

Benta Wawasan Sdn Bhd

Level 12, Wisma Innoprise, Teluk Likas
Peti Surat 11622, 88817, Kota Kinabalu, Sabah
Tel : 088-326 507/326 508 Fax : 088-233 672/ 326 510

SPECIAL ENVIRONMENTAL IMPACT ASSESSMENT

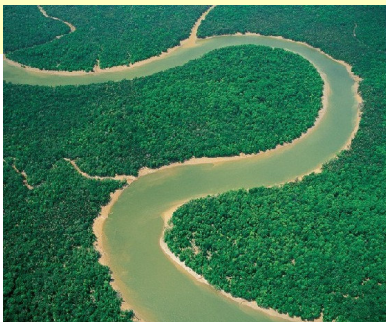
Final Terms of Reference (TOR)

For

Proposed Oil Palm Plantation (OPP) and Industrial Tree Plantation (ITP) Development At Benta Wawasan I and Benta Wawasan IIC, Yayasan Sabah Forest Management Area, Kalabakan and Gunung Rara Forest Reserves, Tawau District, Sabah

Our Ref: CK/EV103-370/04

Date: February 2005



CHEMSAIN KONSULTANT SDN BHD

◆Environment ◆Engineering ◆Monitoring and Auditing ◆Laboratory Services ◆Occupational Health and Safety

Contents

1. GENERAL	1
1.1 PURPOSE OF THE TERMS OF REFERENCE	1
1.2 LEGAL REQUIREMENT	3
1.3 PROJECT BACKGROUND	3
1.4 PROJECT OBJECTIVE	4
2. PROJECT PROPONENT	4
3. EIA CONSULTANT	4
4. PROJECT DESCRIPTION	6
4.1 PROJECT LOCATION	6
4.2 PROJECT AREA.....	7
5. PROJECT STATUS	7
TOTAL	9
24,652	9
SALVAGING IN PROGRESS	9
6. PROJECT ACTIVITIES	12
6.1 PLANNING AND LOG HARVESTING.....	12
6.2 SITE CLEARING& PREPARATION	12
6.3 OPERATION PHASE.....	12
6.4 ABANDONMENT PHASE	13
7. SCOPING ACTIVITIES	13
7.1 PURPOSE	13
7.2 MEETING WITH RELEVANT AGENCIES	13
7.3 AERIAL AND GROUND SURVEYS	13
7.3.1 <i>Forest Resources and Management</i>	13
7.3.2 <i>Soil Erosion Control Management</i>	14
7.3.3 <i>Wildlife</i>	14
7.3.4 <i>Aquatic Life</i>	15
7.3.5 <i>Social Economic Aspect</i>	15

7.3.6	General Pollution	16
7.3.7	Land-Use	16
8.	LIST OF IDENTIFIED AND PROPOSED PRIORITIZED ENVIRONMENTAL ISSUES.....	16
8.1	LONG LIST SCOPING MATRIX.....	17
9.	SCOPE OF WORK FOR SEIA STUDY	18
9.1	PROJECT DESCRIPTION	18
9.2	DESCRIPTION OF THE EXISTING ENVIRONMENT	18
9.2.1	Physico-Chemical Environment.....	19
9.2.2	Biological System	21
9.2.3	Socio-Economics.....	21
9.3	MAIN ENVIRONMENTAL IMPACTS	22
9.3.1	Ecological Impact	23
9.3.2	Soil Erosion and Water Quality	24
9.3.3	Hydrological Impact.....	26
9.3.4	Land Suitability and Topography.....	27
9.3.5	Biomass / Waste	27
9.3.6	Infrastructure, Utilities and Amenities Development.....	27
9.3.7	Transport and Traffic.....	27
9.3.8	Socio Economics.....	27
9.3.9	Environmental Cost and Benefit Analysis	29
9.4	OTHER ENVIRONMENTAL IMPACTS	29
9.4.1	Pests and Diseases Problems	29
9.4.2	Forest Fire.....	29
9.4.3	Abandonment	30
9.5	METHODOLOGY FOR PREDICTION AND EVALUATION OF IMPACT	30
9.6	MITIGATION/CONTROL MEASURES	34
9.7	RESIDUAL IMPACTS.....	34
9.8	ENVIRONMENTAL MONITORING AND AUDITING PROGRAM	34
9.9	ENVIRONMENTAL MANAGEMENT PLAN	34
10.	LIAISON WITH RELEVANT AUTHORITIES.....	35
11.	STUDY SCHEDULE.....	35

1. General

This Terms of Reference is for the preparation of a Special Environmental Impact Assessment (SEIA) for the **Proposed Oil Palm Plantation (OPP) and Industrial Tree Plantation (ITP) Development At Benta Wawasan I and Benta Wawasan IIC, Yayasan Sabah Forest Management Area, Kalabakan and Gunung Rara Forest Reserves, Tawau District, Sabah**. For brevity, the proposed Oil Palm and Tree Plantation will be known as the “Proposed Plantation” or the “Project”.

The Proposed Plantation covers an area of about 109,600 hectares of the Tree Plantation and Forest Management Agreement of **Benta Wawasan Sdn Bhd**, who is the Project Initiator and also a wholly owned subsidiary of Innoprise Corporation Sdn Bhd (ICSB)¹. See Project Location in **Figure 1.0**.

1.1 Purpose of the Terms of Reference

The purpose of these Terms of Reference is to present the content and scope of works to be undertaken in this SEIA. It also aims at addressing key environmental concerns of importance to the decision makers and various stakeholders. This TOR includes the following:

- Background information on the nature and extent of the Project;
- Scope of works for the SEIA study;
- Schedule and methods for assessment of impact, mitigation measures and monitoring programmes, including description of data to be collected; &
- Activities involving the key stakeholders.

In addition, the TOR provides a written framework for the proposed SEIA and allows the SEIA to proceed in a scheduled manner. **Table 1.0** on the next page illustrates the general procedure of the Special EIA in Sabah.

¹ See Definition in **Appendix A**.

Table 1.0: A Summary of EIA Procedure in Sabah

The Seven Steps	Summary of Main Required Activities and the Part Responsible Thereof
Step 1: Project screening	Project Proponent ➤ Consult with EPD if the Project is a Normal EIA or Special EIA
Step 2: Selection of consultants	Project Proponent ➤ Select consultants to undertake preparation of TOR for the EIA
Step 3: Preparation of TOR	EIA Consultant ➤ Prepare scoping note and discuss with EPD ➤ Conduct public consultations with various stakeholders ➤ Prepare a draft TOR and submit to EPD ➤ Finalise the TOR after public hearing and obtain approval from EPD EPD and Project Proponent ➤ Advertise in the local newspaper of the availability of the TOR for review and comment (timeframe – 2 weeks) ➤ Undertake public hearing activities for the SEIA
Step 4: Undertaking the EIA study	EIA Consultant ➤ Identify and Assess key and additional environmental impacts ➤ Identify and assess key and additional mitigating measures ➤ Identify and assess key and additional monitoring programmes
Step 5: Preparation of SEIA report	EIA Consultant ➤ Adhere to the EPD requirements and “Standard Table of Contents” in the preparation of the SEIA report ➤ Prepare the SEIA report in line with the EPD chapter-by-chapter recommendations
Step 6: Review of the SEIA report	EIA Consultant ➤ Submit the SEIA report to the EPD ➤ Undertake the public hearing activities required for SEIA ➤ Participate in the review meetings ➤ Submit additional information if required and finalise the SEIA report
Step 7: Agreement of Environmental Conditions	Project Proponent ➤ Review of the draft Agreement of Environmental Conditions prepared by EPD ➤ Co-sign the Agreement of Environmental Conditions ➤ Implement mitigation measures and monitoring programmes

Source: State Environmental Conservation Department (ECD) Sabah, 2000. “Handbook for Environmental Impact Assessment (EIA) in Sabah”.

1.2 Legal Requirement

Effective September 1999, Environmental Impact Assessment (EIA) is a mandatory requirement for oil palm plantation and industrial tree plantation development activities in Sabah under the *Conservation of Environment Enactment 1996* and the *Conservation of Environment (Prescribed Activities) Order 1999*. Oil palm plantation and Industrial tree plantation developments are Prescribed Activities, which require an EIA approval prior to Project commencement. It falls under the following categories:

Section 1: Agricultural Development

Paragraph (i): development of agricultural estates or plantations covering an area of 500 hectares or more –

(a) *from land under secondary or primary forests;*

(c) *which would involve modification in the use of the land;*

Paragraph (iii): development of agricultural area adjacent to any conservation area, park or sanctuary declared under any written law.

Section 2: Forestry

Paragraph (iii): development of forest plantation having an area of 500 hectares or more.

1.3 Project Background

The main development in this Project is the Oil Palm Plantation (OPP) development. It will be carried out by three major parties, i.e. Yayasan-Melaka JV, Ratus Awansari Sdn Bhd JV and Yayasan Sabah Group (to be mainly managed by Sawit Kinabalu Sdn Bhd and Sabah Softwoods Berhad) and total land area involved is approximately 80,000 hectares (see **Table 2.0**). See areas of these various developers in **Figure 2.0**.

The Project Development Schedule for the OPP development is as shown in **Table 2.0** below. From the table, it can be seen that the OPP will be initiated from Year 2005 onwards and expected to be fully developed by Year 2010. This area will be reverted back to forest after the 30-year cycle.

Table 2.0: Project Development Schedule

DEVELOPER	YEAR 2005 HA	YEAR 2006 HA	YEAR 2007 HA	YEAR 2008 HA	YEAR 2009 HA	YEAR 2010 HA	TOTAL HA
RASB*	0	2,500	4,000	4,500	4,500	5,500	21,000
Yayasan Melaka*	500	1,000	1,200	1,200	1,100	0	5,000
BW Plantations 1	1,000	2,500	5,000	7,500	7,500	1,500	25,000
BW Plantations 2	1,000	2,500	5,000	7,500	7,500	1,500	25,000
BW Plantations 3	0	500	1,100	1,100	1,300	0	4,000
TOTAL HA	2,500	9,000	16,300	21,800	21,900	8,500	80,000

* Joint-Venture Companies

As for the proposed Industrial Tree Plantation (ITP) Development, it will be carried out at a much later stage and will involve mainly planting of high-value tree species such as Jelutong, Sentang, Mahogany, etc. There is not yet a tree planting schedule at the time of preparation of this Terms of Reference (TOR).

1.4 Project Objective

With the drastic dwindling of forest resources within the Yayasan Sabah Concession Area (YSCA), the generation of income for the Yayasan Sabah to continue its socio-economic activities will be greatly affected. In order to complement and supplement the loss in timber revenue, new sources of revenue have to be sought in order to generate sufficient funds for the Yayasan Sabah Group (YSG) to continue its social economic program.

Hence, the Oil Palm (OP) plantation development is undertaken in lieu of *Acacia Mangium* as a financial approach to generate sufficient income to primarily rehabilitate the secondary forests in the Yayasan Sabah Concession Area, and secondarily as a stop gap measure to generate sufficient funds for the Yayasan Sabah Group (YSG) and also the Sabah Government.

The OP development will also bring about economic spin-offs to the Tawau region and the State of Sabah. The planting of 82,000 ha of oil palm is expected to generate about RM50 billion in revenue for one-cycle of cultivation.

2. Project Proponent

Details pertaining to the Project Proponent are as follows:

Benta Wawasan Sdn Bhd

Level 12, Wisma Innoprise, Teluk Likas,
P. O. Box 11623
88817 Kota Kinabalu, Sabah

Tel: 088-326 507/8

Fax: 088-233 672/ 326 510

Contact Person: **Mr. Cyril Pinso**

Designation: Group Manager

3. EIA Consultant

Chemsain Konsultant Sdn Bhd has been appointed as the Principal Consultant for this Special Environmental Impact Assessment (SEIA) study. The Consultant is registered with the Environment Protection Department (EPD), with a firm registration number of **F001** (date of expiry on 30th September 2005). The address and contact person for Chemsain Konsultant are as follows:

Chemsain Konsultant Sdn Bhd

Lot 5, B1-1 & B1-2, 1st & 2nd Floor,
Block B, Iramanis Centre
Jalan Lintas, 88 450
Kota Kinabalu, Sabah

Tel: 088-381 277

Fax: 088-381 280

Contact Person: **Dr. John Chan**

Designation: Director

The study team for the Special Environmental Impact Assessment (SEIA) study is listed in the table below (see also organisation chart in **Appendix B**), together with the details on the status of the EPD's Certificate of Practice.

No.	Expertise and Role	Name & Qualifications
1.	Project Director, Civil Engineering & Waste Management Reg. No: S 0002 Date of Expiry: 30.09.05	Ir. Brian S. H. Chong <i>M. Sc. Env. Eng.</i> <i>B. Sc. Eng. (Civil)</i>
2.	Project Co-ordinator & Land Use Reg. No.: S 0008 Date of Expiry: 30.09.05	Rebecca Poong <i>B. Sc. (Environment)</i>
3.	Water Quality & Monitoring Program Reg. No.: S 0001 Date of Expiry: 30.09.05	Dr. John S.T. Chan <i>PhD Chemistry</i> <i>B.Sc (Hons.) Chemistry</i>
4.	Environmental Management Plan Reg. No.: S 0004 Date of Expiry: 30.09.05	Anthony R. Enchana <i>M.Sc. EIA</i> <i>Adv Dip Applied Chemistry</i> <i>Dip. Sc</i>
5.	Agronomy & Plantation Development Reg. No.: S 0098 Date of Expiry: 03.02.06	Kueh Hong Siong <i>B. Sc. (Agriculture Sc.)</i>
6.	Soil Erosion Risk & GIS Reg. No.: S 0059 Date of Expiry: 08.01.06	Lawrence L.H. Ng <i>B. Sc. (Computer Sc.)</i>
7.	Geology and Slope Stability Reg. No.: S 0099 Date of Expiry: 07.02.06	Geh Poh Khong <i>B. Sc. Honours in Geology</i>
8.	Fauna Ecology Reg. No.: S 0096 Date of Expiry: 03.02.06	Dr. Edwin Jack Bosi <i>Masters of Philosophy</i> <i>Dr of Vet Med</i> <i>Dip. Animal Health & Pdct</i>
9.	Flora Ecology Reg. No.: S 0094 Date of Expiry: 03.02.06	Dr. Yap Son Kheong <i>Ph.D. Forest Biology</i> <i>B.Sc. Botany</i>
10.	Aquatic Ecology Reg. No.: S 0003 Date of Expiry: 30.09.06	Peter Chang <i>B.Sc. (Hons.) Marine Biology & Zoology</i>

No.	Expertise and Role	Name & Qualifications
11.	Hydrology Reg. No.: S 0097 Date of Expiry: 03.02.06	Hong Kee Ann <i>M.Sc Oceaography</i>
12.	Human Environment / Socio-Economics Reg. No.: S 0009 Date of Expiry: 30.09.05	Tan Shwu Mei <i>M. A. Env. Mgmt.</i> <i>B.A (Hons) (Socio & Anthro)</i>
13.	Fire Risk, Emergency Response Plan & Occupational Safety & Health Reg. No.: S 0052 Date of Expiry: 30.09.05	Shahrel B. Bohari <i>B. Sc. (Environment)</i>
14.	Infrastructure, Utilities & Land Use Reg. No.: S 0086 Date of Expiry: 26.09.2005	Fitzer Ford Anastasius <i>B. Sc. (Hons.) Chemistry</i>
15.	Cost Benefit Analysis Reg. No.: S 0095 Date of Expiry: 03.02.06	Soren Beck <i>M.Sc. Political Sc. & Econ.</i>

4. Project Description

4.1 Project Location

The proposed Project is located in the southeast corner of Sabah within the Tawau District (see **Figure 1.0**). It is located in Kalabakan and Gunung Rara Forest Reserves, about 100 km Northwest of Tawau Town. The proposed Project will be located in two separate blocks, i.e. Benta Wawasan I (BW I) and Benta Wawasan IIC (BW IIC).

Generally, it is located within the Yayasan Sabah Forest Management Area, BW I on the northeastern part while BW IIC on the southwestern corner. BW I is bordered by the Kuamut River to the north, Sabah Softwood Bhd plantation to the east and Hutan Simpan Gunung Rara, Hutan Simpan Kalabakan and Luasong Forestry Centre to the west and southwest. Within the Project site (but excluded from the development) is also the Brantian-Tatuid Virgin Jungle Reserve, which is located on the south eastern part of Benta I and measures approximately 4,140 ha in size.

The Project Proponent's international collaborative projects such as the INNIEKA rehabilitation project, the RBJ/NEP Reduced Impact Logging (RIL) project and the Luasong Forestry Centre are all located to the west and north of BW IIC respectively. Sabah Softwoods Sdn Bhd shares its eastern boundary while the southern part is Hutan Simpan Kalabakan.

The land area earmarked for the plantation currently consists mainly of logged-over lowland Dipterocarp forest.

4.2 Project Area

The designated plantation area covers a total area of approximately 109,600 hectares (BW I – 79,400 ha while BW IIC – 30,200 ha). Out of this area, the gross plantable area in accordance to slope gradient for oil palm and industrial tree plantations is about 99,700 hectares, which is approximately 84% of the total Project area. However, the committed area for OPP development (as presented in **Table 2.0** above) is 80,000 hectares. The remaining 9,900 hectares consist of area considered as unsuitable for oil palm or industrial tree plantations, i.e. steep land above 25 degree slope. **Table 3.0** below shows the composition of the designated OPP, ITP and natural forest enrichment area.

Table 3.0: Designated Area Composition (preliminary figures)

Block	0-12° Slope	12-15° Slope	15-20° Slope	20-25° Slope	> 25° Slope	Total
BW I	47,000	10,600	11,500	5,100	5,200	79,400
BW IIC	19,000	1,400	2,500	2,600	4,700	30,200
TOTAL	66,000	12,000	14,000	7,700	9,900	109,600
Usage	Oil Palm Plantation			Industrial Tree Plantation	Natural forest enrichment	

5. Project Status

Located within the Benta Wawasan license area, the Project area is designated for commercial timber production. A forest plantation or Industrial Tree Plantation (ITP) development covering a much bigger area than the proposed Project area was suggested in Year 1999 and an SEIA was carried out, submitted in June 2002 and subsequently approved by the Environment Protection Department (EPD) in April 2003. However, the ITP Project was not fully implemented whereby as of October 2004 only approximately 24,652 hectares of the area was planted with *Acacia mangium*. See **Figure 3.0**.

With the plan to develop the proposed Project area into an oil palm plantation, the Sabah Forestry Department has on 17th June 2004 approved the conversion of the area for oil palm plantation development, for a period not exceeding thirty (30) years and with conditions.

Currently, the proposed Project area is being logged in coupe blocks. The current status (a projection or guideline only) of the logging coupes are presented in **Figure 3.0** and **Table 3.0**. From the data provided by the Project Proponent and from site observation, a large portion of the proposed Project area is either salvaging in progress (approx. 43,503 ha), planted with *Acacia mangium* under the JV SSB Planting Tree Project (approx. 24,652 ha), or re-entry logging in progress (approx. 19,492 ha). A nursery for oil palm is also already established in Benta Wawasan I, Coupe BW3/01 (**Plate 1**). For the area that has been planted with Acacia, it will only be developed into OPP after harvesting.

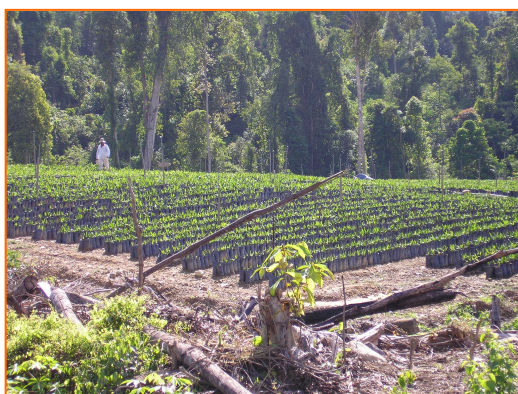







Plate 1:
Oil palm nursery established at BW3/01.

Following the approval of the SEIA for the ITP Project in Year 2003, compliance monitoring was conducted for the logging coupes for the period *October to December 2003* and was submitted to the Environment Protection Department (EPD) for approval. The report for the period *October to December 2004* is still being prepared at the time of preparation of this Terms of Reference (TOR).

Table 3.0: Status of Logging Operation at the Proposed OPP and ITP Project Sites (as of October 2004)

Coupes	Area (ha.)	Current Status
JV Sabah Softwoods Sdn Bhd Planting Tree Project		
BW1/98	1,615	Logging was completed in mid 1999. Land clearing and planting of <i>Acacia mangium</i> have started in Dec 2000 and is now fully developed.
BW2/98	1,875	Logging was completed in the 1999. Land clearing and planting of <i>Acacia mangium</i> have started in Dec 2000 and is now fully developed.
BW3/98	1,560	Re-entry logging was completed in Dec 2000. Fully developed with <i>Acacia mangium</i> .
BW4/98	2,885	Second re-logging operation has completed and about 2055.13 ha are already planted with <i>Acacia mangium</i> .  <i>Photo taken in end of November 2004.</i> <i>GPS reading: E 117°29.028' and N 4° 43.761'</i>
BW5/98	2,115	Fully developed with <i>Acacia mangium</i> after completion of second re-logging operation.

BW1/99	2,230	First and second round of Re-entry has been completed. About 1950.03 ha are already planted with <i>Acacia mangium</i> .  <i>Photo taken in end of November 2004. GPS reading: E 117°29.450' and N 4° 44.573'</i>
BW3/99	1,713	First and second round of Re-entry has been completed. About 704.22 ha are already planted with <i>Acacia mangium</i> .
BW4/99	2,140	First and second round of Re-entry has been completed. About 683.67 ha are already planted with <i>Acacia mangium</i> . The balance will be for Oil Palm development.
BW5/99	1,445	Second Round of Re-entry has been completed. About 480.51 ha are already planted with <i>Acacia mangium</i> .
BW4/00 (B1)	3,170	Re-entry logging in progress. About 505.5 ha already planted with <i>Acacia mangium</i> .
BW2/00 (2)	2,410	First and second round of Re-entry has been completed. KIV for oil palm development.  <i>Photo taken in end of November 2004. Overlooking from BW5/00. GPS reading: E 117°12.769' and N 4°12.769'</i>
BW5/00	1,494	First and second round of Re-entry has been completed. KIV for oil palm development.
TOTAL	24,652	
Salvaging In Progress		
BW2/99	2,280	Salvaging in progress. Expected to be completed in November 2005.
BW9/99	5,306	Salvaging in progress. Expected to be completed in August 2005.
BW1/00	1,407	Salvaging in progress. Expected to be completed in January 2006.
BW2/00/I	2,971	Salvaging in progress. Expected to be completed in June 2005.

BW4/00 (BI)	5,772	Salvaging in progress. Expected to be completed in December 2005.  <i>Photo taken in end of November 2004.</i> <i>GPS reading: E 117°36.403' and N 4°40.403'</i>
BW4/00 (BII)	2,537	Salvaging in progress. Expected to be completed in February 2006.
BW9/00	4,045	Salvaging in progress. Expected to be completed in February 2006.
BW10/00	2,843	Salvaging in progress. Expected to be completed in February 2006.
BW11/00	2,011	Salvaging in progress. Expected to be completed in May 2006.
BW1/01	1,008	Salvaging in progress. Expected to be completed in June 2005.
BW2/01	3,739	Salvaging in progress. Expected to be completed in June 2005.
BW3/01	1,804	Salvaging in progress. Expected to be completed in June 2005.
BW5/01	1,907	Salvaging in progress. Expected to be completed in October 2005.
BW9/01	3,040	Salvaging in progress. Expected to be completed in July 2005.
BW14/01	1,079	Salvaging in progress. Expected to be completed in January 2006.
BW2/02	534	Salvaging in progress. Expected to be completed in December 2005.  <i>Photo taken in end of November 2004.</i> <i>GPS reading: E 117°14.842' and N 4°51.446'</i>

BW10/02	1,220	Salvaging in progress. Expected to be completed in July 2005.
Subtotal	43,503	
Salvaging Not In Operation Yet		
BW3/00	1,420	18 months to complete after operation.
BW4/01	1,769	18 months to complete after operation.
BW12/01	1,543	18 months to complete after operation.
BW5/02	1,857	18 months to complete after operation.
Subtotal	6,589	
Re-log In Progress		
BW6/01	2,096	Re-entry logging in progress. To be completed in August 2005.
BW10/01	1,533	Re-entry logging in progress. To be completed in May 2005.
BW11/01	2,140	Re-entry logging in progress. To be completed in May 2005.
BW9/02	4,784	Re-entry logging in progress. To be completed in October 2005.
BW11/02	2,121	Re-entry logging in progress. To be completed in September 2005.
BW12/02	2,993	Re-entry logging in progress. To be completed in January 2006.
BW9/03	2,305	Re-entry logging in progress. To be completed in March 2006.
BW10/03(OLCS)	1,520	Re-entry logging in progress. To be completed in June 2006.
Subtotal	19,492	
Re-log (OLCS) Not In Operation Yet		
BW12/03	2,292	Awaiting coupe permit from the Sabah Forestry Department.
BW12/04	1,063	Awaiting coupe permit from the Sabah Forestry Department.
BW12/05	1,750	Approximate area only. Not surveyed yet.
Subtotal	5,105	
Sensitive area	9,920	Unworkable area which includes river reserve, road buffer, steep area, salt lick area, VJR buffer, excised area
Under NFM area	339	
Grand Total	109,600	

6. Project Activities

With the proposed oil palm and industrial tree plantation development, it is envisaged that planning of development phasing, scheduling and coordination of the general operation will be carried out in details to ensure smooth execution. The followings are some of the key activities anticipated:

6.1 Planning and Log Harvesting

- Preparation of Forest harvesting plan and Oil Palm and Forest Plantation Management Plans;
- Boundary survey and demarcation of riparian reserves and high risk areas;
- Recruitment of workers and establishment of camps;
- Establishment and/or rehabilitation of skid trails and other infrastructure;
- Harvesting of commercial logs of >40cm dbh; and
- Transporting of logs.

6.2 Site Clearing & Preparation

- Nursery establishment and maintenance (a 1ha nursery usually caters for a planting area of 100 ha);
- Removal and salvage of logs of <40 cm dbh;
- Land clearing and removal of biomass;
- Land preparation (terracing and drainage works for oil palm plantation area); and
- Field planting of seedlings (cover lining and holing and the planting of young palms for oil palm plantation area).

6.3 Operation Phase

- Planting programme and sequence;
- Plantation maintenance and management;
- Silvicultural treatment;
- Pest and Disease control;
- Growth and yield monitoring of plantation;
- Plantation harvest;
- Transportation of logs or FFB to the mill; and
- Maintenance of plantation roads and infrastructure.

6.4 Abandonment Phase

Rehabilitation and enrichment programme (in case the project were abandoned due to unforeseen circumstances). For the oil palm plantation area, the area will be reverted back to Forest Management Area after the 30 years cycle.

7. SCOPING ACTIVITIES

7.1 Purpose

The purpose of scoping is to determine the focus, scope and content of the environmental impact assessment and initial assessment of the potential impacts, possible mitigating measure and monitoring programmes and thereby to a large extent determines the framework for this SEIA. Relevant information from the previous SEIA will be taken into consideration in determining the extent of work for this SEIA.

7.2 Meeting with Relevant Agencies

In order to gauge concerns and perceptions over the proposed Project, meetings and consultations have been carried out and is still on-going with the relevant government agencies and Non-Government organizations. Summaries of the results of the interviews are attached in **Appendix C**. In general, the main concerns related to the development can be further summarized into the following points:

- Physical Impacts – soil erosion and protection of water quality for users downstream;
- Biological Impacts – protection and conservation of wildlife corridor, riparian reserves, sensitive areas and buffer zones and impact on the national and internationally endangered species; human-animal conflict;
- Socio-Economics; and
- Project justification.

7.3 Aerial and Ground Surveys

For the purpose of preparing for this Terms of Reference, one (1) round of aerial survey and site inspection (including road survey, aquatic survey and transects through VJRs within or nearby the Project site) was carried out sometime in November and December 2004. Comparing the observations with those back in Year 2000-2001, the following are some of the key environmental findings:

7.3.1 Forest Resources and Management

Comparing the vegetations observed back in Year 2000-2001, following is the brief description:

- Some of the Project areas are already cleared and planted or going to be planted with *Acacia mangium*.

- A large portion of the Project area is undergoing salvage logging, with very few residual commercial trees left. The areas that are under the salvage logging system also have poor residual forest following severe logging previously. Large timber trees were observed and these were harvested from the steep sites where previous logging activities had not gone in extensively.
- Conventional logging is now being carried out in some areas. These areas have virgin forest along the hill slopes with ridge tops linking to the protection area to Maliau Basin but intensive logging is now removing all the big trees.

7.3.2 Soil Erosion Control Management

Comparing the soil erosion condition back in Year 2000-2001, following is the brief description:

- The skid trails are still generally of reasonably good standard.
- Marking of the riparian reserve or steep area are observed in the logging areas. However, there seems to be encroachment into some of these areas, calling for immediate enforcement to be carried out.
- There is still a very high occurrence of suspended sediments or sedimentation in most of the waterways.
- There is poor or no rehabilitation of cleared or seriously disturbed areas.
- There is poor or no proper drainage system along the roads.
- Some extraction roads are noted to be constructed on steep slope with more than 25° gradient.
- Most of the smaller streams or waterways are noted to be blocked by felled logs or debris.
- Temporary crossings and stream crossings have been constructed using rejected logs.
- No control measure such as cover crop is presented in the planted area especially in the erosion prone areas.

7.3.3 Wildlife

Comparing the wildlife observed back in Year 2000-2001, following is the brief description:

- Generally, the ground surveys indicated very low presence of wildlife in the proposed Project site.
- The only wildlife of significance that is found within the Project site is the orangutans. However, the number of nests noticed was scarce.
- The elephants are reported and observed to confine to the forested areas in the north and western part, and outside the Project site.
- Other rare sightings of wildlife include a barking deer, a mouse deer, a black hornbill and a king cobra.

- Hunting dogs are observed at camps, indicating common hunting of wildlife among the workers, contractors and probably nearby settlers. The 'no hunting' signboards are observed along the road side but does not seemed to be properly maintained.

7.3.4 Aquatic Life

Comparing the aquatic lives observed back in Year 2000-2001, following is the brief description:

- The number of fishes and other aquatic lives is generally lower in areas that are presently being logged or recently logged.
- Subsistence fishing is still carried out all along the rivers. Fishing activities is more intense nearer to the villages such as Kg. Kalabakan and Kg. Brantian.

7.3.5 Social Economic Aspect

Comparing the social data compiled back in Year 2000-2001, following is a brief summary of the current condition:

- The nearest settlement (known as "illegal") to the proposed Project site is Kg Harapan Baru Mukandut (former NBT workers from Kuamut area). Another nearby community is the Luasong Forestry Centre, which is sited between Benta I and Benta IIC.
- All the logging camps have reported Malaria cases and other communicable diseases.
- Clean drinking water is still reported as one of the problems among some of the logging camps and their workers.
- Almost half of the workers (from the sub-contractors) are foreign workers (the Philippines Philipinos and the Indonesian).
- None of the workers have any safety gear or helmet.
- Some of the workers are reported to have little or no formal training in terms of heavy machinery, equipment handling or correct tree felling techniques.
- Most of the workers are not fully aware of the Wildlife Enactment, Environmental Conservation Enactment or any other relevant, Sabahan legislation.
- Many small sub camps are found scattered in the logging sites causing damages to the forest ecosystem. These are also potential pollution sources.
- Most of the logging camps have poor sanitary or living condition and poor housekeeping except for a few established and some mobile (container) logging camps.
- Basic utilities and facilities in Luasong Forestry Centre and Brumas Camp of Sabah Softwoods Bhd are modern and adequately provided for its workers.

7.3.6 General Pollution

- Most of the waterways are noted to be highly turbid.
- No proper waste management is implemented in terms of refuse collection from the camps i.e. packaging materials, tins, bottles etc as such waste is dumped or disposed off indiscriminately.
- Dust pollution is a common occurrence for all the roads especially during dry weather.

7.3.7 Land-Use

- Substantial areas surrounding the proposed plantation area have been opened up for oil palm plantations and other industrial tree crops especially to the southern region of the Project site.

8. List of Identified and Proposed Prioritized Environmental Issues

With reference to the previous Kalabakan SEIA report covering the same area and the recent preliminary site visit, listed below are some of the identified and proposed prioritised environmental issues for this proposed Project:

1. Soil erosion, water quality and hydrology;
2. Terrestrial and aquatic fauna ecology;
3. Human-animal conflict;
4. Flora ecology;
5. Socio economics;
6. Biomass and waste management; and
7. Cost benefit analysis.

Other environmental issues that will be discussed in less detail are:

1. Forest fire management; and
2. Pests and diseases management.

8.1 Long List Scoping Matrix

Activities and the related Environmental Impacts	Magnitude	Permanence	Reversibility	Cumulative
Pre Development Phase – Feasibility Studies, Forest Inventory, Demarcation of high risk area and boundary survey				
Loss of flora along the trails or access route	1	2	2	1
Surface erosion	1	2	2	3
Employment and business opportunities	2	2	2	3
Logging Operation and Land Preparation Stage – Establishment of infrastructure, log harvesting and land clearing				
Increase in soil erosion and sediment load	2	2	2	3
Loss of flora, terrestrial and aquatic fauna diversity	2	3	3	2
Flood hazard due to increased runoff	2	3	3	3
Soil damage (compaction & removal of organic matter, topsoil & nutrients)	2	2	2	3
Benefit from employment and business opportunities	3	2	2	3
Influx of foreign workers	2	2	2	3
Dust Pollution	1	2	2	2
OPP and ITP Plantation Maintenance Stage – Maintenance of plantation, infrastructure and oil palm harvesting				
Benefit from employment and business opportunities	3	2	2	3
Removal of soil nutrient	2	2	2	3
Water pollution	2	2	2	3
Human-animal conflict	2	3	3	3
Fire hazard	2	2	2	3
Abandonment Phase – Rehabilitation with indigenous species				
Increase in flora biodiversity	2	3	2	3
Loss of business and employment	2	2	2	3
Note:				
Magnitude – a measure of the importance in relation to the spatial boundaries. (1) Change/effect only within the project site (2) Change / effect to local conditions and /or to areas immediately outside (3) Regional/ National / International change / effect				
Permanence – defines whether the condition is temporary or permanent (1) No change / not applicable (2) Temporary (3) Permanent				
Reversibility - defines the condition can be changed and is a measure of the control over the effect of the condition. (1) No change / not applicable (2) Reversible (3) Irreversible				
Cumulative – a measure of whether the effect will have a single direct effect or whether there will be a cumulative effect over time, or a synergistic effect with other conditions (1) No change / not applicable (2) Non cumulative / single (3) Cumulative				

Source: EPD, Sabah

9. Scope Of Work for SEIA Study

To complete the SEIA in an efficient manner and to realise the objectives as listed above, the scope of study will address the following specific subjects:

9.1 Project Description

A description of the proposed Project development will be made based on information obtained from the Project Proponent and/or his consultants. The description will cover the following:

- a. Project objective and Statement of Need of the proposed Project.
- b. Description of the Project which shall include:
 - A brief discussion of Project geographical location, size and concept.
 - The development design and layout of the proposed Project.
 - An outline of the Project activities during planning, forest harvesting, land clearing, land preparation, earthwork, infrastructure development, building and amenities, nursery establishment, field establishment, planting, operation and maintenance which include fertiliser application, use of controlled agro-chemicals, harvesting, transportation and replanting.
 - A description of the planting, harvesting and processing facilities (if any).
 - A brief discussion of general supporting infrastructure and utilities such as road, drainage, water supply, power supply, telecommunications, liquid and solid wastes management.
 - The control and monitoring of operations and safety precautions incorporated.
 - An outline of human resources and other social and economic aspects of the Project.

9.2 Description of the Existing Environment

Existing physico-chemical, biological and socio-economics environments will be compiled based on baseline information to be collected from field investigations, secondary sources and from the Project Proponent and or his consultants on the Project as well as consultation with relevant Government Departments. Description of the existing environment is required to provide the necessary baseline data for evaluation of the physical, biological and socio-economic impacts and for the formulation of environmental management measures and monitoring program.

The description will be presented in three main headings as listed in the next few pages:

9.2.1 Physico-Chemical Environment

9.2.1.1 Topographical Characteristics

Description of the existing topographical and physical characteristics of the Project site will be made based on data from field investigations, secondary sources such as topographical maps, geological and soil maps from Lands and Surveys Department and Department of Agriculture as well as details provided by the Project Proponent and/or their consultants.

Data will be assembled from the previous SEIA supplemented by site survey to verify existing conditions and allow impacts to be predicted and mitigated. Information on elevation and slope of the site will be displayed on a map of suitable scale. Where current topographical map, aerial photographs are available, these will be obtained from the Project Proponent.

9.2.1.2 Soil Characteristics and Geology

A description and map (at a suitable scale) covering areas to be affected by the proposed Project with particular reference to those physical and chemical properties of the soils and sub-soils which may influence erosion potential, acid soil potential, a rehabilitation program, or the quality of water leaving the site. The description of soils will include profile depth, stability, permeability, erodibility, drainage, soil structure, rockiness, salinity, sodicity, nutrient status, contaminants and pH subject to availability of information and assessment of its suitability for OPP and ITP. Existing data from the previous SEIA will be sourced as much as possible supplemented by site survey.

The geology of the area will be documented with emphasis on rock types and their possible association with soils and potential hazards.

9.2.1.3 Climatological Aspects

Meteorological parameters such as rainfall, wind-direction, wind patterns and dispersion, relative humidity, temperature, sunshine, and evaporation will be described based on available secondary sources.

9.2.1.4 Hydraulics and Hydrology

The area is located on the headwater of some major rivers including Sg. Kalabakan, Sg. Brantian, Sg. Anjeranjermut, Sg. Tiagau, Sg. Kinabatangan and their tributaries, which feed into the Cowie Bay on the southeastern part of the Project site for the first few rivers and north western part for the latter. Secondary data from the previous SEIA (SEIA for the Proposed Forest Plantation at Kalabakan) will be used and additional data for Kinabatangan catchment will be gathered to examine and understand the hydrological systems and characteristics of the catchment area for these rivers. This will include the review of climatic conditions, specifically rainfall quantities and intensities, delineation of catchments and determine the natural drainage pattern of the whole affected river basin. Hydrological information, including stream flow, stream runoff, water uses and flood records will be described.

9.2.1.5 Baseline Surface Water Quality

Baseline water quality data will be obtained from in-situ testing and analysis of grab samples taken along all main rivers within and near the Project site. River water samples will be taken upstream, midstream and downstream of the Project site. The effect of tidal water (if any) on these river systems will be analysed. The results of analysis will be compared to the previous findings (SEIA for the Proposed Forest Plantation at Kalabakan).

The proposed water sampling parameters are as follows:

Chemical Parameters	
Temperature	Colour (Hazen)
pH value	Dissolved Oxygen
Conductivity	Turbidity (NTU)
Salinity	Total Suspended Solids, TSS
Biochemical Oxygen Demand, BOD	Total Dissolved Solids, TDS
Chemical Oxygen Demand, COD	Ammoniacal Nitrogen
Oil & Grease	Nitrate Nitrogen
Potassium	
Microbiological Parameters	
Total Coliform Count	Faecal Coliform Count
Pesticides Parameters	
Chlorinated	Glyphosphate
Paraquat	Methamidaphos

9.2.1.6 Baseline Noise Levels

Existing ambient noise levels of areas likely to be affected by the proposed Project will be described in terms of tenth and ninetieth percentiles (L10 & L90), equivalent continuous sound pressure level (Leq) and minimum and maximum instantaneous levels (Lmin & Lmax). The existing ambient noise levels will be representative of day and night periods. Prevailing atmospheric conditions at the time of measurement will be reported. As noise is not expected to be a significant impact, only limited data will be collected from selected locations. The results of analysis will be compared to the previous findings in the SEIA for the Proposed Forest Plantation at Kalabakan.

9.2.1.7 Baseline Air Quality (Total Suspended Particulates)

Existing air quality of areas likely to be affected by the proposed Project will be described based on site investigation and the monitoring of air quality for suspended particulates (TSP) levels. Existing and potentially known sources of air pollutants will be identified in the vicinity of the Project site or sensitive receptors from site observations and from secondary information from the Department of Environment (DOE) and the local authorities. Similar with noise, only limited data will be collected for air quality as the impact on air quality is expected to be insignificant and the results of analysis will be compared to the previous findings in the SEIA for the Proposed Forest Plantation at Kalabakan.

9.2.2 Biological System

The Project site is located in close proximity to two world renowned conservation areas i.e Danum Valley Conservation Area and Maliau Basin Conservation Area. Danum Valley which is located in the Ulu Segama Forest Reserve is recognised as the largest least disturbed and most valuable example of lowland rainforest remaining in Sabah, while the scientific communities are working hard to achieve the same status for the Maliau Basin. Both conservation areas are very unique mainly because of its richness in flora and fauna species. Some are newly discovered species while others are rare endangered species. Among the endangered wildlife supported by these forest are the Sumatran rhino, Orang Utan, proboscis monkey, slow loris, sun bear, clouded leopard, Tembadau Bulwer's pheasant, Argus pheasant, and many other species. Based on the available information, the Project area support similar flora and fauna species as it forms part of the wildlife corridor stretching from Danum Valley Conservation Area to Maliau Basin Conservation Area.

Another pristine area to the north of the Project site has recently been proposed as a conservation area, i.e. the Imbak Canyon Conservation Area. This area is approximately 30,000 hectares of virgin forest. One of the interesting findings is the presence of the rare and critically endangered Sumatran rhinos and proboscis monkeys.

For this study, the consultant will undertake to review the report findings in the previous SEIA, supplemented by site visit to update on any changes that may have taken place during the last two years. The study will mainly focus on large mammals and the method of survey may include ground survey using transects and aerial survey using light aircraft to fly over the entire proposed Project site. This is particularly important where the Project site adjoins important protected areas, such as the Virgin Jungle Reserves (VJR). The presentation of the existing biological component will include the following:

- Updated vegetation map and habitat types occurring within the proposed Project area. The map will indicate extent and distribution of existing habitat types.
- Updated estimation of populations and distribution of terrestrial fauna in the area.
- Updated indication of flora species, intensity of forest harvesting and amount of area cleared of vegetation as well as those sites already planted with Acacia.
- Updated database on the aquatic fauna for rivers within and near the Project site.

9.2.3 Socio-Economics

9.2.3.1 Land Use and Land Tenure

The Project site is located within the Yayasan Sabah Forest Management Area. Until recently, the main land use of the area has been for timber industry. The Project site is actually located within the Kalabakan Forest Reserve. There are two (2) two locations earmarked as virgin forest reserve, one located within the Project site while the other one at the boundary of the Project site. In addition to this, the previous SEIA for the Proposed Forest Plantation at Kalabakan has set aside three (3) other locations such as Sg. Kuamut Buffer (5 km wide), Orang Utan Buffer Zone and Salt Lick Buffer. Other land uses nearby the site include Luasong Forestry Centre and forest rehabilitation project areas. The detail land-use

description will be provided for the areas within 3-km radius of the Project site. It will be prepared based on site and aerial inspection of the area and from existing information on land-use from the previous SEIA, District Offices and Lands and Surveys Department, or from structural, development and regional plans available for the area. Some of these information will include:

- Location, contemporary land use and land ownership of the site and the environs;
- Identification of any native title implications;
- Local authority zoning and strategic plan designations for site and environs; and
- Other relevant features.

9.2.3.2 Human Environment

The Project area is very sparsely populated. The apparent reasons for this are poor accessibility and unsuitable terrain and soil for agriculture activities. The obvious human activities in this area are logging activities (past and present), and other forestry related activities such as forestry research centre (Luasong Forestry Centre) and a forest rehabilitation project, i.e. INIKEA.

Description of the human environment will be based on secondary data (SEIA for Proposed Forest Plantation at Kalabakan) supplemented by field survey to verify and update whatever changes that may have taken place for the last two years. Latest demographic and statistics published by the state government and other relevant related studies will be carefully reviewed to determine long term growth trends.

9.2.3.3 Infrastructure, Utilities and Amenities

Infrastructure, utilities and amenities in the Project area are basic. Road access into the Project area is provided by existing network of all-weather logging tracks. Logging companies operating in the area usually maintain this road system. Various older abandoned roads also provide convenient foot access to the project area. Most of the utilities and amenities are provided to cater for the workers of the logging company as well as the research centre located near the Project site. For the last few years since the last SEIA, there may have been additional infrastructure, utilities and amenities established in the area. Based on the previous SEIA, this component will be described in more detail. Site inspections and secondary information from the various public and local authorities will be obtained to update the existing condition.

9.3 Main Environmental Impacts

As mentioned in **Section 3.1**, the different components of this Project i.e. OPP and ITP would result in different impacts on the environment. Prediction and evaluation of impact will be carried out by analysing Project components in relation to the environmental parameters of the Project area. Where necessary, it will be quantified using acceptable modelling techniques. The key environmental impacts with regard to the Project are as follows:

9.3.1 Ecological Impact

The establishment of an OPP and ITP will inevitably lead to clearing of almost the entire affected area. Establishment of monoculture crop will significantly affect the natural environment. The wealth of species and great diversity of native flora exists in the natural forest is apt to suffer a diminution, simplification and change towards comparative artificiality. Migratory patterns of wildlife may be disrupted by the implementation of the OPP and ITP.

Such activity would result in loss of natural terrestrial habitats as well as fishery resources and cause certain degree of disturbance or ecological imbalances, depending on the existing ecological state of the affected area. The impairment can probably cause unfavourable conditions for the survival of the wildlife.

The report findings of the previous SEIA will be reviewed and important information such as vegetation map and habitat types will be updated. The evaluation will be conducted by undertaking site inspection or ground surveys and aerial survey, focussing on the key ecological impact of the Project on flora and fauna. Documentation assessment of the intensity of forest harvesting and amount of area cleared of vegetation as well as those sited already planted with Acacia will be carried out. The population estimate and distribution of terrestrial fauna in the Project area will also be updated. To achieve a holistic approach, the flora and fauna specialists will be working together to enable both team come to agreement upon common conservation sites for both plants and animals.

Given that the conservation areas of Maliau Basin and Danum Valley are internationally known and Imbak Canyon is proposed as a conservation area, it is important that the right approach is taken to ensure native forests and species are conserved or protected. Adequate wildlife corridors will be further recommended to provide a protected pathway along which native wildlife species can move or migrate in relative security, not only within the Project site but also between the conservation areas. These habitats will offer feeding, roosting, breeding, nesting and refuge areas for birds and mammal species native to the region.

In terms of Oil Palm and Forest plantation management, careful planning of the development phasing and direction of felling must be undertaken in order to preserve critical forest areas along water courses and areas which provide special habitats and migration corridors, e.g. rivers, streams, springs, salt-licks, limestone formations, etc.

Oil palm plantation will encounter problem with wildlife such as elephants, wild pigs, orang-utan and porcupine during the planting up to five (5) years. Rats, squirrels and wild pigs are major problem during the production stage. This issue will need to be properly addressed so that appropriate measures can be undertaken.

As for the proposed management system, the assessment will examine the Project Proponent's management plan for the Proposed Project area on pests and disease management, weed management, soil protection and enhancement, crop establishment and maintenance as well as harvesting for both OPP and ITP. Recommended actions or considerations will be suggested, where appropriate and applicable.

Since the Project area is traversed by rivers such as Sg. Kalabakan, Sg. Kinabatangan, Sg. Brantian, Sg. Anjeranjermut, Sg. Tiagau and their tributaries, the aquatic resources in these rivers may be of significance. Assessment for this SEIA will examine the distribution of

aquatic species and biodiversity through review of previous SEIA and field work if necessary. Evaluation will look into indicator species distribution and the importance of these fish populations to the local subsistence fishing activity. In addition, the potential impact on aquatic life due to the discharge of sediments load and pollution during the Project development will be given due consideration. Impacts to the ecological systems due to the establishment of the OPP and ITP will be carried out within the Project area as well as the surrounding areas.

9.3.2 Soil Erosion and Water Quality

9.3.2.1 Soil Erosion

Development of OPP is expected to result in more erosion as compared to ITP development. The main reason is that site preparation for an OPP at an undulating to hilly area involves major earthworks such as levelling and terracing. Soil erosion is a major environmental threat to the sustainability and productive capacity of agriculture and a very serious problem to manage. Water erosion seriously degrades the topsoil and threatens to lead to lower yields in the future. Maintenance cost for dredging and de-silting of waterways and drainage systems contributed by soil erosion could be relatively high.

Preliminary studies of topographical maps reveal that parts of the Project site are hilly to mountainous. Any development in the hilly terrain may bring about serious soil erosion problems and thus affecting the water quality in the rivers. With the proposed development of about 100,000 hectares, soil erosion is expected to be a major environmental issue.

For this study, assessment of impacts will be carried out for two (2) scenarios, *i.e.* with local and with regional perspective.

Under the local perspective, the assessment will examine the buffer zone, riparian reserves, exclusion of high risk or steep areas (>25°), infrastructure layout, water catchment areas and drainage systems (including water intake points, if any). In addition, the assessment will cover the schedules for site clearing and planting and replanting. The evaluation will examine available technology practiced within Sabah and nearby regions and thereafter suggest measures to reduce potential impacts.

On the regional perspective, the assessment will cover the development of whole Project area gradually as well as simultaneously, timing and phasing of the plantation development, catchment areas and clearing phasing. In addition, the impact analysis will focus on potential areas of erosion hazard. In addition, the downstream impacts of the Project, e.g. sediment accumulation in Cowie Bay and the river estuaries will also be determined.

Computer modelling using the Universal Soil Loss Equation and incorporating GIS will be used to determine the potential risk of soil erosion for any particular area planned for planting by classifying slopes into flat, undulating, steep and very steep. Soil loss before and after development will then be determined. The impact of sediment discharge into receiving waterways will be predicted using a one-dimensional sediment transport model.

Preventive or abatement measures will be recommended to protect the soil surface. For example, terracing if carried out in a proper manner can become a soil conservation method.

During development phase, management of soil fertility is important to ensure long term sustainability.

9.3.2.2 Water Quality (Sediments)

Evaluation of water quality within and outside the Project site will be carried out. Based on site observations, most of the waterways show high loads of sediments (i.e. turbid) and logging activity is believed to be one of the main contributing factors to the high concentrations in the rivers. This is a concern when there are settlements depending on the rivers as potable water supplies for their domestic usage. Considering the earthworks involve in site preparation for the OPP and ITP, the existing water quality may be worsening with the proposed development. In addition, there are other plantations or developments that may be ongoing near to the proposed site. The cumulative impacts of the potential sediments on water quality would require holistic approach in the assessment.

Apart from high loads of sediments, some of the rivers are noted to be polluted with domestic waste (solid and sewage), particularly near the base camps. In view of the potential large number of workers during the development phase, it is crucial to ensure adequate and clear water supply for these settlements and the incoming population in addition to ensuring these 'new' settlements do not cause the water quality of the area to deteriorate beyond acceptable limits.

In order to assess the existing water quality, baseline water monitoring will be carried out and the result will be compared with the National Water Quality Standards for Malaysia (NWQSM). Grab water sampling will be carried out upstream, midstream and downstream of all main rivers and streams relevant to the Project site and the samples will be analysed by an accredited laboratory. Some of the relevant baseline water quality parameters include turbidity, which is a measurement of organic and/or inorganic constituents and total suspended solids, which is an indication of the amount of erosion that took place nearby or upstream.

9.3.2.3 Water Quality (Agro-chemicals)

The use of pesticides and weedicides in controlling pests, diseases and weeds in the plantation are normally of great concern in terms of water pollution and occupational safety. Considering that the Project will consist of two different crops (i.e. OPP and ITP), different agro-chemicals is expected to be used for each of them. In total, the Project will be using more varieties of agro-chemicals. From available literature, it is found that traces of herbicides and pesticides are often present in soils and occasionally appear in watercourses. The magnitude of the chemical residues found in the soil or groundwater depends on several factors, including: the amount of any particular chemical used; its formulation; the use of which it is put; the extent of which it persists; its solubility in water; and the extent to which it is broken down (by chemical or microbial means), vitalize or is inactivated on plant material or adsorbed by the soil. In order to assess this, data on agro-chemical type, usage and management would be procured from the Project Proponent.

9.3.3 Hydrological Impact

Land clearing of any type will inevitably disturb the soil surface resulting in high run-off and eventually affecting the site hydrology. When vegetation is removed the hydrological cycle is altered as water that would have been returned to the atmosphere by means of plant transpiration processes, under undisturbed circumstances, now remains within the soil layer. The impact or additional volume of water retained, increases approximately in proportion to the amount of vegetation removed, therefore the greater the amount of vegetation removed, the greater the hydrological impact. Absence of vegetation also allows a greater proportion of direct rainfall to reach the forest floor. The additional rainfall and reduced rates of evapotranspiration translate into increased volumes of water leaving the catchment.

When the amount of disturbed and compacted surfaces are high; there will be an accompanying increase in the fast routing of surface runoff or the storm flow component of the stream flow. However, most of the additional water drains more gradually through the soil, contributing to the slower base flow component of hydrological routing.

Although it is popularly reported that deforestation results in an increased incidence of flood, however, it must also be borne in mind that floods are a natural hazard, particularly in areas that receive heavy rainfall. The speed at which water runs off into a river system determines the height and duration of a flood. Again the changes in volume and timing of storm runoff will be approximately proportional to the extent and amount of reduction in vegetation cover.

Since the headwaters of major rivers such as Sg. Kalabakan, Sg. Kinabatangan, Sg. Brantian, Sg. Anjeranjermut and Sg. Tiagau and their tributaries, which discharge into the Cowie Bay on the southeastern part and Sulu Sea on the northeastern part are located within the Project area, one potential impact of the proposed oil palm plantation is the effect on flood levels and sediments accumulation in the coastal area and estuaries due to the increase in less impervious areas.

Preliminary investigations shows that these rivers and its tributaries are populated with settlements, hence assessment will focus on impact of flooding and sediments in these river systems and the coastal area. Hydrological impacts such as flooding frequency and floodwater surface elevation on these settlements before and after the plantation development will be assessed. For this, hydrological computer modelling will be employed to transform rainfall to runoff and routing of the runoff through the river system.

Another aspect is the associated impact on the nutrient pathway in the proposed development area. Any interference on the natural forest could potentially affect the natural nutrient cycle. Since the tropical soil is generally nutrient poor and has thin topsoil, the development would further jeopardize the nutrient status if the intended activities were carried out at a high intensity and in an uncontrolled manner. The possible ways by which nutrient could be loss through: (i) Timber harvesting; (ii) Soil erosion, (iii) Increased leaching, and (iv) Forest fires. For this SEIA, assessment will base on literature review on the nutrient loss on these aspects in the local context.

9.3.4 Land Suitability and Topography

As assessed in the previous SEIA, some parts of Project area are very steep, or have unstable soils, it may not be viable for productive plantation operations, but should be conserved as protection forest. Assessment will look into the limits of plantation development in terms of landform and soil characteristics. The inherent slope, topography and soil characteristics of the Project site will be assessed to determine the areas suitable for sustainable OPP and ITP management.

9.3.5 Biomass / Waste

Considering the size of the area involved, it is envisaged that significant amount of vegetative waste will be generated during the land clearing stage. Method of disposal will be considered in views of the previous fire and haze situation in the State. On the other hand, if the biomass were to be naturally degraded, the potential fire hazard and as well as potential pest breeding ground will also be examined. Assessment will also be undertaken in relation to disposal of domestic waste and sewage as well as agro-chemicals usage during the operation phase of the plantation.

9.3.6 Infrastructure, Utilities and Amenities Development

In terms of infrastructure, utilities and amenities development, the proposed OPP and ITP will change the existing natural environment into a well-developed property with infrastructure and facilities such as: roads, nurseries, offices, mechanical workshops, workers' housing, fire lookout towers, recreational areas, sanitation and water supply, tele-communication and electricity supply facilities. All these developments would have some impacts to the environment especially increase in surface runoff if there are sited within the sensitive or erosion prone area. Assessment and evaluation will examine the availability of existing infrastructure, facilities and amenities and compare these with the Project requirements.

9.3.7 Transport and Traffic

The Fresh Fruit Bunch (FFB) and logs from the Project site will be transported either by road or river system. Traffic investigations of the main access will be made and the information compared against future traffic generation and the designed capacity of the road system for the area. River traffic will be assessed based on discussions with the local authority and the Marine Department. Navigational and operational safety will be discussed.

9.3.8 Socio Economics

Socio economic issues of significance are mainly related to human settlement, source of livelihood and land use structures. Issues that may arise include:-

- » **Water Pollution** – Since most of the waterways are noted to be highly turbid and some are reported to be polluted with domestic waste, it is imperative to determine clean potable water sources for the future workers as well as for the existing downstream settlements. The proposed methodology to assess the water quality is *in-situ* testing (pH, DO, temp) and laboratory testing of sampled water for BOD, COD, turbidity, TSS, TDS, Amm-N, K,

NO₃-N, oil and grease, pesticides, Total Coliform count and Faecal Coliform count. Visual observations for any indiscriminate dumping of waste in the base camp and waterways will also be carried out.

- » **Loss of fishing areas/livelihood** – Development of OPP and ITP plantations and logging activities may lead to increased erosion and sedimentation of water courses, which may negatively impact the aquatic habitats and fish population, thus affecting the livelihood of the people who depend on fishing, both within and down stream of the site. The methodology for this study include review of available literature and data, discussions with the relevant authorities such as the Fisheries Department, local residents and local fishermen as well as field survey.
- » **Employment opportunities** – The evaluation will take into consideration the local needs and suggest mitigation measures to improve the local livelihoods as well as manpower from outside. The potential social impacts due to any influx of foreigners will also be addressed.
- » **Hunting** – The proximity of plantation to known wildlife areas could increase hunting as the plantation development would improve road access significantly into the previously forested area. For this study, assessment will look into the siting of base camps and mill, plantation road layout and the security within the plantation. The results of the study will be presented in a map showing all the temporary base camp, proposed regional administrative centres, villages and nearby towns, conservation areas and roads.
- » **Safety** – Consideration will be given to safety issue during site clearing and construction stage. Consideration would also be given to health impact due to the use of agro-chemicals in the oil palm plantation. The evaluation will be based on the existing legislative requirements and suitable safety measures to minimise the potential hazard will be suggested.
- » **Waste management** – The assessment will examine the provision of housing condition of the base camps, portable water supply, hygiene of health aspect of the workers, and potential impacts due to the waste generation in the camps.
- » **Industrial, urban and commercial development** – Development of oil palm and industrial tree plantations may generate significant benefits to the local economy through creation of new direct employment, business opportunities, improved access, and indirect, "spin-off" effects in property development and provision of goods and services to the proposed area of development. These positive impacts may bring significant benefits to Tawau and the State as a whole. Evaluation will determine the possible economic benefit due to the proposed development. On the other hand, the demands on the existing facilities such as health, education and utilities by the possible influx of foreigners as a result of this development will also be taken into consideration.
- » **Loss of eco-tourism resources** - Development of this Project may lead to the loss of recreational or eco-tourism resources which is either cleared or converted to monoculture cropping.

- » **Land appreciation** – The proposed plantation will bring socio-economics benefits to various stakeholders: i.e. Project Proponent, Local Communities, Government, etc. The magnitude and distribution of these benefits, between various groups, will be identified and documented in the SEIA.
- » **Dust Pollution** – Currently all the roads leading to the Project site are earth roads. On a fine day, dust generation due to passing vehicles (mostly logging trucks and heavy trucks) can be a hazard especially for those houses situated along the main roads. As part of the evaluation, baseline monitoring for Total Suspended Particles (TSP) will be carried out near these settlements along the main road for 24 hours period to determine the existing level of pollution.
- » **Noise Pollution** – Noise pollution though is not significance in the natural environment like this Project site, would still be assessed. Baseline noise monitoring will be carried out near the main settlements along the main roads and this will serve as a reference level in the evaluation of future noise pollution related to Project implementation.

All these issues will be considered and addressed in the SEIA in order to determine their potential impact. Reference will be made to relevant Government agencies responsible for such matters.

9.3.9 **Environmental Cost and Benefit Analysis**

The evaluation of the environmental cost and benefit is an essential aid to decision-making by the Project approving authority. For this SEIA, the analysis will examine the Project options and also focus on the key issues identified in the above sections, where possible, environmental costs and benefit will be quantified. For the non-quantifiable aspects of the environment, explanatory will be given with example.

9.4 **Other Environmental Impacts**

9.4.1 **Pests and Diseases Problems**

Pest problems occur in both native forest and monocrop plantations. The SEIA will look into the potential pests and useful insects in the existing environment and provide measures to detect and suppress pest and disease attack on both the OPP and ITP development. In addition, plantation sanitation measures will be taken to prevent pest and disease outbreaks, consistent with modern concepts on integrated pest and disease management.

On the other hand, the stock or planting materials for the proposed OPP and ITP may be sourced from outside the State. In any case, it is vital that the planting materials be screened of potential diseases or pests prior to importation. If unchecked, the potential implications to the health and safety of the native forest and wildlife may be detrimental.

9.4.2 **Forest Fire**

Clearing of forest to facilitate plantation establishment creates large quantities of woody biomass which dries on exposure to sun increase the risk of wild fire. Evaluation will cover

the risk of forest fire to the proposed plantation and its surroundings. For this study, the assessment will look into the proposed plantation management plan and where appropriate, suggest warning and control measures and (biological as well as physical) to be integrated into the development phasing, plantation's operational procedures and activities. The evaluation will emphasize on fire prevention strategies consistent with contemporary philosophy on the management of risk. Assessment will also examine the risk of forest fire from the neighbouring area to the proposed plantation area and vice versa.

9.4.3 Abandonment

The environmental implications of abandonment would depend largely on the stage when abandonment takes place. When it occurs during pre-felling stage, the impacts on the forest would be negligible as they are only related to the pre-felling inventory and other preparation for felling operation. Should abandonment occur during harvesting/site clearing, the Project site would consist of a mosaic of regenerating and recently logged-over stands. In terms, of economic benefits, the retention of old-growth timber trees or forest after abandonment would mean opportunities foregone and may have adverse impact on the socio-economic situation locally. The impact of abandonment will be discussed and appropriate recommendation will be presented.

9.5 Methodology for Prediction and Evaluation of Impact

Prediction and evaluation of impact will be carried out by analysing Project components in relation to the environmental parameters of the Project area. Where necessary, it will be quantified using acceptable modelling techniques.

The methodologies used for the prediction of impacts are listed in **Table 1**.

Table 1: Prediction Methods for Assessment Of Impacts

IMPACTS	PREDICTION METHODS
Soil Erosion & Sediment transport	Universal Soil Loss Equation (USLE) Modified Soil Loss Equation (MUSLE) Sediment Delivery Ratio method Computer model which apply the USLE or MUSLE equation, e.g. SWRRB Unsteady state models that apply sediment transport equation and account for sediment budgets, e.g. MIKE11 (DHI)
Flood Hydraulics	Determining flood levels using steady state models, e.g. HECRAS Determining flood levels using unsteady state models, e.g. MIKE 11 (DHI), EXTRAN (US EPA)
Water Quality	Crude estimates of BOD loading in the river system Mathematical or numerical models based on one, two or three-dimensional analysis of pollutant dispersion. Simple models based on mass balance of pollutant, or the Streeter-Phelps Model for simulation of dissolved oxygen profile
Surface Water, Hydrology	Hydrological Procedures for urban and rural settings by the Drainage & Irrigation Dept. (DID) – HP4, HP5 and HP11 Rainfall and runoff models for catchment analysis, flood and streamflow discharge prediction, storage detention, etc., applicable to local or tropical conditions Statistical methods, e.g. Flood Frequency method
Air Quality	Air dispersion model (e.g. Gaussian Plume)
Ecology	Comparative assessment of conservation status and sensitivity of the habitat, flora and fauna Ecological models for species diversity and population changes Relative importance (based on relative density and dominance) Field study
Harvesting	Guidelines on harvesting by the Forestry Department
Transportation	Traffic generation and flow models Field survey
Aesthetics	Analysis of unique (physical, geological, and ecological), scenic values, and comparative assessment with and without Project Judgemental assessment
Infrastructure & Utilities	Existing guidelines, factors or criteria for projection of demand for infrastructure and utilities set by various Government authorities
Socio-economy	Perception rating based on sample assessment of population, Cost-Benefit Analysis Field survey
Land use	Map overlay techniques; comparative evaluation against structure/ local plans Field survey

Note: Methodologies for assessment tabulated above are not exhaustive but show those commonly used by consultants.

To evaluate the severity of impacts, adverse impacts predicted by appropriate assessment methodology, are compared against various standards or criteria as well as baseline data collected to judge their significance on the environment. This will determine whether mitigation of the impacts will be necessary to bring the impacts to acceptable levels. The judgement of significance can be based on one or more of the following:

- Comparison with existing laws, regulations or accepted national or international standards;
- Reference to pre-set criteria such as conservation or protected status of a site, feature or species (such as endemic, rare, endangered or threatened);
- Consistency with pre-set policy objectives (such as for forestry, agriculture, conservation, land use and others); and
- Consultation with experts and acceptability with the relevant decision makers, community or general public.

Table 2 suggests evaluation criteria (but not limited to) for each environmental component.

Table 2: Criteria and Standards Used for Impact Evaluation

IMPACT	EVALUATION CRITERIA	REFERENCE
Soil Erosion and Sedimentation	Guidelines to Control Erosion and Siltation in Malaysia, Guidelines for EIA Approval, Local Government Act. May be evaluated against acceptable flood criteria or water quality standards for various uses.	Various sources (e.g. DID criteria for acceptable flood discharge, DOE, Jabatan Pertanian, MARDI and JPS). Proposed National Water Quality Standards for Malaysia
Floods (and drainage)	Guidelines and criteria issued by the DID with respect to acceptable flood flow or peak discharges for various catchments.	Guidelines and criteria by DID and other relevant authorities
Water Quality	DOE discharge limit Ambient water quality standards for Malaysia. Impacts to water intakes	Environmental Quality (Sewage & Industrial Effluents) Regulations 1979. Third Schedule National Water Quality Standards (NWQS) for Malaysia Standards set by relevant water authorities
Marine Quality	International ambient marine water quality standards e.g. PRC, Japan, USEPA	DOE
Ground water Quality	Based on acceptable International Standards	Malaysian Standard for Water and Packaged Drinking Water, Food Act 1983, Food (Amendment) Regulations 1991.
Coastal Processes	Shoreline classification and critical erosion area. Coastal Zone Management Guidelines.	Stanley, 1985 National Coastal Zone Management Study, PM's Department Shoreline Management Plan for the West Coast of Sabah, 1998
Biodiversity/ Ecology	IUCN and CITES listing of unique and endangered species Endemic species classification Department of Wildlife, Forestry, etc. listings of protected areas, species, etc. Wildlife rescue plan Harvesting	IUCN 1996 Protection of Wildlife Act, 1972 Wildlife protection Ordinance (Sabah and Sarawak). Forestry Act, (1984), Guidelines of Forestry Department, FRIM (1997)
Air Quality	Ambient air quality standards for Malaysia Emission limits	Recommended Malaysian Guidelines, 1989. Environmental Quality (Clean Air) Regulations, 1978
Noise	DOE guidelines for siting and zoning of industries WHO recommended noise exposure limits Threshold levels of wildlife	DOE WHO, undated
Transportation	Acceptable level of service for highway affecting traffic flow Acceptable level of service for marine traffic flow	Highway Research Board, 1985
Land Use	Designated land use within specific structure and local plans	Structure and local plans for various local authorities
Socio-economic	Cost Benefit Analysis (CBA). Historical value and cultural heritage, Archeology	Museum Department, Forestry Department
Occupational Health	Occupational Health and Safety Act, ILO and other guidelines	Occupational Health and Safety Act 514, 1994, ILO, 1972
Aesthetics	Perceived importance of resources and features by local residents and visitors to the area.	Perception rating based on sample assessment of population/visitors
Infrastructure and Utilities	Criteria and guidelines by respective approving agencies and authorities.	Roads - JKR; Sewerage- local authority, Water – Local Water Authority, Electricity – SESB, Telecommunications - Telekom Malaysia

9.6 Mitigation/Control Measures

Recommendations for possible preventive, remedial or compensatory measures will be made for each of the adverse impacts evaluated as significant. Particular attention will be given to impacts mentioned in the previous **Section 6.3**. These recommendations will be made based on discussions with the client and professional judgement based on known applications of technology for the control of pollutants into the environment.

The primary objective of mitigation and control is to ensure that the impacts due to the Project development are minimised or within acceptable limits so as to render it acceptable to the EPD, DOE, SFD, DID, JKR, SWD and other authorities.

Mitigation will consist of a number of related actions, many of which may consist of no more than ensuring effective management and control of site operations. Mitigation measures can take many forms, including the following:

- Preventive - to be addressed during the pre-feasibility study and land application including site selection; exclusion of areas identified as having high environmental risks e.g. soil erosion and flooding, plantation layout particularly for drainage system and road network; provision of buffer zones, and alternatives for development method.
- Control - to be addressed during development and operational phases and related to working practices such as implementing zero burning method instead of open burning, provision of perimeter drains and silt traps, controlled fertiliser application and usage of pesticides, and establishment of cover crops at cleared areas.
- Compensatory - whereby it is recognised that there will be an impact and that some compensation for the loss is to be made. This could include a specific contribution towards local conservation.

9.7 Residual Impacts

Significant potential environment impacts that remain after mitigating measures will be stated. These impacts will need to be properly addressed in the SEIA report.

9.8 Environmental Monitoring and Auditing Program

The implementation of mitigating measures at the proposed site needs to be assessed regularly to ensure their effectiveness. Monitoring and auditing program will be recommended for all stages of the plantation development to ensure environment quality is maintained.

9.9 Environmental Management Plan

The environmental management commitments should be integrated into a draft environmental management plan. Guidelines for the preparation of an environmental management plan will base on the requirements of EPD as well as the DOE. The preliminary environmental management plan should aim at facilitating the following:

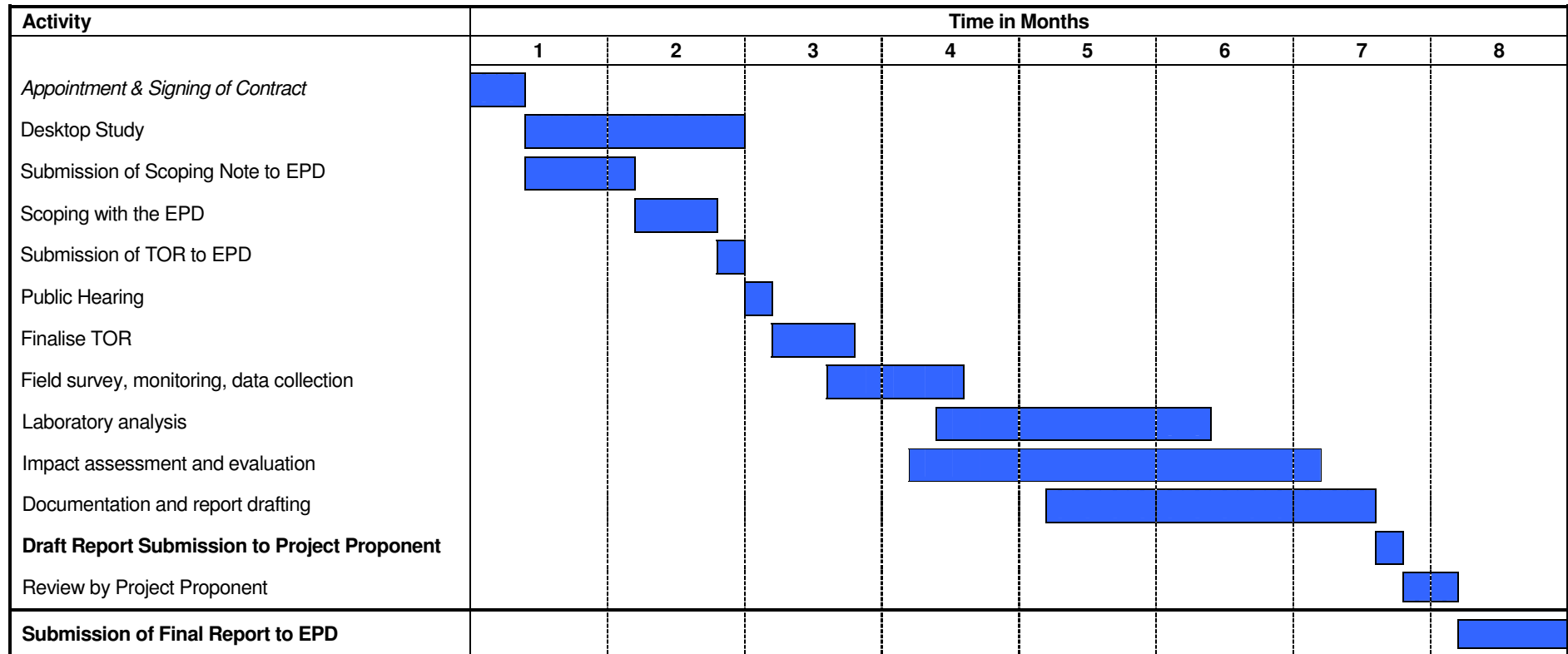
- » Integration of all environmental conditions under different legislation (e.g. requirements under the EPD, DOE, local government requirements) in a readily understandable planning format that addresses a hierarchy of environmental issues e.g. water pollution, waste management, plantation management, emergency response plan,;
- » Integration of environmental conditions into Project's environmental management system (for ready implementation and due diligence);
- » Ongoing auditing of performance of the development;
- » Linkage of development assessment (i.e. impact assessment study) findings with environmental authorities and development permits.

10. Liaison With Relevant Authorities

Chemsain Konsultant Sdn. Bhd. will meet with relevant authorities concerned such as District officers, Environment Protection Department (EPD) Sabah, Department of Environment (DOE), Department of Irrigation and Drainage (DID), Jabatan Kerja Raya (JKR) Sabah, Lands and Surveys Department, Sabah Forestry Department (SFD), Fisheries Department, Sabah Wildlife Department (SWD), non-governmental agencies, etc. to seek their concerns, if any, regarding the Project. Findings from these meetings that may affect the Project concept and layout will be brought to the Project Proponent's attention.

11. Study Schedule

The projected work programme and schedule will be as follows (subject to availability of important information/data for the study):



*Note: The above schedule may be subject to change due to weather conditions at the site and availability of information from client