CHAPTER 2 : TERMS OF REFERENCE OF EIA STUDY

2.1 INTRODUCTION

The Term of Reference is proposed as part of preparation of an Environmental Impact Assessment (EIA) for the "**Proposed Rubber Forest Plantation On Parts Of Compartment 126, 131 & 132 (Block 1) And Parts Of Compartment 125, 126, 131 &132 (Block 2) With An Area Of 1,600.00 Hectares (3,953.67 Acres) At Piah Forest Reserve, District Of Hutan Kuala Kangsar, Perak Darul Ridzuan".**

Project Proponent	:	HANAMURNI SDN. BHD. (Company No.: 471715-T)
Mailing Address	:	B-04-02, Tingkat 4, No. 42, Persiaran Greentown 1, Greentown Business Centre, 30450, Ipoh, Perak Darul Ridzuan.
Contact Person	:	Yong Kit Mun
Position	:	General Manager
Telephone	:	012 – 916 3133

2.2 LIST OF CONSULTANTS/STUDY TEAM

Details of the Environmental Consultant as follow:

Environmental Consultant	: ECA-Environmental Consultant Agencies
Mailing Address	: C-11-24, Kompleks Suria Kinrara, Taman Kinrara Seksyen 3, 47100 Puchong, Selangor Darul Ehsan.
Contact Person	: Rosli Omar
Position	: Manager
Telephone	: 019 – 361 5581
Fax	: 03 – 8070 3883

The list of Study Team is as in **Table 2.1.**

Table 2.1: Study Team

No.	Name	Qualifications
1.	**Loh Tong Loy** - General Environmental Management - Traffic Study Reg. No.: C0018 Valid Date: December 2020	*B. Sc (Hons) (Biochemistry)* *M.Sc (Information Technology)*
2.	**Ir. Muhammad Akhir Othman** - Coastal Engineering Reg. No.: CS0285 Valid Date: July 2019	*B. Sc (Civil Engineering)* *M. Eng (Hydraulics and Coastal)*
3.	**Noor Harniza Binti Haris** - Ecological Studies - Air Quality & Odour - Water Quality - General Environment Management Reg. No.: C0347 Valid Date: November 2018	*B.Sc Applied Science (Hons) Biology* *M. Sc Environment Management*
4.	**Hung Yee Hon** - Quantitative Risk Assessment - Air Quality - Noise - Hydrology Reg. No.: C0096 Valid Date: March 2019	*B. Eng (Civil and Structure)* *M. Env. Management*
5	**Mohd Shah Wahid Haji Othman** - Economic Evaluation - Social Impact Assessment Reg. No.: SS0523 Valid Date: April 2018 (Under Renewal)	B.S. Forestry M.S. (Resource Management & Policy) M.A. Economics PhD (Resource Management & Policy)

2.3 SCOPE OF PROJECT

Section 34(A) of the Environmental Quality (Amendment) Act 1985 states that any person intends to carry out any of the prescribed activities shall need to submit an Environmental Impact Assessment (EIA) report to the Director General of the Department of Environment (DOE) to be endorsed before any approval for carrying out such activity can be granted by the relevant approving authority.

Project proponent for this proposed project is Hanamurni Sdn. Bhd.. The project proponent had gained logging approval from Jabatan Perhutanan Negeri Perak for rubber forest plantation on parts of compartment 126, 131 & 132 (block 1) and parts of compartment 125, 126, 131 & 132 (block 2) with an area of 1,600.00 hectares (3,953.67 acres) at Piah Forest Reserve, District of Hutan Kuala Kangsar, Perak Darul Ridzuan. Approval letter from Jabatan Perhutanan Negeri Perak is attached in **Appendix 1-F** (Ref: PPN.Pk.(S)800/9/8(1) dated on 26 March 2014).

The Project proponent had submitted the application to Jabatan Kemajuan Orang Asli (JAKOA) Perak and Kedah regards in identify the water resources for the nearby Orang Asli Settlements which might be affected by the proposed rubber forest plantation operation. Letter to JAKOA Perak and Kedah is attached in **Appendix 2-A**.

Meanwhile, Project proponent had also submitted the application to Tenaga Nasional Berhad (TNB) Ipoh regards to identify intake station for Projek Hydro Sungai Piah which located about 3km southwest from the project site. Project Proponent will take account of the water intake station for the Project Hydro Sungai Piah which might be affected by the proposed rubber forest plantation operation. Letter to Tenaga Nasional Berhad (TNB) Ipoh is attached in **Appendix 2-B**.

The proposed Project falls under Second Schedule, Prescribed Activity 5(d) and 5(e) according to the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. Second Schedule, Prescribed activity:

- 5(d) refers to "FORESTRY: Logging, or cutting or taking of timber covering an area of 500 hectares or more.
- 5(e) refers to 11 FORESTRY: Development of planted forest covering an area of 500 hectares or more".

Thus, the development of this project requires the approval of the Department of Environment (DOE) before it can be granted the permission to proceed.

As for this project is concerned, six (6) species of TLC have shortlisted for planting and they are; PB 350, RRIM 926, RRIM 929, RRIM 2025, RRIM 2027 and RRIM 3001. The main criteria for the choice of clones are the high latex and wood potential of the clones. Apart from good latex yield, these clones also have good stem form, branching and crown structure as well as resistance to pest and wind damage. To maximize on latex and timber yield based on the performance of the 6 clones, the rotation cycle is fixed at 25 years but may varies depending on market conditions and demand for both latex and timber at that time. In addition to the 6 shortlisted clones other recommended TLC clones may also be planted depending on availability of planting stocks and suitability.

2.4 ALTERNATIVES CONSIDERATIONS

The proposed Project is located on parts of Compartment 126, 131 & 132 (Block 1) and parts of Compartment 125, 126, 131 & 132 (Block 2) with an area of 1,600.00 Hectares (3,953.67 Acres) at Piah Forest Reserve, District of Hutan Kuala Kangsar, Perak Darul Ridzuan. The proposed Project is situated on the valley ground of surrounded high hills where the highest level is 890 m above mean sea level (MSL) and the lowest level is 190 m above mean sea level (MSL). Most of the proposed Project land is covered with forest trees.

Pos Gapeh and Sekolah Kebangsaan Pos Piah are lies about 2 km southwest and 2.8 km southern from the proposed site, respectively. Kampung Lalang is situated approximately 2.5 km southwest from the proposed site. Meanwhile, Kampung Chat and Kampung Kekabu are

located about 3 km southwest and 3.75 km southwest from the proposed Project site. Ladang Tasik Kenering is located about 5 km northwest from the proposed site. Sekolah Kebangsaan Pos Poi (Sungai Siput Utara) is located about 8.8 km southeast from the proposed site. Lenggong is located about 25 km western from the proposed Project site. Sungai Siput and Taiping are situated approximately 35 km southern and 56 km southwest from the proposed Project site, respectively. Thus, the proposed Project is seen to be compatible with the existing landuse.

The proposed Project site can be accessed via existing main road, Jalan Lenggong-Gerik and the turning into junction of proposed access road to the proposed Project site. It is approximately 25 km before reaching the proposed Project site.

The profile of the surrounding developments shows that the concept of timber latex clone plantation would contribute to economic upgrading and usage of the area, In addition to the principal attraction of an environmental-friendly development. Therefore, the proposed Project is the best option available from the environmental and economic viewpoints.

2.5 SIGNIFICANT ENVIRONMENTAL IMPACTS TO BE STUDIED

In general, the potential environmental impacts from the project may be categorized into and discussed separately under the following stages of development.

2.5.1 Impacts during Investigation Stage

The main activity during the investigation stage is the prospecting and geological exploration study and the Environmental Impact Assessment (EIA). Exploration stage normally requires mobilisation of manpower and equipment involving the movement of vehicles, primarily along the existing roads. During the actual exploration, the main activities are as follow:

- Field reconnaissance
- Surveying and mapping

Site specific investigation requires limited establishment of access tracks and paths and the stationing of equipment and personnel at locations throughout the study site for limited period of time, all these activities involve the use of light and portable equipment and tools, which can be easily transported to the site. Small clearings and narrow rentises in the primary vegetation are also required for field reconnaissance and surveying purposes. In a hot and humid climate, it normally takes only a few months for an abandoned clearing to be recolonised by the vegetation.

Any clearing activities and the noise associated with these activities shall not impose disturbance to the wildlife and localised destruction of the floral habitat. Such impacts are localised as the area concerned is indeed small if compared to the whole proposed area. Thus, no major adverse impact has been identified for this stage of development. On contrary, some minor beneficial impacts such as short-term employment and business opportunities are indicated. Business opportunities for the local community are materialised through the provision of supplies and services to the study teams.

To enhance local participation and socio-economic benefits to the local people, the proponent shall endeavour to engage local labour for unskilled and semi-skilled jobs, with the aim of developing a core group of employees for the TLC plantation activities. Wherever possible, supplies and services will be sourced locally to maximise local business and subcontracting opportunities.

2.5.2 Potential Impacts Initial Site Preparation Stage

Initial site preparation stage shall involve several main activities, which may have potential impacts on environment. The activities are as follows:

i. Clearing

- Boundary demarcation and positioning
- Access road, internal roads and transport
- Base camp
- Site clearing/ Logging
- Biomass disposal
- Earthworks activities
- Benching and terracing
- Drainage and culvert installation
- Irrigation works and water storage facilities
- Erosion controls
- Surfacing and paving
- Barrier and fence
- Labour forces
- Utilities

ii. Site/Land Preparation

- Preparation of planting holes
- Nursery
- Cover crops
- Construction of rain shelter
- Transportation/ machinery
- Agrochemical application
- Shortage of materials
- Waste disposal and recovery

Potential impacts from these activities are:

- Soil erosion - **3**; and associated sediment pollution - **2**; due to site clearing and earthwork activities.
- Hydrological changes - **2**; increase of runoff due to clearing of existing vegetation.
- Water pollution - **3**; shall be due to exposed soil during earthworks and agrochemical application.
- Groundwater - **1**; shall be due to no cover plant on ground.
- Air pollution - **1**; potential pollution from machinery.

- Noise pollution - **2**; noise from heavy machinery and equipment on workers.
- Socio-economic impacts - **A**; in terms of employment and business opportunities.
- Generation of wastes - **3**; these majority involve biomass wastes.
- Ecology - **3**; since changing of natural environment.
- Flora and fauna - **3**; major depletion due to land clearing activities.

2.5.3 Potential Impacts during Crop Introduction/Planting Stage

The scope of activities during this stage shall include the following:

- Irrigation and drainage
- Farming technique
- Selection of planting material
- Fertilizer application
- Labour forces
- Planting/ transplanting
- Pest disease and weed control
- Waste disposal and recovery
- Product handling and storage
- Transportation and traffic

Potential impacts from these activities are:

- Soil erosion - **1**; and associated sediment pollution - **1**; upon cover crop growth.
- Hydrological changes - **A**; proper irrigation and drainage.
- Water pollution - **2**; fertilizers and pesticides application.
- Groundwater - **A**; raise of water table upon growth vegetation cover.
- Air pollution - **N**; potential pollution from transportation activities.
- Noise pollution - **N**; minor machinery application.

- Socio-economic impacts - **B**; employment of major permanent workers.
- Generation of wastes - **1**; only general refuse and agrochemical wastes.
- Ecology - **A**; return of vegetation on the ground.
- Flora and fauna - **A**; flora and fauna already common for the area.

2.5.4 Potential Impacts during Crop Maintenance Stage

The crop of trees and surrounding will include the following activities:

- Weeding
- Pest and disease control
- Desilting and clearing of drain
- Fertilization
- Structure maintenance
- Pruning
- Waste disposal
- Irrigation schedule

Potential impacts from these activities are:

- Soil erosion - **N**; and associated sediment pollution - N; growing trees become a canopy to the ground.
- Hydrological changes - **N**; the ground already cope with the new environment.
- Water pollution - **2**; due to application of fertilizers and pesticides.
- Groundwater - **N;** unless of improper usage of agrochemical application.
- Air pollution - **N**; no activities creating the pollution.
- Noise pollution - **N**; minor machinery and equipment used.
- Socio-economic impacts - **A**; in terms of continuity of employment and business opportunities.

- Generation of wastes - **1**; only general refuse and agrochemical wastes.
- Ecology - **A**; growing trees development.
- Flora and fauna - **N**; flora and fauna already common for the area.

2.5.5 Potential Impacts during Harvesting and Replanting Stage

Replanting will be carried out when the forest tree is old, tall and less productive which is approximately 25 years after planting. The harvesting (H) and replanting (R) stage shall cover the main activities such as followings:

- Collection of produce
- Transportation
- Clearing and felling
- Post-harvest field management
- Biomass management

Potential impacts from these activities are:

- Soil erosion - **N(H)**, **2 (R)**; and associated sediment pollution - **N(H)**, **2 (R)**; impact during replanting stage due to removal of trees vegetation.
- Hydrological changes - **N(H)**, **1 (R)**; due to temporary expose ground during replanting.
- Water pollution - **N(H)**, **2 (R)**; increased runoff due to temporary expose ground during replanting.
- Groundwater - **N(H)**, **1 (R)** minor and temporary during replanting.
- Air pollution - **N(H)**, **1 (R)**; involve minor number of machineries.
- Noise pollution - **N(H)**, **2 (R)**; noise from machinery and equipment for felling of trees and collection of biomasses.
- Socio-economic impacts - **B(H)**, **1 (R)**; in terms of continuity of employmentand generating income for harvesting.

- Generation of wastes - **1(H)**, **2 (R)**; these majority include biomass wastes, solid wastes and agrochemical wastes.
- Ecology - **A(H)**, **2 (R)**; since depletion of vegetation during replanting.
- Flora and fauna - **A(H)**, **1 (R)**; due to land clearing activities but some fauna can migrate to neighbouring land.

2.5.6 Potential Impacts during Crop Processing Stage

The scope shall cover the following main activities:

- Storage/ stockpiling
- Transportation

Potential impacts from these activities are:

- Soil erosion and sediment pollution - **N**; insignificant.
- Hydrological changes - **N**; insignificant.
- Water pollution - **1**; during stockpiling if proper drainage.
- Groundwater - **N**; insignificant.
- Air pollution - **2**; odour of scraps.
- Noise pollution - **2**; noise from transport and loading activities.
- Socio-economic impacts- **B**; income generation.
- Generation of wastes - **N**; insignificant.
- Ecology - **N**; insignificant.
- Flora and fauna - **N**; insignificant.

2.5.7 Potential Impacts during Abandonment Stage

Environmentally, reclamation and rehabilitation are perhaps the most important activities for the abandonment stage. It shall cover the following aspects;

- Exposed land
- Landscaping
- Retrenchment
- Removal of structures and machinery

Potential impacts from these activities are:

- Soil erosion and associated sediment pollution - **2**; on filled up area. However, once the tasks completed, impacts will be neutralised.
- Hydrological changes - **A**; as water table rise.
- Water pollution - **1**; during implementation of works.
- Groundwater - **A**; natural water return.
- Air pollution - **1**; during reclamation works. **B**; as the absence of dust generation and dispersion since the operation completed.
- Noise pollution - **1**; temporary noise from heavy machinery during works. **B**; as the absence of activity when Project wind down.
- Socio-economic impacts - **3**; due to stop of employment and business opportunities.
- Generation of wastes - **2**; if improper disposal occurs.
- Ecology - **N**; return to natural environment.
- Flora and fauna - **N**; decolonisation of new species.

2.6 STUDY BOUNDARIES

The proposed Project is located on parts of Compartment 126, 131 & 132 (Block 1) and parts of Compartment 125, 126, 131 & 132 (Block 2) with an area of 1,600.00 Hectares (3,953.67 Acres) at Piah Forest Reserve, District of Hutan Kuala Kangsar, Perak Darul Ridzuan. The proposed Project is situated on the valley ground of surrounded high hills where the highest level is 890 m above mean sea level (MSL) and the lowest level is 190 m above mean sea level (MSL). Most of the proposed Project land is covered with forest trees.

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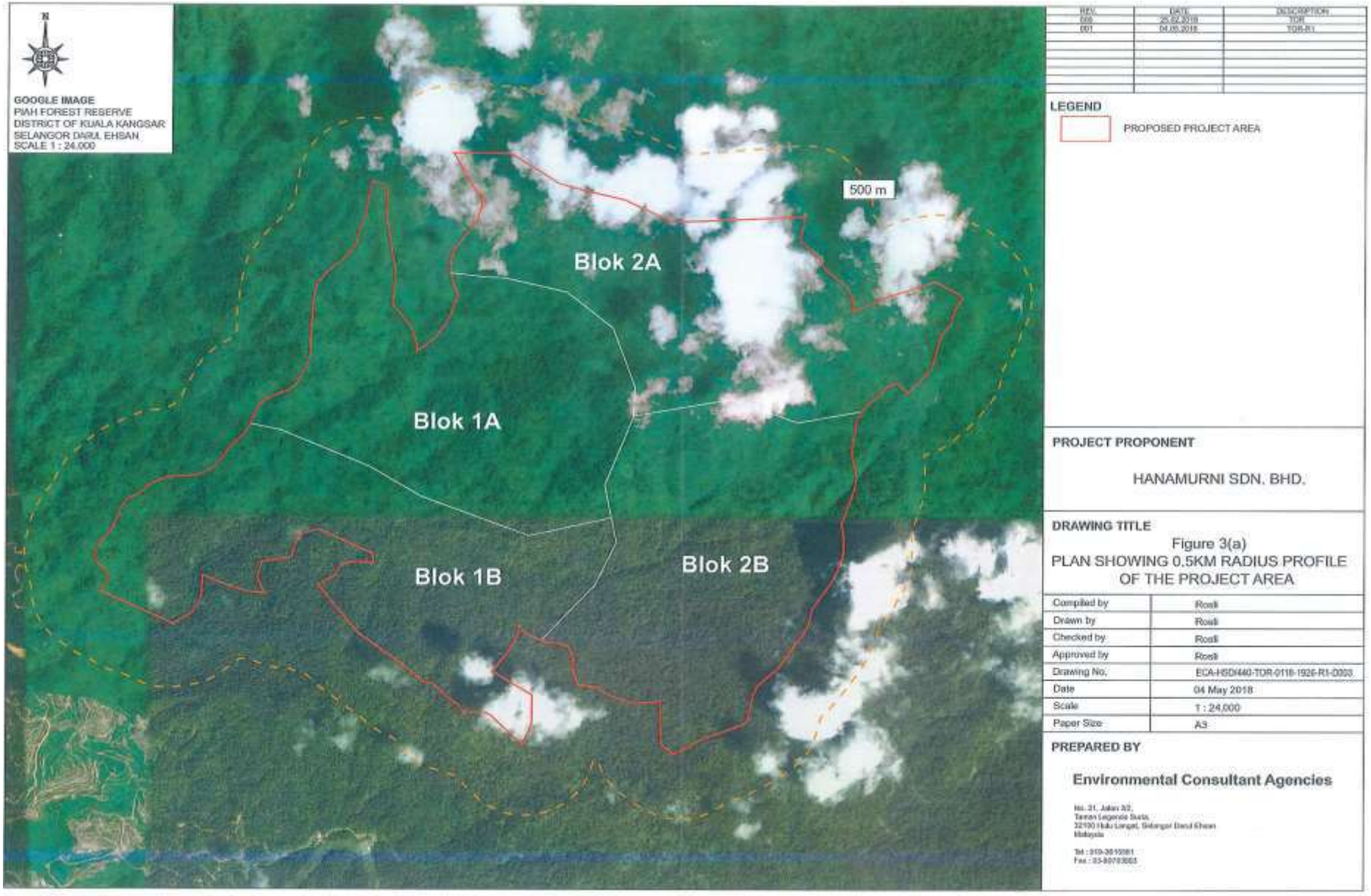
(Sungai Siput Utara) is located about 8.8 km southeast from the proposed site. Lenggong is located about 25 km western from the proposed Project site. Sungai Siput and Taiping are situated approximately 35 km southern and 56 km southwest from the proposed Project site, respectively. Thus, the proposed Project is seen to be compatible with the existing landuse.

The existing landuse profile within 500m radius of the Project site is summarised in **Table 2.2** and enclosed in **Figure 3(a)** is 500m radius plan from the proposed project site, meanwhile **Figure 3(b) and (c)** are 5km radius plan from the proposed project site.

Table 2.2: General Landuse Profile within the Project Site

Sector	Landuse Profile	
0 km – 0.5 km	North	Hilly area, Shrub and Bushes, Piah Forest Reserve
	Northeast	Hilly area, Shrub and Bushes, Piah Forest Reserve
	Northwest	Hilly area, Shrub and Bushes, Piah Forest Reserve
	South	Hilly area, Shrub and Bushes, Piah Forest Reserve
	Southeast	Hilly area, Shrub and Bushes, Piah Forest Reserve
	Southwest	Hilly area, Shrub and Bushes, Piah Forest Reserve
	East	Hilly area, Shrub and Bushes, Piah Forest Reserve
	West	Hilly area, Shrub and Bushes, Piah Forest Reserve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PROJECT PROPONENT
HANAMURNI SDN. BHD.
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Figure 3(a)
PLAN SHOWING 0.5KM RADIUS PROFILE OF THE PROJECT AREA
Compiled by
Rosli
Drawn by
Rosli
Checked by
Rosli
Approved by
Rosli
Drawing No.
ECA-HSD440-TOR-0118-1926-R1-0003
Date
04 May 2018
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Paper Size
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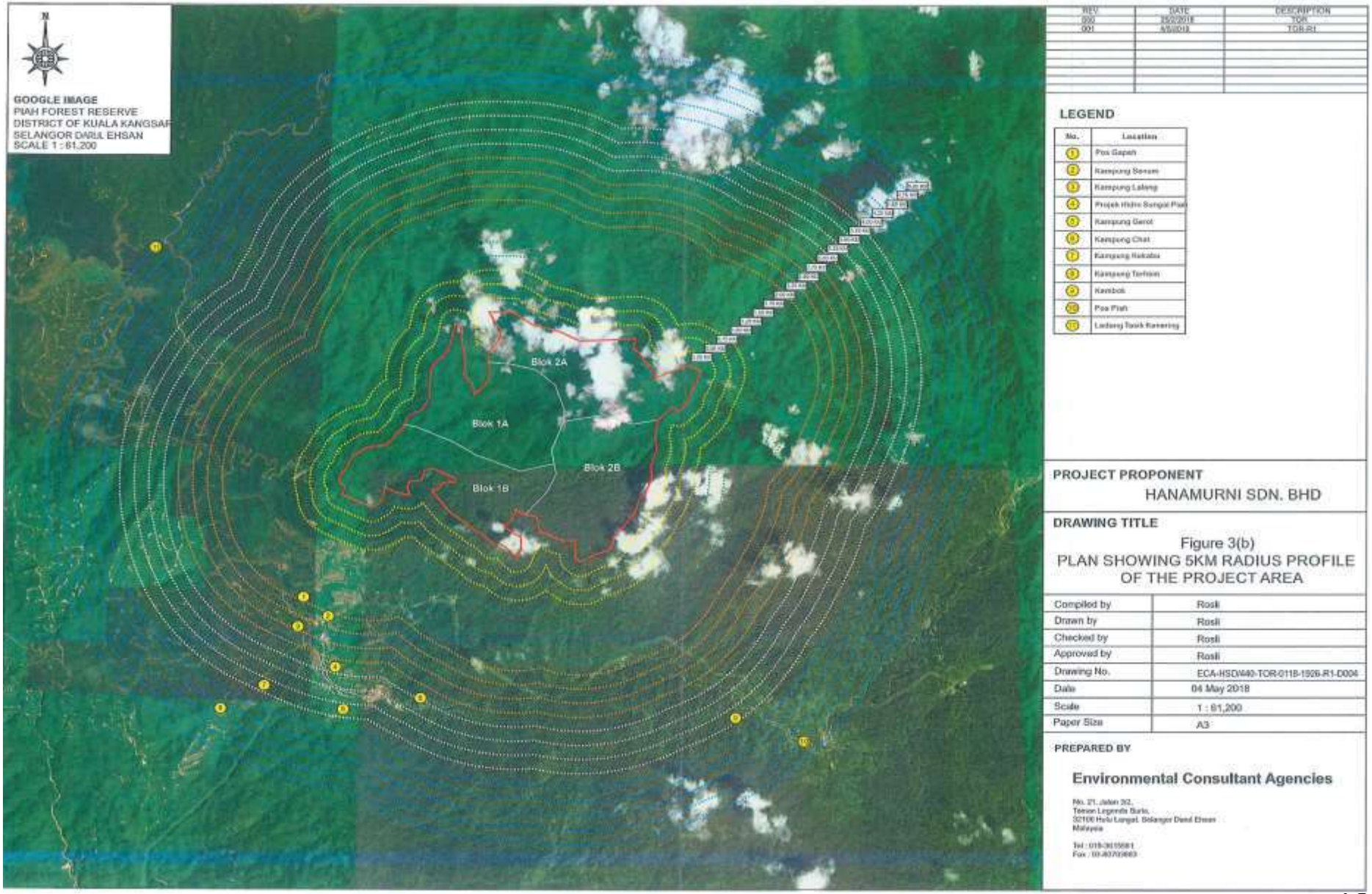
PREPARED BY
Environmental Consultant Agencies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DISTRICT OF KUALA KANGSAR
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SCALE 1 : 61,200
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000
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TOR
LEGEND
No.
Location
PROJECT PROPONENT
HANAMURNI SDN. BHD
DRAWING TITLE
Figure 3(b)
PLAN SHOWING 5KM RADIUS PROFILE OF THE PROJECT AREA
Compiled by
Rosli
Drawn by
Rosli
Checked by
Rosli
Approved by
Rosli
Drawing No.
ECA-HSDV440-TOR-0118-1926-R1-D004
Date
04 May 2018
Scale
1 : 61,200
Paper Size
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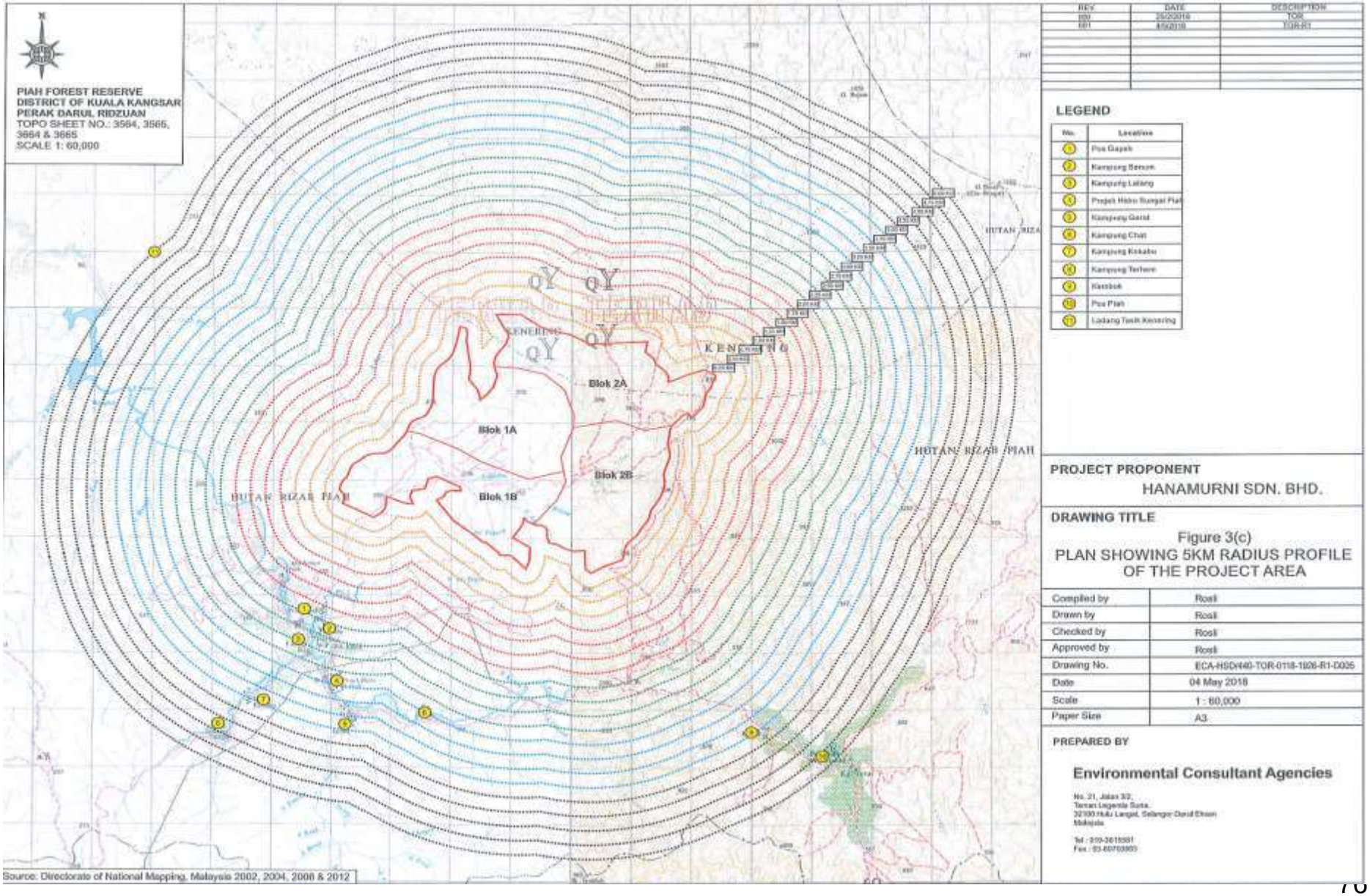
PREPARED BY
Environmental Consultant Agencies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DISTRICT OF KUALA KANGSAR
PERAK DARUL RIDZUAN
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SCALE 1: 60,000
Blok 2A
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HUTAN RIZAB PIAH
LEGEND
PROJECT PROPONENT
HANAMURNI SDN. BHD.
DRAWING TITLE
Figure 3(c)
PLAN SHOWING 5KM RADIUS PROFILE OF THE PROJECT AREA
Compiled by Rosli
Drawn by Rosli
Checked by Rosli
Approved by Rosli
Drawing No. ECA-HSDH40-TOR-0118-1806-R1-D026
Date 04 May 2018
Scale 1 : 60,000
Paper Size A3
PREPARED BY
Environmental Consultant Agencies
Source: Directorate of National Mapping, Malaysia 2002, 2004, 2008 & 2012

2.7 ASSESSMENT STANDARDS

2.7.1 Environmental Baseline Study

For the purpose of environmental impact assessment, sample for air, noise and water will be collected as baseline data.

2.7.2 Water Quality Sampling

Water samplings for this TOR purpose will be taken at thirteen (16) stations. The locations of sampling points are summarised in **Table 2.3**.

Table 2.3: Water Sampling Location

Sampling No.	Sampling Location	Coordinate
W1	Representing water quality level at tributary upstream of Sg. Poi	5°8’54.99” N 101°13’7.64”E
W2	Representing water quality level at tributary upstream of Sg. Sira	5°8’39.13” N 101°13’52.32”E
W3	Representing water quality level at tributary midstream Sg. Sira	5°8’22.34” N 101°14’24.43”E
W4	Representing water quality level at tributary downstream of Sg. Sira	5°7’58.27” N 101°14’8.74”E
W5	Representing water quality level at tributary of Sg. Poi	5°7’16.35” N 101°13’36.30”E
W6	Representing water quality level at tributary of Sg. Adu	5°6’55.16” N 101°13’11.30”E
W7	Representing water quality level at tributary of Sg. Rombai	5°7’14.57” N 101°12’56.82”E
W8	Representing water quality level at tributary of Sg. Rombai	5°7’9.00” N 101°12’37.26”E
W9	Representing water quality level at tributary downstream of Sg. Poi	5°7’34.63” N 101°12’16.00”E
W10	Representing water quality level at tributary downstream of Sg. Poi	5°7’2.02” N 101°11’47.85”E
W11	Representing water quality level at tributary midstream of Sg. Poi	5°8’10.93” N 101°12’45.58”E
W12	Representing water quality level at tributary upstream of Sg. Poi	5°8’25.51” N 101°13’11.90”E

W13	Representing water quality level at tributary upstream of Sg. Poi	5°8'32.70" N 101°12'50.57"E
W14	Representing water quality level at upstream of Sg. Poi	5°6'34.01" N 101°8'11.88"E
W15	Representing water quality level at upstream of Sg. Piah	5°6'44.78" N 101°7'14.14"E
W16	Representing water quality level at upstream of Sg. Piah	5°5'19.60" N 101°8'43.40"E

Water sampling and in-situ measurements will be carried out using a standard water sampler and in-situ meters. Non-conservatives and non-preservable parameters will be analysed in-situ during the sampling exercises. Samples for non-conservative but preservable parameters and other conservative preservable parameters will be acidified to pH 2 prior to analyses at the laboratory. The sample will be testing by accredited laboratory with the Standard Method is listed in **Table 2.4**. The testing result will be compared with the National Water Quality Standard **(Appendix 2-C).** The monitoring location plan is shown in **Figure 4**.

Table 2.4: List of Parameter with Standard Method of Testing

Parameter	Method
pH	APHA 4500-H+B
COD, mg/L	In-House Method, KR-LAB-TM02 (based on MN Method 985026; 985029; 985028, NANOCOLOR UV/VIS Spectrophotometer)
BOD_5 @ 20℃, mg/L	In-House Method, KR-LAB-TM01 (based on MN Method 985822, NANOCOLOR UV/VIS Spectrophotometer)
Suspended Solids, mg/L	APHA 2540 D
Oil & Grease, mg/L	APHA 5520 B
Ammoniacal Nitrogen, mg/L	In-House Method, KR-LAB-TM06 (based on MN Method 91805, MONOCOLOR UV/VIS Spectrophotometer)
Dissolved Oxygen, mg/L	APHA 4500 O, G
Mercury, mg/L	APHA 3112 – B
Cadmium, mg/L	APHA 3111 – B

Hexa-Chromium, mg/L	APHA 3500 – Cr -B
Arsenic, mg/L	APHA 3114 – C
Cyanide, mg/L	APHA 4500 – CN^-C, F
Lead, mg/L	APHA 3111 – B
Tri- Chromium	In House method No. 5 (based on APHA 3500-Cr B)
Copper, mg/L	APHA 3111 - B
Manganese, mg/L	APHA 3111 – B
Nickel, mg/L	APHA 3111 – B
Tin, mg/L	APHA 3111 – B
Zinc, mg/L	APHA 3111 – B
Boron, mg/L	APHA 4500 – B, C
Iron, mg/L	APHA 3111 – B
Phenol, mg/L	APHA 5530 – B, C
Free Chlorine, mg/L	APHA 4500 – Cl F
Sulphide, mg/L	APHA 4500 – S^{2-}, F

The rivers involved in this project are listed as **Table 2.5.**

Table 2.5: List of River Involved

No.	River Involved
1.	Sungai Sira
2.	Sungai Poi
3.	Air Terjun
4.	Sungai Relang
5.	Sungai Rombai
6.	Sungai Adu

2.7.3 Ambient Air Quality

The dust content within the Project site will be undertaken to determine the existing ambient dust content (PM10 and PM 2.5), S02, N02, CO and 03 in the air. Monitoring will be carried out at locations marked A 1, A2, A3, A4 and A5 as shown in **Figure 4** and **Table 2.6**. The ambient air monitoring parameter and its testing method is shown in **Table 2.7**. The monitoring will be carried out by accredited lab. The ambient air monitoring parameter shall comply with New Malaysian Ambient Air Quality Standards, 2013 as attached in **Appendix 2-D**.

Table 2.6: Ambient Air Monitoring Locations

Points	Sampling Location	Coordinates
A1	Project Boundary	5°7'4.66" N 101°11'50.84"E
A2	Pos Gapeh	5°6'16.57" N 101°11'25.01"E
A3	Kampung Lalang	5°6'0.30" N 101°11'18.19"E
A4	Kampung Kekabu	5°5'26.27" N 101°10'48.46"E
A5	Kampung Chat	5°5'18.28" N 101°12'18.13"E

Table 2.7: Ambient Air Monitoring Parameter and Testing Method

Parameter	Standard Method
PM_{10}	AS 2724.6 Determination of Particulate Matter 10µm (PM_{10}) – High Volume Sampler Gravimetric Method
$PM_{2.2}$	In house method – Air – Np.5 (Based on USEPA 40 CFR Part 50 Appendix L) Determination of Particulates matter 2.5 µm ($PM_{2.5}$) – Mini Vol TAS Portable Tactical Air Sampler Gravimetric Method
NO_2	ISC 408 Analysis for Atmospheric Nitrogen Dioxide, NO_2
SO_2	ISC 704 A Determination of Sulphur Dioxide SO_2 content of the atmosphere
CO	APHA 4210 – 07 – 74T Detector Tube Method
O_3	ISC 820 Determination of Ozone (O_3) Content of the Atmosphere

2.7.4 Environmental Noise Monitoring

Noise measurements will be carried out to assess the ambient noise level at the Project site using the Noise Logging Dosimeter. Noise levels will be measured at 5 locations (N1, N2, N3, N4 and N5) as shown in **Figure 4**. Noise levels will be measured twice during the daytime and one at nighttime. **Table 2.8** shows the monitoring location for ambient noise. The ambient noise monitoring parameter and its testing method is shown in **Table 2.9**. Calibration of the Sound Level meter will be conducted at the beginning and at the end

of each measurement. Microphone will be protected with a wind shield. The result shall be compared with DOE guideline for Maximum Permissible Sound Level (LAeq) by receiving land use for planning and new development as shown in **Table 2.10.**

Table 2.8: Environmental Noise Monitoring Location

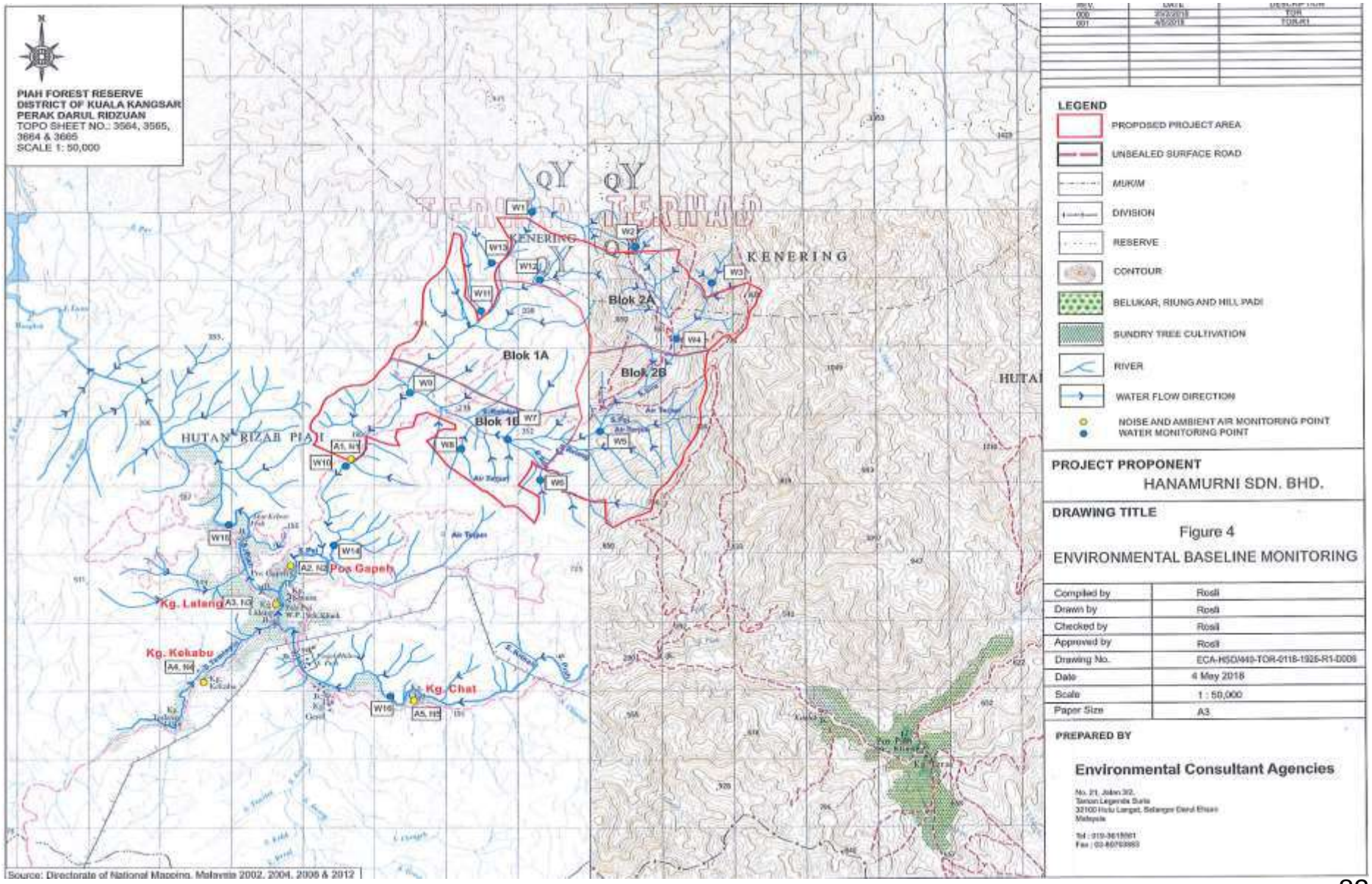
Sampling Ref.	Sampling Location	Coordinates
N1	Project Boundary	5°7'4.66" N 101°11'50.84"E
N2	Pos Gapeh	5°6'16.57" N 101°11'25.01"E
N3	Kampung Lalang	5°6'0.30" N 101°11'18.19"E
N4	Kampung Kekabu	5°5'26.27" N 101°10'48.46"E
N5	Kampung Chat	5°5'18.28" N 101°12'18.13"E

Table 2.9: Environmental Noise Monitoring parameter and testing Method

Parameter	Standard Method
L10, L50, L90 and Total Leq	Calibrated Class 1 noise Meter

Table 2.10: Maximum Permissible Sound Level (LAeq) by Receiving Landuse for Planning and New Development

Receiving Landuse Category	Day time 7.00am–10.00pm	Night time 10.00pm–7.00am
Noise Sensitive Areas, Low Density Residential, Institutional (School, Hospital), Worship Areas.	50 dBA	40 dBA
Suburban Residential (Medium Density) Areas, Public Spaces, Parks, Recreational Areas.	55 dBA	45 dBA
Urban Residential (High Density) Areas, Designated Mixed Development Areas (Residential – Commercial)	60 dBA	50 dBA
Commercial Business Zones	65 dBA	55 dBA
Designated Industrial Zones	70 dBA	60 dBA


PIAH FOREST RESERVE
DISTRICT OF KUALA KANGSAR
PERAK DARUL RIDZUAN
TOPO SHEET NO.: 3564, 3565, 3664 & 3665
SCALE 1: 50,000
Blok 1A
Blok 1B
Blok 2A
Blok 2B
KENERING
HUTAN BIZAR PIAH
Kg. Lalang
Kg. Kekabu
Kg. Chat
Pos Gapeh
LEGEND
PROPOSED PROJECT AREA
UNSEALED SURFACE ROAD
MUKIM
DIVISION
RESERVE
CONTOUR
BELUKAR, RIUNG AND HILL PADI
SUNDRY TREE CULTIVATION
RIVER
WATER FLOW DIRECTION
NOISE AND AMBIENT AIR MONITORING POINT
WATER MONITORING POINT
PROJECT PROPONENT
HANAMURNI SDN. BHD.
DRAWING TITLE
Figure 4
ENVIRONMENTAL BASELINE MONITORING
Compiled by Rosli
Drawn by Rosli
Checked by Rosli
Approved by Rosli
Drawing No. ECA-HSD/449-TOR-0118-1926-R1-0006
Date 4 May 2018
Scale 1 : 50,000
Paper Size A3
PREPARED BY
Environmental Consultant Agencies
Source: Directorate of National Mapping, Malaysia 2002, 2004, 2005 & 2012

2.7.5 Potential Impact Assessment

It shall attempt to identify and assess the equilibrium displacements that could be experienced by specific environmental receptors as a result of the activities that shall be carried out during all stages of the Project. Potential displacements are evaluated in terms of the extent and nature of changes induced (i.e. whether there are significant adverse or beneficial implications), and spatial coverage and temporal nature of the displacements. In order to facilitate these analyses, procedures related to the implementation and operations of the Project have been categorized into discrete activities.

Each Project activity will be individually scrutinized for its potential to induce shifts to the various component environmental equilibrium, or to interact with other activities to generate synergistic or antagonistic effects on selected environmental equilibrium. The principal findings generated from an assessment of each activity's potential to impact on a multi-faceted environment, encompassing physical, chemical, biological and human elements, are summarised in the form of an impact matrix. Descriptive details of each impact source, the corresponding nature of impact with or without mitigation measures, and the potential consequences on the environment are discussed and related to one another in the ensuing discussion.

The matrix is used to identify the potential environmental impacts that may occur during the various stages of development. In this EIA study, the nature of environmental impacts is categorised into six classes according to the level of significance and whether they are negative, positive or residual in nature. These are summarised in **Table 2.11.** The completed matrix for the present EIA study is shown in **Table 2.12**.

Table 2.11: Category of Impacts

Symbol	Impact Class
1	Minor adverse environmental impact
2	Moderate adverse environmental impact
3	Major adverse impact
A	Minor positive impact
B	Major positive impact
U	Potentially adverse, but insufficient information

N	Insignificant impact

Besides the impact assessment, this chapter shall also discuss the specific mitigating or abatement measures that shall be adopted by the Project Proponent in order to minimise or eliminate the potential significant impacts identified.

Table 2.12 : Environmental Impact Assessment Matrix

				PROJECT ACTIVITIES																	
				INVESTIGATION & CONSTRUCTION STAGE								OPERATION STAGE									
				Project Planning	Land Acquisition		Access & Haul Road Construction	Site Clearing	Biomass Disposal	Construction of Basic Facilities & Amenities such as temporary drainage, silt trap, etc.		Earthworks and Landscaping	Transportation and Usage of Haulage	Waste Generation (Solid, Sewerage, etc.)	On0Site Drainage	Workshop & Maintenance	Construction of Buildings and Amenities	Road Construction and Maintenance Activities	Final Construction Clean-Up	
ENVIRONMENTAL COMPONENTS	PHYSICO-CHEMICAL	SOIL	Erosion				3	3		1		2			A		2			
			Slope Stability				2	2		A			2		A		2			
			Soil Compaction				1	1		1		2					2		2	
			Loss of Topsoil				1	1		1		2								
		HYDROLOGY & DRAINAGE	Water Yield					3				3			3		3			
			Dry Season Flow																	
			Fluvial Erosion					3	3			3								

			Stormflow/ Flood Response					3	3			1				1		1		
		SURFACE WATER QUALITY	Sediment Load/ TSS				3	2		2		2	2		A		2	1		
			Chemical Quality					1	1	2			2	2	2	2				
			Biological Quality				1	1	3	2		2	2	2	2					
		GROUND WATER	Water Table Recharge					1				1	A		1					
			Ground water Quality											2		2	2			
		ATMOSPHERE	Local Climate						1			1								
			Noise				1	1		1		1	1			1	1	1	2	
			Air Quality				1	1	1			1	1			1	1	1	2	
	BIOLOGICAL	SPECIES & POPULATIONS	Terrestrial Flora				1	2				3		2			2			
			Terrestrial Fauna				1	2	1			3			1	2	1	1		
			Birds				1	1	1			1				1	1	1	1	
			Aquatic Flora				2	2				2		2						
			Aquatic Fauna				2	2				2		2						
		HABITAT & COMMUNITIES	Terrestrial Habitats				1	2				2		2			2			
			Terrestrial Communities				1	2				2				1	1	1	1	
			Aquatic Habitats				1	2				2		2						
			Aquatic Communities				1	2				2		2						
	HUMAN	HEALTH & SAFETY	Physical Safety/ Health						1							2	1		2	
			Physical Well-being		3												1			
			Communicable Disease											2						

		SOCIAL & ECONOMICS	Business & Employment	A			A	A	A	A		B			A	A	B	A	B	
			Forest Resources		3		1	3												
			Aquatic Resources				1	2				2		2						
			Transport/ Infrastructure				A			A							B			
		AESTHETIC & CULTURAL	Landscape				3	1				3	3				3			
			Sense of Community		3															
			Tranquillity & Peace				3	3								3			3	
			Traditional Lifestyle		3															

2.8 TIMELINE OF STUDIES

The timeframes are established and used administratively, as targets. The steps and target timeframes are provided in **Table 2.13**. The timeframes are indicative only, except where they reflect a statutory requirement.

Table 2.13 : Timeline of Studies

<table>
<tr><td></td><td colspan="4">April</td><td colspan="4">May</td><td colspan="4">June</td></tr>
<tr><td>Assigned to</td><td>1</td><td>2</td><td>3</td><td>4</td><td>1</td><td>2</td><td>3</td><td>4</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>ECA</td><td colspan="2">TOR Write Up</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>DOE</td><td></td><td></td><td colspan="5">TOR Endorsement</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Laboratory</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Env. Monitoring</td><td rowspan="8">Overview of Report</td><td></td><td></td><td></td></tr>
<tr><td>Loh Tong Loy</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Project Description & Traffic Study</td><td rowspan="7">Public Display & Public Comments</td><td></td><td></td></tr>
<tr><td>Ir Muhammad Akhir Othman</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Water Quality Assessment</td><td></td><td></td></tr>
<tr><td>Hung Yee Hon</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Soil Erosion and Sediment Control & Hydrology</td><td></td><td></td></tr>
<tr><td>Noor Harniza Haris</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Flora and Fauna Study</td><td></td><td></td></tr>
<tr><td>Mohd Shah Wahid Haji Othman (Prof)</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Social Impact Assessment</td><td></td><td></td></tr>
<tr><td>ECA</td><td></td><td></td><td></td><td></td><td></td><td colspan="5">Compilation of Report</td><td colspan="2">Submission of Report</td></tr>
<tr><td>Hanamurni Sdn Bhd</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Review of Report</td><td></td></tr>
</table>

2.9 CONSIDERATIONS OF CONCURRENT PROJECTS

The proposed Project is located on parts of Compartment 126, 131 & 132 (Block 1) and parts of Compartment 125, 126, 131 & 132 (Block 2) with an area of 1,600.00 Hectares (3,953.67 Acres) at Piah Forest Reserve, District of Hutan Kuala Kangsar, Perak Darul Ridzuan. The proposed Project is situated on the valley ground of surrounded high hills where the highest level is 890 m above mean sea level (MSL) and the lowest level is 190 m above mean sea level (MSL). Most of the proposed Project land is covered with forest trees. Thus, the environmental impact assessment will be taken into accounted the cumulative impacts of the proposed plantation.

2.10 MODELLING TOOLS, ASSESSMENT METHODOLOGIES

The proposed potential sources of impact during the project activities may include fugitive dust emissions from construction of building and infrastructure, vehicle movements and windborne erosion.

Vehicular movement within the site will result in the degradation of air quality due to dust and smoke. The low surface wind will also minimise the amount of dust from being blown to the surround areas. Moreover, the Project site is located nearby forest and at a good distance from the existing residential area; the impact to the latter will therefore be insignificant.

2.10.1 Traffic Impact Assessment

The primary impact of concern is the ingress and egress of transportation vehicles from Project site into the existing road. Any new development will generate additional trips that will impact prevailing levels of traffic demand. Traffic impact assessment (TIA) enables one to evaluate if existing roads can cope with this additional trips and if necessary, recommend mitigation measures necessary to satisfy the anticipated levels of demand. The objectives of the traffic impact assessment are:

a) To examine the existing traffic volumes of roads surrounding and near to the Project site;
b) To determine the capacities of the roads;
c) To forecast the generated traffic volumes due to the Project;
d) To ascertain the impacts of generated traffic volumes onto the existing traffic influence area; and
e) To identify mitigation measures to minimise the traffic impact due to the Project

The current traffic condition in the vicinity of the proposed Project site will be studied and the traffic impact due to the Project will be evaluated using forecasts of traffic volumes in the impact area from collected traffic data and projected vehicle trips generated by the Project and other developments in the region. The Signalised Intersection Design Research Aid (SIDRA) model is used to determine degree of road capacity saturation average time delay and level of service (LOS) of the road facilities. Reference is made to the Highway Capacity Manual (HCM) (1985) and JKR Arahan Teknik (1987).

The inputs to the SIDRA model are:

a) Total vehicle volume;
b) Volume of heavy vehicle;
c) Uninterrupted speed;
d) Lane width ;
e) Lane discipline;
f) Number of approach lanes;
g) Number of adjacent exit lanes;
h) Median width;
i) Movement description and turn designation; and
j) Minor (opposed) and priority (unopposed) movements.

The outputs from the model are:

i. Total vehicle volume;
ii. Volume of heavy vehicle; and
iii. Uninterrupted speed.

LOS is an overall parameter that describes the operational condition of a traffic stream. It incorporates useful traffic indicators such as speed and travel time, freedom of manoeuvre, traffic interruptions, comfort, convenience and safety. The degree of saturation (v/c) is an important parameter for traffic capacity analysis. Being a ratio of traffic volume to road capacity, it is therefore dependent on several factors such as the number of lanes, width and adjacent interruption of traffic flow. The principal objective of capacity analysis is to estimate the maximum traffic carrying capacity for various sections of the road network. The average delay (v/s) is a parameter that indicates the travel condition of a vehicle in the traffic stream. The longer the average delay time, the less comfortable is the ride.

2.10.2 Land Disturbing Pollution Prevention and Mitigation Measures (LDP2M2)

When land clearing activities are being undertaken, the potential for soil erosion by hydrological forces and subsequent sediment pollution will be greatly increased. These hazards will be most when the vegetative cover has been removed and the exposed soils are further disturbed. Therefore, erosion and sedimentation control purpose are to ensure minimum or no direct water discharge into any of the nearby natural water courses. The surface runoff from the working area is being channelled into the temporary drainage system and subsequently to the sedimentation pond built in place, before finally discharge.

The drainage design and proposed silt traps shall be designed in accordance to Urban Stormwater Management Manual for Malaysia 2012 (Manual Saliran Mesra Alam 2) produced by Jabatan Pengairan dan Saliran, Malaysia. Working areas are protected by perimeter bund and perimeter drain from external flow, thereby limiting erosion and sedimentation problem in the area. The erosion and sedimentation problem are contributed by discharge of sediment laden water generated after the sand washing and eroded sediments carried by stormwater runoff.

The followings Best Management Practices (BMPs) shall be carried out prior to the physical commencement of site clearing works:-

- Construction of temporary site access, construction of interlocking pavements, wash through and hoarding along perimeter of the site.
- Construction of temporary earth drain, and earth dykes, temporary drainage and outfall structures and associated works.
- To implement stockpile management
- Vehicle, equipment area, materials storage area
- Minimum site clearing.

i. Soil Erosion Modelling

- **Universal Soil Loss Equation (USLE)**

Significant advances have been made in our knowledge of the mechanics of soil erosion and the interrelationships between the erosion processes. As a result, some form of soil erosion modelling may predict the anticipated amount of soil erosion. There are a few predictive models that could be used, but the most widely used and perhaps the most reliable method is based on the so-called Universal Soil Loss Equation (USLE) (Wischmeier and Smith, 1962). The USLE predicts soil loss as a function of six factors, each of which may be calculated and expressed numerically. It is represented by the equation below:

E = R.K.L.S.C.P **(Equation 1)**

Where,
E : Mean Annual Soil Loss
R : Rainfall Erosivity Index
K : Soil Erodibility Index
L : Slope Length Factor
S : Slope Steepness Factor
C : Vegetation/Cover Factor
P : Soil Conservation Practice Factor

The rainfall erosivity index, R is actually a compound index of rainfall kinetic energy and the maximum 30-minute rainfall intensity. The values for all storm events have to be summed to obtain the annual value. The computation is therefore lengthy and requires comprehensive rainfall records from autographic gauges. Therefore, R factor can be refer to **Figure 3.10**: Rainfall erosivity Map for Perak State (Guideline for Erosion and Sediment Control in Malaysia, DID 2010). Since this project site is located at District of Hutan Kuala Kangsar Perak, the rainfall erosivity factor is,

R = 14,000 MJ.mm/ha/yr

Where,

P (mm) : Mean Annual Rainfall

I_{30} : Maximum 30-minute rainfall intensity = 75 mm/hr

For the present modelling exercise, the annual rainfall of **Lubok Merbau Meteorological Station** is used.

Soil erodibility; K defines the resistance of the soil to both detachment and transport. In the absence of empirical value, the K factor of a soil is usually determined on the basis of percent sand, percent silt plus very fine sand, percent organic matter, soil structure and permeability. Limited information is available on the erodibility of Malaysian soils. For this modelling exercise, an average K value of 0.051 is used.

The factors of slope length (L) and slope steepness (S) are normally combined into a single index, LS. The appropriate value may be obtained from the following equation:

$$\mathbf{LS = (0.065 + 0.045S + 0.0065S^2) \times (L/22.13)^n} \qquad \textbf{(Equation 2)}$$

Where L is in meter and S is in percent. The slope gradient within the project site is in range of 10° up to 40°. In the present modelling exercise, slope 40° is considered in the worst-case scenario and an average slope length of 50 meters was assumed. The vegetation/ cover factor, C represents the ratio of soil loss under a given crop or vegetation cover for that from bare soil. For bare soil, C is 1.0. In forested areas, C is 0.001-0.002 with undergrowth, and 0.01-0.10 without undergrowth (Morgan, 1986).

The soil conservation practice factor, P is the ratio of soil loss where contouring is practiced to that where it is not. When the soil is plowed up and down the steepest slope with no soil conservation measure, P is 1.0. In construction site application, P reflects the roughening of the soil surface by tractor treads or by rough grading, raking or disking. The effect of contouring is not independent of the slope factor, so that different P values are obtained for the different slope gradient (Wischmeier and Smith, 1978). Terracing and contour ridges effectively change the slope characteristics. The best procedure then is to use the same P value for contouring and then adjust the LS value according to the spacing between the terraces.

- **The Modified Universal Soil Loss Equation (MUSLE)**

The Modified Universal Soil Loss Equation (MUSLE) is perhaps the most frequently used equations for sediment yield estimation. It is developed by Williams (1975) to calculate sediment yields of a catchment as a result of a specific storm event. This empirical relationship is expressed by the following equation for individual storm events:

$$\mathbf{Y = 89.6\ (VQ_p)^{0.56}\ (K.L.S.C.P)} \qquad \textbf{(Equation 3)}$$

Where,

Y : Sediment yields per storm event (tonnes)
V : Runoff volume in cubic meter
Q_p : Peak discharge in m^3/s

The peak discharge is related to the rainfall intensity and catchment area via the Rational Method:

$$\mathbf{Q = (C.\mathit{i}.A)/360} \qquad \textbf{(Equation 4)}$$

Where,

Q : Peak flow (m^3/s)
C : Runoff coefficient
i : Average rainfall intensity (mm/hr)
A : Drainage area (ha)

- **Slope Analysis**

The slope gradient map is used as a reference in the field survey and also used to produce essential maps such as erosion map, landform map, construction suitability map and engineering geological map. Since there is no permanent structure in the project site, thus, there is no crucial to carry out Geology Terrain Mapping. Therefore, the slope gradient map and contour map will be proceeding in EIA stage to ensure there is no development at project site that consist of slope more than 40°.

ii. Ecology Studies

The secondary data for the ecology studies were obtained from Jabatan Perhilitan Negeri Perak. The principal objectives of this Study are to:

- Establish the existing terrestrial flora and fauna database within the proposed site;
- Provide pertinent information and analysis on the nature, extent and severity of potential environmental impacts during different phases of the Project; and
- Recommend mitigation measures for minimizing potentially adverse environmental impacts to acceptably low levels

If required by others department, the ecology study shall include the flora inventory/ listing based on ground observation method and plotting method. Estimation of the biomass generation for each plot and the whole area of the site. Finding of the flora survey, which includes identification of protection status (protected, endemic, etc. based on IUCN Red List); assessment of possible impacts based on project development phase and recommendation of suitable mitigation measures. Other than flora study, flora survey shall include with the fauna inventory/ listing based on direct and indirect method (including trapping method). Finding of the fauna survey, which includes identification of protection status (endangered, protected, etc. based on IUCN Red List and Malaysian Wildlife Conservation Act); assessment of possible impacts based on project development phase and recommendation of suitable mitigation measures.

iii. Methodology of Flora

The survey outcomes shall in terms of inventory list of recorded flora and the estimation of the biomass from the plant covers. The survey shall conduct by using two methods:

- **Ground Observation**

The flora survey shall conduct by randomly exploring the Project area and listing all existing plants. Observed plants shall record, identify and photography.

- **Plot Enumeration**

One 20 m x 20 m plot shall establish and subdivided into 4 sub-plots at every 10 m interval. Each sub-plot shall have a dimension of 10 m length x 10 m width. The plot shall cover an area of 0.04 ha (20 m x 20 m). The plot lines shall measure by using 30 m measuring tape, marker pole, inclinometer and Leica Disto 08 Laser Rangefinder. Coordinates for the plot center shall record by using Garmin GPS 60 CSx. Bearing for each plot markers shall determine by using prismatic compass during plot establishment.

At every sub-plot, all trees 5 cm DBH (diameter at breast height) shall enumerate, measure and identify. DBH of recorded trees shall be measured by using 2 m Lufkin Executive Thinline Diameter Tape at 1.3 m above ground level. Leica Disto 08 Laser Rangefinder shall be used to measure tree height and shall be attached to Manfrotto Tripod to minimize error in readings.

iv. Methodology of Fauna

The presence of the vertebrate species in the Project area will be made based on direct and indirect evidences.

- **Direct observation**

Direct visual observations shall make either with unaided eyes or aided with a pair of binoculars. This method is suitable for birds

especially the airborne ones and diurnal mammals. The DSLR camera and telescopic lens shall use for taking photographs.

- **Indirect evidence**

Indirect evidence in the field will be based on the following observations:

- ✓ Foot prints
- ✓ Faecal pellets, faeces or dung
- ✓ Nests
- ✓ Wallowing pools or sites
- ✓ Well-worn trails/ animal paths
- ✓ Odour or scent for certain animals
- ✓ Carcass
- ✓ Bedding sites
- ✓ Feeding traces
- ✓ Aural observations especially birds and certain calling mammals
- ✓ Interview with locals
- ✓ Literature reviews

v. Social-Economic Study

Any development Project when implemented will certainly impose certain impacts, whether positive or negative, and disturbances on the people, especially those who are located AROUND and WITHIN the Project site. In determining the impacts of the proposed Project, all existing inhabitants located within the Zone of Influence were investigated in the socio- economic impact assessment study.

This study encompasses various aspects of the socio-economic environment of the affected region, defined as Zone of Influence, which includes the existing community structure; economic base, employment/unemployment; distribution of income; goods and services; utilities; recreation; public health and safety; cultural peculiarities, aspirations and attitudes will be explored. It also includes public perception of the proposed development which may vary according to community structure. The Zone of Influence is an

area encompassed within the 3 km radius from the proposed Project site identified for the purpose of assessing the impacts resulting from the Project implementation.

The main objectives of this Socio-Economic Impact Assessment can, thus, be summarised as follow:

- To study the existing socio-economic environment of the inhabitants living within the Project's Zone of Influence
- To assess the perceptions and opinion of the inhabitants living within the said Zone of Influence on the potential impacts of the Project during preparation and during its implementation on the socio-economic environment of the affected region
- To make the assessments of the impacts of the Project on the inhabitants and socio- economic environment as a result of its implementation
- To suggest the mitigating measures that could be adopted in order to minimise the negative impacts during the preparation and the implementation of the proposed Project.

Subsequent to this study a summary of the assessment will be made whilst taking into consideration that the development Project will:

- Minimises the potential negative impact on the affected population
- Provides the most socio-economic benefits to the society at large.

The application of sample survey technique to collect the data requires the construction of a special questionnaire to be administered on the respondents in order to capture the primary data which will then be analysed using SPSS package. The locations are identified based on the distance from the Project site and on the assumptions that they will be able to provide the necessary data to be analysed.

vi. Water Quality Assessment

Rubber Forest Plantation involves land clearing which can lead to soil erosion and sedimentation. Surface runoff will flow into nearby rivers, thus degrading the water quality in water bodies surrounding the plantation area. The proposed rubber forest plantation is located within six (6) rivers; Sg. Sira, Sg. Poi, Air Terjun, Sg. Relang, Sg. Adu and Sg. Rombai. Those rivers will eventually join up to Sg. Poi to flow into the Sg. Piah. It is anticipated that the surface runoff from rubber forest plantation will be discharged into Sg. Poi and Sg. Piah.

The objectives of the water quality study are:

- To assess the existing water quality conditions at the project area and its surroundings.
- To assess the potential water quality impacts from the proposed rubber forest plantation including impact to surrounding water intakes.
- To propose possible mitigation measures if required.

The scope of works shall include the following:

Stage 1: Field measurement, data collection and analysis of environmental parameters to serve as the model inputs.

Stage 2: Carry out hydrological and hydraulic analysis, extensive water quality modelling simulation works to predict the impacts from the proposed rubber forest plantation.

Stage 3: Result appraisal and impact assessment including impacts to water intakes.

Stage 4: Mitigation measures, report writing and documentation.

- **Stage 1 - Primary and Secondary Data Collection**

Relevant data shall be obtained through primary and secondary data collection. Field surveys shall be conducted to measure river cross sections, river flow rate and water quality parameters to establish detailed spatial and temporal baseline condition at the vicinity of the project site. In addition, site visit shall be conducted to observe and comprehend the existing environmental conditions surrounding the

project site, such as identifying environmental sensitive areas (ESAs). Desktop study as well as information request from relevant authorities shall be carried out to gain secondary data to compliment the collected primary data (eg. rainfall data, past water quality studies, existing drainage layout).

River Cross Sections

River cross section survey shall be carried out along Sg. Sira, Sg. Poi, Air Terjun, Sg. Relang, Sg. Adu , Sg. Rombai, Sg. Piah in the EIA stage.

Water Sampling

Water samples shall be collected along the rivers to comprehend in-situ baseline conditions. **Table 2.14** show the sixteen (16) water sampling points (WQ1 - WQ16). Water samples shall be collected continuously for 3 days during spring and neap tides; each day the samples shall be collected once at high tide and once at low tide. The water samples shall be collected from mid depth only using a dedicated water sampler. The collected samples shall then be delivered to an accredited laboratory for further analyses. Parameters such as Dissolved Oxygen (DO), salinity and pH will be measured in-situ while the parameters listed in **Table 2.15** wilt be analysed at the laboratory.

Table 2.14 : Coordinate of Water Quality Sampling Stations

W	Latitude (N)	Longitude (E)
W1	5° 9' 3.7476"	101° 13' 15.834"
W2	5° 6' 48.9852"	101° 11' 41.2728"
W3	5° 7' 57.972"	101° 12' 37.4256"
W4	5° 8' 27.8808"	101° 13' 11.7372"
W5	5° 8' 31.92"	101° 12' 47.844"
W6	5° 6' 25.4628"	101° 11' 47.2956"
W7	5° 8' 15.828"	101° 9' 42.4656"
W8	5° 5' 37.788"	101° 14' 7.4004"

W9	5° 8' 39.2784"	101° 14' 6.8352"
W10	5° 8' 18.0276"	101° 14' 34.872"
W11	5° 7' 48.2736"	101° 14' 16.6668"
W12	5° 7' 18.7572"	101° 13' 45.0264"
W13	5° 6' 52.182"	101° 13' 32.2392"
W14	5° 7' 21.63"	101° 12' 51.3972"
W15	5° 7' 43.7196"	101° 14' 43.584"
W16	5° 7' 37.524"	101° 12' 20.3292"

Table 2.15 : Parameters to be Analyse in the Laboratory

No.	Parameter
1	Biochemical Oxygen Demand (BOD)
2	Chemical Oxygen Demand (COD)
3	Total Suspended Solids (TSS)
4	Ammonia (NH_3)
5	Aluminium
6	Iron
7	Arsenic
8	Mercury
9	Cadmium
10	Lead
11	Nickel

- **Stage 2 - Numerical Modelling**

Water quality impact assessment from the proposed project will be conducted using numerical modelling. The modelling work shall be carried out using lnfoWorks RS or Deltares Sobek software.

Hydrodynamic Modelling

First, hydrodynamic model shall be conducted to derive the flow pattern of the rivers to serve as the base for water quality model. The hydrodynamic model shall be setup, calibrated and verified before being coupled with the water quality model. The setup of hydrodynamic model would require the input of river cross-section

data and inflow input. The inflow data of normal flow and low flow condition shall be derived from recorded rainfall and streamflow data.

Water Quality Modelling

The calibrated hydrodynamic model shall be coupled with the water quality model. The collected water quality data shall be use as the baseline input and calibration for the water quality modelling. Water quality parameters that shall be included in the model simulation are Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Ammonia, Aluminum, Iron, Arsenic, Mercury, Cadmium, Lead and Nickle.

The water quality modelling scenarios would be modelled during normal flow and low flow. The scenarios to be modelled are as follows:

- ✓ Scenario 1: Baseline condition
- ✓ Scenario 2: During normal flow with treated discharge effluent
- ✓ Scenario 3: During low flow with treated discharge effluent
- ✓ Scenario 4: During low flow with tailing pond failure

- **Stage 3 - Impact Assessment**

The baseline condition shall form the reference for the water quality impact predictions. The impacts from the proposed project to the rivers including water intake stations shall be assess by evaluating the end results of all modelled scenarios to the established water quality standards and guidelines set by DOE. Violation of set standards and guidelines shall be determined. The adopted standards and guidelines are of those mentioned next page.

The river water quality study shall be prepared in accordance with the following references:

- ✓ National Water Quality Standards for Malaysia (INWQS)
- ✓ National Standard for Drinking Water Quality

- **Stage 4 - Mitigation Measures**

Based on the impact assessment, appropriate mitigation measures shall be recommended if required. Situation where mitigation measures will be needed are when the predicted water quality violates the standards and guidelines set by DOE.

2.11 POSSIBLE MITIGATION MEASURES

The potential environmental impacts from the Project and possible mitigation measures are summarised in **Table 2.16.**

Table 2.16: Possible Mitigation Measures

Impact	Sources of Impact	Pollution Prevention and Mitigation Measures (P2M2)
Dust Pollution	Construction	• Frequent spraying of water on the exposed surface especially during dry seasons. • Regular spraying the entrance and exit points of the site. • Traffic controls such as speed limits and traffic volume restrictions to reduce dust churned up by vehicles. The recommended speed is not exceeding 30 km/h along the haulage road. • Transport of earth and materials should be confined to non-peak hours, if possible. • The burning of plant debris and other construction wastes is prohibited. A warning sign board must be erected to send the message across at all time. • Proper maintenance and frequent servicing of vehicles to reduce exhaust fume emissions. • Carry out dust monitoring programme.
Noise	Development	• The machinery used should also be properly checked and maintained at optimum operating conditions. All

		machinery should be shut down when not in use. • Overall noise level emitted from the transportation of the construction equipment and materials to be controlled by routing all construction vehicles to routes that will cause minimum disturbance. • Any complaints from nearby residents should be immediately attended to and actions taken. • Impose and enforce a speed limit on all vehicles moving within the project site for example at max of 30 km/h. • Maintain natural buffer zones to attenuate the noise impact. • Carry out noise monitoring programme. • Install effective noise suppression system.
Water Quality	Development/ Operation	• Ensure minimum or no direct water discharge into any of the nearby natural water courses. • The surface runoff from the development area is being channeled into the temporary drainage system and subsequently to the sedimentation pond built in place, before finally discharge. • Adequate sedimentation pond, siltation pond to contain water. • Oil and grease leakages from servicing the construction equipment, is to be drained into a drum for collection and disposed as 'scheduled waste' at the designated skid areas. • Fuel, grease, engine oil storage must be carefully sited to avoid contamination of the surface waters. • Domestic and solid wastes should be collected in covered bins and finally disposed off into an approved dumpsite.

		• BMPs practices will be carry out with suitability due to existing of Sungai onsite of project area.
Soil Erosion and Sedimentation	Development	• Limit the work area to the minimum and expedite work during dry season. • Maintain the sediment pond constructed. • Maintain bund and drainage in place within the project site to minimize soil erosion on-site as well as runoff and siltation off-site. • Any exposed area to be compacted and turfed immediately.
Waste Generation	Development/ Construction	• Proper disposal at approved dump site. • Adequate disposal bin prepared on site.
Health and Safety (Operation)	Dust Nuisance	• Carry out dust monitoring programme. • Workers should be supplied with respiratory masks.
	Noise Nuisance	• Carry out noise monitoring programme. • Provide workers with earplugs or earmuffs. • Have work shifts for the workers.
	Occupational Accidents	• Follow the emergency response plan formulated.

2.12 CONCLUSION

This Term of Reference (TOR) of the proposed rubber forest plantation project is significant as it governs the environmental implementation programmes as well as blooming the development growth of Piah Forest Reserve, District of Hutan Kuala Kangsar, Perak Darul Ridzuan and is served as an evidence and guidance to get approval from DOE before proceeding with EIA study.