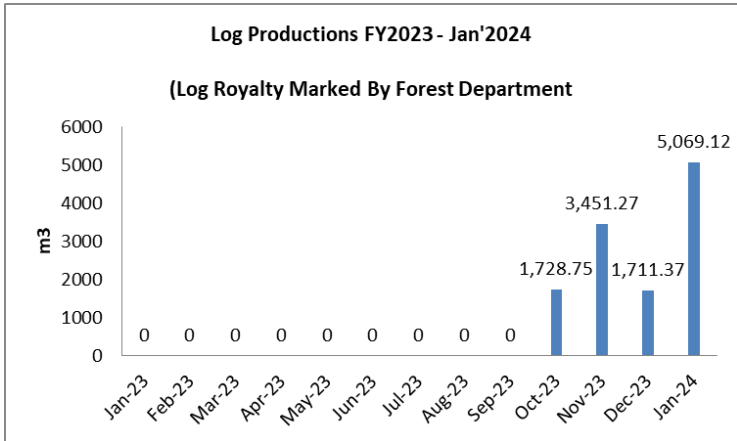
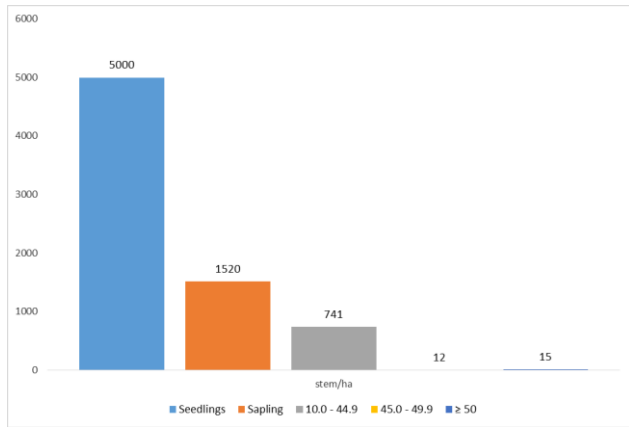


Penuan-Lebuwai FMU (T/3370)

Summary of Monitoring Results on
Timber Yield and Forest Conditions

Item	Particulars	Data Source(s)	Interim Results/Remarks
1	Yield of Forest Products	Royalty Volume	 <ul style="list-style-type: none"> Net log production for October – December 2023 was about 6,891 m³; followed by about 5,069 m³ for January 2024. Only timber was produced. There is no commercial production of other forest products during this period.
2	Forest Regeneration	<p>To-date, a total of 23 Permanent Sample Plots (PSP) has been established – as stratified by i) terrain classes; ii) timber stocking density; and iii) soil series.</p> <p>The number of PSP within the FMU is to be increased gradually.</p> <p>Reassessment, however, has not been conducted.</p>	<ul style="list-style-type: none"> Regeneration of seedlings and saplings conforms to the <i>Reverse J-curve</i> (Whitmore and Burnham, 1984) (Figure 1). <p>Figure 1: Average stand population distribution (<i>n</i>/ha) by diameter classes in T/3370 – derived from the established 22 PSP.</p> 
3a	Condition of the Forest	The analyzed data to-date has been derived from the established 22 PSP.	<ul style="list-style-type: none"> The stand density in the harvestable range was lower than the primary forest; but comparable with other logged-over forest in Peninsular Malaysia (Heng, 2000) and Sarawak (Heng, 2013). Non-Dipterocarps were significantly more than Dipterocarps in the lower diameter classes. The adoption of SFM and continuous good RIL practice are vital to timber resource sustainability.
3b	Condition of the Forest	Eight (8) Post-harvest Diagnostic Sampling Plots (DSP) have been established and enumerated.	<ul style="list-style-type: none"> The analysis is on-going; and thus, the status of post-harvest forest stocking is unknown.
4	Growth Rate	To-date, re-assessment of PSP	<ul style="list-style-type: none"> The MAI was determined based on cross comparison with the stand condition of Bahau-Kahei FMU (T/3236), which is adjacent to FMU

		has not been done, due to the fact that those 22 PSP have been established recently.	T/3370 and shared similar ecological environment. <ul style="list-style-type: none"> It is reasonably presumed that there is no substantial difference in the environmental factors; therefore, FMU T/3370 shall adopt the MAI of 1.0 m³/ha/year to project growth and yield, until more PSP are established progressively and re-assessment is carried out in the future. 																																																																																												
Item	Particulars	Data Source(s)	Interim Results/Remarks																																																																																												
5	Composition and Observed Changes of Flora and Fauna	<p>Flora: Sourced from 22 PSP; Chapters 2, 8 and 10 of FMP for FMU T/3370.</p> <p>Fauna: Sourced Monitoring of High Conservation Value for Penuan-Lebuwai FMU (T/3370), Jaya Tiasa Holdings Bhd., December 2023.</p>	<ul style="list-style-type: none"> Information on the composition of flora and fauna shall form the baseline at this stage paving way for future monitoring. <p>Flora:</p> <ul style="list-style-type: none"> The total number of enumerated flora species (<i>i.e.</i> trees) was 380; which was further segregated into timber groups and growing conditions (Table 1). <p>Table 1: Total number of enumerated flora species (<i>i.e.</i> trees) in T/3370 and segregated into timber groups and growing conditions.</p> <table border="1"> <thead> <tr> <th colspan="4">Total Number of Trees Species Enumerated</th> </tr> <tr> <th colspan="4">380</th> </tr> <tr> <th colspan="2">Dipterocarp</th> <th colspan="2">Non-dipterocarp</th> </tr> <tr> <th colspan="2">75</th> <th colspan="2">305</th> </tr> <tr> <th>Light-demanding</th> <th>Shade-tolerant</th> <th>Light-demanding</th> <th>Shade-tolerant</th> </tr> </thead> <tbody> <tr> <td>51</td> <td>24</td> <td>274</td> <td>31</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Across all DBH classes (≥ 10.0 cm), Non-Dipterocarp is dominant than Dipterocarp (Table 2). <p>Table 2: Average stand density, basal area and gross volume by DBH classes and timber groups based on enumerated 22 PSP.</p> <table border="1"> <thead> <tr> <th rowspan="2">Timber Group</th> <th colspan="3">Parameters</th> </tr> <tr> <th>stems (n/ha)</th> <th>Basal Area (m²/ha)</th> <th>Volume (m³/ha)</th> </tr> </thead> <tbody> <tr> <td>Dipterocarps</td> <td>168</td> <td>8.42</td> <td>140.93</td> </tr> <tr> <td>Non-Dipterocarps</td> <td>482</td> <td>17.96</td> <td>257.69</td> </tr> <tr> <td>Total</td> <td>650</td> <td>26.38</td> <td>398.62</td> </tr> </tbody> </table> <p>Fauna:</p> <p>A. Observed changes of Forest Fauna (Mammals)</p> <ul style="list-style-type: none"> Our wildlife survey on November 2023 has identified a total of 18 of mammal species in Coupe 01A (post-harvesting) detected via camera trapping method. Seventeen (17) or 94.4% species fall under RTE species; WLPO, IUCN and CITES. Calculation of the indices between present with the past survey yielded different result as summarized in the table below:- <table border="1"> <thead> <tr> <th colspan="7">ESTIMATION OF POPULATION DYNAMICS</th> </tr> <tr> <th>YEAR</th> <th>JUL 2018</th> <th>2019</th> <th>2020</th> <th>SEP 2021</th> <th>SEP 2022</th> <th>NOV 2023</th> </tr> <tr> <th>INDEX</th> <th>BASE</th> <th>PRE-H</th> <th>PRE-H</th> <th>PRE-H</th> <th>PRE-H</th> <th>POST-H</th> </tr> </thead> <tbody> <tr> <td>H'</td> <td>1.69</td> <td>-</td> <td>-</td> <td>1.43</td> <td>1.91</td> <td>2.45</td> </tr> <tr> <td>E_H</td> <td>0.26</td> <td>-</td> <td>-</td> <td>0.40</td> <td>0.48</td> <td>0.45</td> </tr> <tr> <td>D_S</td> <td>0.25</td> <td>-</td> <td>-</td> <td>0.28</td> <td>0.17</td> <td>0.12</td> </tr> <tr> <td>D_M</td> <td>1.99</td> <td>-</td> <td>-</td> <td>1.69</td> <td>2.50</td> <td>3.15</td> </tr> </tbody> </table> <ul style="list-style-type: none"> In overall, statistical analysis for the population of mammals for the present survey in November 2023 has characterized high species diversity with high species richness and evenness detected if compared to previous and baseline data. Interestingly, the data was taken after logging in Coupe 01A. Pig-tailed Macaque has record the highest individual detected with 	Total Number of Trees Species Enumerated				380				Dipterocarp		Non-dipterocarp		75		305		Light-demanding	Shade-tolerant	Light-demanding	Shade-tolerant	51	24	274	31	Timber Group	Parameters			stems (n/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)	Dipterocarps	168	8.42	140.93	Non-Dipterocarps	482	17.96	257.69	Total	650	26.38	398.62	ESTIMATION OF POPULATION DYNAMICS							YEAR	JUL 2018	2019	2020	SEP 2021	SEP 2022	NOV 2023	INDEX	BASE	PRE-H	PRE-H	PRE-H	PRE-H	POST-H	H'	1.69	-	-	1.43	1.91	2.45	E _H	0.26	-	-	0.40	0.48	0.45	D _S	0.25	-	-	0.28	0.17	0.12	D _M	1.99	-	-	1.69	2.50	3.15
Total Number of Trees Species Enumerated																																																																																															
380																																																																																															
Dipterocarp		Non-dipterocarp																																																																																													
75		305																																																																																													
Light-demanding	Shade-tolerant	Light-demanding	Shade-tolerant																																																																																												
51	24	274	31																																																																																												
Timber Group	Parameters																																																																																														
	stems (n/ha)	Basal Area (m ² /ha)	Volume (m ³ /ha)																																																																																												
Dipterocarps	168	8.42	140.93																																																																																												
Non-Dipterocarps	482	17.96	257.69																																																																																												
Total	650	26.38	398.62																																																																																												
ESTIMATION OF POPULATION DYNAMICS																																																																																															
YEAR	JUL 2018	2019	2020	SEP 2021	SEP 2022	NOV 2023																																																																																									
INDEX	BASE	PRE-H	PRE-H	PRE-H	PRE-H	POST-H																																																																																									
H'	1.69	-	-	1.43	1.91	2.45																																																																																									
E _H	0.26	-	-	0.40	0.48	0.45																																																																																									
D _S	0.25	-	-	0.28	0.17	0.12																																																																																									
D _M	1.99	-	-	1.69	2.50	3.15																																																																																									

			<p>27.4% species composition, followed by Long-tailed Porcupine (10.0%) and Long-tailed Macaque (9.1%). There was a presence of RTE species, new record to the FMU; which is Marbled Cat (<i>Pardofelis marmorata</i>) with 0.5% species composition.</p> <ul style="list-style-type: none"> • Sign of recovery on the population of Bearded Pig also presence in the FMU, where the first sight was in Block 30, Coupe 01A. After a long decades of its presence since ASF breaking in the FMU, since July 2020. There also a good sign of recovery where the numerous of piglets following their mother crossing our camera trap in Block 29, Coupe 01A, dated 10 November 2023. Species composition for Bearded Pig is 4.1%. <p><u>B. The Population of Hose’s Langur (<i>Presbytis hosei</i>) in Apan Burung (HCV no. SL0001/01) Apan Bangat (SL0002/01) and Apan Sado (HCV no. SL0003/01).</u></p> <ul style="list-style-type: none"> • Our wildlife survey in November 2023, via camera trapping on HCV area, the Salt-licks; Apan Burung, Apan Bangat and Apan Sado has identified a total of 9 species of mammal species inhabit the area. Hose’s Langur has recorded the highest species composition than others; 41.6% composition or 91 individual detected within a period of 2 months, followed by Sambar Deer and Malayan Porcupine. • Other species such as Malayan Sunbear, Binturong and Banded Civet were observed crossing our camera trap without licking mineral on the salt-licks. <p><u>Evaluation</u></p> <ul style="list-style-type: none"> • No major issues arise from logging operation on the population of mammals in Coupe 01A and the Salt-licks.
--	--	--	---

Item	Particulars	Data Source(s)	Interim Results/Remarks
6	Environmental Impacts of Forest Operations	<p>At FMU level → <i>HCVF Assessment Report</i>.</p> <p>At operational level → <i>Environmental Compliance Audit (ECA) Report</i>, made under the NRE (Audit) Rules, 2008 covering on:</p> <ol style="list-style-type: none"> Biodiversity conservation; Forest harvesting operations; Control of soil erosion and sedimentation; Protection of water quality; Waste disposal management; and Abandonment plan. 	<ul style="list-style-type: none"> • HCV attributes 1 – 4 identify the environmental aspects complete with appropriate mitigation measures (Figure 2) and their levels of implementation are been described in the HCV monitoring report. It also follows <i>Guideline 5 of The Green Book</i> (FDS, 2019a). <p style="text-align: center;">Figure 2: The ‘<i>SOP on Monitoring HCV Attributes</i>’ at FMU level.</p> <div data-bbox="1050 1429 1222 1697" data-label="Image"> </div> <ul style="list-style-type: none"> • Internal Audit for FMU T/3370 – against <i>MC&I SFM</i> – has been conducted on 13th – 16th July 2020; followed by Verification Audit on 9th – 11th December 2020). The latest Internal Audit was conducted on 29th Nov - 1st Dec 2023 (Figure 3). The summary of audit findings is as shown in Table 5; and follow-up actions shall be taken to address the non-compliances. <p>Figure 3: A picture showing cover pages of Internal Audit and that were made available in 2023.</p>

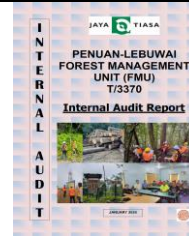
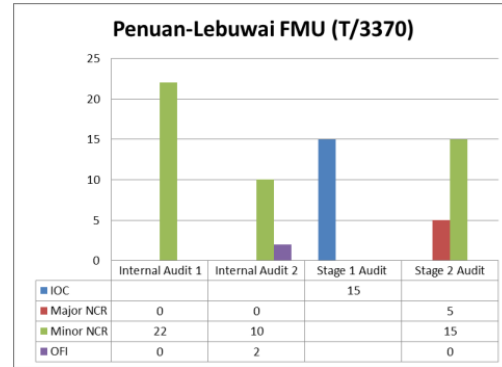
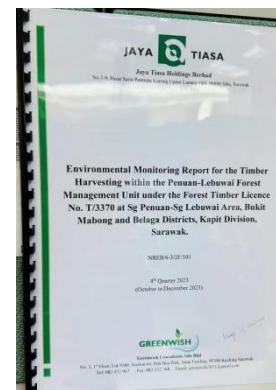


Table 5: The summary of audit findings for T/3370.



- The latest EMR for FMU T/3370 was conducted in October - December 2023 (Figure 4). No major pollution has been detected and the water quality was found to be good.

Figure 4: The EMR for T/3370 (Q4; 2023).



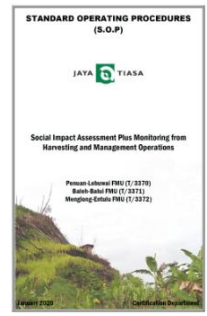
- In the active coupe, road density at 3.8 m/ha and skid trail density at 64.7 m/ha are within the permissible limits, i.e. below the 10 m/ha – 13 m/ha (road density) and 80 m/ha – 90 m/ha (skid trail density), respectively. In addition, the 20-m width of Stream Buffer Reserve (SBR) has also been demarcated on both banks of permanent waterways (Guideline 10A of *The Green Book* (FDS, 2019b)) and *RIL Guidelines* (FDS, 2021)).

Item	Particulars	Data Source(s)	Interim Results/Remarks
7	Social Impacts of Forest Operations	<p>At the FMU level:</p> <ul style="list-style-type: none"> HCVF Assessment Report; and Social Impact Assessment (SIA) Report <p>At the operational level:</p> <ul style="list-style-type: none"> <i>Environmental Monitoring Report (EMR)</i>; covering locals and forest workers on: 	<ul style="list-style-type: none"> HCV attributes 5 – 6 identifying the basic needs and cultural values of the local communities in Long Busang, Long Jawe and Sang Anau-Long Bulan. These settlements, however, are situated outside of the FMU with mere presence of SA – been established by Long Busang and Long Jawe at this stage. Sang Anau-Long Bulan has been engaged after a separate dialogue held on 22nd March 2022, establishing itself as the origin of Long Bulan that has been inundated under Bakun HEP (<i>Item #3 in HCV 5 of 'Public Summary (for) Penuan-Lebuwai FMU (T/3370): Summary of Identified High Conservation Value (HCV) Attributes'</i>). In SIA (conducted in July and August 2023 at Long Busang, Long Jawe, Sang Anau and Long Bulan (<i>Asal</i>) settlements) four key impacts comprising water supply and qualities, livelihood, air and

- Occupational Safety and Health (OSH);
- Road and River Traffic Safety; and
- Socio-Economic Consideration.
- Internal audit.

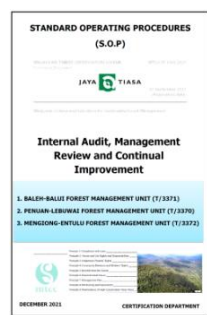
- noise pollution and social cultural life were studied:
- Out of the 4 key impacts, water supply and qualities and livelihood (forest resources) were identified as major social impacts;
 - Water supply and quality
 - There is no significant impact on community's water catchment at Long Busang, Long Jawe, Sang Anau and Long Bulan (*Asal*). All the water catchment is now well safeguarded for potable and other daily usage.
 - From river - Based on the output, the river quality is not affected in all settlements; however, the locals are less dependent on water supply from river for their daily usage.
 - Livelihood – all of these communities were depend on the natural produce for their livelihood. Level of negative impact from forest operations towards supply of natural produce is low and the impacts mostly from previous logging operations. Competition for the forest resources from outsiders due to better accessibility by road;
 - Some degree of siltation has also occurred from previous harvesting activities, but it has not caused disruption to the river transportation by locals for conducting farming mostly along the river; and
 - FMU shall monitor the major impacts once in every five years, *i.e.* based on the *SOP on SIA (Figure 5)*.

Figure 5: The 'SOP on SIA plus Monitoring from Harvesting and Management Operations' at FMU level.



- In addition, the annual internal audit shall be conducted, *i.e.* based on the *SOP on Internal Audit, Management Review and Continual Improvement (Figure 6)*.

Figure 6: The 'SOP on Internal Audit, Management Review and Continual Improvement' at FMU level.



- To-date, the SA areas for both Long Busang and Long Jawe are yet to be demarcated. In addition, cultural sites and water catchment areas are located outside of the FMU area.
- To safeguard the basic needs of the local communities, the FMU has already put the RIL practices in place.
- The CRC has been established and endorsed by FDS; with the 1 – 3 meetings to-date; acting as one of the channels for FPIC process. Until now, no major issue has been encountered.

			<ul style="list-style-type: none"> The FMU has strived to prioritize the employment for the local communities from Long Busang, Long Jawe, Sang Anau and Long Bulan (<i>Asal</i>). To-date, the FMU is currently employs 10 local people as surveyor, logging and dump truck operators; mechanics; log scalers; store assistant and production assistant. On CSR to the affected communities, the FMU has made contributions in various forms. It includes the regularly maintained road leading to Long Busang and also other contributions to benefit the community. The FMU has met all of the OSH as stipulated under OSHA, 1994: <ul style="list-style-type: none"> Health, Safety and Environment (HSE) Policy has been communicated to all employees through training and displayed the policy at notice board at several designated locations; risk assessment has been conducted for all main and support operations in the FMU and documented in the HIRARC register; Safety Operation Procedures (SOP) and training programs for all type of works have been disseminated to forest workers; Safety and Health Committee (SHC) has been set up to discuss on HSE-related matters regularly; Emergency Response Team (ERT) has been established to assist and prepare for any unforeseen circumstances; and hazardous areas with proper signages at the work sites have been identified and demarcated.
8	Forest Protection		<ul style="list-style-type: none"> The FMU Production Area has been encroached for farming purposes – especially by some members of the Long Busang community, due to easy access via logging road. The case has been reported to FDS and remedial actions have been drawn up and shall be implemented in stages.
9	Productivity and Efficiency of Forest Management		<ul style="list-style-type: none"> The productivity of Pre-harvest team was between 6 – 7 mandays/ha. Timber harvest productivity was approximately 130 m³/day, as harvest disruption was affected by various factors such as harvest delay/suspension, machinery breakdown, manpower shortage, etc. The FMU shall extend similar study into other areas such as PSP and DSP establishment and re-assessment; including boundary demarcation and/or monitoring, etc.; and to produce useful figures for more accurate cost control.
10	Cost of Forest Management		<ul style="list-style-type: none"> About RM5.4 million (or RM793.50/m³) was allocated for the effective implementation of RIL practices for Financial Year (FY) 2023, inclusive of research and development and training, which are fundamental in SFM. For FY 2024, the proposed budget allocation is about RM16.5 million (or RM659.50/m³).

References

- FDS. 2019a. Guideline 5: Guidelines for monitoring of High Conservation values. Pp. 127 – 133. In *The Green Book: Manuals, Procedures and Guidelines for Forest Management Certification in Sarawak (Natural Forest)*. Management and Planning Division, Forest Department Sarawak. 284 p.
- FDS. 2019b. Guideline 10A: RIL for ground-based harvesting system (Part 1). Pp. 215 – 244. In *The Green Book: Manuals, Procedures and Guidelines for Forest Management Certification in Sarawak (Natural Forest)*. Management and Planning Division, Forest Department Sarawak. 284 p.
- HCVRNS. 2017. *Baseline Information of Status and Population Dynamics of Mammal, Avifauna and Herpetofauna Species in Timber License No. T/3370, Penuan-Lebuwai FMU, Kapit Division, Sarawak*. December 2017. High Conservation Value Resource Network, Sarawak. 61 p.
- Heng, R.K.J. 2000. *An Estimate of Primary Productivity in Ayer Hitam Forest Reserve*. Master of Science Thesis. Universiti Putra Malaysia. 292 p.
- Heng, R.K.J. 2013. *Structure, Biomass and Carbon Assessment of Chronosequence Rehabilitated Tropical Forest Stand*. Ph.D. Thesis. Universiti Putra Malaysia. 262 p.
- Whitmore, T.C. and C.P. Burnham. 1984. *Tropical Rain Forests of the Far East*. Second Edition. ELBS. 352 p.

This document has been updated on 23rd February 2024 (Friday).