from the effluent and water quality monitoring programs,															
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ANNUAL

Environmental Performance Report

LOCATION MAP