ANNEX 1: Data on Existing Environment

Annex 1.1: Soil Data

The main soil associations found within the project site are Lokan (43 %), Crocker (35 %) and Maliau (16 %) (Figure A1.1). Pockets of Labau, Kalabakan, Serudong and Gomantong Associations are also found. These associations are generally associated with the geological landform of the area

Lokan Association can be mapped on hills with amplitudes of up to 300 m width slopes commonly exceeding 25°. Orthic Acrisols of the Kumansi Family is dominant on mudstone to the east of Sapulut. Soil depth and slope are not correlated, but on the summits and upper slopes the soils are generally deeply weathered and on the lower slopes the soils are usually shallower and less weathered.

Crocker Association occurs on mountains with amplitudes greater than 300 m at altitudes narrow ridge and long slopes. Orthic Acrisols of the Tanjong Lipat Family is the dominant soils. They are generally not deeply weathered and are only moderately deep becoming shallower with increasing slope. Landslides are common and the soils are developed from colluvium rather than from solid rock.

Maliau Association occurs on hills and mountains at altitudes ranging from 150 m to over 1,650 m. These hills and mountains are often arranged in series of concentric circles around a central core with outward facing scarp slopes and inward facing dip slopes. Sandstones of fine sand are the dominant parent materials. Orthic Acricols of the Kapilit and Tanjong Lipat Families are the dominant soils on the scarpslopes but Dystric Cambisols of the Antulai Family are dominant on the steepest slopes in association with Lithosols and rock outcrops.

Labau Association occurs on narrow valley floors comprising series of low terraces. Parent materials are dominantly moderately fine-to-coarse-textured, often stony, alluviums derived partly from sedimentary and igneous rocks. Kalabakan Association occurs on moderate hills with amplitudes less than 75 m and slopes ranging from 10° to 20°. Parent materials consist of mudstone and minor mudstone. Orthic Acrisols of the Kumansi Family is the dominant soils. Serudong Association occurs on the dipslopes of mountain cuestas, which are formed largely of sandstone with minor interbedded mudstone. Gleyic Podzols of the Pa Sia Family and Orthic Acrisols of the Kapilit Family are the dominant soils in association. Gomantong Association with Rendzinas of the Loc Sambuang Family occurs on limestone outcrops and also on stony limestone colluvium.

The main soil units recorded within the project area include Orthic Acrisol, Gambisol, Podzol, Gleysol and Lithosol. The dominant and major soil unit is Orthic Acrisol, which is sandy and low in fertility. It is derived mainly from the parent materials of sandstone, siltstone and mudstone.

Generally, these soils are well drained and usually with soil texture ranging from sandy to clayey foam. This resulted in heavy leaching to the nutrients of the soil due to its low binding ability. In view of past management and repeated logging activities, large parts of the area inevitably experienced some erosion and compaction.

Table A1.1 (a): Particle Size Distribution (Tanjong Lipat Family)

Depth (cm)	***Particle size distribution (%)***		
	Clay	***Silt***	***Sand***
0 - 3	18	29	53
3 - 18	25	34	41
18 - 53	35	29	36
53 - 85	35	22	43
Average	***28***	***29***	***43***

Table A1.1 (b): Particle Size Distribution (Kapilit Family)

Depth (cm)	Particle size distribution (%)		
	Clay	Silt	Sand
0 - 5	8	20	72
5 - 28	15	20	65
28 - 38	15	18	67
38 - 88	18	15	67
Average	**14**	**18**	**68**

Table A1.1 (c): Particle Size Distribution (Kumansi Family)

Depth (cm)	Particle size distribution (%)				
	Clay	Silt	Fine Sand	Coarse Sand	Others
0 - 5	-	-	-	-	-
5 - 25	47	30	16	4	3
25 - 53	55	26	13	2	4
53 - 120	59	25	12	2	2
Average	**54**	**27**	**14**	**3**	**2**

Table A1.1 (d): Particle Size Distribution (Antulai Family)

Depth (cm)	Particle size distribution (%)				
	Clay	Silt	Fine Sand	Coarse Sand	Others
0 - 4	-	-	-	-	-
4 - 28	19	14	12	53	1
28 - 80	19	12	9	58	1
Average	**19**	**13**	**11**	**56**	**1**

Table A1.1 (e): Particle Size Distribution (Pa Sia Family)

Depth (cm)	Particle size distribution (%)			
	Clay	Silt	Fine Sand	Coarse Sand
0 - 5	19	29	45	5
5 - 15	22	28	45	7
15 - 20	22	27	31	21
Average	**21**	**28**	**40**	**11**

Table A1.1 (f): Particle Size Distribution (Loc Sambuang Family)

Depth (cm)	Particle size distribution (%)				
	Clay	Silt	Fine Sand	Coarse Sand	Others
0 - 10	48	22	6	2	22
10 - 20	58	23	7	1	11
Average	**53**	**22**	**7**	**2**	**16**

Figure A1.1: Soil Map of the Project Area

Annex 1.2: Hydrological Data

The hydrology of the project site is shown in Figure A1.2. Field measurements of hydraulic properties of the rivers have been carried-out with the aid of measuring tape and flow meter (GLOBAL Flow Probe FP101). The flows measured on 05 Jun & 03 Jul 2002, 27 Mar & 02 Apr 2003 and 06 to 10 Sept 2004 are summarised below:

Table A1.2 (a): Hydraulic Properties of Rivers/Streams

Locality	***Unit***	***Sg Sapulut (D/S)***	***Sg Siliawan (D/S)***	***Sg Pinangah (D/S)***	***Sg Saburan (D/S)***
		W1	***W2***	***W3***	***W4***
Co-ordinates		04° 42' 13" N 116° 30' 19" E	04° 43' 05" N 116° 31' 47" E	04° 47' 32" N 116° 35' 48" E	04° 42' 21" N 116° 36' 45" E
Elevation	m	279	300	533	268
Catchment Area	km^2	1234	56	570	149
Bottom Width	m	80	14	15	32
Top Width	m	90	20	31	35
Water Depth	m	2.0	0.2	0.6	1.0
River Depth	m	5.0	2.4	18.6	4.0
Speed	m/s	0.25	0.13	0.10	0.3
Flow	m^3/s	40	0.36	0.90	9.6
Capacity	m^3/s	106.25	5.30	42.78	50.25

Table A1.2 (a): Hydraulic Properties of Rivers/Streams (continued)

Locality	***Unit***	***Sg Saburan* (U/S)***	***Sg Sansiang (U/S)***	***Sg Sansiang (D/S)***	***Sg Tibow (U/S)***
		W5	***W6***	***W7***	***W8***
Co-ordinates		04° 43' 14" N 116° 44' 03" E	04° 40' 37" N 116° 50' 33" E	04° 37' 37" N 116° 44' 56" E	04° 35' 28" N 116° 49' 59" E
Elevation	m	280	440	380	456
Catchment Area	km^2	149	380	380	84
Bottom Width	m	21	2.0	6.0	8.0
Top Width	m	23.5	3.9	8.0	10.0
Water Depth	m	0.8	0.3	1.8	0.4
River Depth	m	4.8	3.3	3.0	3.8
Speed	m/s	0.4	0.10	0.1	0.20
Flow	m^3/s	9.0	0.06	1.1	0.64
Capacity	m^3/s	42.72	0.97	3.36	6.84

Table A1.2 (a): Hydraulic Properties of Rivers/Streams (continued)

Locality	***Unit***	***Sg Sansiang (D/S)***	***Sg Simatuoh (D/S)***	***Sg Beliar (D/S)***	***Sg Salung (D/S)***
		W9	***W10***	***W11***	***W12***
Co-ordinates		04° 39' 22" N 116° 36' 38" E	04° 40' 08" N 116° 33' 20" E	04° 28' 03" N 116° 34' 03" E	04° 34' 37" N 116° 27' 25" E
Elevation	m	303	300	235	40
Catchment Area	km^2	1234	21	91	90
Bottom Width	m	25	10	15	18
Top Width	m	35	11	18.5	20
Water Depth	m	0.4	0.3	1.0	1.0
River Depth	m	2.4	1.3	6.0	2.5
Speed	m/s	0.50	0.04	0.20	0.1
Flow	m^3/s	5.0	0.12	3.0	4.5
Capacity	m^3/s	36.0	0.55	10.05	6.65

Table A1.2 (a): Hydraulic Properties of Rivers/Streams (continued)

Locality	***Unit***	***Sg Sinikalaun (D/S)***	***Sg Logongon (D/S)***	***Tributary of Sg Sapulut***
		W13	***W14***	***W15***
Co-ordinates		04° 33' 53" N 116° 26' 46" E	04° 33' 47" N 116° 26' 31" E	04° 39' 18" N 116° 36' 32" E
Elevation	m	167	163	298
Catchment Area	km^2	14	533	2
Bottom Width	m	9.5	43	1.2
Top Width	m	10.0	53	3.0
Water Depth	m	0.3	3.8	0.1
River Depth	m	1.3	5.3	1.9
Speed	m/s	0.1	0.3	0.20
Flow	m^3/s	0.3	91.2	0.02
Capacity	m^3/s	0.98	116.64	0.8

Conditions of rivers during site surveys are as follows:

Table A1.2 (b): River/Stream Conditions

River/Stream	Condition	Use For	Affected Village/Settlement			
			Water Supply	Irrigation	Navigation	Fishing
Sg Siliawan	Normal	Water Supply & Fishing	Kg Siliawan**	Nil	Nil	Kg Siliawan
Sg Pinangah	Normal	Nil	Nil	Nil	Nil	Nil
Sg Lombunaan	Normal	Nil	Nil	Nil	Nil	Nil
Sg Saburan	Normal	Navigation & Fishing	Nil	Nil	Kg Labang, Kg Samuran, Kg Sanuank, Kg Sandukon & Kg Tataluan	Kg Labang, Kg Samuran, Kg Sanuank, Kg Sandukon & Kg Tataluan
Sg Sansiang	Normal	Water Supply	Kg Tataluan*, Kg Sandukon, Kg Labang* & Kg Sanuank	Nil	Nil	Nil
Sg Tibow	Clean	Water Supply & Fishing	Jabatan Perhutanan Tibow	Nil	Nil	Jabatan Perhutanan Tibow
Sg Palangan	Normal	Nil	Nil	Nil	Nil	Nil
Sg Sakikilan	Normal	Nil	Nil	Nil	Nil	Nil
Sg Sabunutan	Normal	Nil	NI	Nil	Nil	Nil
Sg Beliar	Clean	Fishing	Nil	Nil	Nil	Nil
Sg Sablangan	Normal	Water Supply	Atlantic Sawmill	Nil	Nil	Nil
Sg Simatuoh	Normal	Water Supply & Fishing	Kg Simatuoh	Nil	Nil	Kg Simatuoh
Sg Salung	Normal	Water Supply, Navigation & Fishing	Kg Salong*	Nil	Kg Salong	Kg Salong
Sg Lalobou	Normal	Nil	Nil	Nil	Nil	Nil
Sg Sinikalaun	Normal	Water Supply, Navigation & Fishing	Kg Sinikalaun*	Nil	Kg Sinikalaun	Kg Sinikalaun
Sg Sapulut	Normal	Water Supply, Navigation & Fishing	Sapulut Township, Kg Bigor*, Kg Labang*, Kg Tonomon & Kg Simatuoh*	Nil	Sapulut Township, Kg Bigor, Kg Labang, Kg Tonomon & Kg Simatuoh	Sapulut Township, Kg Bigor, Kg Labang, Kg Tonomon & Kg Simatuoh
Sg Logongon	Normal	Water Supply, Navigation & Fishing	Kg Balantos*, Kg Kuyoh*, Kg Sikait*, Kg Kuala Sebenait* & Kg Sumolopop*	Nil	Kg Balantos, Kg Kuyoh, Kg Sikait, Kg Kuala Sebenait & Kg Sumolopop	Kg Balantos, Kg Kuyoh, Kg Sikait, Kg Kuala Sebenait & Kg Sumolopop

*Notes: * During dry period; **During harvesting period*

Table A1.2 (b): River/Stream Conditions (continued)

River/Stream	***Condition***	***Use For***	***Affected Village/Settlement***			
			Water Supply	***Irrigation***	***Navigation***	***Fishing***
Sg Sumatalun	Normal	Water Supply & Navigation	Kg Sasandukon*, Kg Sibuah*, Kg Saliko*, Kg Kakutar* & Kem Sri Seliku*	Nil	Kg Sasandukon, Kg Sibuah, Kg Saliko, Kg Kakutar & Kem Sri Seliku	Kg Sasandukon, Kg Sibuah, Kg Saliko, Kg Kakutar & Kem Sri Seliku
Sg Sasandukon	Clean	Water Supply	Kg Sasandukon	Nil	Nil	Nil
Sg Sabuloh	Normal	Water Supply	Kg Agis	Nil	Nil	Nil

*Note: * During dry period*

Figure A1.2: Hydrology of the Project Area

Annex 1.3: Socio-Economics Data

Population

Nabawan

District of Nabawan / Pensiangan covers an area of 6,089 kilometres' square, which represent approximately 8.0 % of total Sabah land mass. Based on the 2000 Population Statistics, District of Pensiangan has population of 23,944, which represent 1.0 % of Sabah total population. Of these 12,780 were males and 11,164 females. The corresponding population density was 4 people per kilometre square. Total household for the district was 4,673.

Nabawan / Pensiangan district has 106 villages and one major township, namely Nabawan. Nabawan Township is located some 110 km southeast of Kota Kinabalu and accessible by a combination of sealed and gravel roads, Jalan Kota Kinabalu – Keningau and Jalan Keningau – Nabawan.

The ethnic composition consists of 84 % Bumiputera, 1 % Chinese and 1 % others. Immigrants (14%) make up the balance of Nabawan / Pensiangan population. Murut represents the majority of the Bumiputera group. They work as farmers, fishermen, businessmen, labourers and officers.

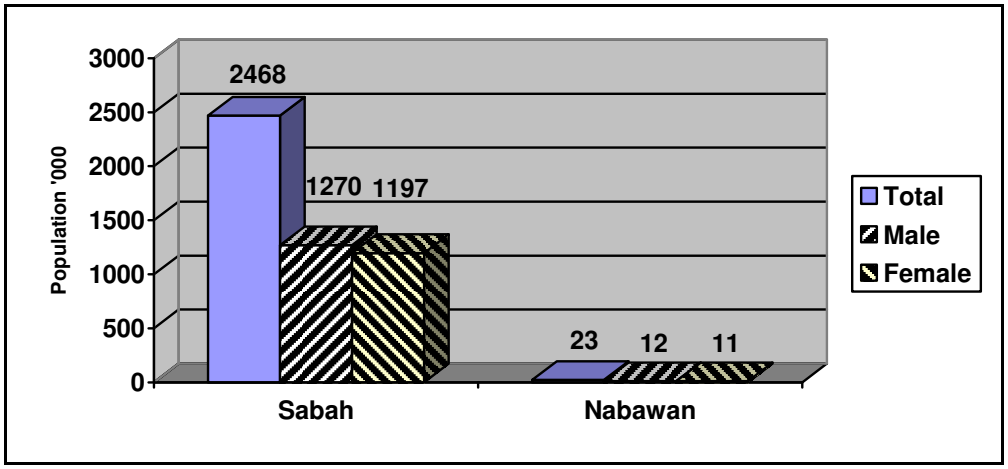


Figure A1.3: Population in 2000

Project Area

There are no villages or human settlements within the project site, except of one staff quarters owned by the project proponent and another staff quarters owned by a private operator (Atlantic Sawmill).

Table A1.3 (a-1): Household and Population Distribution – Within Project Site

Settlements	Position Off Site	No. of Houses	Population
Atlantic Sawmill	Within site	5 Blocks	120 #
Sapulut Forest Development	Within site	7 Blocks	150 #

Note: # Estimated

Major human settlements are located mainly east and southeast of the project site, within the State land along Sg Sapulut, Sg Pampangon and Sg Logongon. These local villages with a total population of 3,526 include Sapulut Township, Kg Tataluan, Kg Sandukon, Kg Sanuank, Kg Samuran, Kg Labang, Kg Liningkar, Kg Simatuoh, Kg Siliawan, Kg Ampulos, Kg Tonomon, Kg Bigor, Kg Agis, Kg Tapuluon, Kg Balantos, Kg Salong, Kg Sinikalaun, Kg Sosogoh, Kg Kuyoh, Kg Sikait, Kg Kuala Sabenait, Kg Sumolopop, Kg Binanding, Kg Pagalungan, Kg Sumakiuwakiu, Kg Mangkam, Kg Silungai, Kg Kuala Sumatalun and Kg Sasandukon.

In the eastern area of the project site, human settlement is limited to Jabatan Perhutanan Tibow, which is provided with main office and staff quarters (29 personnel).

Table A1.3 (a-2): Household and Population Distribution – In the Vicinity

Settlements	Position off Site	Co-ordinates	No. of Houses	Population
Jabatan Perhutanan Tibow	Within excised area	04° 47' 26" N; 116° 47' 16" E	22	29
Kg Tataluan	0.1 km west	04° 39' 55" N; 116° 36' 27" E	2*	145
Kg Sandukon	0.5 km north	04° 40' 09" N; 116° 36' 11" E	3*	207
Kg Sanuank	1.1 km north	04° 40' 15" N; 116° 36' 11" E	3	26
Kg Samuran	2.8 km west	04° 36' 37" N; 116° 32' 01" E	9	89
Kg Labang	3.6 km north	04° 41' 53" N; 116° 35' 47" E	38	300
Kg Liningkar	2.3 km north	04° 40' 01" N; 116° 34' 01" E	8	58
Kg Simatuoh	1.0 km north	04° 40' 26" N; 116° 33' 20" E	4*	180
Kg Ampulos	1.8 km north	04° 41' 29" N; 116° 35' 27" E	3	24
Kg Tonomon	1.3 km north	04° 41' 28" N; 116° 31' 37" E	2*	76
Kg Siliawan	0.4 km south	04° 42' 40" N; 116° 32' 01" E	2**	42
Kg Bigor	1.8 km south	04° 42' 10" N; 116° 30' 21" E	15	139
Sapulut Township	1.8 km south	04° 42' 10" N; 116° 39' 01" E	7	87
Kg Agis	2.3 km west	04° 36' 13" N; 116° 27' 11" E	5	70
Kg Tapuluon	1.5 km west	04° 36' 00" N; 116° 26' 09" E	5	21
Kg Balantos	0.8 km west	04° 34' 14" N; 116° 27' 20" E	8	50
Kg Salong	1.3 km west	04° 34' 48" N; 116° 27' 18" E	12	168
Kg Sinikalaun	1.0 km west	04° 34' 00" N; 116° 26' 58" E	2*	100
Kg Sosogoh	2.0 km west	04° 34' 35" N; 116° 26' 19" E	26	159
Kg Kuyoh	1.3 km west	04° 33' 05" N; 116° 26' 44" E	8	51
Kg Sikait	2.5 km southwest	04° 32' 40" N; 116° 25' 51" E	32	188
Kg Kuala Sabenait	3.0 km southwest	04° 31' 24" N; 116° 26' 10" E	3	21
Kg Sumolopop	4.0 km southwest	04° 31' 21" N; 116° 25' 32" E	4	23
Kg Binanding	5.0 km southwest	04° 30' 10" N; 116° 25' 27" E	6	34
Kg Pagalungan	6.1 km southwest	04° 30' 02" N; 116° 33' 20" E	41	500

*Notes: * Longhouse; ** Occupied during harvesting period only*

Table A1.3 (a-2): Household and Population Distribution – In the Vicinity (continued)

Settlements	Position off Site	Co-ordinates	No. of Houses	Population
Kg Sumakiuwakiu	6.8 km southwest	04° 29' 51" N; 116° 24' 59" E	1*	101
Kg Mangkam	7.3 km southwest	04° 29' 27" N; 116° 25' 00" E	1*	117
Kg Silungai	7.5 km southwest	04° 29' 10" N; 116° 25' 16" E	2*	155
Kg Kuala Sumatalun	8.0 km southwest	04° 28' 38" N; 116° 25' 40" E	8	45
Kg Sasandukon	6.5 km south	04° 28' 45" N; 116° 29' 59" E	1*	350
Kg Sibuah	8.3 km south	04° 27' 59" N; 116° 34' 40" E	2*	120
Kg Saliko	8.3 km south	04° 27' 29" N; 116° 35' 27" E	3*	210
Kg Kakutar	8.3 km south	04° 28' 52" N; 116° 36' 10" E	5	126
Kem Sri Seliku	9.8 km south	04° 27' 21" N; 116° 35' 10" E	2	10

*Note: * Longhouse*

Table A1.3(b): Socio-Economics Data (visited settlement)

Kampong	No of Population	JKKK (Chairman)	Ketua Kampong
Jabatan Perhuatan Tibow	29	-	En. Solivister Tiongin (Ketua Pegawai Perhutanan Tibow)
Kg Tataluan	145	En. Batanda bin Lamat	KK Andoi bin Tawanon
Kg Labang	300	En. Batanda bin Lamat	KK Korom Panuon
Kg Simatuoh	180	NA	KK Minggin Emboh
Kg Ampulos	24	Nil	Nil
Kg Tonomon	76	En. Inapar Gumbunon	KK Minggin Emboh
Kg Bigor	139	En. Statly bin Ampihang	KK Minggin Emboh
Sapulut Township	87	KAN Disto bin Snagau	Nil
Kg Agis	70	En. Ambur bin Kasah	KK Alan bin Seromon
Kg Salong	158	En. Ambur bin Kasah	KK Kasah Ambayan
Kg Sinikalaun	100	NA	NA
Kg Sikait	188	NA	KK Mansang bin Angula
Kg Pagalungan	500	En. Andua bin Panatan	KK Sambang bin Lumbis
Kg Sasandukon	350	Nil	KK Tari bin Ganit
Kg Sibuah	150	En. Kapito bin Sagi	KK Endok bin Mandis
Kg Saliko	210	En. Asok bin Yusof	KK Pindah bin Dullah
Kg Kakutar	126	En. Asok bin Yusof	KK Pindah bin Dullah

Note: NA – No JKKK or KK appointed during EIA Study

Table A1.3(c): Sources of Water Supply

Village	Water Supply	Source	Remarks
Atlantic Sawmill	Gravity	Sg Sablangan	Affected
SFD Campsite	Gravity	Tributary of Sg Tibow	Affected
Jabatan Perhutanan Tibow	Rain Water		Not Affected
	River	Sg Tibow	Affected
Kg Tataluan	Well		Not Affected
	River	Sg Sansiang*	Affected
	Gravity	Tributary of Sg Sansiang	Affected
Kg Sandukon	Rain Water		Not Affected
	River	Sg Sansiang	Affected
Kg Sanuank	River	Sg Sansiang	Affected
Kg Samuran	Gravity	Tributary of Sg Sansiang	Affected
Kg Labang	Rain Water		Not Affected
	River	Sg Sansiang*	Affected
		Sg Sapulut*	Affected
Kg Liningkar	Rain Water		Not Affected
	Gravity	Tributary of Sg Sapulut	Not Affected
Kg Simatuoh	River	Sg Simatuoh	Affected
		Sg Sapulut*	Affected
Kg Ampulos	Rain Water		Not Affected
	Gravity	Tributary of Sg Sapulut	Not Affected
Kg Tonomon	Gravity	Tributary of Sg Sapulut	Affected
	River	Sg Sapulut*	Affected
Kg Siliawan	River	Sg Siliawan**	Affected
Kg Bigor	Gravity	Tributary of Sg Sapulut	Not Affected
	River	Sg Sapulut*	Affected
Sapulut Township	Rain		Not Affected
	River	Sg Sapulut	Affected
Kg Agis	Rain Water		Not Affected
	River	Sg Sabuloh	Not Affected
Kg Tapuluon	Gravity	Tributary of Sg Logongon	Not Affected
Kg Balantos	Gravity	Tributary of Sg Logongon	Not Affected
	River	Sg Logongon*	Not Affected
Kg Salong	Rain Water		Not Affected
	River	Sg Salung*	Affected
Kg Sinikalaun	Rain Water		Not Affected
	River	Sg Sinikalaun*	Affected
Kg Sosogoh	Gravity	Tributary of Sg Logongon	Not Affected
	River	Sg Logongon*	Not Affected
Kg Kuyoh	Rainwater		Not Affected
	River	Sg Logongon*	Not Affected
Kg Sikait	Rainwater		Not Affected
	River	Sg Logongon*	Not Affected
Kg Kuala Sabenait	Rainwater		Not Affected
	River	Sg Logongon*	Not Affected
Kg Sumolopop	Rainwater		Not Affected
	Gravity	Tributary of Sg Logongon	Not Affected
	River	Sg Logongon*	Not Affected

*Notes: * During dry period; ** During harvesting period*

Table A1.3 (c): Sources of Water Supply (Continued)

Village	Water Supply	Source	Remarks
Kg Binanding	Gravity	Tributary of Sg Logongon	Not Affected
Kg Pagalungan	Gravity	Tributary of Sg Logongon	Not Affected
Kg Sumakiwakiu	Gravity	Tributary of Sg Logongon	Not Affected
Kg Mangkam	Gravity	Tributary of Sg Logongon	Not Affected
Kg Silungai	Gravity	Tributary of Sg Logongon	Not Affected
Kg Kuala Sumatalun	Gravity	Tributary of Sg Sumatalun	Not Affected
Kg Sasandukon	Gravity	Sg Sasandukon	Not Affected
	River	Sg Sumatalun*	Affected
Kg Sibuah	Gravity	Tributary of Sg Sumatalun	Not Affected
	River	Sg Sumatalun*	Not Affected
Kg Saliko	Gravity	Tributary of Sg Sumatalun	Not Affected
	River	Sg Sumatalun*	Not Affected
Kg Kakutar	Gravity	Tributary of Sg Sumatalun	Not Affected
	River	Sg Sumatalun*	Not Affected
Kem Sri Seliku	Rainwater		Not Affected
	River	Sg Sumatalun*	Not Affected

*Note: * During dry period*

Archaeological Sites

Batu Punggul is one of the tourist attractions in Sabah, which is progressively promoted by Sabah Tourism Promotion Corporation (STPC) in early 90's. Batu Punggul is a unique structure of huge limestone rock standing approximately 300 m height and related to Murut ethnic legends. In archaeological view, Batu Punggul contains cave at its foot, due to incursions of Sg Sansiang. The cave mouth is approximately 19 m deep and 6 m to 12 m across. It is reported used by the Muruts even in pre-historic times, both as a refuge in times of war, and as an escape in the terrible and hysterical times when smallpox and cholera epidermics decimated this population up into this century.

Adjacent, and at a lower level is Batu Tinahas at approximately 20 minutes on-foot journey from Batu Punggul. Batu Tinahas is a cave approximately 9 m above the forest floor and flood plain, 12 m deep and 30 m across facing the river. Many bats and their guano are present in the cave. According to Jabatan Muzium Negeri Sabah, Batu Tinahas is suspected to have historical value of the area.

Batu Punggul and Batu Tinahas could only be accessed via Sg Sansiang, as both are located in remote area. Accomodation is available, in longhouse homestay package at Kg Tataluan located 2 km north of Batu Punggul. Based on record, the average tourist arrival (foreign and local tourists) is 5 to 15 visitors per month. Package trip is arranged by local population of Kg Tataluan and Kg Labang.

Batu Saap is a limestone hill located within the project site. The uniqueness of this area is the existence of coconut (*Cocos nucifera*), nibung (*Oncosperma figillarium*) and Rumbia Bukit (*Eugeissona utilis*) trees on Batu Saap. The surrounding area is covered by secondary forest/vegetation. Currently, there is no access road to this site, but can be accessible by foot, off the existing Jalan Sapulut – Kalabakan. According to Jabatan Muzium Negeri Sabah, Batu Saap is not gazetted as archaeological site and there is no known future plan to gazette the area as archaeological site.

Socio-Economic Survey Data

The project has its own socio-economic aspects, which need to be examined. The socio-economic analysis was based on socio survey, interviews, field observation and secondary data collected from various government agencies and local associations. A socio-economic survey was conducted in May and Sep 2004. In addition, socio-economic data from previous EIA Studies in Mar and Oct 2003 was also incorporated. The purpose of the survey was to provide the socio-economic background of the communities that may be affected and to gauge their opinions and views on the project. A total of 899 respondents and two social associations were interviewed for the socio-economic survey. The results of the survey are summarised below:

Date of Survey: 27 Mar & 29 Oct 2003; and 11 to 12 May & 6 to 10 Sep 2004

Purpose of Survey: To provide the socio-economic background of the communities that may be affected and to gauge their opinions and views on the project.

	Directly Affected	Indirectly Affected	Total
No of Population	3,555	466	4,021
No of Samples	846	53	899
No of Household	32	6	38

Kampung / Settlement Details

Directly Affected

Settlement	*Gazetted*	*Population*	*Samples*	*JKKK / JKDB (Chairman)*	*Ketua Kampung*
Jabatan Perhutanan Tibow	Yes	29	4	Nil	Solvister Tiongin (Ketua Pegawai Perhutanan Tibow)
Kg Tataluan	Yes	145	44	En. Batanda B. Lamat	KK. Andoi Bin Tawanon
Kg Sandukon	Yes	207	-	En. Sahap Ansanggut	KK. Tiri Bin Gamit
Kg Sanuank	No	26	-	Nil	Nil
Kg Samuran	Yes	89	-	Nil	KK. Sisiop Bin Lumbis
Kg Labang	Yes	300	104	En. Batanda B. Lamat	KK. Korom Panuon
Kg Liningkar	No	58	-	Nil	Nil
Kg Simatuoh	Yes	180	41	N/A	KK. Minggin Bin Emboh
Kg Ampulos	No	24	10	Nil	Nil
Kg Tonomon	Yes	76	38	En. Inapar Gumbunon	KK. Minggin Bin Emboh
Kg Siliawan	No	42	-	Nil	Nil
Kg Bigor	Yes	139	100	En. Zainol Angkasang	KK. Minggin Bin Emboh
Sapulut Township	Yes	87	21	En. Zainol Angkasang	KAN Disto Bin Sangau
Kg Agis	Yes	70	40	En. Ambur Bin Kasah	KK. Alan Seromon
Kg Tapuluon	No	21	-	Nil	Nil
Kg Balantos	Yes	50	-	N/A	KK. Tingkalor Bin Anturi
Kg Salong	Yes	168	86	En. Ambur Bin Kasah	KK. Alan Seromon
Kg Sinikalaun	No	100	15	Nil	Nil
Kg Sosogoh	Yes	159	-	N/A	KK. Akat Ampaul
Kg Kuyoh	No	51	-	Nil	Nil
Kg Sikait	Yes	188	30	N/A	KK. Mangsang Bin Angula
Kg Kuala Sabenait	No	21	-	Nil	Nil
Kg Sumolopop	No	23	-	Nil	Nil
Kg Binanding	Yes	34	-	En. Atong Bin Andawa	KK. Ebit Bin Bandang
Kg Pagalungan	Yes	500	33	En. Andua B. Panatan	KK. Sambang Bin Lumbis
Kg Sumakiwakiu	Yes	101	-	En. Andua B. Panatan	KK. Sambang Bin Lumbis
Kg Mangkam	Yes	117	-	En. Andua B. Panatan	KK. Sambang Bin Lumbis
Kg Silungai	Yes	155	-	En. Agus Tuspresa	KK. Anduyou Bin Tulamus
Kg Kuala Sumatalun	No	45	-	Nil	Nil
Kg Sasandukon	Yes	350	280	N/A	KK. Tari Bin Ganit
Sub Total		**3,555**	**846**		

Kampung / Settlement Details (*Cont.*)

Indirectly Affected

Settlement	*Gazetted*	*Population*	*Samples*	*JKKK / JKDB (Chairman)*	*Ketua Kampung*
Kg Sibuah	Yes	120	20	En. Kapito Bin Sagi	KK. Endok Bin Mandis
Kg Saliko	Yes	210	18	En. Asok Bin Yusof	KK. Pindah Bin Rulah
Kg Kakutar	Yes	126	15	En. Asok Bin Yusof	KK. Pindah Bin Rulah
Kem Sri Seliku	Yes	10	-	Nil	Nil
Sub Total		**466**	**53**		
Grand Total		**4,021**	**899**		

a) Population Structure

Ethnic Origin

All respondents are of Bumiputera origin from Murut and Kadazan community.

Age Structure

Approximately half of the respondents (46 %) were 40 years old and above. This means that the population is mainly of the younger age group. In terms of potential productive capacity of the population, it is observed that 62 % of the population is at their prime stage of economic life, i.e. between 30 - 49 years of age.

Level of Education

The educational level is low with only 7 % of the respondents completed secondary education.

Occupation

Main economic activity in the study area is in the agricultural sector (85 %), mainly plantation of paddy and fruit trees for own daily consumption.

Leisure Activity

The most popular leisure activity is fishing, farming and hunting. Fishing activity mainly carried out along Sg Sansiang, Sg Sapulut, Sg Simatuoh Sg Logongon, Sg Sumatalun and Sg Logongon. Farming is normally carried out within village areas. Animal hunting is concentrated along Sg Beliar, Sg Saburan, Sg Lalobou and Sg Sansiang Forest Reserve.

b) Household Size

Household Size

The distribution of the household size ranges from less than 4 to 9 members per household. Majority of the respondents (90 %) are having more than 9 members per household, mainly from staying in longhouses. Approximately 8 % is having 7 to 9 members per household and 1 % is having 4 to 6 members per household. The average household size is 24.

House Ownership

Almost all respondents claimed they owned houses (99 %). Most houses are of longhouse kampung type constructed from timber with zinc roof.

Length of Stay

Majority of the respondents (97 %) was wither born in the area or has stayed for more than 10 years and considered as permanent residents.

c) Income and Expenditure

Household Income

Majority of the respondents (96 %) receives average income of less than RM 300 per month.

Household Expenditure

Majoirty of the respondents (96 %) spend less than RM 250 per month. The expenditure was for food and drinks, clothing, transportation, children education, utilities and miscellaneous items. In general, the populations' level of expenditure is congruent with their level of income. This expenditure pattern, together with their income levels indicates that the majority of them belong to the very low income group.

Household Items

Ownerships of basic facilities are limited with 1 % owned television set, radio (3 %) and furniture (1 %). Approximately 5 % of the respondents own transportation facility. None of the respondent owned any telecommunication facility.

d) Amenities and Infrastructure

Water Supply

Majority of the respondents (62 %) relies on gravity river water system for drinking purposes. Approximately 27 % of the respondents obtains water from rain and 11 % rely on well. However, during dry period these respondents obtain water directly from local rivers for their daily water supply.

Existing Infrastructure / Utilities

Road condition, electricity and water supply are not satisfactory among the respondents.

e) Perception

Awareness

All respondents are aware of the project development.

Expressed Opinion About the Project

Majority of the respondents (81 %) expressed favourable views of the project, with approximately 2 % disagreed and 17 % are uncertain.

The agreed respondents stated that the project may (i) provide new road network, thus improving access condition: (ii) create more employment opportunities: and (iii) further development to the surrounding area.

Major disagreements to the project are mainly related to the river water pollution that affects local population daily activities. Some of those disagreed imposed reasonable conditions mainly related to the requirements of clean water supply, either in the form of water storage facility or protection of water catchment areas. Accordingly, they may agree to the project if continuous supply of clean can be assured. It is believed that with the implementation of various mitigation measures during project operation arised from this EIA Study, additional protection on water supply can be achieved.

Figure A1.3(b): Expressed Opinion about the Project

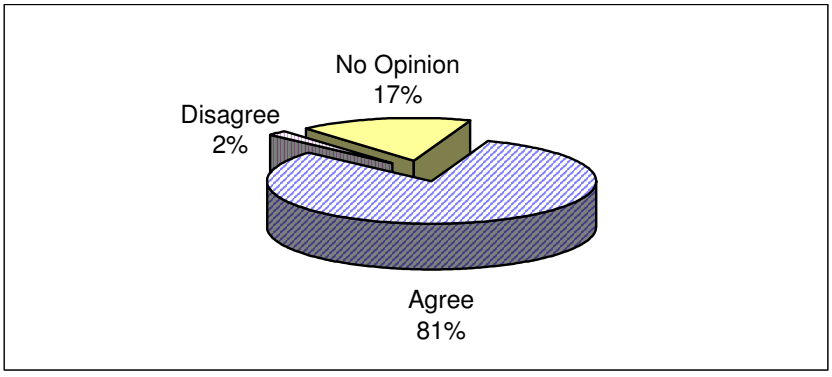


Table 1.3(c-1): **Distribution of Population Ethnic Group**

Ethnic Group	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Murut	842	99.0	53	100.0	895	99.0
Kadazan	4	1.0	0	0.0	4	1.0
Total	**846**	**100**	**53**	**100**	**899**	

Table 1.3(c-2): **Distribution of Population Age Structure**

Age Group (Years)	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
< 29	44	5.2	8	15.1	52	5.8
30 - 39	359	42.4	7	13.2	366	40.7
40 - 49	311	36.8	10	18.9	321	35.7
> 50	132	15.6	28	52.8	160	17.8
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-3): **Distribution of Population Level of Education**

Education Level	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
No Education	93	11.0	38	71.7	131	14.6
Primary	698	82.0	0	0.0	698	77.3
Secondary	51	6.0	15	28.3	66	7.1
Tertiary	4	1.0	0	0.0	4	1.0
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-4): **Distribution of Population Occupation**

Occupation Categories	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Services	14	1.7	0	0.0	14	1.5
Agriculture	746	88.2	18	34.0	764	85.0
Others	86	10.1	35	66.0	121	13.5
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-5): **Distribution of Population Leisure Activity**

Leisure Activity	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Fishing	801	94.7	45	84.9	846	94.1
Hunting	792	93.6	35	66.0	827	92.0
Farming	812	96.0	18	33.9	830	92.3

Table 1.3(c-6): **Distribution of Population Household Size**

No of Person	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
< 4	6	0.7	0	0.0	6	0.7
4 - 6	9	1.1	0	0.0	9	1.0
7 - 9	51	6.0	23	43.4	74	8.2
> 9	780	92.2	30	56.6	810	90.1
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-7): **Distribution of Population House Ownership**

Ownership	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Own House	842	99.0	53	100.0	895	99.0
Provided	4	1.0	0	0.0	4	1.0
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-8): **Distribution of Population Length of Stay in the Area**

Length of Stay (Year)	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Born Here	755	89.2	53	100.0	808	89.9
> 10	68	8.0	0	0.0	68	7.6
< 10	23	2.8	0	0.0	23	2.5
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-9): **Distribution of Population Monthly Household Income**

Income (RM)	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
< 300	822	97.0	45	84.9	867	96.0
301 – 500	10	1.0	8	15.1	18	2.0
501 – 700	10	1.0	0	0.0	10	1.0
> 700	4	1.0	0	0.0	4	1.0
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-10): **Distribution of Population Monthly Household Expenditure**

Expenditure (RM)	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
< 250	822	97.0	38	71.7	860	95.7
251 – 450	20	2.0	15	28.3	35	3.3
> 450	4	1.0	0	0.0	4	1.0
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-11): **Distribution of Population Household Items**

Household Item	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Television	10	1.1	0	0.0	10	1.1
Radio	16	1.9	7	0.8	23	2.6
Motor/Car	46	5.4	0	0.0	46	5.1
Furniture	10	2.4	0	0.0	10	1.1
Video	0	0.0	0	0.0	0	0.0
Fridge	0	0.0	0	0.0	0	0.0
Washing Machine	0	0.0	0	0.0	0	0.0
Telephone	4	0.5	0	0.0	0	0.0

Table 1.3(c-12): **Sources of Water Supply in the Study Area**

Source of Water	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Gravity	501	59.2	53	100.0	554	61.6
Rain	245	29.0	0	0.0	245	27.3
Well	100	11.8	0	0.0	100	11.1
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-13): **Distribution of Acceptable Existing Infrastructure / Utilities**

Infrastructure	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
- Electricity	15	1.8	0	0.0	15	1.7
- Water Supply	20	2.4	10	18.9	30	3.3
- Road	41	4.9	0	0.0	41	4.6
- Solid Waste	0	0.0	0	0.0	0	0.0

Table 1.3(c-14): **Awareness of Population on the Project**

Awareness	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Aware	846	100.0	53	100.0	899	100.0
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table 1.3(c-15): **Opinion of Population on the Replantation Project**

Opinion	Directly Affected		Indirectly Affected		Total	
	Number of Population	Percentage (%)	Number of Population	Percentage (%)	Number of Population	Percentage (%)
Agree	687	81.2	43	81.1	730	81.2
Disagree	19	2.2	0	0.0	19	2.1
No Opinion	140	16.6	10	18.9	150	16.7
Total	**846**	**100**	**53**	**100**	**899**	**100**

Table A1.3 (d): Interview Data

Kampung	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Jabatan Perhutanan Tibow	1. En. Solvister Tiongin	Ketua Pegawai Perhutanan Tibow	29/10/03 / 1530 hrs	No Opinion	The project area has been logged several times previously. Sg Sansiang and Sg Tibow could be affected by the project, which flow to Sg Sapulut (local river use by downstream villagers for water supply. However, environmental and socio-economic impacts could be minised with the application of appropriate mitigation measures.
Kg Tataluan	1. KK Andoi Bin Tawanon	Ketua Kampung	07/09/04 / 1545 hrs	Agree	The project can be implemented if appropriate licence issued by related authority. Project proponent should protect gravity water system and provide hunting ground for local population.
	2. En. Angalom bin Baukum	Villager	07/09/04 / 1600 hrs	Agree	Compensation on water gravity / supply should be provided by the project proponent.
	3. En. Panusul Bin Batayas	Villager	07/09/04 / 1200 hrs	Agree	The logging activity may provide job opportunity among the local population.
	4. Pn. Intang Bte Lamat	Villager	07/09/04 / 1140 hrs	Agree	The existence of project near Kg Tataluan may create job opportunity among the local population.
Kg Labang	1. Sisiop Bin Lumbis	Villager	09/09/04 / 1120 hrs	Agree	The project could provide assistance to local population of Kg Labang, particularly during emergency from existence of logging vehicles.
	2. En. Laminit Bin Bakayas	Villager	09/09/04 / 1108 hrs	Agree	The project proponent should provide adequate compensation on water pollution and dust. The logging activity upstream of Sg Sapulut had badly impact the water quality.
	3. En. Silungai Bte Gasam	Villager	09/09/04 / 1140 hrs	Agree	The project could provide assistance to local population of Kg Labang, particularly during emergency from existence of logging vehicles.
Kg Simatuoh	1. Jimmy Bin Miggin	Villager	09/09/04 / 1220 hrs	Disagree	The existing logging operators are reluctant to help local population, when needed. Previous compensations requested by local population were not entertained.
	2. Peter Bin Minggin	Villager	09/09/04 / 1215 hrs	No Opinion	No comment.

Table A1.3 (d): Interview Data (Continued)

Kampung	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Kg Ampulos	1. En. Sinusun Bte Mantan	Villager	09/09/04 / 1410 hrs	Agree	The project proponent could help local population during emergency. However, alternative gravity water system and water tanks should be provided.
Kg Tonomon	1. En. Okon Andasom	Villager	09/09/04 / 1310 hrs	Agree	The project may provide further development to the area.
Kg Bigor	1. En. Andirios Ampihang	Villager	08/09/04 / 1050 hrs	Agree	The project proponent is a responsible logging operator and has established road leading to Sapulut and its surrounding area, which benefit local population.
Sapulut Township	1. KAN Disto Bin Sangau	Ketua Anak Negeri	13/09/04 / 1000 hrs	No Opinion	No comment.
	2. En. Sopilit	Villager	08/09/04 / 1205 hrs	Agree	The project should be implemented in stages to minimize water pollution.
	3. En. Paulos	Villager	08/09/04 / 1200 hrs	Agree	The project proponent has established road leading to Sapulut and its surrounding area, which benefit local population However, water pollution to Sg Sapulut and Sg Logongon should be controlled.
Kg Agis	1. En. Tangulan Bin Pundang	Villager	08/09/04 / 1230 hrs	No Opinion	No comment.
	2. En. Aping Bin Umon	Villager	08/09/04 / 1240 hrs	Agree	The project could provide job opportunity to the local population. However, the project proponent should assist local population, when needed.
Kg Salong	1. Pn Pikah Bte Illang	Villager	08/09/04 / 1305 hrs	No Opinion	No comment.
	2. En. Juini Bin Antarus	Villager	08/09/04 / 1340 hrs	Agree	The project proponent should take more responsibility on the problems faced by local population. Water supply affected by the project should be addressed and compensated accordingly.
	3. En. Hairol Bin Tampasak	Villager	08/09/04 / 1350 hrs	Agree	The project proponent should take more responsibility on the problems faced by local population. Water supply affected by the project should be addressed and compensated accordingly.

Table A1.3 (d): Interview Data

Kampung	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Kg Salong	4. Pn. Rukinah Bte Ahimau	Villager	08/09/04 / 1340 hrs	No Opinion	No comment.
	5. En. Sundin Aping	Villager	27/03/03 / 1450 hrs	No Opinion	Follow majority decision.
	6. Pn. Samokon Ansilong	Villager	27/03/03 / 1325 hrs	Agree	Agreed to the project provided adequate compensation and water tanks are given to the affected villagers.
	7. En. Batin Imbil	Villager	27/03/03 / 1415 hrs	Disagree	Sg Salung will be affected. However, the project proponent should provide compensation and water tanks to the affected villagers.
	8. En. Allen Jamis	Villager	27/03/03 / 1430 hrs	Agree	Agreed to the project provided adequate compensation and water tanks are given to the affected villagers.
Kg Sinikalaun	1. En. Tarindim Ahiman	Villager	27/03/03 / 1445 hrs	No Opinion	Follow majority decision.
Kg Sikait	1. En. Mansang Angula	Ketua Kampung	27/03/03 / 1355 hrs	No Opinion	Good development for local population. However, the project proponent should provide compensation and water tanks to the affected villagers.
Kg Pagalungan	1. KK Sambang Bin Lumbis	Ketua Kampung	08/09/04 / 1330 hrs	Agree	The logging operation could help local population in terms of transportation.
	2. En. Anggang Bin Lingga	Villager	09/09/04 / 1245 hrs	Agree	The project proponent has rights to log within the concession area. However, appropriate compensation should be provided to villages located close to the project boundaries.
	3. En Agip Bin Isap	Villager	09/09/04 / 1230 hrs	Agree	The project area is located far from Kg Pagalungan and would not directly affect local population. However, local villages such as Kg Salong and Kg Agis, which are located close to the project boundaries should be compensated accordingly.

Table A1.3 (d): Interview Data

Kampung	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Kg Sasandukon	1. KK Balon Gandit	Ketua Kampung	09/09/04 / 1335 hrs	Agree	The project would not cause major environmental problems to local population. Other logging activity south of FMU 14 is believed to cause river pollution to Sg Sumatalun.
Kg Sibuah	1. Pn. Saginon Bte Pinda	Villager	08/09/04 / 1100 hrs	No Opinion	No comment.
	2. KK. Indok Bin Mandis	Ketua Kampung	08/09/04 / 1115 hrs	Agree	The project would not cause major environmental problems to local population. Other logging activity south of FMU 14 is believed to cause river pollution to Sg Sumatalun. Water quality of Sg Beliar should be conserved to protect the aquatic habitat, as the river is used by local population for fishing.
Kg Saliko	1. En. Micheal Bin Kimeh	Villager	08/09/04 / 1330 hrs	Agree	The project would not affect local villagers of Kg Saliko. However, over logging of area upstream of Sg Beliar should be avoided to conserve local hunting ground. The area is well known as hunting ground among the local population.
	2. En. Lampa Bin Pinda	Villager	08/09/04 / 1340 hrs	Agree	The project would not affect Kg Saliko. However, the project proponent should conserve the area upstream of Sg Beliar for hunting purposes, particularly wild boar and “payau”.
Kg Kakutar	1. En. Angusah Bin Korom	Villager	08/09/04 / 1305 hrs	Agree	Kg Kakutar is located far from the logging activity of FMU14.
	2. Iumpak Binti Hari	Villager	08/09/04 / 1310 hrs	Agree	FMU 14 project boundary is located far from their settlement.

Table A1.3 (d): Interview Data (continued)

Authorities	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Jabatan Air Nabawan	1. En. George Ulat	Juruteknik Air Daerah	23/09/04 / 1035 hrs	Agree	There are no known or gazetted water catchment area for potable water supply along Sg Saburan, Sg Sangsiang, Sg Kuala Sumatalun, Sg Salung and Sg Sinikalaun. However, these rivers are used by local villagers for daily water supply (gravity water supply). People in Sapulut Township are currently served either by rainwater, gravity or river.
Jabatan Hidupan Liar Kota Kinabalu	1. Puan. Jum Rafiah	Pegawai Hidupan Liar	14/09/04 / 0900 hrs 17/09/04 / 1000 hrs 29/09/04 / 1430 hrs	-	No comments.
Jabatan Hidupan Liar Keningau	1. En. Benedict Bin Jani	Pegawai Hidupan Liar	06/09/04	No Opinion	The project proponent should comply fully to the provision of Section 38, Wildlife Conservation Enactment, 1997. In addition, the project proponent should not allowed illegal hunting within the logging area. To-date, there is no proposal to set-up licensed hunting area within sapulut Forest Reserve.
Jabatan Kerja Raya Nabawan	1. En. Ulah Sumping	Pegawai JKR	01/09/04 / 1000 hrs	No Opinion	Recommends that small trees be protected during logging operation and road construction. Logged over area should be re-planted with good quality timber species. Permission from JKR should first be obtained, prior to connection of logging road to any public road.
Jabatan Muzium Negeri Sabah, Kota Kinabalu	1. En Peter Molijol	Penolong Seksyen Arkeologi	23/09/04 / 1040 hrs	No Opinion	Batu Punggul and Batu Tinahas are gazetted as cultural sites for tourism purposes, while Batu Saap is not gazetted yet. There is no known archaeological value of these areas.
Jabatan Pengairan dan Saliran Keningau	1. En. Van Kong	Jurutera	10/09/04 / 0815 hrs	No Opinion	There is no Government irrigation intake along the Sg Sapulut, Sg Logongon, Sg Sansiang and Sg Tibow, as these rivers are located in remote area.
Jabatan Pengairan dan Saliran Sook	1. En. Abel Pottung	Pegawai Pengairan & Saliran	01/10/04 / 0950 hrs	No Opinion	No comment.
Jabatan Perikanan Nabawan	1. En. Libang Bin Ambului	Pegawai Penguasa Perikanan	27/10/04 / 0900 hrs	No Opinion	The department has released fish seeds along rivers within the project area. Local fishing programme called “Tagal” or prohibited fishing area was established within District of Nabawan for Sg Sapulut, Sg Pampangon and Sg Sumatalun. It is recommended that the project area be preserved as virgin jungle, as most of the rivers are used for navigation and have a potential to be developed for eco-tourism.

Table A1.3 (d): Interview Data (continued)

Authorties	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
Jabatan Perhutanan Nabawan	1. En. Indra P.H. Sunjoto	Pegawai Perhutanan	10/09/04 / 1105 hrs	Agree	The project area is under the jurisdiction of Jabatan Perhutanan Tibow. It is recommended that the project be implemented with extra care to avoid major impacts to environment. Proper harvesting plan and method of logging should be implemented to ensure sustainable forest development.
Jabatan Perhutanan Tibow	1. En. Solvister Tiongin	Pegawai Perhutanan Daerah	17/06/04 / 1600 hrs	No Opinion	The project site has been logged previously by twenty six logging contractors since 1994 and there is no forest fire recorded within Sapulut Forest Reserve.
	2. En. Slyvester Micheal	Penolong Pegawai Perhutanan	16/09/04 / 1030 hrs	No Opinion	The proposed logging in FMU 14 is subject to an EIA approval.
Klinik Kesihatan Nabawan	1. En. David Makabis	Inspektor Kesihatan	30/09/04 / 1550 hrs	No Opinion	Project proponent should excise the water catchment area from logging activities, as most rivers/tributaries downstream of Sg Sapulut and Sg Logongon are used by local population as their sources of water supply.
Pejabat Daerah Nabawan	1. En. Sukiang Bin Ensing	Penolong Pegawai Daerah	10/09/04 / 1010 hrs	Disagree	Logging activity in Sapulut area had caused water pollution. Local water gravity systems were badly damaged by logging operation. Water supply to Sapulut Township was affected and consequently local population has to rely on rain water and small streams to obtain drinking water.
	2. En. Disto Sangau	Wakil Ketua Anak Negeri	13/09/04 / 1000 hrs	No Opinion	The large project area is licensed to the project proponent.
Pusat Biodiversiti Sabah	1. En. Julius Kodoh	Pegawai Perhutanan	27/09/04 / 1450 hrs	No Opinion	To-date, there is no study or research within the existing of Phenology Area. However, the area should be conserved and protected. Forest plantation has relatively long gestation of period, absence of early flow and remains inattractive. He recommends that project proponent applies agroforestry technique within ITP area to provide avenues for early and continuous returns of agricultural component thereby increasing the supply of timber for wood-based industries.

Table A1.3 (d): Interview Data (continued)

Authorities	*Name*	*Position*	*Date/Time*	*Agree / Disagree*	*Comments*
WWF, Kota Kinabalu	1. En. Raymond J. Afred	Project Manager (AREAS)	05/10/04 / 0945 hrs	No Opinion	Based on High Priority Area for Elephant and Orang Utan Map, 35 percent of the proposed ITP area will affect the important area for elephant and orang utan. In addition, trans-boundary of water pollution could be expected due to the project area location within the Pensiangan Catchment. Proper mitigation measures and suitable wildlife and water monitoring should be implemented. The concepts of ITP need to be re-considered wheter land clearing is needed or not. Some parts of the degraded forest could be developed for enrichment or tree planting programmes. Socio-economic activities in FMU14 should be highlighted and clearly addressed including hunting ground, water supply, cultural and spiritual areas.
	2. En. Junaidi (John) Payne	Consultant to Heart of Borneo and AREAS	30/09/04 / 1000 hrs	No Opinion	Maintaining the potential for soil conservation and restoration not only is environmentally responsible but also makes economic sense for development of ITPs. It is better to use bulldozers only for road construction, but use manpower and front-loaders for work on all soil surfaces that are to be planted. In addition, investigate the use of felled small-size trees (30 cm dbh) such as *Macaranga hypoleuca* (mahang daun putih) for core veneer. Skidding would best be done by manpower and winching to the road with long cable besides using heavy machinery to get logs perhaps this will give job opportunity for the local people.
Yayasan Sabah (Research & Development Division)	1. Dr. Waidi Sinun	Group Manager	06/09/04	No Opinion	Agree that no logging or plantation within MBCA Buffer Zone 1 and no plantation within MBCA Buffer Zone 2. Rehabilitation within both MBCA Buffer Zones should be carried out with native species only. Salt licks, water catchment areas, and major animal routes to and from the salt licks should be identified and protected as wildlife corridors. Hunting or gaharu collecting should be strictly prohibited. Old logging roads should be blovked to prevent access by poachers and illegal settlers. Monitoring of rainfall and other climatic indicators is strob\ngly endorsed. Potential increase in vehicular traffic from the project and the project effect on the proposed upgrading of Jalan Sapulut - Kalabakan should be addressed.

Annex 1.4: Meteorological Data

Study on the existing meteorology aspect of the site was based on data provided by Jabatan Pengairan dan Saliran Sabah, Jabatan Pertanian Sabah, and Jabatan Perkhidmatan Kajicuaca. The nearest meteorological station in operation are located at Sapulut Township with rainfall data. Other meteorological stations are located at Nabawan Township, Luasong, Kalabakan, tawau and Kota Kinabalu.

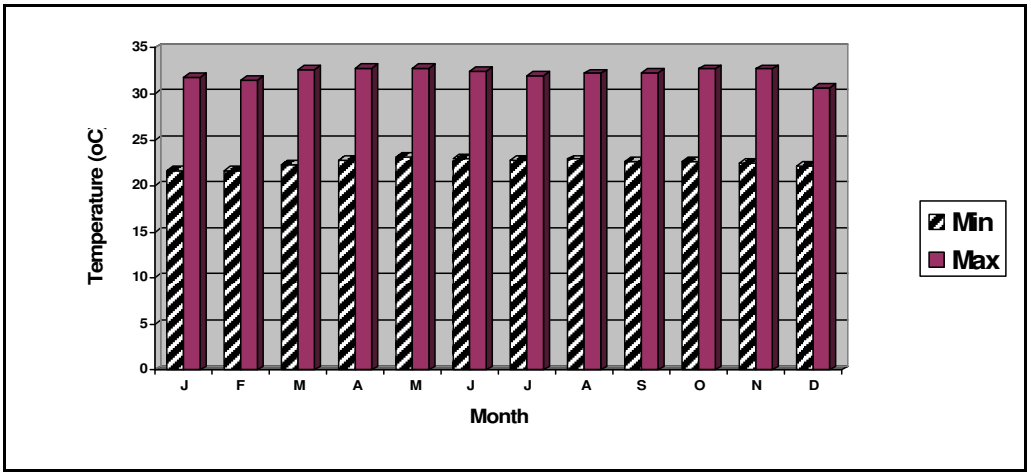
Table A1.4: Meteorological Stations

	Latitude	Longitude	Elevation (AMSL)	Distance off Project Site
Sapulut	04° 41' 46 "N	116° 29' 14" E	265 m	3 km west
Nabawan	05° 03' 02 "N	116° 26' 24" E	472 m	30 km northwest
Keningau	05° 20' 00" N	116° 09' 00" E	14 m	75 km northwest
Luasong	04° 38' 44 "N	117° 23' 44" E	250 m	55 km east
Kalabakan	04° 26' 16 "N	117° 30' 00" E	27 m	65 km southeast
Tawau	04° 18' 00" N	117° 53' 00" E	20 m	115 km southeast
Kota Kinabalu	05° 56' 00" N	116° 03' 00" E	14.5 m	140 km northwest

The climate of this subregion is a typical equatorial climate with uniform temperature, high humidity and substantial amount of rainfall. Its climatic variations are characterized by the effects of two monsoons regimes namely the May to September south-west monsoon and November to March north-east monsoon, with some modifications by land-sea breeze, intertropical convergence, typhoons and local topography.

Temperature

Temperature records show that a fairly uniform daily temperature experienced at this area. There are no temperature records for Sapulut and records for Luasong is used instead (Figure A4.1(a)). The average annual 24-hour mean temperature is 27° C. Average mean daily temperature for daytime is between 30.7° C and 32.9° C and for night-time is between 20.9° C and 23.1° C.

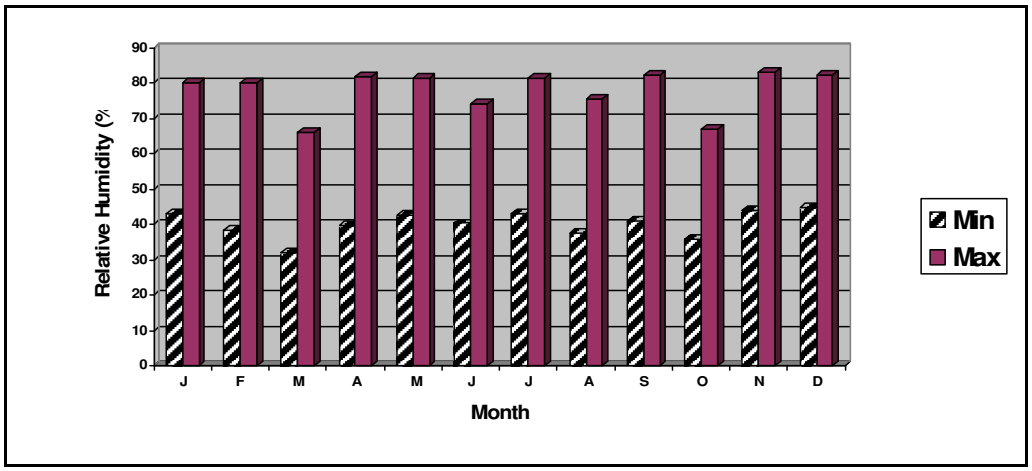


Source: Sapulut Forest Development Sdn Bhd

Figure A1.4(a): Temperature Records for Luasong (1990 – 1996)

Relative Humidity

Relative humidity records show that a fairly constant over a year. There are no relative humidity records for Sapulut and records for Keningau is used instead (Figure A4.1(b)). Mean annual relative humidity is 71 %. Average mean daily maximum and minimum are 78 % and 40 %, respectively.

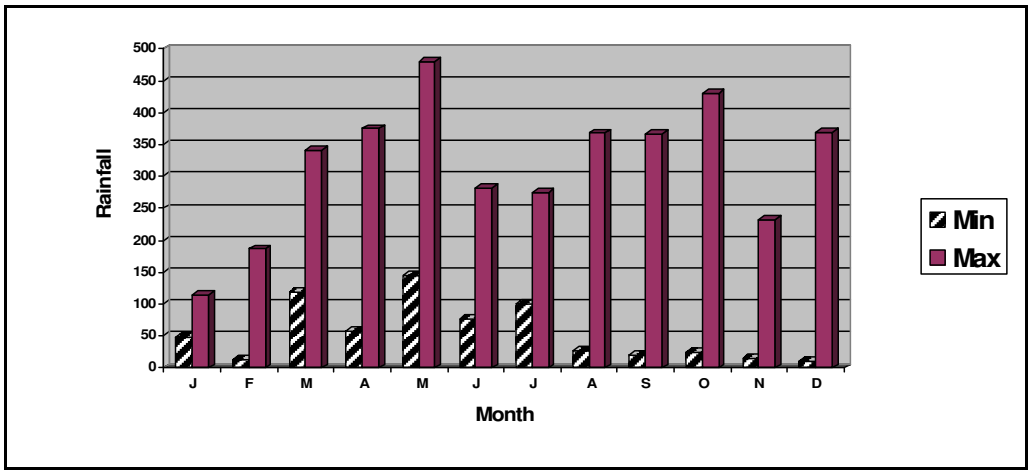


Source: Jabatan Perkhidmatan Kajicuaca, Malaysia

Figure A1.4(b): Relative Humidity Records for Keningau (1990 – 1995)

Rainfall

Rainfall is predominantly convectional although the monsoons have intensifying influence. Generally, there are two wet seasons in the area, which are monsoon in nature. These are within August to December and March to May yearly. However, the rainfall pattern in the area is unique. Even outside the monsoon period, the area is constantly being nourished by the consistent precipitation of convectional rain, which normally occurs in the afternoon. So virtually, there is no experience of distinctive dry season within the project area. Cumulative annual rainfall for the area averages approximately 2319 mm per year with monthly average of 198 mm (Figure A1.4(c)).



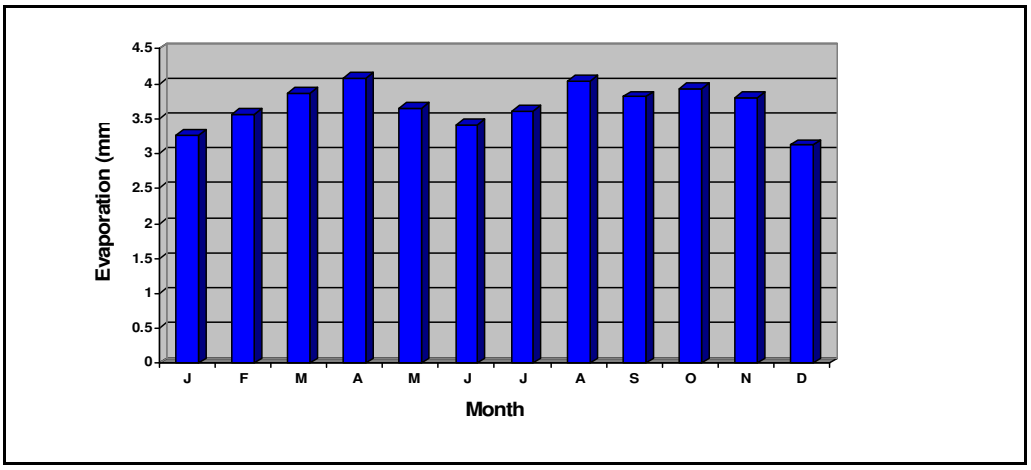
Source: Jabatan Pertanian Sabah

Figure A1.4(c): Rainfall Records for Sapulut (1987 – 1997)

Rainfall data in the surrounding area shows similar annual precipitation volume, except Maliau Basin. At Nabawan (35 km north-northwest), Luasong (30 km east) and Kalabakan (85 km east-southeast), the average annual rainfall is 2,816 mm, 2,322 mm and 2,090 mm, respectively. The average annual rainfall within Maliau Basin is estimated as 3,800 mm.

Evaporation

The mean daily evaporation rate is generally uniform throughout the year. There are no evaporation records for Sapulut and records for Tawau is used instead (Figure A4.1(d)). Mean daily evaporation range from 3.0 to 4.0 mm, with an annual average of 3.7 mm per day.

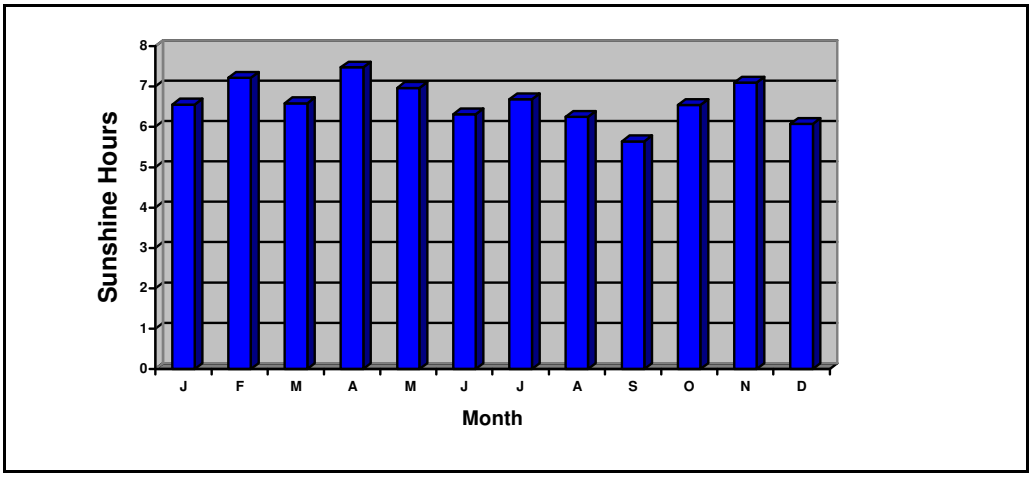


Source: Jabatan Perkhidmatan Kajicuaca, Malaysia

Figure A1.4(d): Evaporation Records for Tawau (1982 – 1997)

Sunshine Hours

There are no sunshine hours records for Sapulut and records for Keningau is used instead (Figure A4.1(e)). The average annual receipt of bright sunshine hours is approximately 6.6 hours per day. The month of December has the lowest sunshine hours of 6.1 hours per day while April receives the most sunshine with 7.5 hours per day.

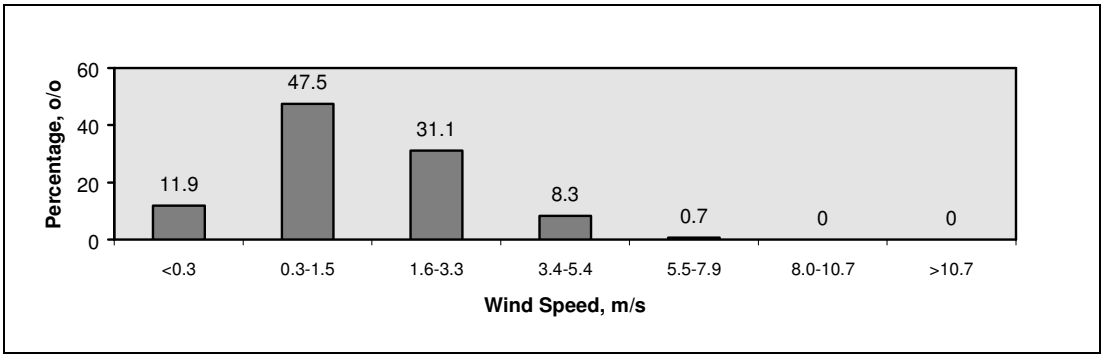


Source: Jabatan Perkhidmatan Kajicuaca, Malaysia

Figure A1.4(e): Sunshine Hours Records for Keningau (1990 – 1995)

Surface Wind

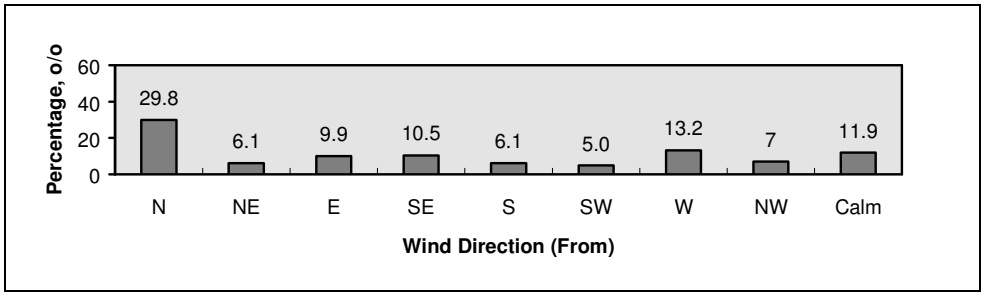
There are no surface wind records for Sapulut and records for Tawau is used instead. On annual basis, predominant winds are from the east at up to 3.3 m/s, which account for 30 % frequency. The mean wind speed is 1.6 m/s. The state of calm is represented by 12 % frequency (Figure A1.4(f-1)).



Source: Jabatan Perkhidmatan Kajicuaca, Malaysia

Figure A1.4(f-1): Distribution of Annual Wind Speed for Tawau

On a seasonal basis, predominant wind at the project site is from the east with wind velocities of up to 5.4 m/s (Figure A1.4(f-2)). The state of calm for the whole period is represented by 12% of the time.



Source: Jabatan Perkhidmatan Kajicuaca, Malaysia

Figure A1.4(f-2): Distribution of Annual Wind Direction for Tawau

Annex 1.5: Biological Data

Biological Survey

Biological survey was carried out on 11 to 13 May, 06 to 10 Sep and 13 to 17 Dec 2004. In addition, biological data was also obtained from previous biological surveys for other EIA Studies on 23 to 24 Oct & 20 to 21 Nov 2000; 07 to 08 Mar & 04 to 06 Dec 2001; 01 to 07 Jul & 02 Aug 2002; 26 to 28 Mar, 01 to 04 Apr & 25 to 27 Sep 2003; and 13 to 14 Jan 2004.

The purpose of the survey is to identify the biological habitat (any unique or rare plants of major conservation or scientific interest; or rare or protected faunal species) that may be affected by the project. The study focused on the assessment of site location in terms of outer protected areas and on the assessment of previous use of the site and forecast on the future land use for the area (to establish if the area has any potential for future protection of bio-diversity).

19 survey stations for vegetation and wildlife, and 21 survey stations for aquatic habitat were established (Figure A1.5).

Survey Method

Survey method is generally based on (i) site survey (sighting, plant features, call noted, track observed, sighted at market); (ii) report (local authorities, research, or local population); or (iii) known to exist on similar habitat.

The assessment of fauna ecology is based on the available literature, habitat maps, vegetation maps as well as ground survey to look for potential wildlife corridor or sanctuaries within and in the immediate vicinity of the project site.

The field investigations include transect lines into particular habitats (based on vegetation), habitat characteristics, food availability, roosting, breeding and nesting, refuge areas, species diversity and others. In addition, overall assessment of forest cover and land uses surrounding the project area based on available maps was also made. Review of available literature and consultation with local authorities, local community and campsites were carried out to assist with the field investigation.

The assessment of flora ecology takes into account the general diversity of species and their habitats through existing vegetation maps. General survey was carried out to gain an overview of the area, special habitats and rivers. Ground survey was carried out on selected habitats by using logging roads to assess the existing vegetation within the project site. Line transects in different habitats were used to assess the florastic differences.

The assessment of aquatic life was based on review of the available literature, consultation with local authorities / community and ground survey. Distribution of aquatic species and biodiversity was determined through random net casting and traps. Assessment looked into indicator species distribution and the importance of these fish populations to the local subsistence fishing

Survey Area

The site surveys were carried out to obtain baseline data on the abundance and distribution of species. Several sampling units were established including at different vegetation types (montane forest, highland mix dipterocarp, lowland dipterocarp, cultivation area); and at different 'activity' types (river, archaeology site, virgin jungle reserve, periphery of Maliau Basin, Phenology area, salt lick). The sampling units include points/stations, transects, quadrats, or habitat features

Areas surveyed include (i) within project site; (ii) in the vicinity of the project site (Maliau Basin Conservation Area, Sg Pinangah Forest Reserve, Sg Siliawan Virgin Jungle Reserve, Sg Sansiang Virgin Jungle Reserve, Gunung Rara Forest Reserve, Nurod Urod Virgin Jungle Reserve and Sapulut Forest Reserve); (iii) rivers (Sg Pinangah, Sg Siliawan, Sg Lombunaan, Sg Saburan, Sg Sapulut, Sg Sansiang, Sg Tibow, Sg Sakikilan, Sg Sabunutan, Sg Sablangan, Sg Salung, Sg Lalobou, Sg Sinikalaun and Sg Beliar).

Figure A1.5: Biological and Sensitive Area Map

Table A1.5: Biological Survey Stations

Habitat	*Effect*	*Station*	*Location*
Vegetation & wildlife	Directly Affected (Within project site)	t1	Northwest of project site near Sg Siliawan
		t2	Upstream of Sg Pinangah
		t3	Batu Saap
		t4	Along Jalan Sapulut – Kalabakan
		t5	Coupe A
		t6	Coupe D
		t7	Phenology Area
		t8	Coupe B
		t9	Coupe C
		t10	ITP Area of 2,811 Ha
		t11	Upstream of Sg Beliar near Idris' Gate and Atlantic Sawmill
		t12	Convergence of Sg Salung and Sg Lalobou
	Indirectly Affected (In the vicinity)	t13	Southern part of Sg Pinangah Forest Reserve
		t14	Southwest of Buffer Zone 1 of Maliau Basin Conservation Area
		t15	Southwest of Sg Siliawan Virgin Jungle Reserve
		t16	Sg Sansiang Virgin Jungle Reserve
		t17	Southern part of Gunung Rara Forest Reserve
		t18	Western part of Nurod Urod Virgin Jungle Reserve
		t19	Northern part of FMU 13
Aquatic	Directly Affected (Within project site)	q1	Sg Pinangah
		q2	Sg Siliawan
		q3	Sg Lombunaan
		q4	Sg Saburan
		q5	Sg Sapulut
		q6	Sg Simatuoh
		q7	Sg Sansiang
		q8	Sg Tibow
		q9	Sg Sakikilan
		q10	Sg Sabunutan
		q11	Sg Sablangan
		q12	Sg Salung
		q13	Sg Lalobou
		q14	Sg Sinikalaun
		q15	Sg Beliar
	Indirectly Affected (In the vicinity)	q16	Sg Pampangon
		q17	Sg Pensiangan
		q18	Sg Logongon
		q19	Sg Kuala Sumatalun
		q20	Sg Sumatalun
		q21	Sg Palangan

Note: Sampling locations are shown in Figure A1.5

Definitions:	- Surveyed	Sighted	S/S
		Plant Features Noted	S/P
		Call Noted	S/C
		Track Observed	S/T
		Sighted at Nearby Market	S/M
	- Reported	By Local Authorities	R/A
		By Research	R/S
		By Local Population	R/L
	- Known	Known to Exist in Similar Habitat	K

Habitat:	T	Tree
	H	Herb
	Tr	Terrestrial
	S	Shrub
	C	Climber
	L	Liana
	E	Ephiphyte
Distribution:	1	Rare
	2	Frequent
	3	Very Common

Biological Resources

The biological environment in the project site comprises principally of two major habitats, namely:

- Terrestrial Habitat – inland vegetation represented by lowland dipterocarp forest, highland dipterocarp forest, montane forest, develop and permanent cultivation area.
- Aquatic Habitat – comprises of freshwater of Sg Pinangah, Sg Siliawan, Sg Lombunaan, Sg Saburan, Sg Sapulut, Sg Simatuoh, Sg Sansiang, Sg Tibow, Sg Sakikilan, Sg Sabunutan, Sg Sablangan, Sg Salung, Sg Lalobou, Sg Sinikalaun, Sg Beliar and their tributaries.

Vegetation

Biological survey found that there are approximately 321 floral species within the project site, represented by 88 families of vegetation. In view of close proximity to MBCA, 7 known protected plant species are recorded within the project site.

Family / Species	*Within Site*	*In Vicinity*
No of Family	88	109
Protected Species	7	11

As a whole, the floristic composition of the study area is typical of jungle/secondary forest, hill dipterocarp forest, lower and upper montane forest, develop and permanent cultivation vegetation area where mainly found in the interior part of Sabah.

The hilly area is covered with undisturbed jungle/secondary forest and dominated by emergent trees of dipterocarp species. Some occasional stands of tall tree species can be seen protruding out of the secondary growth. Although limited in height, the tree canopies are generally open which allow seedlings to germinate and grow rapidly and eventually form a rather dense vegetation cluster resembling that of the secondary forest. The flora of exploited and developed area contains many secondary elements of pioneer species and laden with climbing plants and epiphytes such as ferns and lianas, which add considerably to the volume of plant material and to the diversity of the forests. The lowland areas are covered mainly by develop and permanent cultivation.

Project Site

The project site is dominated by jungle/secondary forest, riparian vegetation, shrubs and grasses. Predominant vegetations consist of Upland (50.3 %) and Lowland (31.8 %) Mixed Dipterocarp Forests, which have been heavily logged since the early 1970s. Other vegetations include Upland Mixed Dipterocarp & Kerangas Forest (16.4 %), Upland Kerangas Forest (1.4 %), and Lowland Mixed Dipterocarp & Kerangas Forest (0.1 %). Other smaller pockets of vegetations are the Lower Montane Forest and the Upland Mixed Dipterocarp & Limestone Forests.

The forest stand comprises many trees in the lower diameter classes and few dominants and co-dominants. Most of the trees are light demanders but have the ability to survive for long periods under suppressed conditions. Occasionally, gregarious tendencies occur due to various factors such as elevation and this result in almost pure stand of one species in the area. Occurring over such a large area and under a wide range of conditions of soils, elevation, topography, drainage and weather, variations in stand composition and structure are inevitable.

The Lowland Mixed Dipterocarp Forest usually extends up to an altitude of 750 m AMSL, which the stand structure and species composition begin to change to the Upland Mixed Dipterocarp Forest.

Generally, the Lowland and Upland Mixed Dipterocarp Forests are characterised by the predominant of the family Dipterocarpaceae that accounts to 70 % to 90 % of the commercial timber volume present. The forest is generally heterogeneous with Dipterocarp species being predominant. The stand volume and species composition can be highly variable between sites. The most commonly occurring tree species belong to Dipterocarp genera of *Shorea, Parashorea, Dryobalanops* and *Dipterocarpus*. The Red, White and Yellow Seraya groups are the most commercial important groups present.

The commonly found dominant species within the project area include the species of *Macaranga* spp. ("Mahang"), *Dillenia excelsa* ("Simpoh Laki"), *Eupatorium odoratum* ("Rumput Siam"), *Dipterocarpus* spp. ("Keruing"), *Shorea* spp. ("Seraya"), *Octomeles sumatrana* ("Binuang"), *Eleusine indica* ("Rumput Belulang"), *Paspoalum vaginatum* ("Rumput"), *Cynometra inaequifolia* ("Katong Katong"), *Mimosa invisa* ("Semalu"), *M. pudica* ("Semalu"), *Gnetum gnemon* ("Tinjau"), *Orthiopteris kingii* ("Legub"), *Dicranopteris alternans* ("Resam"), *Drynaria saprsisora* ("Sakat"), *Pyrrosia lanceolata* ("Tetumpang") and *Lygodium circinnatum* ("Paku Jari").

There are seven protected plant species recorded within the project site including two species of "Halia hutan" *(Globba propinqua and Zingiber* sp.), three species of "Lampias" *(Podocarpus imbricatus, P. nerifolius and P. polystachyus),* "Polod" *(Arenga undulatifolia)* and "Botu" *(Caryota mitis)*. These plant species are protected because of their commercial value as ornamental trees.

In the Vicinity of Project Site

The biological environment in the vicinity of the project site comprises principally of primary forest; secondary forest; mixed agriculture; riparian vegetation; shrubs, grasses, epiphytes, climbers and ferns. Plant families usually represented by trees in this area include Anacardiaceae, Annonaceae, Araceae, Bombacaceae, Celastraceae, Dilleniaceae, Dipterocarpaceae, Ericaceae, Euphorbiaceae, Fagaceae, Flacourtiaceae, Gesneriaceae, Guttiferae, Lauraceae, Leguminosae, Loganiaceae, Loranthaceae, Melastomataceae, Meliaceae, Moraceae, Myristicaceae, Myrtaceae, Ochnaceae, Orchidaceae, Rosaceae, Rubiaceae, Sapindaceae, Sterculiaceae, Theaceae, Tiliaceae, Urticaceae, Verbenaceae, Vitaceae, Zingiberaceae, Podocarpaceae, Arecaceae and Asclepiadaceae. The undergrowth vegetation is dominated by the family of Commpositae, Graminae, Glecheniaceae and Schizoeaceae.

The commonly found dominant species in the vicinity of the project area include the species of *Eupatorium odoratum* ("Rumput Siam"), *Dipterocarpus* spp. ("Keruing"), *Hopea* sp. ("Selangan"), *Shorea* spp. ("Seraya"), *Glochidion hypoleucum* ("Obah"), *Dinochloa* sp. ("Pering Pering"), *Imperata cylindrica* ("Lalang"), *Ischaemum timorense* ("Rumput Rumput"), *Paspoalum vaginatum* ("Rumput"), *Mimosa pudica* ("Semalu"), *Melastoma* spp. ("Senduduk"), *Pometia pinnata* ("Membuakat"), *Dicranopteris alternans* ("Resam") and and *D. linearis* ("Resam").

There are eleven protected plant species recorded in the vicinity of the project site, including "Mawar Hutan" (*Rhododendron* sp.), "Periuk Kera" (*Nepenthes* sp.), four species of "Halia Hutan" (*Globba propinqua, G. pendula, Zingiber* sp. and *Z. coloratum*), three species of "Lampias" (*Podocarpus imbricatus*, *P. neriifolius* and *P. polystachyus)*, "Polod" *(Arenga undulatifolia) and* "Botu" *(Caryota mitis)*.

Mixed-agriculture such as "Mangga", "Pisang", "Durian", and "Rambutan" are commonly found near the village/settlement areas. Riparian or freshwater vegetation can be found along the stream banks of Sg Pinangah, Sg Siliawan, Sg Lombunaan, Sg Saburan, Sg Sapulut, Sg Sansiang, Sg Tibow, Sg Sakikilan, Sg Sabunutan, Sg Sablangan, Sg Salung, Sg Lalobou, Sg Sinikalaun and Sg Beliar. Among the dominant plant species usually represented in this area include the species of "Tebu Sungai" and "Resam".

Lowland Mixed Dipterocarp Forest

Lowland Mixed Dipterocarp Forest generally consists of emergent trees some 60 m in height, a dominant and co-dominant strata having a height of about 45 m, an intermediate layer of trees with canopies of between 23 to 30 m, and suppressed vegetation. In some instances, where emergent trees are rare, the forest becomes a three-stratum stand. Ground vegetation is of moderate density and does not seriously impede walking. Approximately 50 % of the upper-story trees usually belong to the family of Dipterocarpaceae (many species of the genera *Anisoptera*, *Dipterocarpus*, *Dryobalanops*, *Hopea*, *Shorea* and *Parashorea*). Non-dipterocarps common in the upper story include *Dryera costulata¸ Gluta* spp., *Intsia palembanica*, *Koompassia malacoensis*, *Melanorrhoea* spp., *Palaquium* spp. and *Sindora* spp. Although these forests show a remarkable homogeneity at the family level, the distribution pattern at species level is extremely complex.

Upland Mixed Dipterocarp Forest

The Upland Mixed Dipterocarp Forest is very similar to the lowland dipterocarp forest formation and occurs on hilly terrain elevation zones between 750 m and 1,300 m AMSL. A large percentage of lowland floras also grow here. The ridges are often dominated by *Shorea* spp. and typical non-dipterocarps frequently occur include *Swintonia* spp. It usually grows in groves and tolerates dry conditions quite well.

Montane Forest

The tropical Montane Forest is a special forest type which is composed of forest ecosystems of distinctive floristic and structural form. It typically occurs as a relatively narrow altitudinal zone where the atmospheric environment is characterised by persistent, frequent or seasonal cloud cover at the vegetation level. Wind-driven clouds influence the atmospheric interaction through reduced solar radiation and vapour deficit, canopy wetting, and general suppression of evapotranspiration. The net precipitation (throughfall) in such forests is significantly enhanced (beyond rainfall contribution) through direct canopy interception of cloud water (horizontal precipitation or cloud stripping) and low water use by the vegetation. One of their most obvious features is an abundance of mosses, ferns, orchids and other epiphytic plants on every tree and rock surface. The structure of a montane forest is very different from that of lowland forest. There are very few tall trees.

Montane forests are divided into Lower Montane Forest (between 1,200 m and 1,500 m AMSL) and Upper Montane Forest (above 1,500 m AMSL). The montane forest within FMU14 is a Lower Montane Forest where dipterocarps and fruit trees are less common while species of conifer and laurel predominate. The commonly conifers species occur within the project site include *Podocarpus imbricatus* and *Podocarpus neriifolius*, together with smaller trees of *Dacrydium falciforms* and *Dacrydium beccarii* and some *Castanopsis* spp.

Kerangas Forest

Kerangas Forest or referred as Heath Forest have at least two canopied communities of scrub and low forest with an undergrowth in which pitcher plants are common. There are four forms of Kerangas Forest in Sabah including Coastal Padang, Swampy Padang, Inland Dry Heath Forest and Sandstone Escarpments. Small portion of Kerangas Forest in the form of sandstone escarpments found north and northeast of the project site, respectively. It occurs mostly below 600 m AMSLl on highly leached sandstone soils of Serudong Association. The soils are acidic, siliceous and often coarse (podzols). The forest area often dominated by *Tristania clementis, Euginia* spp., *Calophyllum* spp., *Diospyros* spp., *Eleocarpus* sp., *Ixonanthes reticulate, Myristica cinnamomea, Parkia* spp. and *Vatica* spp

Wildlife

The project area is rich in wildlife population despite of logging activities in the past and present, which may somewhat affects and alters their natural habitat. The site survey carried out indicates that the condition and population of wildlife in the forest is reasonably well. A total of 233 faunal species have been recorded within the project area, represented by 77 familes of wildlife. 52 known protected wildlife species are recorded within the project site.

Family / Species	***Within Site***	***In Vicinity***
No of Family	77	89
Protected Species	52	86

Amphibia and Reptilia

A total of 17 amphibian and 19 reptilian species are known to exist within the project area. There are no known protected amphibian species within the project site. However, 4 protected reptile species are known to be present near Sg Salung, Sg Longongon and Sg Sapulut, and confirmed by local population. The protected species include Crocodile (*Crocodylus porosus*), Monitor Lizard (*Varanus rudicolis* and *V. salvator*) and Python (*Python reticulates*). These species are protected because of threat from killing to obtain animal skins.

Common amphibias recorded in the project area include the species of Toad and Frog, and common reptiles include the species of Skink, Lizard and Snake. These amphibians and reptiles species are commonly recorded in the vicinity of the project site.

Birds

Diverse species of birds can be found in the area totalling not less than 163 species. They include 28 protected bird species including Besra (*Accipiter virgatus*), Brahminy kite (*Haliastur Indus*), Bristle-Head (*Pityriasis gymnocephala*), Caucal (*Centropus rectunguis*), Darter (*Anhinga melanogaster*), Dove (*Chalcophaps indica*), Eagle (*Ictineatus malayensis*), Falconet (*Microhierax latifrons*), Flycatcher (*Cyornis caerulata* and *Terpsiphone paradise*), Goshawk (*Accipiter trivirgatus*), Heron (*Ardea sumantrana* and *Butorides striatus*), Hornbill (*Annorrhinus galeritus*, *Berenicornis comatus* and *Rhinoplax vigil*), Magpie Robin (*Copsychus saularis*), Owl (*Strix leptogrammica*), Partridge (*Arborophilla charltonii*, *Haematortyx sanguiniceps* and *Rollulus rouloul*), Pheasant (*Lophura bulwerii* and *Argusianus argus*), Pigeon (*Treron capellei*), Shama (*Copsychus malabaricus*), Wagtail (*Motacilla alba* and *M. flava*) and Woodpecker (*Celeus brachyurus*). Most of these species are characteristic of the lowland dipterocarp forest.

These species are protected because of the aesthetic value of the birdlife. Birds are appreciated for their beauty and symbolism, their colouring, song, behaviour, flight and freedom. The species of birds recorded in the project area are commonly found in other forest areas of Sabah.

Mammals

A total of 34 mammal species have been recorded within the project area. They include 20 protected wildlife species including Deer (*Cervus unicolor* and *Muntiacus muntjak*), Elephant (*Elephas maximus*), Flying Lemur (*Cynocephalus variegates*), Gibbon (*Hylobates moloch*), Macaque (*Macaca fascicularis* and *M. nemestrina*), Mouse-Deer (*Tragulus javanicus* and *T. napu*), Musang (*Hemigalus derbyanus*), Orang Utan (*Pongo pygmaeus*), Otter (*Aonyx cinerea* and *Lutra sumatrana*), Pangolin (*Manis javanica*), Rhino (*Dicerorhinus sumatrensis*), Squirrel (*Callosciurus prevostil* and *Ratufa affinis*), Tembadau (*Bos banteng*), and Bearded Pig (*Sus barbatus*). These mammals are protected because they are hunted by local people as source of food or caught as pets or objects of curious observation in captivity.

Common resident mammals found in the area include Rat, Bat, Bearded Pig, Squirrel and Mouse-Deer. Mammals recorded within the project site are also reported in the vicinity.

Aquatic Life

Aquatic habitat known to exist in the area are limited to freshwater fishes, crustacean, mollusca and algae along Sg Pinangah, Sg Siliawan, Sg Lombunaan, Sg Saburan, Sg Sapulut, Sg Simatuoh, Sg Sansiang, Sg Tibow, Sg Sakikilan, Sg Sabunutan, Sg Sablangan, Sg Salung, Sg Lalobou, Sg Sinikalaun and Sg Beliar.

17 families of aquatic life are recorded within the project site, but none of these species are identified as endangered or protected species. Commonly found aquatic species include Ikan Toruh, Botuon, Belanak Sungai, Dumpis, Terbol, Turongou, Salab, Pelian, Patin, Ketam Sungai, Udang Sungai, Siput Sungai and Alga.

Family / Species	*Within Site*	*In Vicinity*
No of Family	17	19
Protected Species	0	0

Fishes

Freshwater fishes are noted to thrive along Sg Pinangah, Sg Siliawan, Sg Lombunaan, Sg Saburan, Sg Sapulut, Sg Simatuoh, Sg Sansiang, Sg Tibow, Sg Sakikilan, Sg Sabunutan, Sg Sablangan, Sg Salung, Sg Lalobou, Sg Sinikalaun and Sg Beliar with high aquatic population and diversity. Freshwater fishes from the family of Anabatidae, Cobitidae and Cyprinidae are most common fishes recorded here.

Crustacean

Crustacea from the family of Gecarcinucoidae and Palaemonidae are most common along Sg Pinangah, Sg Siliawan, Sg Saburan, Sg Sapulut, Sg Simatuoh, Sg Tibow, Sg Salung and Sg Sinikalaun and its main tributaries.

Mollusca

Mollusca from the family of Cerithidae, Melanoidae and Pilidae are most common along Sg Pinangah, Sg Siliawan, Sg Saburan, Sg Sapulut, Sg Simatuoh, Sg Tibow, Sg Salung and Sg Sinikalaun and its main tributaries.

Algae

Freshwater algae from the family of Achnanthaceae, Chlorophyceae, Naviculaceae and Tubellariaceae are most dominant within and in the vicinity of the project site.

Sensitive Areas

There are three highly sensitive biological habitats within and in the immediate vicinity of the project site, namely Maliau Basin Conservation Area (immediately northeast of project site), Phenology Area (within the project site), and salt licks (within and immediately east of the project site),

Maliau Basin Conservation Area

Located in the centre of the southern part of the Malaysian state of Sabah in Borneo, immediately northeast of the project site, Maliau Basin is approximately the shape of a saucer, perched on highlands, the rim of the elevated basin ranges from 1500 m to 1900 m AMSL, the peak of Gunung Lutong, the highest mountain in the area. The almost circular basin is delimited by cliffs on almost all sides. This peculiar shape had been moulded by faults and earth movements resulting in the Tanjung Formation during the early to middle Miocene age. A set of Sg Maliau tributaries fans out into the area. Sg Maliau itself gorged out of the south-eastern corner of the basin into Sg Kuamut which in turn feeds the longest and largest river in Sabah, Sg Kinabatangan.

Maliau Basin Conservation Area (MBCA), formerly part of the Yayasan Sabah Consession Area, covering an area of 43,800 hectares was upgraded to Class I Protection Forest Reserve in 1997 and extended to 58,840 hectares, encomprising additional forested areas to the north and east of the basin. The area is under increasing number of development pressures, most of them invasive in nature and that unless proactive measures are taken, the area in the not so distant future will be under sieged.

MBCA is a unique and pristine rain-forest area which dominated by lower montane and heath forest but including major areas of lowland dipterocarp forest as well. The rugged terrain is uninhabited and its biodiversity is still only partly known. The area is important for biodiversity conservation, nationally and internationally. It is one of the spectacular and pristine wilderness remaining in Malaysia, where it has been left undisturbed primarily because of its remoteness and inaccessibility.

In the context of Sabah's protected area system, MBCA contributes firstly as an outstandingly undisturbed an important water catchment area with a rich fauna and flora including many scarce, threatened and endemic species. For instance so far 55 of the 145 Malaysian bird species listed on IUCN's newly revised Red List of Threatened Species (September 2000) have been found in the MBCA. Total species richness of most taxon has still to be identified, but so far 56 terrestial mammal species, 207 bird species and 460 plant species have been found. Surveys have been carried out only approximately 20 % of the MBCA.

There are two buffer areas to provide protection, in form of an intermediate land use, between external activities and the conservation area proper.

- Buffer Zone Area 1 (Class II Forest Reserve for forest regeneration and conservation area – 38,837 hectares). The primary purpose of Buffer Zone Area 1 is to extend and priorities conservation objectives in this area and for these objectives to guide the limited development activities permitted in this area. This area will provide an essential 'ecological' extension to MBCA and provide a link between the unique habitats within MBCA and the surrounding lowland rain forest.
- Buffer Zone Area 2 (Class II Forest Reserve for natural forest management – 93,957 hectares). Buffer Zone Area 2 primary purpose is to allow development activities to take place but for such activities to be compatible with the overall conservation objectives of MBCA. The area shall remain as production forest to be manged under a natural forest management regime.

Phenology Area

The Phenology Area is approximately 120 ha and managed by Jabatan Perhutanan Sabah. It is located within the project site at Latitude 04° 42' 16" N and Longitude 116° 43' 44" E, near Sg Saburan. Based on local authority information, there is no specific research on biological has been done within this area. The area is conserved for observation to study the timing of natural events or annual cycles of plants and animals along with their relationship to the weather and climate, and how they respond to seasonal changes in their environment because of many contributing factors such as latitude, altitude and buffering effects of large bodies of water. The migration of various birds, the blooming of wildflowers and woody plants, and the development of locally indigenous insects are all examples of phenological events which can easily be observed. For example, in botany, it refers to the timing of flower emergence, sequence of bloom, fruiting, and leaf dropping.

The uses of this area is to collect seeds and to predict how the correlation with insect emergence, correlation with crop planting dates, forest-scaping with insect (cover crops, hedgerows, strip crops) to attract beneficial insects and enhance natural biological control, designing orchards for pollination and ripening sequence, designing perennial flower beds and wildflower plantings and prediction of the global warming trends.

Salt Lick

There are three known salt licks within and in the vicinity of the project site.

Latitude	***Longitude***	***Size (radius)***	***Locality***
04° 35' 12.1" N	116° 29' 23.5" E	20 m	Within site
04° 37' 23.5" N	116° 49' 05.0" E	25 m	0.5 km east
04° 29' 24.0" N	116° 51' 07.2" E	50 m	6 km south

Salt lick within the project site is located near Sg Lalabou. Based on site visit on 01 to 04 April 2003 and 06 to 10 Sep 2004, animal tracks were noted in the surrounding area and believed to be Bearded Pig, Wild Boar and "Payau". There were no signs or presence of large protected animals such as elephants or rhinos.

There are two salt licks believed to be present in the vicinity of the project site, 0.5 km east and 6 km south, respectively. The salt lick in the east was visited on 13 to 17 Dec 2004. Foot prints of elephants were noted within the salt lick and visible tracks noted south and north of the salt lick. This indicates that the salt lick is frequented by elephants for movements between Maliau and Indonesian border. Salt lick to the south was not visited due to access problem. But based on local population information, the salt lick is also frequented by elephants moving between Maliau and Indonesian Border.

Salt lick is defined as a place where salt water is found on the surface of the earth, to which wild animal resort to lick up. The water is generally rich in minerals and around these springs, encrustation and travertine domes can be found. The mineral-rich water and soil around these springs attract rhinos and other animals, sometimes called "core area". Salt lick which is one of the natural source of nutrients for animals are known to attract mammals (including large protected mammals) such as elephants, tembadau, rhinos, deer and bearded pig. The mineral contents of salt lick include calcium, chlorine, sodium, phosphate, magnesium, potassium and sulphate.

Salt lick is unique in that animals have much greater appetite for the sodium and chloride than for other minerals. Because most plants provide insufficient sodium for animal feeding and may lack adequate chloride content, salt supplementation is a critical part of a nutritionally balanced diet for animals. In addition, because animals have a definite appetite for salt, it can be used as a delivery mechanism to ensure adequate intake of less palatable nutrients and as a feed limiter.

Salt lick is also used as part of animal home range or sometimes called "peripheral area", with large species distribution usually found in the vicinity of the salt licks and stays in the neighborhood for some years. Most mammals such rhino use specific routes to go to the salt lick and these parts of the home range called "corridor" to the salt lick. Thus, the access to salt lick should not be blocked, as it is part of the social function for animals. However, because of wild animals searching for salt licks, this will be a big game for hunters who will spend much of his time hide and wait near the salt lick area for hunting.

Protected Area

In addition to Sapulut Commercial Forest Reserve, there are two other gazetted commercial forest reserves and three virgin jungle reserves.

Class	*Type*	*Forest Reserve*	*F.D. No*	*Area (Ha)*
II	Commercial	Sg Pinangah	73/1E	237,872
II	Commercial	Sapulut	101/5E	241,885
II	Commercial	Gunung Rara	89/1E	219,794
VI	Virgin Jungle Reserve	Sg Siliawan	101/55	2,136
VI	Virgin Jungle Reserve	Sg Sansiang	101/17A	344
VI	Virgin Jungle Reserve	Nurod Urod	102/74	1,705

Commercial Forest Reserve

Sapulut, Sg Pinangah and Gunung Rara Commercial Forest Reserves are gazetted under Class II (Commercial Forest Reserve) for supply of timber and other produce to meet the general demands of trade. The commonly species in this area include *Dyera costulata* ("Jelutong Bukit"), *Lophopetalum* sp. ("Peropok Dual"), *Eupatorium odoratum* ("Rumput Siam"), *Dipterocarpus* spp. ("Keruing"), *Hopea* sp. ("Selangan"), *Parashorea* malaanonan ("Urat Mata Daun Lichen"), *Shorea* sp. ("Seraya"), *S. agami* ("Melapi"), *Eleusine indica* ("Rumput Belulang"), *Joinvillea* spp. ("Rumput"), *Paspoalum vaginatum* ("Rumput"), *Mimosa invisa* ("Semalu"), *M. pudica* ("Semalu"), *Melastoma malabathricum* ("Senduduk"), *Gnetum gnemon* ("Tinjau"), *Caryota mitis* ("Botu"), *Orthiopteris kingii* ("Legub"), *Dipteris conjugate* ("Paku"), *Drynaria saprsisora* ("Sakat"), *Zizyphus* spp. ("Tangau"), *Dicranopteris alternans* ("Resam"), and *D. linearis* ("Resam").

Mammals found within these forest reserves include *Elephas maximus* (Elephant), *Bos javanicus* (Tembadau), *Macaca fascicularis* (Long-Tailed Macaque), *M. nemestrina* (Pig-Tailed Macaque), *Hylobates muelleri* (Borneon Gibbon), *Semnopithecus cristasus* (Silver-Leaf Monkey), *Prebystis rubicunda* (Red-Leaf Monkey) and *Nycticebus coucang* (Slow Loris). While, bird families of Buzzard, Kingfisher, Spiderhunter, Heron, Hornbill, Shrike, Barbet, Cuckoo, Malkoha, Dove, Pigeon, Bristlehead, Flowerpecker, Drongo, Broadbill, Treeswift, Flycatcher, Fantail, Sunbird, Babbler, Partridge, Woodpecker, Munia, Bulbul, Trogon and Shama are common within these forest reserves.

Virgin Jungle Reserve

Sg Siliawan, Sg Sansiang and Nurod Urod Virgin Jungle Reserves are gazetted under Class VI (Virgin Jungle Reserve) for research purposes. In addition, the existence of these virgin jungles is also important for the preservation and conservation of water catchment areas. The commonly plant species in these areas include *Dyera costulata* ("Jelutong Bukit"), *Durio* sp. ("Durian"), *Lophopetalum* sp. ("Peropok Dual"), *Eupatorium odoratum* ("Rumput Siam"), *Dipterocarpus* spp. ("Keruing"), *Hopea* sp. ("Selangan"), *Parashorea* malaanonan ("Urat Mata Daun Lichen"), *Shorea* sp. ("Seraya"), *S. agami* ("Melapi"), *Elusine indica* ("Rumput Belulang"), *Gnetum gnemon* ("Tinjau"), *Caryota mitis* ("Botu"), *Orthiopteris kingii* ("Legub"), *Dipteris conjugate* ("Paku"), *Drynaria saprsisora* ("Sakat"), *Zizyphus* spp. ("Tangau"), *Dicranopteris alternans* ("Resam"), and *D. linearis* ("Resam").

Mammal species commonly dound in this area are similar to the commercial forest reserves, which include species of Macaque, Monkey, Deer, Flying Lemur, Leopard, Mongoose, Gibbon, Porcupine, Slow Loris, Otter, Marten, Teledu, Squirrel, Pig, Tarsier, Mouse-Deer, Musang, Civet, and Linsang. Bird families of of Goshawk, Besra, Kite, Eagle, Darter, Hornbill, Caucal, Plover, Dove, Pigeon, Falconet, Wagtail, Flycatcher, Partridge, Argus, Pheasant, Woodpecker, Piculet, Pitta, Bristle-Head, Owl, Babbler, Shama, Robin and forktail can also be found within these forest reserves.

Hunting

Hunting is carried out by local population within and in the immediate vicinity of the project area. Popular hunting animals include wild boar and "payau". Typical hunting method is either by dog or licensed gun. There are four main hunting sites, namely (i) downstream of Sg Saburan – frequented by villagers of Kg Labang, Kg Samuran, Kg Sandukon and Kg Liningkar; (ii) upstream of Sg Beliar – Kg Kakautar, Kg Sliko and Kg Sibuah; (iii) Sg Lalobou – Kg Tapuluon, Kg Balantos and Kg Salong; and (iv) Sg Sansiang V.J.R. – Kg Tataluan.

Hunting Area	*Compartment*	*Latitude*	*Longitude*
Sg Saburan	48, 63, 86 & 87	04° 43' 06" North	116° 40' 11" East
Upstream of Sg Beliar	216, 217, 219 & 232	04° 34' 34" North	116° 34' 28" East
Sg Lalobou	250, 252, 253, 256 & 257	04° 36' 45" North	116° 29' 42" East
Sg Sansiang V.J.R.	Outside project area	04° 38' 06" North	116° 36' 27" East

The population of Kg Labang, Kg Samuran, Kg Sandukon and Kg Liningkar carry-out hunting near Sg Saburan. The hunting area, which is known for having large population of wild boar involves NFM compartments 48, 63, 86 & 87. The area is accessible via Sg Sapulut and Sg Saburan.

Hunting area upstream of Sg Beliar is used by local population of Kg Kakutar, Kg Saliko and Kg Sibuah. The hunting area involves part compartments 216, 217, 219 and 232. These compartments are designated for ITP except compartment 232.

The other hunting area within the project site is located near Sg Lalobou and popular with local population of Kg Tapuluon, Kg Balantos and Kg Salong. The hunting area is located within compartments 250, 252, 253, 256 and 257. These compartments are designated for ITP except compartment 257. Large wildlife population is belived to be related to the presence of a salt lick, immediately south of the hunting area.

In the vicinity, hunting is carried out by local population of Kg Tataluan within Sg Sansiang Virgin Forest Reserve. However, as the area is a gazetted Class I Forest Reserve, hunting activity is limited, which normally carried out during fruit seasons only. It is believed that significant population of wild boar is present during fruit seasons to search for fruits as food.

Herbs

There are five known species of herbs recorded within the project site. These herbs have potential to be developed for medical purposes, including species of *Adina rubella, Coyx lachrymal, Mallotus apelta, Pteris multifida* and *Pyrrosia lingua*.

Adina rubella is a deciduous tree with smooth stem reaches to 2 m in height. The branches are red. The seed capsule is also purpilish-red when ripe and shaped like a strawberry. It normally grows on wet positions along the edges of rivers, particularly upstream Sg Pinangah, downstream Sg Simattuoh, upstream Sg Sansiang, downstream Sg Tibow and upstream Sg Saburan. The plant is use for treatment of internal parasitic diseases, ulcers, traumatic bleeding, dysentery and diarrhoea.

Coyx lachrymal is a perennial herb with erect stem grows to 1.5 m in height. It has axilliary spike inflorescene, and staminate spikelets on top. The plant grows wild in meadows and colder hill areas, particularly along Jalan Sapulut – Kalabakan, downstreams of rivers and within hilly area of upland mixed dipterocarp forest. The plant is use for treatment of ber-beri, diarrhea, lung abscess, pneumonia, oedema and difficulties in urination.

Mallotus apelta is deciduous shrub with erect stem grows to 4 m. The branches are covered with yellow scabrous hairs. The fruit is an achene with long thorns. The plant grows in sunny places in wastelands, along Jalan Sapulut – Kalabakan, road leading to campsite of Coupe D and near Atalantic sawmill. The plant is use for treatment of tonsillitis, otitis media, boils and abscesses, oedema, chronic hepatitis, splenomegaly and uterine prolapse.

Pteris multifida is a perennial evergreen herb. The underground tap-root is thick but short and densely covered with brown scales. The plant grows along wells and in cracks of rocks placed in damp areas, particularly near Batu Saap and within hilly area of upland mixed dipterocarp forest. The plant is use for treatment of cuts, dysentery, hepatitis and urinary tract infections. It is also an antidote to poisioning of insecticide, smartweed and spindle tree.

Pyrrosia lingua is a perennial herb. The slender, stoloniferous rhizomes are covered with brown scales. The leaf surface is dark green and the undersides are rusty in colour. The plant grows along cliffs and in cracks of rocks placed in damp areas, particularly near montane forest within MBCA Buffer Zone 1. The plant is use for treatment of urinary tract infections, oedema, haematuria and heamoptysis.

Table A1.5(a): Flora Surveyed within the Project Site

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
I. ANGIOSPERM					
Anacardiaceae	*Anacardium occidentale*	Rengas	T	S/S	2
	Buchanania arborescens	Kepala Tundang	T	S/S	2
	Gluta spp.	Rengas air	T	S/S	3
	Mangifera sp.	Mangga	T	S/S	3
	Melanorrhoea wallichii	Rengas	T	S/S	2
	Pentaspadon motleyi	Pelajau	T	S/S	3
	Semecarpus sp.	Rengas	T	S/S	3
	Swintonia spp.	Rengas	T	S/S	2
Annonaceae	*Meiogyne virgata*	Karai	T	S/S	2
	Orophea corymbosa	Karai	T	S/S	3
	O. myriantha	Karai Hitam	T	S/S	3
	Polyalthia sumatrana	Karai Putih	T	S/S	3
	Pseuduvaria reticulata	Boyai	T	S/S	3
	Uvaria littoris	Kenang	T	S/S	3
Apocynaceae	*Alstonia angustiloba*	Pulai	T	S/S	3
	Dyera costulata	Jelutong Bukit	T	S/S	3
Araceae	*Colocasia esculenta*	Keladi	H	S/S	3
	Pistia stratiotes	Kiapu	H	S/S	3
Bombacaceae	*Durio* sp.	Durian	T	S/S	2
	Neesia spp.	Durian Monyit	T	S/S	3
Bignoniaceae	*Dolichandrone spathacea*	Tui	T	S/S	3
Burseraceae	*Canarium denticulatum*	Kedondong	T	S/S	3
Caricaceae	*Carica papaya*	Betik	T	S/S	1
Celastraceae	*Lophopetalum* sp.	Perupok Dual	T	S/S	3
	L. javanicum	Perupok Dual	T	S/S	3
Combretaceae	*Planchonia* sp.	Putat	T	S/S	3
	Terminalia citrina	Talisai Jambu	T	S/S	3
Compposita e	*Eupatorium odoratum*	Rumput Siam	H	S/S	3
Convolvulaceae	*Ipomea batatas*	Ubi Jalar	C	S/S	3
	I. aquatica	Kangkung	C	S/S	3
	Merremia borneensis	Kekangkung	C	S/S	3
Datiscaceae	*Octomeles sumatrana*	Binuang	T	S/S	3
Dilleniaceae	*Dillenia excelsa*	Simpoh Laki	T	S/S	3
	D. grandifolia	Simpoh	T	S/S	2
Dipterocarpaceae	*Anisoptera marginata*	Pengiran Durian	T	S/S	3
	Dipterocarpus spp.	Keruing	T	S/S	3
	Dryobalanops spp.	Kapur	T	S/S	3
	Hopea spp.	Selangan	T	S/S	3
	Parashorea spp.	Urat Mata	T	S/S	3
	Parashorea malaanonan	Urat Mata Daun Lichen	T	R/L	3
	Shorea spp.	Seraya	T	S/S	3
	S. acuminatissima	Seraya Kuning Runching	T	R/L	2
	S. agami	Melapi	T	S/S	3
	S. biawak	Selangan Batu	T	S/S	3
	S. pauciflora	Oba	T	S/S	3
	S. stipularis	Seraya	T	S/S	3
	Vatica spp.	Resak	T	S/S	3
Ebenaceae	*Diospyros elliptifolia*	Kayu Malam	T	S/S	2
	D. tuberculata	Kayu Malam	T	S/S	3
Elaeocarpaceae	*Elaeocarpus* sp	Kungkurad	T	S/S	3
Erythroxylaceae	*Erythroxylum cuneatum*	Perepat Burong	T	S/S	3
Euphorbiaceae	*Acalypha caturus*	Tetepong	T	S/S	3
	Aporusa grandistipulata	Galang Galang	T	S/S	3
	A. nitida	Bagil	T	S/S	3
	Antidesma leucopodium	Kilas Perempuan	T	S/S	2
	Baccaurea lanceolata	Limpaung	T	S/S	3
	B. stipulata	Kunau	T	S/S	3
	Bridelia stipularis	Balatotan	T	S/S	3
	Cleistanthus paxii	Garu	T	S/S	2
	Drypetes macrophylla	Odopon Puteh	T	S/S	3
	Endospermum peltatum	Marapangi	T	S/S	3
	Glochidion superbum	Gerumong Jantan	T	S/S	3
	Koilodepas longifolium	Kilas	T	S/S	3
	Macaranga spp.	Mahang	T	S/S	3
	Mallotus apelta	Pokok Tiga	H	S/S	3
	M. korthalsii	Mallotus	T	S/S	3
	M. mollissimus	Dahu	T	S/S	3
	Omphalea spp.	Palia	T	S/S	3
	Sauropus spp.	Nasi Nasi	T	S/S	3
Fagaceae	*Castanopsis* spp.	Berangan	T	S/S	2
	Lithocarpus cantleyanus	Mempening	T	S/S	2
	L. ewyckii	Mempening	T	S/S	2
	Quercus argentata	Mempening	T	S/S	2
Flacourtiaceae	*Casearia* spp.	Tapion Kirabas	T	S/S	2
	Hamolium foetidum	Takaliu	T	S/S	2
	Hydnocarpus woodii	Karpus	T	S/S	2
	Flacourtia rukam	Rukam	T	S/S	3

Note: No protected species in this list

Table A1.5(a): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
	Ryparosa accuminata	Giewei	T	S/S	2
	R. hulletii	Giewei	T	S/S	3
	Xylosma sumatrana	Linau	T	S/S	2
Graminae	*Coix lachryma*	Jelai	H	S/S	3
	Dinochloa sp.	Pering Pering	H	S/S	3
	Eleusine indica	Rumput Belulang	H	S/S	3
	Imperata cylindrica	Lalang	H	S/S	3
	Ischaemum timorense	Rumput Rumput	H	S/S	3
	Joinvillea spp.	Rumput	H	S/S	3
	Paspoalum vaginatum	Rumput	H	S/S	3
	Schizostachyum longispicuatum	Tamiang	H	S/S	3
	Thysanolaena maxima	Alang	H	S/S	2
Guttiferae	*Calophyllum* spp.	Bintangor	T	R/L	3
	Garcinia forbesii	Bebata	T	S/S	3
	G. parvifolia	Kandis	T	S/S	2
Hanguanaceae	*Susum malayanum*	Ampil	T	R/L	2
Hypericaceae	*Cratoxylum* sp.	Geronggang	T	S/S	2
Hypoxidaceae	*Curculigo latifolia*	Kulingo	T	R/L	2
Icacinaceae	*Stemonurus scorpioides*	Katok	T	S/S	2
Lauraceae	*Actinodaphne oleifolia*	Medang	T	S/S	2
	Alseodaphne spp.	Medang Payang	T	S/S	2
	Beilschmiedia micrantha	Medang Wangi	T	S/S	2
	B. tawaensis	Medang Wangi	T	S/S	2
	Cinnamomum griffithii	Kayu Manis	T	S/S	3
	C. javanicum	Kayu Manis	T	S/S	3
	Cryptocarya spp.	Medang Dering	T	S/S	2
	Dehaasia sp.	Medang	T	S/S	2
	D. caesia	Medang	T	S/S	2
	Eusideroxylon zwageri	Belian	T	S/S	2
	Litsea spp.	Medang	T	S/S	3
Leeaceae	*Leea indica*	Mali Mali	T	S/S	2
Leguminosae	*Adenanthera pavonina*	Saga	T	S/S	2
	Albizia chinensis	Batai Cina	T	S/S	2
	A. singularis	Batai	T	S/S	2
	Archidendron triplinervium	Aki Aki	T	S/S	2
	Bauhinia spp.	Tetapak	T	S/S	3
	Caesalpinia sappan	Sapang	T	S/S	2
	Cassia alata	Bebusok	S	S/S	2
	C. nodosa	Busok Busok	T	S/S	2
	Cynometra inaequifolia	Katong Katong	T	S/S	3
	Dialium indum	Keranji	T	S/S	3
	Entada spp.	Tanui	T	S/S	3
	Intsia palembanica	Merbau	T	S/S	3
	Koompasia excelsa	Mengaris	T	S/S	3
	K. malaccensis	Impas	T	R/L	3
	Milletia vasta	Melati	T	S/S	3
	Mimosa invisa	Semalu	H	S/S	3
	M. pudica	Semalu	H	S/S	3
	Parkia speciosa	Kupang	T	R/L	3
	Peltophorum racemosum	Timbarayong	T	S/S	2
	Phanera kockiana	Tepis	T	S/S	2
	Pithecellobium ellipticum	Jaring	T	S/S	2
	P. jiringa	Jaring	T	S/S	3
	Pongamia pinnata	Marabahai	T	S/S	2
	Saraca declinata	Gapis	T	S/S	2
	Serialbizzia splendens	Kungkurad	T	S/S	3
	Sindora spp.	Sepetir	T	S/S	3
Linaceae	*Ixonanthes reticulate*	Pagar Anak	T	R/S	2
Loganiaceae	*Fagraea cuspidata*	Tembusu	T	S/S	3
	Mitrasacme spp.	Birah	T	R/S	2
	Strychnos ignatii	Rumilit	T	R/S	2
Loranthaceae	*Dendropthoe varians*	Gudung	T	R/S	2
	Helixanthera spp.	Antoi	T	R/S	2
	Loranthus spp.	Kopo	T	R/S	2
	Macrosolen cochinchensis	Salan	T	R/S	2
Lythraceae	*Lagerstroemia speciosa*	Bungor	T	S/S	3
Maranthaceae	*Donax canniformis*	Akar Panah	T	S/S	2
Melastomataceae	*Allomorphia* spp.	Gosing	S	S/S	2
	Axinandra borneensis	Tetiup	S	S/S	3
	Medinilla sp.	Gosing	S	S/S	3
	Melastoma malabathricum	Senduduk	S	S/S	3
	M. polyanthum	Senduduk	S	R/S	3
	Memecylon edule	Gegosing	S	R/S	3
	M. paniculatum	Gegosing	S	R/S	3
	Pternandra coerulescens	Sireh	S	R/S	2
	Sonerila spp.	Sireh	S	R/S	2

Note: No protected species in this list

Table A1.5(a): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
Meliaceae	*Aglaia* spp.	Lelangsat	T	S/S	3
	Azadirachta excelsa	Limpaga	T	S/S	3
	Dysoxylum spp.	Lantupak	T	S/S	3
	Lansium domesticum	Langsat	T	S/S	3
	Walsura pinnata	Lantupak	T	S/S	3
Moraceae	*Artocarpus* sp.	Tarap	T	S/S	3
	A. anisophyllus	Tarap Nasi	T	R/L	3
	A. dadah	Buruni	T	S/S	2
	A. elasticus	Togop	T	S/S	2
	Ficus sp.	Ara	T	S/S	3
	Ficus callosa	Ara	T	S/S	3
Musaceae	*Musa paradisiaca*	Pisang	T	S/S	2
	M. sapientum	Pisang	T	S/S	2
Myristicaceae	*Horsfieldia* spp.	Pianggu	T	R/L	3
	Knema spp.	Darah Darah	T	R/L	3
	Myristica cinnamomea	Penara	T	R/L	2
Myrtaceae	*Eugenia* spp.	Obah	T	S/S	3
	Rhodamnia cinerea	Mempoyan	T	S/S	2
	Syzygium sp.	Pepanjat	T	S/S	3
	Tristaniopsis spp.	Pelawan Pelawan	T	R/L	2
	T. laurina	Pelawan Pelawan	T	R/L	2
Myrsinaceae	*Ardisia* sp.	Lempanai	T	S/S	2
	A. elliptica	Surusop	T	S/S	3
Ochnaceae	*Euthemis leucocarpa*	Timis	T	R/S	2
	E. minor	Timis	T	R/S	2
	Gomphia borneensis	Gompit	T	R/S	2
	G. serrata	Gompit	T	R/S	2
Olacaceae	*Ochanostachys amentacea*	Tanggal	T	R/S	2
Oxalidaceae	*Sarcotheca diversifolia*	Tabarus	T	R/S	2
Piperaceae	*Peperromia* spp.	Daing	C	R/L	3
	Piper spp.	Sirih	C	R/L	3
Poaceae	*Saccharum* spp.	Tebu Sungai	H	S/S	3
Polygalaceae	*Polygala* spp.	Rakang	T	R/L	2
	Xanthophyllum spp.	Minyak Berok	T	R/L	2
Proteaceae	*Helicia robusta*	Gasi	T	R/L	2
Pteridaceae	*Pteris multifida*	Rumput Ekor Ayam	H	S/S	3
Rosaceae	*Angelesia splendens*	Timpaluan	T	R/L	2
	Parinari laurina	Torog	T	S/S	2
	Prunus arborea	Kelanus	T	R/S	2
	Rubus mollucanus	Mandailos	T	R/S	2
Rubiaceae	*Acranthera* spp.	Sawon	T	R/S	2
	Adina rubella	Mengkeniab	H	S/S	3
	A. trichotoma	Mengkeniab	T	S/S	2
	Anthocephalus chinensis	Bangkal	T	S/S	2
	Chassalia spp.	Landing	T	R/L	2
	Gaertnera borneensis	Tulei	T	R/L	2
	Hedyotis spp.	Kelumpi	T	R/L	2
	Hydnophytum spp.	Kiam	T	R/L	2
	Ixora congesia	Jejarum	T	R/L	3
	I. elliptica	Kiam	T	S/S	2
	Jackia ornata	Selumar	T	S/S	3
	Lasianthus boeneensis	Grubai	T	R/L	2
	Lucinaea spp.	Selasi	T	R/L	2
	Nauclea subdita	Bangkal Udang	T	R/L	2
	Neolamarckia cadamba	Laran	T	S/S	2
	Paederia spp.	Lempoyan	T	R/L	2
	Pavetta spp.	Lumpai	T	R/L	2
	Praravinia spp.	Buloh Buloh	T	R/L	2
	Pleiocarpidia sandakanica	Buloh Buloh	T	S/S	2
	Timonius eskerianus	Tapai	T	R/L	2
	T. flavescens	Tapai Apai	T	S/S	2
	Uncaria spp.	Bangkal Kuning	T	R/L	2
Rutaceae	*Clausena excavate*	Lelimau	T	R/L	3
	Luvunga spp.	Lonsom	T	R/L	3
	Melicope sp.	Tenuang	T	S/S	3
Sapindaceae	*Allophylus cobbe*	Membuakat	T	S/S	3
	Guioa pleuropteris	Senyamok	T	S/S	2
	Mschocarpus peritapetalus	Membuakat	T	S/S	3
	Nephelium lappaceum	Rambutan Hutan	T	S/S	2
	N. mutabile	Meritam	T	R/L	2
	N. ramboutan	Rambutan Hutan	T	S/S	2
	Ofophora fruticosa	Balingasan	T	S/S	3
	Paranephelium nitidum	Membuakat	T	S/S	3
	P. xestophyllum	Membuakat	T	S/S	3
Sapotaceae	*Madhuca* spp.	Nyatoh Madhuca	T	S/S	2
	Palaquium sp.	Nyatoh	T	S/S	2
	P. beccarianum	Nyatoh	T	R/L	2
Smilacaceae	*Smilax borneensis*	Canar	T	R/L	2
Sonneratiaceae	*Duabanga moluccana*	Magas	T	S/S	2

Note: No protected species in this list

Table A1.5(a): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
Sterculiaceae	*Heritiera simplicifolia*	Kembang	T	R/L	2
	Pterospermum elongatum	Bayor	T	S/S	2
	Scaphium affine	Kembang Semangkok	T	R/L	2
	Sterculia sp.	Kalumpang	T	S/S	2
Symplocaceae	*Symplocos fasciculate*	Jiak	T	S/S	2
	S. henschelli	Jiak	T	R/L	2
	S. pendula hirtisylis	Jiak	T	R/L	2
Tetrameristaceae	*Tetramerista glabra*	Tuyot	T	S/S	3
Theaceae	*Adinandra dumosa*	Bawing	T	R/L	3
	Pyrenaria kunstleri	Seminyak	T	S/S	3
	Schima spp.	Gatal Gatal	T	S/S	3
Thymelaeaceae	*Wikstroemia tenuiramis*	Tindot	T	S/S	3
Tiliaceae	*Brownlowia peltata*	Pinggau-Pinggau	T	S/S	3
	Microcos sp.	Kerodong Damak	T	S/S	2
	Pentace adenophora	Takalis Daun Bulat	T	S/S	2
	Pentace laxiflora	Takalis Daun Halus	T	S/S	2
Ulmaceae	*Gironniera nervosa*	Ampas Tebu	T	S/S	2
Urticaceae	*Dendrocnida elliptica*	Papaku	T	S/S	3
	Elatostema spp.	Jelatang	T	R/L	2
	Poikilospermum suaveolens	Pulus	T	R/S	2
	Trema orientalis	Randagong	T	S/S	2
Verbenaceae	*Callicarpa candicans*	Jengger	T	R/S	2
	C. longifolia	Lapi	T	R/S	2
	Clerodendron spp.	Buak	T	R/S	2
	Petraeovitex spp.	Buak	T	R/S	2
	Vitex pubescens	Kulimpapa	T	S/S	3
Vitaceae	*Ampleocissus* spp.	Lakum	T	R/L	2
	Cissus hastate	Kibarara	T	R/L	2
	Pterisanthes spp.	Punak	T	R/L	2
	Tetrastigma lanceolarium	Punak	T	R/L	2
	T. papillosum	Punak	T	R/L	2
Zingiberaceae	*Achasma* sp.	Tuhau	H	S/S	3
	A. megalocheilos	Tepus	H	S/S	3
	Alpinia spp.	Tolidus	H	R/L	2
	*Globba propinqua**	Halia Hutan	H	R/L	3
	Zingiber sp.*	Halia Hutan	H	R/L	3
II.GYMNOSPERM					
Gnetaceae	*Gnetum gnemon*	Tinjau	C	R/S	3
	G. leptostachyam	Tinjau	C	S/S	3
Podocarpaceae	*Dacrydium beccarii*	Sempilor	T	R/S	2
	D. elatum	Sempilor	T	R/S	2
	D. falciforme	Sempilor	T	R/S	2
	*Podocarpus imbricatus**	Lampias	T	R/L	3
	*P. neriifolius**	Lampias	T	R/L	3
	*P. polystachyus**	Lampias	T	R/S	3
Rhamnaceae	*Alphitomia incana*	Pakudita	T	S/S	2
	Ventilago spp.	Rilit	C	R/S	2
	Zizypus spp.	Tangau	C	S/S	2
III. PALM					
Arecaceae	*Areca* spp.	Pinang	T	S/S	2
	*Arenga undulatifolia**	Polod	T	S/S	2
	Calamus impar	Rotan	C	S/S	2
	C. jayensis	Rotan	C	S/S	2
	C. pogocanthus	Rotan	C	S/S	2
	*Caryota mitis**	Botu	T	S/S	2
	Daemonorops spp.	Palma	T	R/S	2
	Iguanura polymorpha	Palma	T	R/S	2
	Korthalsia echinometra	Palma	T	R/S	2
	Licuala longipes	Palma	T	R/S	2
	Oncosperma tigillarium	Nibung	T	S/S	2
	Pinanga spp.	Pinang Hutan	T	R/S	2
Palmae	*Cocos nucifera*	Kelapa	T	S/S	1
	Metroxylon sagu	Rumbia Bukit	T	S/S	1
Pandanaceae	*Freycinetia* spp.	Pandan Hutan	T	S/S	2
	Pandanus helicopus	Rasau	T	S/S	2
IV. FERN					
Asclepiadaceae	*Asplenium sp.*	Paku Sarang Burung	Tr	S/S	2
	Dischidia major	Tetumpang	C	S/S	3
	Hoya latifolia	Paku	E	R/S	2
Blechnnaceae	*Blechnum orientale*	Biding	Tr	S/S	2
Cyatheaceae	*Cyathea latebrosa*	Paku	Tr	R/S	2
Dennstaedtiaceae	*Orthiopteris kingii*	Legub	Tr	S/S	3
Dipteridaceae	*Dipteris conjugate*	Paku	Tr	R/S	3
Glecheniaceae	*Dicranopteris alternans*	Resam	Tr	S/S	3
	D. linearis	Resam	Tr	S/S	2
Gleicheniaceae	*Gleichenia linearis*	Resam	Tr	S/S	2

*Note: * Protected species*

Table A1.5(a): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
Lindsaeaceae	*Lindsaea* spp.	Paku	Tr	R/S	2
Lycopodiaceae	*Lycopodium cernuum*	Paku	Tr	R/S	2
Oleandraceae	*Oleandra pistillaris*	Paku	Tr	R/S	2
Orchidaceae	*Eria* spp.	Anggrek	E	R/L	2
	Eulophia spp.	Anggrek	E	R/L	2
Polypodiaceae	*Drynaria saprsisora*	Sakat	E	S/S	3
	Lecanopteris carnosa	Sakat	E	R/S	2
	L. sinuosa	Sakat	E	R/S	2
	Playtcerium coronarium	Sakat	E	R/S	2
	P. ridleyi	Sakat	E	R/S	2
	Pyrrosia lanceolata	Tetumpang	E	S/S	3
	P. lingua	Tetumpang Terbang	H	S/S	3
Schizoeaceae	*Lygodium circinnatum*	Paku Jari	L	S/S	3
	L. flexuosum	Paku Jari	L	S/S	3
Selaginellaceae	*Selaginella conferta*	Paku Lumut	Tr	R/S	3
Vittariaceae	*Antrophyum callifolium*	Paku	Tr	R/S	3

Note: No protected species in this list

Table A1.5(b): Fauna Surveyed within the Project Site

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
AMPHIBIA				
Bufonidae	*Ansonia leptopus*	Brown Toad	R/L	3
	Bufo asper	Common Toad	S/C	3
	B. biporcatus	Borneo Common Toad	R/L	3
	B. divergens	Crested Toad	R/S	3
	B. melanostictus	Borneo Common Toad	R/L	3
	Pedostibes hosii	Blackish Toad	R/L	2
Michrohylidae	*Kaloula pulchra*	Stocky Frog	R/L	2
Ranidae	*Amalops* sp.	Stream Frog	R/L	2
	Rana spp.	Forest Stream Frog	R/L	3
	R.chalocnata	Forest Stream Frog	S/C	3
	R. hosii	Stream Frog	R/L	2
	R. staurois	Stream Frog	R/L	2
Rhacophoridae	*Polypedates* spp.	Tree Frog	R/L	2
	P. otilophus	Tree Frog	R/L	2
	P. rhacophorus	Tree Frog	R/L	2
	Rhacophorus sp.	Tree Frog	S/S	3
	R. gauni	Tree Frog	R/L	2
REPTILIA				
Agamidae	*Bronchocela cristatella*	Crested Lizard	R/L	2
Boidae	*Python reticulates**	Reticulated Python	R/L	2
Colubridae	*Ahaetulla prasina*	Vine Snake	R/L	2
	Dendrelaphis spp.	Bronzeback Snake	R/L	2
	D. caudolineatus	Bronzeback Snake	R/L	2
	D. pictus	Painted Bronzeback Snake	R/L	2
	Elaphe flavolineata	Common Racer Snake	S/S	2
	Elaphe spp.	Racer Snake	S/S	2
	Ptyas mucosus	Rat Snake	R/L	2
Crocodylidae	*Crocodylus porosus**	Crocodile	R/L	1
Donganidae	*Dogania subplana*	Shoft-Shelled Turtle	R/L	2
Elapidae	*Naja naja*	Common Cobra	R/L	2
Emydidae	*Terapene* sp.	Terrapin	R/L	2
Scincidae	*Apterygodon vittatus*	Striped Tree Skink	R/L	2
	Mabuya multifasciata	Common Skink	S/S	3
	Riopa bowringgi	Lesser Skink	S/S	3
Varanidae	*Calotes versicolor*	Changeable Lizard	S/S	3
	*Varanus rudicolis**	Monitor Lizard	R/L	3
	*Varanus salvator**	Monitor Lizard	S/S	2
BIRD				
Accipitridae	*Accipiter trivirgatus**	Crested Goshawk	R/L	2
	*A.virgatus**	Besra	R/A	2
	Butastur indicus	Grey-Faced Buzzard	S/S	2
	*Haliastur indus**	Brahminy Kite	R/S	3
	*Ictinaetus malayensis**	Black Eagle	R/A	2
	Pernis apivorus	Honey-Buzzard	R/L	2
Aegithinidae	*Aeghitina viridissima*	Green Iora	R/L	2
	Chloropsis cyanopogon	Lesser Green Leafbird	R/S	2
	C. sonnerati	Greater Green Leafbird	R/S	2
Alcedinidae	*Actenoides concreta*	Collared Kingfisher	R/A	2
	Alcedo euryzona	Blue-Banded Kingfisher	R/L	2
	Ceyx erithacus	Oriental Kingfisher	R/A	2
	C. rufidorsus	Rufous-Backed Kingfisher	R/S	2

*Note: * Protected species*

Table A1.5(b): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
	Halcyon capensis	Stork-Billed Kingfisher	R/S	2
	Lacedo pulchella	Banded Kingfisher	R/S	2
Apodidae	*Aerodramus* spp.	Swiftlet	R/S	2
	Collocalia esculenta	Glossy Swiftlet	R/S	2
	Hemiprocne longipennis	Treeswift	S/S	2
	Rhapidura leucopygialis	Silver-Rumped Swift	S/S	2
Arachnotherinae	*Arachnothera longirostra*	Little Spiderhunter	R/L	3
	A.affinis	Grey-Breasted Spiderhunter	R/S	2
	A.chrysogenys	Yellow-Eared Spiderhunter	R/S	2
	A.flavigaster	Spectacled Spiderhunter	R/S	3
	A.robusta	Long-Billed Spiderhunter	R/S	3
Ardeidae	*Ardea sumantrana**	Great-Billed Heron	R/S	1
	*Butorides striatus**	Little Heron	R/S	2
Bucerotidae	*Annorrhinus galeritus**	Bushy-Crested Hornbill	S/S	2
	Anthracoceros spp.	Hornbill	R/L	2
	*Berenicornis comatus**	White-Crested Hornbill	R/L	2
	*Rhinoplax vigil**	Helmeted Hornbill	R/L	2
	Rhyticeros undulates	Wreathed Hornbill	R/L	2
Campephagidae	*Coracina* spp.	Cuckoo- Shrike	R/L	2
	C. fimbriata	Lesser-Cuckoo Shrike	R/S	2
	Hemipus spp.	Flycatcher-Shrike	R/L	2
	H. hirundinaceus	Black-Winged Flycatcher-Shrike	R/S	2
	Lanius cristatus	Brown Shrike	R/S	2
	Pericrocotus spp.	Minivet	R/L	2
	P. flammeus	Scarlet Minivet	R/S	2
	Tephrodornis virgatus	Large Wood-Shrike	R/S	2
Capitonidae	*Calorhamphus fuliginosus*	Brown Barbet	R/L	2
	Megalaima spp.	Barbet	R/L	2
Caprimulgidae	*Eurostopodus temminckii*	Malaysian Eared Nightjar	R/S	2
Centropodinae	*Centropus rectunguis**	Short-Toed Caucal	R/A	2
	C. sinensis	Greater Caucal	R/A	2
Columbidae	*Chalcophaps indica**	Emerald Dove	S/S	2
	Ducula aenea	Green Imperial Pigeon	R/S	2
	D. badia	Mountain Imperial Pigeon	R/S	2
	Streptopelia chinensis	Spotted-Necked Dove	S/S	2
	Treron spp.	Pigeon	R/L	2
	*T. capellei**	Pigeon	R/A	2
Corvidae	*Corvus* spp.	Crowned	R/L	2
	C. enca	Slender-Billed Crow	R/S	2
	Platylophus galericulatus	Crested Jay	R/L	2
	Platysmurus leucopterus	Black Magpie	R/L	2
Cuculidae	*Cacomantis* spp.	Cuckoo	R/L	2
	C. merulinus	Plaintive Cuckoo	R/S	2
	Cuculus fugax	Hodgson's Hawk-Cuckoo	R/S	3
	C. micropterus	Indian Cuckoo	R/S	3
	Phaenicophaeus spp.	Malkoha	R/L	2
	P. chlorophaeus	Raffle's Malcoha	R/S	3
Dicaeidae	*D. trochileum*	Headed Flowerpecker	R/L	2
	D. trigonostigma	Orange-Bellied Flowerpecker	R/L	2
Dicruridae	*Dicrurus* spp.	Drongo	R/L	2
Estrildidae	*Lonchura fuscans*	Dusky Munia	S/S	3
Eurylaimidae	*Calyptomena viridis*	Green Broadbill	R/L	2
	Corydon broadbill	Dusky Broadbill	R/S	2
	C. sumatranus	Dusky Broadbill	R/S	2
	Cymbirhynchus macrorhynch	Black-and-Red Broadbill	R/S	2
	Eurylaimus javanicus	Banded Broadbill	R/L	2
Falconidae	*Falcon peregrinus*	Peregrine Falcon	R/S	2
Hemiprocnidae	*Hemiprocne longipennis*	Grey-Rumped Treeswift	R/S	3
	H. comata	Whiskered Treeswift	R/S	3
	*Microhierax latifrons**	White-Fronted Falconet	R/A	2
Hirundinidae	*Hirundapus giganteus*	Needletail	S/S	2
	Hirundo tahitica	Pacific Swallow	S/S	2
Meropidae	*Merops viridis*	Bee-Eater	R/A	2
	Nyctyornis amictus	Bee-Eater	R/A	2
Motacillidae	*Motacilla alba**	Grey Wagtail	R/L	2
	*M. flava**	Yellow Wagtail	R/L	2
	Nyctyornis amictus	Bee-Eater	R/A	2
Muscicapinae	*Cyornis caerulata**	Sunda Blue Flycatcher	R/L	2
	C. banyumas	Hill Blue Flycatcher	R/L	2
	C. superba	Borneo Blue Flycatcher	R/L	3
	Ficedula dumetoria	Rofous-Chested Flycatcher	R/S	2
	Hypothymis azurea	Black-Naped Monarch	R/S	2
	Muscicapa latrostris	Asian Brown Flycatcher	R/L	3
	Muscicapa spp.	Flycatcher	R/L	2
	M. indigo	Indigo Flycatcher	R/S	2
	M. thalassina	Verditer Flycatcher	R/S	2

*Note: * Protected species*

Table A1.5(b): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
	Rhipidura albicollis	White-Throated Fantail	R/S	2
	R. javanica	Pied Fantail	R/L	2
	R. perlata	Spotted Fantail	R/S	2
	*Terpsiphone paradise**	Asian Paradise Flycatcher	R/L	2
Nectariniidae	*Aethopyga siparaja*	Crimson Sunbird	R/S	3
	A. temminckii	Temminck's Sunbird	R/S	2
	Anthreptes spp.	Sunbird	R/L	2
	Anthreptes rhodolaema	Red-Throated Sunbird	R/S	2
	A. simplex	Plain Sunbird	R/S	2
	Arachnothera spp.	Eared Sunbird	R/L	2
	Hypogrmma hypogrammicum	Purple-Naped Sunbird	R/S	3
	Nectarinia separata	Purple-Throated Sunbird	R/S	2
Pellorneinae	*Malacopteron magnirostre*	Moustached Babbler	R/L	3
	Trichastoma abbotii	Temminck's Babbler	R/L	3
Phalacrocoracidae	*Anhinga melanogaster**	Oriental Darter	R/S	1
Phasianidae	*Arborophilla charltonii**	Chestnut-Neckled Partridge	R/A	2
	*Argusianus argus**	Argus Pheasant	R/L	2
	*Haematortyx sanguiniceps**	Crimson-Headed Partridge	R/S	2
	*Lophura bulwerii**	Bulwer's Pheasant	R/S	2
	*Rollulus rouloul**	Crested Partridge	R/A	2
Picinae	*Blythipicus rubiginosus*	Maroon Woodpecker	R/S	2
	*Celeus brachyurus**	Rufous Woodpecker	R/L	3
	Meiglyptes spp.	Woodpecker	R/A	2
	M. tritis	Buff-Rumped Woodpecker	R/S	2
	Mulleripicus pulverulentus	Great Slaty Woodpecker	R/S	2
	Picoides canicapillus	Woodpecker	R/A	2
	Picus mentalis	Checker-Throated Woodpecker	R/S	2
	Reinwardtipicus validus	Orange-Backed Woodpecker	R/S	2
	Sasia abnormis	Rufous Piculet	R/L	2
Pittidae	*Pitta* spp.	Pitta	R/L	2
Ploceidae	*Lonchura fuscans*	Dusky Munia	R/S	3
	L. leucogastra	White-Bellied Munia	R/S	2
Podargidae	*Batrachostomus auritus*	Frogmouth	R/S	2
Prionopidae	*Pityriasis gymnocephala**	Bornean Bristle-Head	R/L	2
Psittacidae	*Psittinus cyanurus*	Blue-Rumped Parrot	R/S	2
Pycnonotidae	*Criniger bres*	Grey-Cheeked Bulbul	R/S	3
	C. finschi	Finsch's Bulbul	R/S	2
	C. phaeocephalus	Yellow-Bellied Bulbul	R/S	3
	Pyconotus spp.	Bulbul	R/L	2
	P. brunnues	Red-Eyes Bulbul	R/L	2
	P. goiavier	Yellow-Vented Bulbul	S/S	2
Rallidae	*Amaurornis phoenicurus*	White-Breasted Waterhen	S/S	2
Sittidae	*Sitta frontalis*	Velvet-Fronted Nuthatch	R/L	2
Strigidae	*Strix leptogrammica**	Brown Wood-Owl	R/S	2
Sturnidae	*Gracula religiosa*	Hill Myna	R/S	3
Sylviidae	*Abroscopus supercillilaris*	Yellow-Bellied Wabler	R/L	2
	Acrocephalus orientalis	Oriental Reed-Warbler	R/S	2
	Gerygone sulphurea	Flyeater	R/L	2
	Orthotomus spp.	Tailorbird	R/L	2
	Prinia flaviventris	Yellow-Bellied Prinia	R/L	2
Timaliidae	*Alcippe brunneicauda*	Brown Fulvetta	R/S	2
	Garrulax lugubris	Black Laughingthrush	R/S	2
	G. palliatus	Sunda Laughingthrush	R/S	2
	G. mitratus	Chestnut Laughingthrush	R/S	2
	Kenopia striata	Striped Wren-Babbler	R/S	2
	Macronous gularis	Striped Tit-Babbler	R/S	2
	M. ptilosus	Fluffy-Backed Tit-Babbler	R/S	2
	Malacocincla malaccense	Short-Tailed Babbler	R/S	2
	M. separium	Horsfield's Babbler	R/S	2
	Malcopteran spp.	Babbler	R/L	2
	M. affine	Sooty-Capped Babbler	R/S	2
	Napothera atrigularis	Black-Throated Wren-Babbler	R/S	2
	N. epilepidota	Eye-Browed Wren-Babbler	R/S	2
	Pellorneum capistratum	Black-Capped Babbler	R/S	2
	Pteruthius flaviscapis	White-Browed Shrike-Babbler	R/S	2
	Ptilocichla leucogrammica	Bornean Wren Babbler	R/L	3
	Stachyris spp.	Babbler	R/L	2
	Pomatorhinus montanus	Babbler	R/L	3
	Ptilocichla leucogrammica	Bornean Wren Babbler	R/L	3
Trogonidae	*Harpactes diardii*	Diard's Trogon	R/L	2
	H. duvauceli	Scarlet-Rumped Trogon	R/S	2
Turdidae	*Copsychus malabaricus**	White-Rumped Shama	R/L	2
	*C. saularis**	Magpie Robin	R/L	2
Zosteropidae	*Zosterops everetii*	Everett's White-Eye	R/L	2
MAMMAL				
Bovidae	*Bos banteng**	Tembadau	R/L	1
Cercopithrcidae	*Macaca fascicularis**	Long-Tailed Macaque	R/A	2
	*M. nemestrina**	Pig-Tailed Macaque	S/S	2

*Note: * Protected species*

Table A1.5(b): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
Cervidae	*Cervus unicolor**	Sambar Deer	S/S	2
	*Muntiacus muntjak**	Barking Deer	R/L	2
Cynocephalidae	*Cynocephalus variegatus**	Flying Lemur	R/L	2
Elephantidae	*Elephas maximus**	Elephant	R/A	1
Hipposideridae	*Hipposideros ridley*	Ridley's Roundleaf Bat	R/L	2
Manidae	*Manis javanica**	Pangolin	R/L	2
Mollosidae	*Cheiromeles torquatus*	Naked Bat	R/L	2
Muridae	*Rattus baluensis*	Rat	R/L	3
	R. rattus	House Rat	R/L	2
	R. surifer	Red Spiny Rat	R/L	2
	R. tiomanicus	Field Rat	R/L	2
Mustelidae	*Aonyx cinerea**	Small-Clawed Otter	R/L	2
	*Lutra sumatrana**	Hairy-Nosed Otter	R/L	2
Nycteridae	*Nycteris javanica*	Insect Bat	R/L	3
Pongidae	*Hylobates moloch**	Bornean Gibbon	R/L	1
	*Pongo pygmaeus**	Orang Utan	R/A	1
Pteropidae	*Cynopterus brachyotis*	Dog-Faced Fruit Bat	R/L	2
	Pethetor lucasi	Dusky Fruit Bat	R/L	2
Rhinocerotidae	*Rhinoceros sumatrensis**	Rhinoceros	R/A	1
Sciuridae	*Callosciurus notatus*	Plaintain Squirrel	R/L	3
	*C. prevostii**	Prevost Squirrel	R/L	2
	*Ratufa affinis**	Giant Squirrel	R/L	2
Suidae	*Sus barbatus**	Bearded Pig	S/S	3
Tarsiidae	*Tarsuis bacanus**	Western Tarsier	R/L	2
Tragulidae	*Tragulus javanicus**	Smaller Mouse-Deer	R/L	2
	*T. napu**	Greater Mouse-Deer	R/S	2
Tupiidae	*Tupaia glis*	Common Tree-Shrew	R/L	2
	T. gracilis	Slender Treeshrew	R/A	2
	T. minor	Lesser Tree-Shrew	R/L	2
	T. tana	Large Tree-Shrew	R/L	2
Viverridae	*Hemigalus derbyanus**	Banded Musang	R/L	2

*Note: * Protected species*

Table A1.5(c): Aquatic Surveyed within the Project Site

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
FISHES				
Anabatidae	*Betta unimaculata*	Ikan Laga	R/L	3
Bagridae	*Mystus nemurus*	Baung	R/L	3
	M. sabanus	Baung	R/L	3
Clariidae	*Clarias batrachus*	Keli	R/L	3
Cobitidae	*Acanthopsis choirorhynchus*	'Toruh'	R/L	3
Cyprinidae	*Acrossocheeilus hexagonoe*	Tengas	R/L	3
	Gara borneensis	'Botuon'	R/L	2
	Luciosoma melanotaenia	'Pait'	R/L	2
	L. pellergrini	'Lakau'	R/L	2
	Lobocheilus bo	Belanak Sungai	R/L	3
	Nematobramis everetii	'Dumpis'	S/S	3
	Osteochilus microcephalus	Terbol	R/L	3
	Puntius sp.	Turongou	S/S	3
	Rasbora spp.	Seluang	R/L	3
	Schismatorhyncus sp.	Salab	R/L	3
	Tor douronensis	Pelian	R/L	3
Gastromyzontidae	*Gastrommyzon* sp.	'Rokot'	R/L	3
Pangasidae	*Pangasius* spp.	Patin	S/S	3
Monopteridae	*Monopterus* spp.	Belut	R/L	3
CRUSTACEAN				
Palaemonidae	*Atya* sp.	Udang Sungai	R/L	3
Portunidae	*Periclemenes* sp.	Udang Kecil	R/L	3
	Thelphusula sp.	Ketam Sungai	R/L	3
MOLLUSCA				
Cerithidae	*Cerithium rhizoporum*	Siput Sungai	R/L	2
Pilidae	*Pila saitata*	Siput Gelupu	R/L	2
ALGAE				
Achnanthaceae	*Achnanthes* sp.	Alga	K	3
Chlorophyceae	*Anabaena inaequalis*	Alga Hijau	K	3
	A. circinalis	Alga Hijau	K	3
	Closterium spp.	Alga Hijau	K	3
	Cylindrospermum sp.	Alga Hijau	K	3
	Oscllatoria limose	Alga Hijau	K	3
	O. rubescens	Alga Hijau	K	3
	O. tenius	Alga Hijau	K	3
	Scenadesmus arcuatus	Alga Hijau	K	3
	S. armatus	Alga Hijau	K	3
	S. bijuga	Alga Hijau	K	3
	Spirogyra sp.	Alga Hijau	K	3
	Ulothrix aequalis	Alga Hijau	K	3
	Uroglena sp.	Alga Hijau	K	3
	U. zonata	Alga Hijau	K	3
	Volvox aureus	Alga Hijau	K	3
	V. globator	Alga Hijau	K	3
	Zygnema sp.	Alga Hijau	K	3
Naviculaceae	*Amphora* spp.	Alga Kuning-Hijau	K	3
	Cymbella sp.	Alga Kuning-Hijau	K	3
	Gomphomena spp.	Alga Kuning-Hjau	K	3
Nitzschiaceae	*Navicula* sp.	Alga	K	3
Tubellariaceae	*Diatoma* sp.	Alga Biru-Hijau	K	3

Note: No protected species in this list

Table A1.5(d): Flora Surveyed within the Project Site

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
I. ANGIOSPERM					
Acanthaceae	*Acanthus* spp.	Jeruyi	T	R/S	3
	Barteria prionitis	Gitis	H	S/S	2
Agavacea	*Pleomele angustifolia*	Suji	T	R/S	3
Alangiaceae	*Alangium ebenaceum*	Kondolon	T	R/S	3
Anacardiaceae	*Anacardium occidentale*	Rengas	T	S/S	2
	Buchanania arborescens	Kepala Tundang	T	R/S	3
	Gluta sp.	Rengas Ayer	T	R/S	3
	Koordersiodendron pinnatum	Ranggu	T	R/S	3
	Mangifera foetida	Mangga Hutan	T	R/S	2
	M. panjang	Bambangan	T	S/S	3
	M. rigida	Mangga Hutan	T	R/S	3
	Melanorrhoea wallichii	Rengas	T	R/S	3
	Parishia insignis	Layang Layang	T	R/S	3
	Pentaspadon motleyi	Pelajau	T	S/S	3
	Semecarpus sp.	Rengas	T	S/S	3
Annonaceae	*Artabotrys suaveolens*	Anga	T	S/S	3
	A.roseus	Anga	T	R/S	3
	Desmos spp.	Pisang Munyit	T	R/S	3
	Fissistigma spp.	Pisi Pisi	T	R/S	3
	Goniothalamus ridleyi	Babangkau	T	R/S	3
	Meiogyne virgata	Karai	T	S/S	3
	Orophea sp.	Karai	T	S/S	2
	Polyalthia bullata	Karai	T	R/S	3
	P. insignis	Karai	T	R/S	3
	P. sumatrana	Karai Putih	T	S/S	3
	Popowia odoardoi	Binitan	T	R/S	3
	P. pisocarpa	Binitan	T	R/S	3
	Pseuduvaria reticulata	Boyai	T	S/S	3
	Uvaria littoris	Kenang	T	S/S	3
Apocynaceae	*Alstonia angustiloba*	Pulai Bukit	T	S/S	3
	Alyxia pilosa	Bintaro	T	R/S	3
	Dyera costulata	Jelutong Bukit	T	S/S	3
Aquifoliaceae	*Ilex trifoliate*	Morogis	T	R/S	3
	I. cymosa	Bangkulatan	T	R/S	3
Araceae	*Alocasia sp.*	Buntui	H	S/S	3
	Colocasia esculenta	Keladi	H	S/S	3
	Pistia stratiotes	Kiapu	H	S/S	3
	Pothos spp.	Sumad	T	R/S	3
	Scindapus spp.	Sumad	T	R/S	3
Araucariaceae	*Agathis* spp.	Mengilan	T	R/S	2
Araliaceae	*Osmoxylon borneensis*	Kelubi	T	R/S	3
	Schefflera spp.	Katok	T	R/S	3
Begoniaceae	*Begonia* spp.	Butek	T	R/S	3
Bombacaceae	*Durio* sp.	Durian	T	R/S	2
	D. acutifolius	Durian Daun Runching	T	R/S	3
	D. kutejensis	Durian Merah	T	R/S	3
	Neesia synandra	Durian Monyit	T	S/S	3
Bignoniaceae	*Dolichandrone spathacea*	Tui	T	S/S	3
Burseraceae	*Canarium denticulatum*	Kedondong	T	S/S	3
	Dacryodes rugosa	Kendodong	T	R/S	2
	Scutinanthe brunnea	Kedondong Hutan	T	S/S	2
Caricaceae	*Carica papaya*	Betik	T	S/S	2
Casuarinaceae	*Casuarina sumatrana*	Sempilau Bukit	T	R/S	3
Celastraceae	*Cassine kochinchinensis*	Pungsu	T	R/S	3
	Lophopetalum sp.	Perupok Dual	T	S/S	3
	L. javanicum	Perupok Dual	T	S/S	3
Compppositae	*Eupatorium odoratum*	Rumput Siam	H	S/S	3
Combretaceae	*Planchonia* sp.	Putat	T	S/S	3
	Terminalia citrina	Talisai Jambu	T	S/S	3
Connaraceae	*Agelaea borneensis*	Lelangsat	T	R/S	3
Convolvulaceae	*Ipomea batatas*	Ubi Jalar	C	S/S	3
	I. aquatica	Kangkung	C	S/S	3
	Merremia borneensis	Kekangkung	C	S/S	3
Cucurbitaceae	*Cucurbita moschata*	Labu Manis	C	S/S	2
	Cucumis sativus	Ketimun	C	S/s	2
Cunoniaceae	*Weinmannia blumei*	Sumu Silan	T	R/S	3
Cyperaceae	*Carex* spp.	Seding	T	R/S	3
	Mapania urceolata	Jukut	T	R/S	3
Datiscaceae	*Octomeles sumatrana*	Binuang	T	S/S	3
Dilleniaceae	*Dillenia* sp.	Simpoh	T	R/S	3
	D. borneensis	Simpoh Gajah	T	R/S	3
	D. excelsa	Simpoh Laki	T	S/S	3
	D. grandifolia	Simpoh	T	S/S	3
Dipterocarpaceae	*Anisoptera marginata*	Pengiran Durian	T	S/S	3
	Dipterocarpus sp.	Keruing	T	S/S	3
	D. acutangulus	Keruing Merah	T	R/S	3
	D. caudiferus	Keruing Putih	T	R/S	3

Note: No protected species in this list

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
	D. confertus	Keruing Kubis	T	R/S	3
	D. costulatus	Keruing Kipas	T	S/S	3
	D. crinitus	Keruing Mempelas	T	S/S	3
	D. exalatus	Keruing Rapak	T	S/S	3
	D. gracilis	Keruing Kesat	T	R/S	3
	D. oblongifolius	Keruing Neram	T	S/S	3
	D. stellatus	Keruing Bulu	T	R/S	3
	Dryobalanops spp.	Kapur	T	S/S	3
	D. lanceolata	Kapur Panji	T	R/S	3
	Hopea spp.	Selangan	T	S/S	1
	H. beccariana	Selangan Perak	T	R/S	1
	H. nervosa	Selangan Jangkang	T	R/S	1
	H. sangal	Gagili	T	R/S	3
	Parashorea malaanonan	Urat Mata Daun Lichen	T	R/S	3
	P. tomentella	Urat Mata Beludu	T	R/S	3
	Shorea spp.	Seraya	T	S/S	3
	S. acuminatissima	Seraya Kuning Runching	T	R/S	3
	S. agami	Melapi	T	S/S	3
	S. almon	Seraya Kerukup	T	R/S	3
	S. angustifolia	Seraya Kuning Bukit	T	R/S	3
	S. argentifolia	Seraya Daun Mas	T	R/S	3
	S. asahi	Selangan Batu Asah	T	R/S	3
	S. biawak	Selangan Batu	T	S/S	3
	S. bracteolata	Melapi Parang	T	R/S	3
	S. coriacea	Seraya Tangkai Panjang	T	R/S	3
	S. faguetiana	Seraya Kuning Siput	T	R/S	3
	S. fallax	Seraya Daun Kasar	T	R/S	3
	S. flaviflora	Seraya Daun Besar	T	R/S	3
	S. foxworthyii	Selangan Batu Bersisik	T	R/S	1
	S. gibbosa	Seraya Kuning Gajah	T	R/S	3
	S. johorensis	Seraya Majau	T	R/S	3
	S. laevis	Selangan Batu Kumus	T	R/S	1
	S. leprosula	Seraya Tembaga	T	S/S	2
	S. macrophylla	Kawang Jantung	T	S/S	3
	S. macroptera	Seraya Melantai	T	R/S	2
	S. mecistopteryx	Kawang Burung	T	R/S	3
	S. obscura	Selangan Batu Tandok	T	R/S	1
	S. ovalis	Seraya Kepong	T	R/S	3
	S. parvifolia	Seraya Punai	T	S/S	3
	S. pauciflora	Oba Suluk	T	S/S	3
	S. pilosa	Kawang Bulu	T	R/S	1
	S. platycarpa	Seraya Paya	T	R/S	3
	S. platyclados	Seraya Bukit	T	R/S	3
	S. superba	Selangan Batu Daun Halus	T	R/S	3
	S. smithiana	Seraya Timbou	T	S/S	3
	S. venulosa	Seraya Kerangas	T	R/S	3
	S. waltoni	Seraya Kelabu	T	R/S	3
	Vatica spp.	Resak	T	S/S	3
	V. albiramis	Resak Putih	T	R/S	3
	V. dulitensis	Resak Bukit	T	R/S	3
	V. oblongifolia	Resak Daun Panjang	T	R/S	3
Ebenaceae	*Diospyros elliptifolia*	Kayu Malam	T	S/S	3
	D. macrophylla	Kayu Malam	T	R/S	3
	D. tuberculata	Kayu Malam	T	S/S	3
Elaeocarpaceae	*Elaeocarpus* sp.	Kungkurad	T	S/S	3
Ericaceae	*Diplycosia barbigera*	Maras	T	R/S	3
	D. chrysothrix	Maras	T	R/S	3
	D. heterophylla	Maras	T	R/S	3
	Rhododendron spp.*	Mawar Hutan	T	R/L	3
Erythroxylaceae	*Erythroxylum cuneatum*	Perepat Burong	T	S/S	3
Euphorbiaceae	*Acalypha caturus*	Tetepong	T	S/S	3
	Agrostistachys longifolia	Kayu Garang	T	R/S	3
	A. leucopodium	Kilas Perempuan	T	S/S	3
	A. lucida	Sumping	T	R/S	3
	A. neurocarpum	Sumping Gudaun	T	R/S	3
	Aporusa grandistipulata	Galang Galang	T	S/S	3
	A. nitida	Bagil	T	S/S	3
	Baccaurea bracteata	Tampoi	T	R/S	2
	B. lanceolata	Limpaung	T	S/S	3
	B. macrocarpa	Tampoi Merah	T	R/S	3
	B. stipulata	Kunau	T	S/S	3
	Blumeodendron tokbrai	Gangulang	T	R/S	3
	Bridelia stipularis	Balatotan	T	S/S	3
	Cleistanthus paxii	Garu	T	S/S	3
	Croton caudatus	Angguk Angguk	T	R/S	3
	Drypetes macrophylla	Odopon Puteh	T	S/S	3
	Endospermum peltatum	Marapangi	T	S/S	3
	Glochidion hypoleucum	Obah	T	R/S	3
	G. superbum	Gerumong	T	S/S	3

*Note: * Protected species*

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
	G. wallichianum	Obah	T	R/S	3
	Hevea brasiliensis	Getah	T	S/S	3
	Koilodepas longifolium	Kilas	T	S/S	3
	Macaranga beccariana	Sedaman Jari	T	S/S	3
	M. costulata	Sedaman	T	S/S	3
	M. gigantea	Merkubong	T	R/S	3
	M. hypoleuca	Sedaman Putih	T	R/S	3
	M. pruinosa	Sedaman	T	R/S	3
	M. tanarius	Mahang	T	S/S	3
	M. triloba	Sadaman	T	S/S	3
	M. wrayi	Mahang	T	S/S	3
	Mallotus korthalsii	Mallotus	T	S/S	3
	M. mollissimus	Dahu	T	S/S	3
	Omphalea spp.	Palia	T	R/S	3
	Sauropus spp.	Nasi Nasi	T	R/S	3
Fagaceae	*Castanopsis* spp.	Berangan	T	S/S	3
	Lithocarpus cantleyanus	Mempening	T	S/S	3
	L. echinifer	Mempening	T	R/S	3
	Quercus argentata	Mempening	T	R/S	3
Flacourtiaceae	*Casearia* spp.	Tapion Kirabas	T	R/S	3
	Homalium foetidum	Takaliu	T	S/S	3
	Hydnocarpus woodii	Karpus	T	R/S	3
	Flacourtia rukam	Rukam	T	S/S	3
	Ryparosa accuminata	Giewei	T	S/S	3
	R. hulletii	Giewei	T	S/S	3
	Xylosma sumatrana	Linau	T	S/S	3
Gesneriaceae	*Aeschynanthus* spp.	Secang	T	R/S	3
	Didymocarpus amoenus	Sebasah	T	R/S	3
	D. crocea	Sebasah	T	R/S	3
	D. hispida	Sebasah	T	R/S	3
Graminae	*Dinochloa* sp.	Pering Pering	H	S/S	3
	D. scandens	Pering Pering	H	R/S	3
	Eleusine indica	Rumput Belulang	H	S/S	3
	Imperata cylindrica	Lalang	H	S/S	3
	Joinvillea spp.	Rumput	H	R/S	3
	Ischaemum timorense	Rumput Rumput	H	S/S	3
	Paspoalum vaginatum	Rumput	H	S/S	3
	Schizostachyum longispicuatum	Tamiang	H	R/S	3
	Thysanolaena maxima	Alang	H	S/S	3
Guttiferae	*Calophyllum* sp.	Bintangor	T	R/S	2
	C. bursicolum	Bintangor	T	R/S	3
	C. gracilipes	Bintangor	T	R/S	3
	C. nodosum	Bintangor	T	R/S	3
	Garcinia forbesii	Bebuta	T	S/S	3
	G. mangostana	Manggis	T	R/S	2
	G. parvifolia	Kandis	T	R/S	3
Hanguanaceae	*Susum malayanum*	Ampil	T	R/S	3
Hypericaceae	*Cratoxylum* sp.	Geronggang	T	S/S	3
Hypoxidaceae	*Curculigo latifolia*	Kulingo	T	R/S	3
Icacinaceae	*Stemonurus scorpioides*	Katok	T	S/S	3
Illiciaceae	*Illicium* spp.	Rupuk	T	R/S	3
Juncaceae	*Juncus* spp.	Cacabian	T	R/S	3
Leeceae	*Leea aculeate*	Vitis	T	S/S	3
Lauraceae	*Actinodaphne oleifolia*	Medang	T	R/S	3
	Alseodaphne spp.	Medang Payong	T	R/S	3
	Beilschmiedia micrantha	Medang Wangi	T	R/S	3
	B. tawaensis	Medang Wangi	T	S/S	3
	Cinnamomum javanicum	Kayu Manis	T	R/S	3
	C. racemosa	Kayu Manis	T	R/S	3
	Cryptocarya spp.	Medang Dering	T	R/S	3
	Dehassia sp.	Medang	T	S/S	3
	D. caesia	Medang	T	R/S	3
	Eusideroxylon zwageri	Belian	T	S/S	2
	Litsea spp.	Medang	T	R/S	3
	Notaphoebe obovata	Lamau Lamau	T	S/S	3
	Phoebe spp.	Medang Lada	T	R/S	3
Lecythidaceae	*Barringtonia gigantostachya*	Pulut	T	S/S	3
	B. sarcostachys	Tampalang	T	R/S	3
Leguminosae	*Adenanthera pavonina*	Saga	T	S/S	3
	Albizia chinensis	Batai Cina	T	S/S	3
	A. singularis	Batai	T	R/S	3
	Archidendron triplinervium	Aki Aki	T	S/S	3
	Bauhinia diptera	Tetapak	T	R/S	3
	Caesalpinia sappan	Sapang	T	S/S	3
	Cassia alata	Bebusok	S	S/S	3
	C. javanica	Busok Busok	T	S/S	3
	Cynometra spp.	Katong Katong	T	R/S	3
	C. inaequifolia	Katong Katong	T	S/S	3

Note: No protected species in this list

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
	Dialium indum	Keranji	T	S/S	3
	Entada spp.	Tanui	T	R/S	3
	Intsia palembanica	Merbau	T	S/S	3
	Koompasia excelsa	Mengaris	T	S/S	3
	K. malaccensis	Impas	T	R/S	3
	Milletia vasta	Melati	T	S/S	3
	Mimosa invisa	Semalu	H	S/S	3
	M. pudica	Semalu	H	S/S	3
	Mucuna spp.	Akai	T	R/S	3
	Parkia speciosa	Kupang	T	R/S	3
	P. jiringa	Jering	T	R/S	3
	Peltophorum racemosum	Timbarayong	T	S/S	3
	Phanera kockiana	Tepis	T	R/S	3
	Pithecellobium ellipticum	Jaring	T	S/S	3
	P. jiringa	Jaring	T	S/S	3
	Pongamia pinnata	Marabahai	T	S/S	3
	Saraca declinata	Gapis	T	S/S	3
	Serialbizzia splendens	Kungkurad	T	S/S	3
	Sindora spp.	Sepetir	T	S/S	3
	Sympetalandra borneensis	Merbau Lalat	T	S/S	3
Liliaceae	*Dianella ensifolia*	Bakung	T	R/S	3
Linaceae	*Ixonanthes reticulate*	Pagar Anak	T	R/S	3
Loganiaceae	*Fagraea spp*	Tembusu	T	R/S	2
	F. blumii	Tembusu	T	R/S	3
	F. cuspidata	Tembusu	T	S/S	3
	F. racemosa	Tembusu	T	R/S	3
	Mitrasacme spp.	Birah	T	R/S	2
	Strychnos ignatii	Rumilit	T	R/S	3
Loranthaceae	*Dendropthoe varians*	Gudung	T	R/S	3
	Helixanthera spp.	Antoi	T	R/S	3
	Loranthus spp.	Kopo	T	R/S	3
	Macrosolen cochinchensis	Salan	T	R/S	3
Lythraceae	*Lagerstroemia speciosa*	Bugor	T	S/S	3
Magnoliaceae	*Magnolia* sp.	Chempaka	T	R/S	3
	Talauma beccarii	Chempaka	T	R/S	3
Maranthaceae	*Donax* spp.	Akar	T	R/S	3
	D. canniformis	Akar Panah	T	S/S	3
	Phacelophrynum spp.	Akar	T	R/S	3
Melastomataceae	*Allomorphia* spp.	Gosing	S	R/S	3
	Axinandra borneensis	Tetiup	S	S/S	3
	Creaghiella setosa	Gosing	S	R/S	3
	Diplectria glabra	Gosing	S	R/S	3
	Dissochaeta beccariana	Gosing	S	R/S	3
	Driessenia spp.	Gosing	S	R/S	3
	Medinilla sp.	Gosing	S	S/S	3
	Melastoma spp.	Senduduk	S	S/S	3
	M. polyanthum	Senduduk	S	R/S	3
	Memecylon laevigatum	Gegosing	S	R/S	3
	M. paniculatum	Gegosing	S	R/S	3
	Pternandra coerulescens	Sireh	S	R/S	3
	Sonerila spp.	Sireh	S	R/S	3
Meliaceae	*Aglaia affinis*	Lelangsat	T	R/S	3
	A. elliptica	Langsat Langsat	T	S/S	3
	A. oligophylla	Lelangsat	T	R/S	3
	Amoora spp.	Lantupak	T	R/S	3
	Azadirachta excelsa	Limpaga	T	S/S	3
	Chisocheton beccarianum	Lisi Lisi	T	R/S	3
	Dysoxylum spp.	Lantupak	T	S/S	3
	D. acutangula	Lantupak	T	R/S	3
	Lansium domesticum	Langsat	T	S/S	3
	Walsura pinnata	Lantupak	T	S/S	3
Moraceae	*Artocarpus* sp.	Tarap	T	S/S	3
	A. anisophyllus	Tarap Nasi	T	R/S	3
	A. dadah	Buruni	T	S/S	3
	A. elasticus	Togop	T	S/S	3
	A. odoratissimus	Tarap	T	R/S	3
	Ficus sp	Ara	T	S/S	3
Musaceae	*Musa paradisiaca*	Pisang	T	S/S	3
	M. sapientum	Pisang	T	S/S	3
Myristicaceae	*Horsfieldia* spp.	Pianggu	T	R/S	3
	Knema albifolia	Darah Darah	T	R/S	3
	K. laurina	Darah Darah	T	R/S	3
	Myristica cinnamomea	Penara	T	R/S	3
Myrtaceae	*Eugenia* spp.	Obah	T	R/S	3
	E. barringtoniodes	Obah	T	R/S	3
	E. cerasiformis	Obah	T	R/S	3
	E. foetida	Obah	T	R/S	3
	E. stipulata	Obah	T	R/S	3
	Rhodamnia cinerea	Mempoyan	T	S/S	3

Note: No protected species in this list

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
	Syzygium sp.	Pepanjat	T	S/S	3
	Tristania clementis	Pelawan Pelawan	T	R/S	3
	T. laurina	Pelawan Pelawan	T	R/S	3
Myrsinaceae	*Ardisia* sp.	Lempanai	T	S/S	3
	A. elliptica	Surusop	T	S/S	3
Nepenthaceae	*Nepenthes* sp.*	Periuk Kera	C	R/S	3
Ochnaceae	*Euthemis leucocarpa*	Timis	T	R/S	3
	E. minor	Timis	T	R/S	3
	Gomphia borneensis	Gompit	T	R/S	3
	G. serrata	Gompit	T	R/S	3
Olacaceae	*Ochanostachys amentacea*	Tanggal	T	R/S	3
	Scorodocarpus borneensis	Bawang Hutan	T	R/S	3
Oleaceae	*Chionanthus beccarianus*	Maragaram	T	R/S	3
	Jasminum spp.	Maragaram	T	R/S	3
Orchidaceae	*Abdominea minimiflora*	Anggrek	E	R/S	2
	Acriopsis gracilis	Anggrek	E	R/S	2
	Bulbophyllum acuminatum	Anggrek	E	R/S	3
	B. limbatum	Anggrek	E	R/S	3
	B. nigromaculatum	Anggrek	E	R/S	3
	Chelonistele amplissima	Anggrek	E	R/S	3
	C. lurida	Anggrek	E	R/S	3
	Cleisostoma subulatus	Anggrek	E	R/S	3
	Coelogyne cuprea	Anggrek	E	R/S	3
	Dendrobium cinnabarium	Anggrek	E	R/S	3
	D. pachyanthum	Anggrek	E	R/S	3
	Dimorphorchis lowii	Anggrek	E	R/S	3
	Eria melaleuca	Anggrek	E	R/S	3
	Lecanorchis spp.	Anggrek	E	R/S	3
	Malaxis punctata	Anggrek	E	R/S	3
	Maleola sp.	Anggrek	E	R/S	2
	Nephelaphyllum pulchrum	Anggrek	E	R/S	2
	N. trapoides	Anggrek	E	R/S	2
	Stereosandra jayanica	Anggrek	E	R/S	2
	Vanilla spp.	Anggrek	E	R/S	2
Oxalidaceae	*Sarcotheca diversifolia*	Tabarus	T	R/S	3
Pinaceae	*Agathis dammara*	Mengilan	T	S/S	3
Piperaceae	*Peperromia* spp.	Daing	C	R/S	3
	Piper spp.	Sirih	C	R/S	3
Poaceae	*Saccharum* spp.	Tebu Sungai	H	S/S	3
Polygalaceae	*Polygala* spp.	Rakang	T	R/S	3
	Xanthophyllum affine	Minyak Berok	T	R/S	3
	Xanthophyllum spp.	Minyak Berok	T	S/S	3
Proteaceae	*Helicia robusta*	Gasi	T	R/S	3
Rosaceae	*Angelesia splendens*	Timpaluan	T	R/S	3
	Parastemon urophyllus	Nyalas	T	R/S	3
	Parinari laurina	Torog	T	S/S	3
	Prunus arborea	Kelanus	T	R/S	3
	Rubus mollucanus	Mandailos	T	R/S	3
Rubiaceae	*Adina trichotoma*	Mengkeniab	T	S/S	3
	Acranthera spp.	Sawon	T	R/S	3
	Anthocephalus chinensis	Laran	T	S/S	3
	Argostemma spp.	Bamba	T	R/S	3
	Chassalia spp.	Landing	T	R/S	3
	Gaertnera borneensis	Tulei	T	R/S	3
	Hedyotis spp.	Kelumpi	T	R/S	3
	Hydnophytum spp.	Kiam	T	R/S	3
	Ixora congesia	Jejarum	T	R/S	3
	I. elliptica	Kiam	T	S/S	3
	Jackia ornata	Selumar	T	S/S	3
	Lucinaea spp.	Selasi	T	R/S	3
	Nauclea subdita	Bangkal Udang	T	R/S	3
	Neolamarckia cadamba	Bangkal	T	S/S	3
	Paederia spp.	Lempoyan	T	R/S	3
	Pavetta spp.	Lumpai	T	R/S	3
	Pleiocarpidia sandakanica	Buloh Buloh	T	S/S	3
	Praravinia sericotricha	Buloh Buloh	T	R/S	3
	Prismatomeris beccariana	Kahitutan	T	R/S	3
	Streblosa spp.	Kingki	T	R/S	3
	Timonius eskerianus	Tapai	T	R/S	3
	T. flavescens	Tapai Apai	T	S/S	3
	Uncaria spp.	Bangkal Kuning	T	R/S	3
	Urophyllum glabrum	Mata Keli	T	R/S	3
	Zeuxantha moultonii	Kekupi	T	R/S	3
Rutaceae	*Clausena excavate*	Lelimau	T	R/S	3
	Luvunga spp.	Lonsom	T	R/S	3
	Melicope sp.	Tenuang	T	S/S	3
	Tetractomia tetrandra	Papait	T	R/S	3

*Note: * Protected species*

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
Sapindaceae	*Allophylus cobbe*	Kulimpapa burung	T	S/S	3
	Guioa pleuropteris	Senyamok	T	S/S	3
	Mschocarpus peritapetalus	Membuakat	T	S/S	3
	Nephelium cuspidatum	Rambutan	T	R/S	3
	N. mutabile	Meritam	T	R/S	3
	N. lappaceum	Rambutan	T	S/S	3
	Ofophora fruticosa	Balingasan	T	S/S	3
	Paranephelium nitidum	Membuakat	T	S/S	3
	P. xestophyllum	Membuakat	T	S/S	3
	Pometia pinnata	Membuakat	T	R/S	3
Sapotaceae	*Ganua kingiana*	Nyatoh King	T	R/S	3
	Madhuca spp.	Nyatoh Madhuca	T	S/S	3
	Palaquium sp.	Nyatoh	T	S/S	3
Sabiaceae	*Meliosma sumatrana*	Gapas Gapas	T	S/S	3
Saurauiaceae	*Saurauia acuminata*	Sukung Sukung	T	R/S	3
Saxifragaceae	*Polyosma integrifolia*	Bedaru	T	R/S	3
Scrophulariaceae	*Lindernia* spp.	Lindan	T	R/S	3
Smilacaceae	*Smilax borneensis*	Canar	T	R/S	3
Sonneraticeae	*Duabanga moluccana*	Magas	T	S/S	3
Sterculiaceae	*Heritiera simplicifolia*	Dugun	T	R/S	3
	Pterospermum elongatum	Bayor	T	S/S	3
	Scaphium affine	Kembang Semangkok	T	R/S	3
	Sterculia sp.	Kalumpang	T	S/S	2
Symplocaceae	*Symplocos fasciculata*	Jiak	T	S/S	3
Tetrameristaceae	*Tetramerista glabra*	Tuyot	T	S/S	3
Theaceae	*Adinandra dumosa*	Bawing	T	R/S	3
	Pyrenaria kunstleri	Seminyak	T	R/S	3
	Schima spp.	Gatal Gatal	T	R/S	3
	Ternstroemia spp.	Kerangas	T	R/S	3
Thymeleaceae	*Wikstroemia androsaemifolia*	Tindot	T	R/S	3
	W. tenuiramis	Tindot	T	R/S	3
Tiliaceae	*Brownlowia* spp.	Pinggau Pinggau	T	S/S	3
	B. peltata	Pinggau	T	S/S	3
	Microcos sp.	Kerodong Damak	T	S/S	3
	Pentace laxiflora	Takalis Daun Halus	T	R/S	3
Ulmaceae	*Gironniera nervosa*	Ampas Tebu	T	R/S	3
Urticaceae	*Dendrocnida elliptica*	Papaku	T	S/S	3
	Elatostema spp.	Jelatang	T	R/S	3
	Poikilospermum suaveolens	Pulus	T	R/S	3
	Trema orientalis	Randagong	T	S/S	3
Verbenaceae	*Callicarpa candicans*	Jengger	T	R/S	3
	C. longifolia	Lapi	T	R/S	3
	Clerodendron spp.	Buak	T	R/S	3
	Teijsmanniodendron holophyllum	Buak Buak Batu	T	R/S	3
	Vitex pubescens	Leban	T	S/S	3
Vitaceae	*Ampleocissus* spp.	Lakum	T	R/S	3
	Cissus hastate	Kibarara	T	R/S	3
	C. reperus	Anggor	T	R/L	2
	Leea indica	Mali Mali	T	R/S	3
	Pterisanthes spp.	Punak	T	R/S	3
	Tetrastigma lanceolarium	Punak	T	R/S	3
	T. papillosum	Punak	T	R/S	3
Zingiberaceae	*Achasma* sp.	Tuhau	H	S/S	2
	A. megalocheilos	Tepus	H	S/S	3
	Alpinia spp.	Tolidus	H	R/S	3
	Amomum spp.	Galayo	H	R/S	3
	Costus speciosus	Galayo	H	R/S	3
	*Globba propinqua**	Halia Hutan	H	R/S	3
	*G. pendula**	Halia Hutan	H	R/S	3
	Plagiostachys spp.	Galayo	H	R/S	3
	Zingiber sp.*	Halia Hutan	H	R/S	3
	*Z. coloratum**	Halia Hutan	H	R/S	3
II.GYMNOSPERM					
Gnetaceae	*Gnetum gnemon*	Tinjau	C	R/S	3
	G. leptostachyam	Tinjau	C	S/S	3
Podocarpaceae	*Dacrydium beccarii*	Sempilor	T	R/S	3
	D. elatum	Sempilor	T	R/S	3
	D. falciforme	Sempilor	T	R/S	3
	D. pectinatum	Sempilor	T	R/S	3
	Phyllocladus hypophyllus	Podo	T	R/S	3
	*Podocarpus imbricatus **	Lampias	T	R/S	3
	*P. neriifolius **	Lampias	T	R/S	3
	*P. polystachyus **	Lampias	T	R/S	3
Rhmnaceae	*Alphitomia incana*	Pakudita	T	S/S	3
	Ventilago spp.	Rilit	C	R/S	3
	Zizypus spp.	Tangau	C	S/S	3

*Note: * Protected species*

Table A1.5(d): Flora Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	VERNACULAR NAME	HABITAT	RECORD	DISTRIBUTION
III. PALM					
Arecaceae	*Areca* spp.	Pinang	T	R/S	3
	Arenga undulatifolia *	Polod	T	R/S	3
	Calamus caesius	Rotan	C	R/S	3
	C. jayensis	Rotan	C	R/S	3
	C. pogocanthus	Rotan	C	R/S	3
	Caryota mitis *	Botu	T	R/S	3
	Daemonorops spp.	Palma	T	R/S	3
	Iguanura polymorpha	Palma	T	R/S	3
	Korthalsia echinometra	Palma	T	R/S	3
	Licuala longipes	Palma	T	R/S	3
	Oncosperma horridum	Nibong	T	R/S	3
	Pinanga spp.	Pinang Hutan	T	R/S	3
	Salacca affinis	Salak	T	R/S	3
Palmae	*Calamus* spp.	Rotan	L	S/S	3
Pandanaceae	*Freycinetia* spp.	Pandak Hutan	T	R/S	3
	Pandanus helicopus	Rasau	T	S/S	3
IV. FERN					
Asclepiadaceae	*Dischidia major*	Tetumpang	C	S/S	3
	Hoya latifolia	Paku	E	R/S	3
Aspleniaceae	*Asplenium* sp.	Paku Sarang Burung	Tr	S/S	3
	Asplenium nidus	Paku Sarang Burung	E	S/S	3
Blechnnaceae	*Blechnum orientale*	Biding	Tr	S/S	3
Cyatheaceae	*Cyathea latebrosa*	Paku	Tr	R/S	3
Dennstaedtiaceae	*Orthiopteris kingii*	Legub	Tr	S/S	3
Dipteridaceae	*Dipteris conjugata*	Paku	Tr	R/S	3
Gleicheniaceae	*Dicranopteris alternans*	Resam	Tr	S/S	3
	D. linearis	Resam	Tr	S/S	3
	Gleichenia linearis	Resam	Tr	S/S	3
Lindsaeaceae	*Lindsaea* spp.	Paku	Tr	R/S	3
Lycopodiaceae	*Lycopodium cernuum*	Paku	Tr	R/S	3
Oleandraceae	*Oleandra pistillaris*	Paku	Tr	R/S	3
Polypodiaceae	*Drynaria saprsisora*	Sakat	E	S/S	2
	Lecanopteris carnosa	Sakat	E	R/S	3
	L. sinuosa	Sakat	E	R/S	3
	Playtcerium coronarium	Sakat	E	R/S	3
	P. ridleyi	Sakat	E	R/S	3
	Pyrrosia lanceolata	Tetumpang	E	S/S	2
Schizoeaceae	*Lygodium circinnatum*	Paku Jari	L	S/S	2
	L. flexuosum	Paku Jari	L	S/S	2
Selaginellaceae	*Selaginella conferta*	Paku Lumut	Tr	R/S	3
Taenitidaceae	*Taenitis blechnoides*	Paku	Tr	R/S	3
Verbenaceae	*Lantana camara*	Tahi Ayam	Tr	S/S	3
Vittariaceae	*Antrophyum callifolium*	Paku	Tr	R/S	3

*Note: * Protected species*

Table A1.5(e): Fauna Surveyed within the Project Site

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
AMPHIBIA				
Bufonidae	*Ansonia leptopus*	Brown Toad	R/L	3
	Bufo asper	Common Toad	K	3
	B. biporcatus	Borneo Common Toad	R/L	3
	B. melanostictus	Borneo Common Toad	R/L	3
	Pedostibes hosii	Blackish Toad	R/L	3
Michrohylidae	*Kaloula pulchra*	Stocky Frog	R/L	3
Ranidae	*Amalops* sp.	Stream Frog	R/L	3
	Rana spp.	Forest Stream Frog	R/L	3
	R. chalocnata	Forest Stream Frog	K	3
	R. hosii	Stream Frog	R/L	3
	R. staurois	Stream Frog	R/L	3
Rhacophoridae	*Polypedates* spp.	Tree Frog	R/L	3
	P. otilophus	Tree Frog	R/L	3
	P. rhacophorus	Tree Frog	R/L	3
	Rhacophorus sp.	Tree Frog	S/S	3
	R. gauni	Tree Frog	R/L	3
REPTILIA				
Agamidae	*Bronchocela cristatella*	Crested Lizard	R/L	3
Boidae	*Python reticulatus* *	Reticulated Python	R/L	2
Colubridae	*Ahaetulla prasina*	Vine Snake	R/L	3
	Dendrelaphis spp.	Bronzeback Snake	R/L	3
	D. caudolineatus	Bronzeback Snake	R/L	3
	D. pictus	Painted Bronzeback Snake	S/S	3
	Elaphe flavolineata	Common Racer Snake	S/S	3
	Ptyas mucosus	Rat Snake	R/L	2
Crocodylidae	*Crocodylus porosus**	Crocodile	R/L	1
Donganidae	*Donania subplana*	Soft-Shelled Turtle	R/L	2
Elapidae	*Naja naja*	Common Cobra	R/L	2
Emydidae	*Terapene* sp.	Terrapin	R/L	2
Scincidae	*Apterygodon vittatus*	Striped Tree Skink	R/L	2
	Mabuya multifasciata	Common Skink	S/S	3
	Riopa bowringgi	Lesser Skink	S/S	3
Varanidae	*Calotes versicolor*	Changeable Lizard	S/S	2
	Varanus rudicolis *	Monitor Lizard	R/L	2
	Varanus salvator *	Monitor Lizard	S/S	2
BIRD				
Accipitridae	*Accipiter trivirgatus**	Crested Goshawk	R/L	2
	*A. virgatus**	Besra	R/A	2
	Butastur indicus	Grey-Faced Buzzard	S/S	3
	*Haliastur indus**	Brahminy Kite	R/S	2
	*Ictinaetus malayensis**	Black Eagle	R/A	2
	Pernis apivorus	Honey-Buzzard	R/L	2
	*Spilornis cheela**	Crested Serpent-Eagle	R/S	2
Aegithinidae	*Aegithina viridissima*	Green Iora	R/L	2
	Chloropsis cyanopogon	Lesser Green Leafbird	R/S	2
	C. sonnerati	Greater Green Leafbird	R/S	2
Alcedinidae	*Actenoides concreta*	Collared Kingfisher	R/A	2
	Alcedo euryzona	Blue-Banded Kingfisher	R/L	2
	A. meninting	Blue-Eared Kingfisher	R/S	2
	Ceyx erithacus	Oriental Kingfisher	R/A	2
	C. rufidorsus	Rufous-Backed Kingfisher	R/S	3
	Halcyon capensis	Stork-Billed Kingfisher	R/S	2
	H. chloris	Collered Kingfisher	R/L	3
	H. concreta	Collered Kingfisher	R/S	3
	Lacedo pulchella	Banded Kingfisher	R/S	3
Anhingidae	*Anhinga melanogaster**	Oriental Darter	R/S	1
Apodidae	*Aerodramus* spp.	Swiftlet	R/S	3
	Collocalia esculenta	Glossy Swiftlet	R/S	2
	Hemiprocne longipennis	Treeswift	S/S	2
Arachnotherinae	*Arachnothera longirostra*	Little Spiderhunter	R/L	3
	A. affinis	Grey-Breasted Spiderhunter	R/S	2
	A. chrysogenys	Yellow-Eared Spiderhunter	R/S	2
	A. crassirostris	Thick-Billed Spiderhunter	R/S	2
	A. flavigaster	Spectacled Spiderhunter	R/S	3
	A. robusta	Long-Billed Spiderhunter	R/S	3
Ardeidae	*Ardea sumantrana**	Great-Billed Heron	R/S	3
	*Butorides striatus**	Little Heron	R/S	3
Artamidae	*Artamus leucorhynchus*	Wood Swallow	R/L	2

*Note: * Protected species*

Table A1.5(e): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
Bucerotidae	*Anorrhinus galeritus**	Bushy-Crested Hornbill	S/S	1
	Anthracoceros spp.	Hornbill	R/L	1
	*A. coronatus**	Pied Hornbill	R/S	1
	*A. malayanus**	Black Hornbill	R/S	1
	*Berenicornis comatus**	White-Crested Hornbill	R/L	1
	*Buceros rhinoceros**	Rhinoceros Hornbill	R/A	1
	*Rhinoplax vigil **	Helmeted Hornbill	R/L	1
	*Rhyticeros undulates**	Wreathed Hornbill	R/L	1
Campephagidae	*Coracina* spp.	Cuckoo- Shrike	R/L	2
	C. fimbriata	Lesser-Cuckoo Shrike	R/S	3
	C. striata	Bar-Bellied Cuckoo Shrike	R/S	3
	Hemipus spp.	Flycatcher-Shrike	R/L	2
	H. hirundinaceus	Black-Winged Flycather-Shirke	R/S	3
	H. picatus	Bar-Winged Flycatcher-Shrike	R/S	3
	Lanius cristatus	Brown Shrike	R/S	2
	Pericrocotus spp.	Minivet	R/L	2
	P. flammeus	Scarlet Minivet	R/S	3
	P. igneus	Fiery Minivet	R/S	3
	Tephrodornis virgatus	Large Wood-Shrike	R/S	3
Capitonidae	*Calorhamphus fuliginosus*	Brown Barbet	R/L	2
	Megalaima spp.	Barbet	R/L	2
	M. australis	Blue-Eared Barbet	R/S	3
	M. chrysopogon	Gold-Whiskered Barbet	R/S	3
	M. eximia	Black-Throated Barbet	R/S	3
	M. henricii	Yellow-Crowned Barbet	R/S	3
	M. monticola	Mountain Barbet	R/S	3
	M. mystacophanos	Red-Throated Barbet	R/S	3
	M. rafflesii	Red-Crowned Barbet	R/S	2
Caprimulgidae	*Eurostopodus temminckii*	Malaysian Eared Nightjar	R/S	3
Centropodinae	*Centropus rectunguis**	Short-Toed Caucal	R/A	2
	C. sinensis	Greater Caucal	R/A	2
Chloropseidae	*Aegithina viridissima*	Green Iora	R/S	3
	Chloropsis cochinchinensis	Blue-Winged Leafbird	R/S	3
	C. cyanopogon	Lesser Green Leafbird	R/S	3
	C. sonnerati	Greater Green Leafbird	R/S	3
Cuculidae	*Cacomantis* spp.	Cuckoo	R/L	2
	C. merulinus	Plaintive Cuckoo	R/S	3
	Cuculus fugax	Hodgson's Hawk-Cuckoo	R/S	3
	C. micropterus	Indian Cuckoo	R/S	3
	*Chrysococcyx xanthorhynchus**	Violet Cuckoo	R/S	3
	Phaenicophaeus spp.	Malkoha	R/L	2
	P. chlorophaeus	Raffle's Malcoha	R/S	3
	P. curvirostris	Chestnut-Breasted Malcoha	R/S	3
	P. diardi	Black-Bellied Malcoha	R/S	3
	P. javanicus	Red-Billed Malcoha	R/S	3
	Surniculuc lugubris	Drongo Cuckoo	R/S	3
Columbidae	*Chalcophaps indica**	Emerald Dove	S/S	3
	Ducula aenea	Green Imperial Pigeon	R/S	2
	D. badia	Mountain Imperial Pigeon	R/S	3
	Streptopelia chinensis	Spotted-Necked Dove	S/S	2
	Treron spp.	Pigeon	R/L	2
	*T. capellei**	Pigeon	R/A	3
	T. olax	Green Pigeon	R/S	3
Corvidae	*Corvus spp.*	Crowned	R/L	2
	C. enca	Slender-Billed Crow	R/S	3
	Platylophus galericulatus	Crested Jay	R/L	2
	Platysmurus leucopterus	Black Magpie	R/L	2
Cracticidae	*Pityriasis gymnocephala*	Bornean Bristlehead	R/S	3
Dicaeidae	*Dicaeum chrysorrheum*	Yellow-Vented Flowerpecker	R/S	3
	D. cruentatum	Scarlet-Backed Flowerpecker	R/S	3
	D. monticola	Black-Side Flowerpecker	R/S	3
	D. trachileum	Headed Flowerpecker	R/L	3
	D. trigonostigma	Orange-Bellied Flowerpecker	R/L	2
	Prionochilus maculatus	Yellow-Breasted Flowerpecker	R/S	3
	P. xanthopygius	Yellow-Rumped Flowerpecker	R/S	3
Dicruridae	*Dicrurus spp.*	Drongo	R/L	2
	D. aeneus	Bronzed Drongo	R/S	3
	D. annectans	Crow-Billed Drongo	R/S	2
	D. hottentottus	Spangled Drongo	R/S	3
	D. paradiseus	Greater Racket-Tailed Drongo	R/S	3
Estrildidae	*Lonchura fuscans*	Dusky Munia	S/S	3
	L. leucogastra	White-Bellied Munia	R/S	2
Eurylaimidae	*Calyptomena viridis*	Green Broadbill	R/L	2
	Corydon broadbill	Dusky Broadbill	R/S	2
	C. sumatranus	Dusky Broadbill	R/S	3
	Cymbirhynchus macrorhynchus	Black-and-Red Broadbill	R/S	2
	Eurylaimus javanicus	Banded Broadbill	R/L	2
	E. ochromalus	Black-Yellow Broadbill	R/S	3

*Note: * Protected species*

Table A1.5(e): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
Falconidae	*Falcon peregrinus**	Peregrine Falcon	R/S	3
Hemiprocnidae	*Hemiprocne longipennis*	Grey-Rumped Treeswift	R/S	3
	H. comata	Whiskered Treeswift	R/S	3
	*Microhierax latifrons**	White-Fronted Falconet	R/A	2
Hirundinidae	*Hirundapus giganteus*	Needletail	S/S	2
	Hirundo spp.	Swallow	R/L	3
	H. rustica	Barn Swallow	R/S	2
	H. tahitica	Pacific Swallow	S/S	3
Meropidae	*Merops viridis*	Bee-Eater	R/A	2
	Nyctyornis amictus	Bee-Eater	R/A	2
Motacillidae	*Motacilla alba**	Grey Wagtail	R/L	2
	M. cineria	Grey Wagtail	R/S	2
	*M.flava**	Yellow Wagtail	R/L	2
Muscicapinae	*Culicicapa ceylonensis*	Grey-Headed Flycatcher	R/S	3
	Cyornis caerulatus	Large-Billed Blue Flycatcher	R/S	2
	*C. carulata**	Flycatcher	R/L	2
	C. concreta	White-Tailed Flycatcher	R/S	3
	C. banyumas	Hill Blue Flycatcher	R/L	2
	C. superba	Borneo Blue Flycatcher	R/L	3
	Ficedula dumetoria	Rofous-Chested Flycatcher	R/S	3
	F. westermanni	Little Pied Flycatcher	R/S	3
	Hypothymis azurea	Black-Naped Monarch	R/S	3
	H. pyrhopterum	Rufous-Winged Philentoma	R/S	2
	Muscicapa spp.	Flycatcher	R/L	3
	M. indigo	Indigo Flycatcher	R/S	3
	M. latrostris	Asian Brown Flycatcher	R/L	3
	M. sibirica	Dark-Sided Flycatcher	R/S	3
	M. thalassina	Verditer Flycatcher	R/S	3
	Philentoma pyrhopterum	Rofous-Winged Flycatcher	R/S	3
	P. velatum	Maroon-Breasted Flycatcher	R/S	3
	Rhinomyias ruficauda	Chestnut-Tailed Flycatcher	R/S	3
	R. umbratilis	Grey-Chested Flycatcher	R/S	3
	Rhipidura albicollis	White-Throated Fantail	R/S	3
	R. javanica	Pied Fantail	R/L	2
	R. perlata	Spotted Fantail	R/S	3
	*Terpsiphone paradise**	Paradise Flycatcher	R/L	2
Nectariniidae	*Aethopyga siparaja*	Crimson Sunbird	R/S	3
	A. temminckii	Temminck's Sunbird	R/S	2
	Anthreptes spp.	Sunbird	R/L	3
	Anthreptes rhodolaema	Red-Throated Sunbird	R/S	2
	A. simplex	Plain Sunbird	R/S	2
	A. singalensis	Ruby-Cheeked Sunbird	R/S	2
	Hypogrmma hypogrammicum	Purple-Naped Sunbird	R/S	3
	Nectarinia sparata	Purple-Throated Sunbird	R/S	2
Oriolidae	*Irena puella*	Asian Fairy Bluebird	R/S	3
	Oriolus xanthonotus	Dark-Throated Oriole	R/S	3
Pellorneinae	*Malacopteron magnirostre*	Moustached Babbler	R/L	3
	Trichastoma abbotii	Temminck's Babbler	R/L	3
Phalaropodidae	*Phalaropus lobatus*	Red-Necked Pharalope	R/S	3
Phasianidae	*Arborophilla charltonii**	Partridge	R/A	2
	*Argusianus argus**	Great Argus	R/S	3
	*Haematortyx sanguiniceps**	Crimson-Headed Partridge	R/S	3
	*Lophura bulwerii**	Bulwer's Pheasant	R/S	3
	*Rollulus rouloul**	Crested Partridge	R/A	2
Picinae	*Blythipicus rubiginosus*	Maroon Woodpecker	R/S	3
	*Celeus brachyurus**	Rufous Woodpecker	R/L	3
	Dinopium rafflesii	Woodpecker	R/A	2
	*Drycocopus javensis**	Woodpecker	R/A	2
	Hemicircus concretus	Woodpecker	R/A	2
	Meiglyptes spp.	Woodpecker	R/A	2
	M. trists	Buff-Rumped Woodpecker	R/S	3
	M. tukki	Buff-Necked Woodpecker	R/S	3
	Mulleripicus pulverulentus	Great Slaty Woodpecker	R/S	3
	Picoides canicapillus	Woodpecker	R/A	2
	Picus mentalis	Checker-Throated Woodpecker	R/S	2
	P. puniceus	Woodpecker	R/A	2
	Reinwardtipicus validus	Orange-Backed Woodpecker	R/S	3
	Sasia abnormis	Rufous Piculet	R/L	2
Pittidae	*Pitta spp.*	Pitta	R/L	2
	*P. arquata**	Blue-Banded Pitta	R/S	3
	*P. baudi**	Blue-Headed Pitta	R/S	3
	*P. caerulea**	Giant Pitta	R/S	3
	*P. guajana**	Banded Pitta	R/S	3
Podargidae	*Batrachostomus auritus**	Frogmouth	R/S	3
Prionopidae	*Pityriasis gymnocephala**	Borneoan Bristle-Head	R/L	2
Psittacidae	*Psittinus cyanurus**	Blue-Rumped Parrot	R/S	3
	*Loriculus galgulus**	Hangging Parrot	R/S	3

*Note: * Protected species*

Table A1.5(e): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
Pycnonotidae	*Criniger bres*	Grey-Cheeked Bulbul	R/S	3
	C. finschi	Finsch's Bulbul	R/S	2
	C. ochraceus	Ochraceous Bulbul	R/S	3
	C. phaeocephalus	Yellow-Bellied Bulbul	R/S	3
	Hypsipetes charlottae	Puff-Vented Bulbul	R/S	3
	H. criniger	Hairy-Backed Bulbul	R/S	3
	H. flavala	Ashy Bulbul	R/S	3
	H. malaccensis	Streaked Bulbul	R/S	3
	Lole olivacea	Buff-Vented Bulbul	R/S	2
	Pyconotus spp.	Bulbul	R/L	2
	P. atriceps	Black-Headed Bulbul	R/S	2
	P. brunnues	Red-Eyes Bulbul	R/L	2
	P. cyaniventris	Grey-Bellied Bulbul	R/S	3
	P. erythropthalmos	Spectacled Bulbul	R/S	3
	P. eutilotus	Puff-Backed Bulbul	R/S	3
	P. goiavier	Yellow-Vented Bulbul	S/S	2
	P. melanoleucos	Black-White Bulbul	R/S	3
	P. simplex	Cream-Vented Bulbul	R/S	2
	P. squamatus	Scaly-Breasted Bulbul	R/S	2
Rallidae	*Amauronis phoenicurus*	White-Breated Waterhen	S/S	2
Sittidae	*Sitta frontalis*	Velvet-Fronted Nuthatch	R/L	2
Strigidae	*Strix leptogrammica**	Brown Wood-Owl	R/S	3
Sturnidae	*Gracula religiosa**	Hill Myna	R/S	3
Sylviidae	*Abroscopus supercillilaris*	Yellow-Bellied Wabler	R/L	2
	Acrocephalus orientalis	Oriental Reed-Warbler	R/S	2
	Gerygone sulphurea	Flyeater	R/L	2
	Orthotomus spp.	Tailorbird	R/L	2
	O. atrogularis	Dark-Necked Tailorbird	R/S	3
	O. ruficeps	Ashy Tailor Bird	R/L	3
	O. sericeus	Rufous-Tailed Tailorbird	R/S	3
	Phylloscopus borealis	Arctic Warbler	R/S	2
	P. trivirgatus	Mountain Leaf-Warbler	R/S	3
	Prinia flaviventris	Yellow-Bellied Prinia	R/L	3
Timaliidae	*Alcippe brunneicauda*	Brown Fulvetta	R/S	3
	Garrulax lugubris	Black Laughingthrush	R/S	3
	G. palliates	Sunda Laughingthrush	R/S	3
	G. mitratus	Chestnut Laughingthrush	R/S	3
	Kenopia striata	Striped Wren-Babbler	R/S	3
	Macronous gularis	Striped Tit-Babbler	R/S	3
	M. ptilosus	Fluffy-Backed Tit-Babbler	R/S	3
	Malacocincla malaccense	Short-Tailed Babbler	R/S	2
	M. separium	Horsfield's Babbler	R/S	2
	Malacopteran spp.	Babbler	R/L	3
	M. affine	Sooty-Capped Babbler	R/S	3
	M. cinereum	Scaly-Crowned Babbler	R/S	3
	M. magnirostre	Moustached Babbler	R/S	3
	M. magnum	Rufous-Crowned Babbler	R/S	3
	Napothera atrigularis	Black-Throated Wren-Babbler	R/S	2
	N. epilepidota	Eye-Browed Wren-Babbler	R/S	3
	Pellorneum capsitratum	Black-Capped Babbler	R/S	3
	Pomatorhinus montanus	Babbler	R/L	3
	Pteruthius flaviscapis	White-Browed Shrike-Babbler	R/S	3
	*Ptilocichla leucogrammica**	Bornean Wren Babbler	R/L	3
	Stachyris spp.	Babbler	R/L	2
	S. erythroptera	Chestnut-Winged Babbler	R/S	3
	S. maculate	Chestnut-Rumped Babbler	R/S	3
	S. nigriceps	Grey-Throated Babbler	R/S	3
	S. nigricollis	Black-Throated Babbler	R/S	3
	S. poliocephala	Grey-Headed Babbler	R/S	3
	S. rufifrons	Rufous-Fronted Babbler	R/S	2
	*Trichastoma bicolor**	Ferruginous Babbler	R/S	3
	T. pyrrhogenys	Temminck's Babbler	R/S	3
	*T. rostratum**	White-Chested Babbler	R/S	3
	T. sepiarium	Haorsfield's Babbler	R/S	3
	Yuhina everetti	Chestnut-Crested Yuhina	R/S	3
	Y. zantholeuca	White-Bellied Yuhina	R/S	3
Trogonidae	*Harpactes diardii*	Diard's Trogon	R/L	3
	H. duvauceli	Scarlet-Rumped Trogon	R/S	3
	H. kasumba	Red-Naped Trogon	R/S	3
	H. oreskios	Orange-Breasted Trogon	R/S	3
Turdidae	*Brachypteryx montana*	White-Browed Shortwing	R/S	3
	*Copsychus malabaricus**	White-Rumped Shama	R/L	3
	C. pyrropyga	Rufous-Tailed Shama	R/S	3
	*C. saularis**	Magpie Robin	R/L	2
	C. stricklandi	White-Browed Shama	R/S	2
	Enicurus spp.	Forktail	R/L	2
	*E. leschenaulti**	White-Crowned Forktail	R/S	3
	E. ruficapillus	Chestnut-Naped Forktail	R/S	3

*Note: * Protected species*

Table A1.5(e): Fauna Surveyed within the Project Site (continued)

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
Zosteropidae	*Oculocincta squamifrons*	Pygmy White-Eye	R/S	3
	Zosterops atricapilla	Black-Capped White-Eye	R/S	3
	Z. everetti	Everett's White-Eye	R/L	2
MAMMAL				
Bovidae	*Bos banteng**	Tembadau	R/A	1
Cercopithrcidae	*Macaca fascicularis**	Long-Tailed Macaque	R/A	2
	*M. nemestrina**	Pig-Tailed Macaque	S/S	2
	*Presbytis aygula**	Grey-Leaf Monkey	R/S	3
	*P. rubicunda**	Red-Leaf Monkey	R/A	2
	*P. aygula**	Silver-Leaf Monkey	R/A	2
Cervidae	*Cervus unicolor**	Sambar Deer	R/L	2
	Muntiacus atherodes	Bornean Yellow Muntjac	R/S	2
	*M. muntjac**	Barking Deer	R/L	2
Cynocephalidae	*Cynocephalus variegatus**	Flying Lemur	R/L	2
Elephantidae	*Elephas maximus**	Elephant	R/A	1
Embalionuridae	*Emballonura monticola*	Lesser Sheath-Tailed Bat	R/S	3
	E. rivalis	Greater Sheath-Tailed Bat	R/S	3
Erinaceidae	*Echinosorex gymnurus*	Moonrat	R/A	2
Felidae	*Neofelis nebulosa**	Clouded Leopard	R/A	1
	Prionailurus planiceps	Leopard Cat	R/S	2
Herpestidae	*Herpestes semitorquatus**	Collared Mongoose	R/S	3
Hipposideridae	*Hipposideros ridley*	Ridley's Roundleaf Bat	R/L	2
Hystricidae	*Hystrix brachyura**	Common Porcupine	R/A	2
Lorisidae	*Nycticebus coucang**	Slow Loris	R/L	2
Manidae	*Manis javanica**	Pangolin	R/L	2
Mollosidae	*Cheiromeles torquatus*	Naked Bat	R/L	2
Muridae	*Rattus baluensis*	Kinabalu Rat	R/L	3
	R. fulvescens	Long-Tailed Mountain Rat	R/S	3
	R. rattus	House Rat	R/L	2
	R. surifer	Red Spiny Rat	R/L	2
	R. whiteheadi	Whitehead's Rat	R/S	3
Mustelidae	*Aonyx cinerea**	Small-Clawed Otter	R/A	2
	*Lutra sumatrana**	Hairy-Nosed Otter	R/L	2
	*Martes flavigula**	Marten	R/A	2
	*Mydaus javanensis**	Teledu	R/A	2
Nycteridae	*Nycteris javanica*	Insect Bat	R/L	3
Pongidae	*Hylobates muelleri**	Borneon Gibbon	S/S	1
	*H. moloch**	Borneon Gibbon	R/S	2
Pteropidae	*Cynopterus brachyotis*	Dog-Faced Fruit Bat	R/L	3
	Pethetor lucasi	Dusky Fruit Bat	R/L	2
	*Ptreopus hypomelanus**	Lesser Flying Fox	R/S	2
Rhinocerotidae	*Rhinoceros sumatrensis**	Sumatra Rhinoceros	R/S	1
Rhinolophidae	*Hipposideros diadema*	Diadem Roundleaf Bat	R/S	3
	H. sabanus	Fawn Roundleaf Bat	R/S	3
	Rhinolophus borneensis	Borneon Horseshoe Bat	R/S	3
	R. luctus foetidus	Least Horseshoe Bat	R/S	3
Sciuridae	*Callosciurus natotus*	Red-Bellied Sculptor Squirrel	R/S	3
	C. nigrovittatus	Borneon Black-Banded Squirrel	R/S	3
	C. notatus	Plaintain Squirrel	R/L	3
	*C. prevostii**	Squirrel	R/L	2
	Dremomys everetti	Ground Squirrel	R/A	2
	Exilisciurus exillis	Plain Pygmy Squirrel	R/S	3
	E. whiteheadi	Whitehead's Pigmy Squirrel	R/S	2
	Gyloptes sinus	Sculptor Squirrel	R/A	2
	Lariscus insignis	Ground Squirrel	R/A	2
	Nannosciurus melanotis	Black-Eared Pygmy Squirrel	R/S	3
	*Ratufa affinis**	Giant Squirrel	R/L	2
	*Rheithrosciurus macrotis**	Tufted Ground Squirrel	R/S	2
	Rhinosciurus laticaudatus	Ground Squirrel	R/A	2
	Sundasciurus hippurus	Horse-Tailed Squirrel	R/S	3
	S. lowii	Low's Squirrel	R/S	3
	S. tenuis	Slender Squirrel	R/S	3
Soricidae	*Suncus murinus*	Shrew	R/A	2
	Crocidura fuliginosa	Sunda Shrew	R/A	2
	C. monticola	White-Tooted Shrew	R/A	2
Suidae	*Sus barbatus**	Bearded Pig	S/S	3
Tarsiidae	*Tarsuis bacanus**	Western Tarsier	R/L	2
Tragulidae	*Tragulus javanicus**	Smaller Mouse-Deer	S/T	3
	*T. napu**	Greater Mouse-Deer	R/S	2
Tupiidae	*Ptilocerus lowii*	Pentail Treeshrew	R/A	2
	Tupaia dorsalis	Striped Treeshrew	R/A	2
	T. glis	Common Tree-Shrew	R/L	3
	T. gracilis	Slender Treeshrew	R/A	2
	T. minor	Lesser Tree-Shrew	R/L	3
	T. tana	Large Tree-Shrew	R/L	2
Viverridae	*Hemigalus derbyanus**	Banded Musang	S/S	2
	*Paradoxurus hermaphroditus**	Palm Civet	R/A	2
	*Prionodon linsang**	Banded Linsang	R/A	2
	*Viverra tangalunga**	Civet	R/A	2

*Note: * Protected species*

Table A1.5(f): Aquatic Surveyed within the Project Site

GROUP/FAMILY	SPECIES	COMMON NAME	RECORD	DISTRIBUTION
FISHES				
Anabatidae	*Anabas testudineus*	Puyu	R/L	3
	Betta unimaculata	Ikan Laga	R/L	3
Bagridae	*Mystus nemurus*	Baung	R/L	3
	M. sabanus	Baung	R/L	3
Clariidae	*Clarias batrachus*	Keli	R/L	3
Cobitidae	*Acanthopsis choirorhynchus*	'Toruh'	R/L	3
Cyprinidae	*Acrossocheeilus hexagonoe*	Tengas	R/L	3
	Gara borneensis	'Botuon'	R/L	3
	Luciosoma melanotaenia	'Pait'	R/L	3
	L. pellergrini	'Lakau'	R/L	3
	Lobocheilus bo	Belanak Sungai	R/L	3
	Nematabramis everetti	'Dumpis'	S/S	3
	Osteochilus microcephalus	Terbol	S/S	3
	Puntius schwanenfeldii	Turongou	R/L	3
	P. sealei	Turongou	R/L	3
	Rasbora spp.	Seluang	R/L	2
	Schismatorhyncus sp.	Salab	R/L	3
	Tor douronensis	Pelian	R/L	3
Gastromyzontidae	*Gastrommyzon* sp.	'Rokot'	R/L	3
Pangasidae	*Pangasius* spp.	Patin	S/S	3
Monopteridae	*Monopterus* spp.	Belut	R/L	3
CRUSTACEAN				
Gecarcinucoidea	*Parathelphusa valida*	Ketam Sungai	R/S	3
Palaemonidae	*Atya* sp.	Udang Sungai	R/L	3
	Periclemenes sp.	Udang Kecil	R/L	3
Portunidae	*Periclemenes* sp.	Udang Kecil	R/L	3
	Thelphusula	Ketam Sungai	R/L	3
MOLLUSCA				
Cerithidae	*Cerithium rhizoporum*	Siput Sungai	R/L	3
Melanoidae	*Melanoides* spp.	Siput	R/L	3
Pilidae	*Pila saitata*	Siput Gelupu	R/L	3
ALGAE				3
Achnanthaceae	*Achnanthes* sp.	Alga	K	3
Chlorophyceae	*Anabaena inaequalis*	Alga Hijau	K	3
	A. circinalis	Alga Hijau	K	3
	Closterium spp.	Alga Hijau	K	3
	Cylindrospermum sp.	Alga Hijau	K	3
	Oscllatoria limose	Alga Hijau	K	3
	O. rubescens	Alga Hijau	K	3
	O.tenius	Alga Hijau	K	3
	Scenadesmus arcuatus	Alga Hijau	K	3
	S. armatus	Alga Hijau	K	3
	S. bijuga	Alga Hijau	K	3
	Spirogyra sp.	Alga Hijau	K	3
	Ulothrix aequalis	Alga Hijau	K	3
	U. zonata	Alga Hijau	K	3
	Volvox aureus	Alga Hijau	K	3
	V. globator	Alga Hijau	K	3
	Zygnema sp.	Alga Hijau	K	3
Naviculaceae	*Amphora spp.*	Alga Kuning-Hijau	K	3
	Cymbella sp.	Alga Kuning-Hijau	K	3
	Gomphomena spp.	Alga Kuning-Hjau	K	3
Nitzschiaceae	*Navicula sp.*	Alga	K	3
Tubellariaceae	*Diatoma sp.*	Alga Biru-Hijau	K	3

Note: No protected species in this list

Annex 1.6: Forestry Data

- Forest Inventory
- Compartment Data

Table A1.6(a): Forest Inventory - Growing Stock within FMU 14

Table A1.6(b): Forest Inventory - Number of Trees within FMU 14

Table A1.6(c): Compartment Data

Compartment No	*Area (ha)*	*Remarks*
1	129	NFM
2	158	NFM
3	276	NFM
4	247	NFM
5	112	NFM
6	185	NFM
7	155	NFM
8	125	NFM
9	193	NFM
10	139	NFM
11	228	NFM
12	127	NFM
13	253	NFM
14	185	NFM
15	125	NFM
16	140	NFM
17	258	NFM
18	131	NFM
19	188	NFM
20	257	NFM
21	180	NFM
22	178	NFM
23	207	NFM
24	270	NFM
25	147	NFM
26	115	NFM
27	295	NFM
28	203	NFM
29	156	NFM
30	266	NFM
31	192	NFM
32	207	NFM
33	205	NFM
34	158	NFM
35	269	NFM
36	186	NFM
37	130	NFM
38	130	NFM
39	144	NFM
40	186	NFM
41	249	NFM
42	239	NFM
43	309	NFM
44	306	NFM
45	281	NFM
46	528	C
47	431	NFM
48	206	NFM
49	337	NFM
50	297	NFM

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Table A1.6(c): Compartment Data (continued)

Compartment No	Area (ha)	Remarks
51	197	NFM
52	346	NFM
53	128	C
54	186	NFM
55	257	NFM
56	134	C
57	298	NFM
58	564	NFM
59	244	NFM
60	499	NFM
61	335	NFM
62	148	NFM
63	327	NFM
64	512	NFM
65	586	NFM
66	263	NFM
67	284	NFM
68	148	NFM
69	207	NFM
70	213	NFM
71	423	NFM
72	190	NFM
73	233	NFM
74	489	C
75	621	C
76	203	C
77	338	C
78	428	NFM
79	195	NFM
80	301	NFM
81	425	NFM
82	324	NFM
83	643	NFM
84	220	NFM
85	337	NFM
86	291	NFM
87	100	NFM
88	219	NFM
89	200	NFM
90	267	NFM
91	227	NFM
92	269	NFM
93	603	NFM
94	316	NFM
95	234	NFM
96	237	NFM
97	488	NFM
98	357	NFM
99	448	NFM
100	365	NFM

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Table A1.6(c): Compartment Data (continued)

Compartment No	Area (ha)	Remarks
101	586	NFM
102	627	NFM
103	314	NFM
104	510	NFM
105	230	C
106	562	NFM
107	583	NFM
108	400	NFM
109	236	NFM
110	655	NFM
111	692	NFM
112	542	NFM
113	323	NFM
114	517	NFM
115	518	NFM
116	345	NFM
117	506	NFM
118	533	NFM
119	549	NFM
120	305	NFM
121	253	C
122	447	NFM
123	627	NFM
124	468	NFM
125	553	NFM
126	354	NFM
127	580	NFM
128	334	NFM
129	412	NFM
130	482	NFM
131	305	NFM
132	521	NFM
133	422	NFM
134	435	NFM
135	434	NFM
136	390	NFM
137	160	NFM
138	535	NFM
139	642	NFM
140	555	NFM
141	181	NFM
142	245	NFM
143	514	NFM
144	500	NFM
145	292	NFM
146	458	NFM
147	93	NFM
148	550	NFM
149	464	NFM
150	251	NFM

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Table A1.6(c): Compartment Data (continued)

Compartment No	Area (ha)	Remarks
151	625	NFM
152	265	NFM
153	132	NFM
154	183	NFM
155	655	NFM
156	338	NFM
157	604	NFM
158	456	NFM
159	271	NFM
160	362	NFM
161	302	NFM
162	572	NFM
163	248	NFM
164	397	NFM
165	396	ITP
166	449	ITP
167	518	ITP
168	357	ITP
169	504	ITP
170	524	ITP
171	581	ITP
172	247	ITP
173	354	ITP
174	410	ITP
175	338	ITP
176	489	ITP
177	468	ITP
178	461	ITP
179	373	ITP
180	197	ITP
181	338	ITP
182	360	ITP
183	324	ITP
184	375	ITP
185	355	ITP
186	393	ITP
187	605	ITP
188	403	ITP
189	551	ITP
190	341	ITP
191	616	ITP
192	568	ITP
193	746	ITP
194	579	ITP
195	398	ITP
196	277	ITP
197	608	ITP
198	533	ITP
199	404	ITP
200	415	ITP

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Table A1.6(c): Compartment Data (continued)

Compartment No	Area (ha)	Remarks
201	369	ITP
202	282	ITP
203	179	ITP
204	387	ITP
205	320	ITP
206	243	ITP
207	436	ITP
208	410	ITP
209	575	ITP
210	554	ITP
211	121	ITP
212	197	ITP
213	520	ITP
214	434	ITP
215	343	ITP
216	303	ITP
217	663	ITP
218	588	ITP
219	649	ITP
220	485	ITP
221	507	ITP
222	366	ITP
223	352	ITP
224	399	ITP
225	244	ITP
226	597	ITP
227	103	ITP
228	321	ITP
229	472	NFM
230	375	NFM
231	572	NFM
232	611	NFM
233	255	NFM
234	418	NFM
235	174	NFM
236	399	ITP
237	461	ITP
238	456	ITP
239	258	ITP
240	411	ITP
241	487	ITP
242	310	ITP
243	273	ITP
244	208	ITP
245	320	ITP
246	341	ITP
247	306	ITP
248	226	ITP
249	323	ITP
250	373	ITP

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Table A1.6(c): Compartment Data (continued)

Compartment No	***Area (ha)***	***Remarks***
251	427	ITP
252	402	ITP
253	259	ITP
254	428	NFM
255	111	NFM
256	293	NFM
257	154	NFM
258	190	NFM
259	209	NFM
260	367	NFM
261	251	NFM
262	103	C
263	228	NFM
264	344	C
265	313	NFM
266	465	NFM
267	253	NFM
268	240	NFM
269	340	NFM
270	331	NFM
271	299	NFM
272	213	NFM
273	380	NFM

Notes: NFM – Natural Forest Management; ITP – Industrial Tree Plantation; C - Conservation

Annex 1.7: Prescribed / Controlled Burning

Open Burning

The banning of open burning is a well intentioned effort to reduce smoke impacts on the populations of Malaysia and surrounding countries. Unfortunately, the policy may lead to the opposite result as well as other environmental problems.

During drought periods, when haze from many sources becomes an issue in South East Asia, forest fire becomes a serious threat. As seen in 1998, these fires can over large areas, even when fought aggressively. The problem is compounded significantly when these fires burn in plantation and logging areas where debris is present on the ground.

Banning of open burning, which was the primary method to dispose of logging debris, creates very dangerous fire spread conditions during droughts. Fires spreading through such debris create significant smoke volumes as well as spreading the fire into other areas. Burning under controlled conditions and with proper method, produces far less smoke than forest fires burning uncontrolled during drought.

Additionally, banning of open burning greatly increases the use of herbicide to clear unwanted vegetation for planting of trees and other cover. The combination of unburned debris with herbicided vegetation creates an explosive forest fire situation during droughts.

In North America, open burning has also been a long standing but controversial practice in forestry and agriculture. Over the past 20 years, much effort has been placed on developing techniques to reduce smoke has on populations. These programs have successfully allowed burning under regulated conditions to ensure that smoke problems are minimized. In the case of British Columbia, smoke complaints from the public have virtually disappeared over the past 10 years. This has been accomplished through a comprehensive smoke management plan process, burning permit system, smoke reduction techniques and development of alternatives to burning.

Areas within the concession, especially logging and plantation harvesting areas have significant hazard. Burning of the areas reduced the hazard in the short-term until vegetation grows into the area. In order to maintain a reduced hazard level, tree cover must shade out the ground vegetation and/or the vegetation must be managed.

Prescribed Burning Procedures

- Burning to be carried out in 2 to 3 blocks, with total area of approximately 100 hectares at any one time.
- Each block will be surrounded by plantation track which acts as firebreak.
- A fire fighting team is to be stationed at the burning site.
- Ground is to be lighted from the perimeter of the block so that the fire will burn towards the centre of the block.
- Burning is permitted only when the fire danger rating is medium or less, i.e. the Keetah-Byram Drought Index (KBDI) is in the range of 100 to 120.
- Burning is permitted only when the atmospheric ventilation is good and the wind flow will not carry the smoke to populated area.

Beneficial Effects of Burning

Fire is the most economical traditional tool available for disposing of logging slash to convert logged over land into plantation. Mechanical method of clearing wood debris is very costly. Modern foresters use controlled or 'Prescribed' burning as a silvicultural treatment. Such fires are applied to natural fuels under weather, fuel moisture, and soil moisture conditions that will allow confinement of the fire to a predetermined area and at an intensity of heat and rate of spread required in accomplishing certain planned benefits.

The objectives of 'Prescribed' burning in the establishment of forest plantation are (i) to remove logging slash for ease of planting, (ii) to reduce fuel accumulations that contribute to high-intensity wildfires, (iii) to reduce disease and insect problem and lastly (iv) to control undesirable and competing weed species.

The government has imposed a ban on open burning soon after the devastating forest fire in 1997 / 1998 which destroyed large area of forest and caused environmental pollution due to haze. Since then the establishment of plantation had become difficult and costly especially in getting rid of the logging slash. Experiences from Sabah Forest Industries Sdn Bhd (SFI) forest plantation show that the 'no burning' policy had adversely affect establishment of eucalyptus plantation whereby the growth was generally poor. Plantation establishment on unburnt sites show mosaics of stunted growth.

Findings on unburnt site through observation

- Newly planted seedling was slow to produce new shoots / twigs.
- Incidence of cricket and grasshopper attact was high.
- Patches of stunted growth.
- Early colonization by noxious weed such as lallang and mikinia.
- High mortality giving higher supply rate – up to 50 %.

Findings on burnt site through observation

- Newly planted seedlings produce new shoot within 3 weeks of planting.
- Incidence of insect attack was very low.
- Generally even growth except on disturbed site such as landing, tractor path.
- Low density of noxious weed.
- Low supply rate – between 15 to 20%.

One factor contributing to the positive effect of burning on eucalyptus growth could be due to improvement in nutrition. Fire drastically speeds up the process of oxidation and thus the availability of some of the mineral nutrient such as phosphorus, potassium, calcium and magnesium is increased. Nitrogen is added to surface soil after a fire even though a considerable amount may be volatilized. Much of this may be in the form of ammonium ion since nitrates decompose at temperature in excess of 15^{o}C. Other factors include the increase of pH, exchangeable cations, percent base saturation and the decrease in exchangeable acidity resulting from the positive impact of burning.

Apart from soil characteristics, the other factor is that the burnt ground is free of weeds. Tree species especially Eucalyptus cannot tolerate weeds and will become stunted at an early stage if weed competition exist.

Annex 1.8: Forest Plantation

Plantation Activity

Generally areas with slopes of less than 15° will be converted into forest plantation. There are approximately 32,981 ha of such area within ITP area. Plantations will not be established in areas that have slopes beyond 25°.

The objective of forest restoration is to improve and enhance the productivity of the severely degraded forests by planting indigenous species (*Laran, Binuang, Jelutong, Hopea, Kapur* and *Seraya*) and other species (*Rubber*, *Acacia, Albizia, Teak,* and others). Percentage distribution of trees to be planted are 65 % non-native species (30 % *Acacia mangium*, 20 % *Rubber*, 10 % *Albizia*, 5 % *Teak* and others), and 35 % indigenous species.

The planned plantation acitivity is to be carried out until the year 2013, based on the following schedule:

Year	*Total*
2006	2,811
2007	2,824
2008	3,176
2009	3,084
2010	3,216
2011	3,035
2012	3,154
2013	3,195

The plantation of non-native species is expected to be fully established by the next planning period (year 2014 - 2023).

Plantation Establishment

Forest plantation activities would involve the following:

Site Preparation

Site preparation will commence after all the commercial timber and pulpwood logs in the area had been removed. It will vary with forest conditions. Generally, it involves underbrushing, felling and stacking in rows. The area should be planted within 3 months of site clearing to avoid new competing vegetation.

Planting

Planting will be carried out manually. The spacing used is 4m x 2m (4m between rows) for commercial plantations. There will be 1,250 planting points per hectare. The spacing for Teak will be quite different and need a bigger spacing for good growth quality. Phosphate fertilisers will be added to each hole to compensate for the generally phosphate-deficient soils.

Tending

Tending operations would involve the following:

- In the plantations for commercial logs, weeding may be carried out sometime after the first thinning (4 years).
- Fertilizers will be applied at the time of weeding normally up to two years after planting and after thinning. The standard NPK fertilizer may be applied.

- Pruning will be carried out if and when necessary during the tending operations to improve stem form and to prevent the development of large branches which may devalue the wood product as the result of knots. If required, it should be undertaken during the tending operation up to 4 years after planting. However, actual pruning regimes will differ for different species.
- Two thinnings will be carried out. The first thinning is at the 4th year and the second thinning at the 8th year. The thinning regime for Teak will be dependent on the spacing adopted. It is quite likely that at least two thinnings will be undertaken.

Pest & Disease

There is a wide variety of pests and diseases, which are known to attack and infect mature and immature trees, depending on species type:

- Acacias – *Acacia crassicarpa* may be attacked by the ambrosia beetle or pinhole borer (*Platypus cupulatus*). The development of the black stains caused by fungi or bacteria deposited by the beetles do not affect the quality of paper produced, however it will degrade the quality of saw logs. *A. mangium* at nursery sites may be attacked by scale insects (*Hemiaspidoproctus cineres*). Mangium are also susceptible to heartrot and termite attack.
- Teak –pests and diseases which can threaten Teak plantation include stem borers (*Xyleutus* sp.), defoliators (*Hyblaea puerea*) and fungi (*Pseudomonas solanacearum*) which causes the wilting and browning of the leaves.

Fire Protection

Extensive networks of fire breaks using natural and artificial boundaries will be established. Fire towers will be erected at strategic locations and equipped with two-way radios. Fire prevention plan for the whole FMU 14 area will be formulated in detail during FDP mid-term review. This plan will draw up the equipment requirements, personnel involved, chain of command for fire fighting, responsibilities of the personnel and training requirements.

Harvesting & Transportation

Cable yarders will be used in harvesting to minimise top soil damage and ground compaction so as to maintain favourable plantation growing sites. Transportation will use logging trucks to transport logs to sawmill in various parts of Sabah.

Chemicals

The standard NPK fertilizer (Agroblen) may be applied at nursery and on field. At the time of weeding normally up to two years after planting and after thinning the standard NPK fertilizer at 15:15:15 may be applied at a rate 100 gm per plant from Year 1 to Year 2 for commercial plantations; and at rate of 300 gm per tree after the first thinning and 600 gm per tree after second thinning. The existing practice of weeding is by manual method such as slashing the weeds surrounding the trees. However, Glyphosate IPA 41% is normally used on field to control weeds for trees of approximately 1 year after planting.

Normally, there will be no pesticide application on field. However, fungicide of Benlate (active ingredient 50% w/w & inert 50% w/w) is used on nursery. In future, a suitable insecticide may be applied to seedlings prior to planting in the field to control cricket attack. These materials are kept in the storage building of the nurseries.

Details application of fertilizer, herbicide and pesticide are shown on Table A1.8.

Table A1.8: Chemicals Application

Type	***Material***	***Quantity/ Rate***	***Storage***
Fertilizer	Agroblen	Nursery i. Polybag (3 g per litre of soil). • Agroblen 10 : 26 : 10 : 3 MgO at 5 g per 251 cc of soil. ii. Trays. • Agroblen 10 : 26 : 10 : 3 MgO at 3 g per 171 cc of soil.	Nursery Store Building
	Compound Fertilizer (NPK)	Field • NPK (15:15:15) at 100 g per tree in areas of poor soil fertility.	
Herbicide	Glyphosate IPA 41%	3 litres per ha for trees 1 year after planting	
Pesticide	Benlate	10 g per 14 litre of water	

ANNEX 2: Methodology & Analysed Data

Annex 2.1: Soil Erosion Rates Calculation

Universal Soil Loss Equation (USLE): $A = R \times K \times LS \times C \times P$

Where:
- A = Annual Soil Loss in tons/ha
- R = Rainfall Erosivity Index in J/ha
- K = Soil Erodibility Factor in tons/J
- LS = Slope Length & Steepness Factor
- C = Vegetation Cover Factor
- P = Erosion Control Practice Factor

Rainfall Erosivity Index, R: $R = EI_{30} / 100$

E = Mean annual precipitation (assumed 2319 mm for project site)
I_{30} = 100 mm/hr (assumed for Sabah)

Soil Erodibility Factor, K:Nomograph

Tanjong Lipat	28 % Clay; 29 % Silt; 43 % Sand	---- > K = 0.26
Kapilit	14 % Clay; 18 % Silt; 68 % Sand	---- > K = 0.18
Kumansi	54 % Clay; 27 % Silt; 17 % Sand; 2 % Others	---- > K = 0.23
Antulai	19 % Clay; 13 % Silt; 67 % Sand; 1 % Others	---- > K = 0.15
Pa Sia	21 % Clay; 28 % Silt; 51 % Sand	---- > K = 0.25
Loc Sambuang	53 % Clay; 22 % Silt; 9 % Sand; 16 % Others	---- > K = 0.21

Slope Length & Steepness Factor, LS: $LS = (-/L/100)(0.136 + 0.097S + 0.0139 S^2)$

L = Slope length in meter
S = Slope steepness in percent

Vegetation Cover Factor, C:

0.9 = Forest logging (conventional)
1.0 = Road

Erosion Control Practice Factor, P:

0.9 = Trackwalking up and down slope

Annex 2.2: Transportation Calculation

Road Transportation

a) Industrial Tree Plantation (ITP)

Production capacity: 13,000 to 14,000 m^3 per month

Operating days: 25 days per month

Production per day = 14,000 / 25 = 560 m^3/day

Based on truck capacity of 30 m^3: Number of truck trips = 19 trucks per day or 38 trips per day

Maximum no of trips along main logging road is 38 per day

b) Natural Forest Management (NFM)

Production capacity: 6,000 to 8,000 m^3 per month

Operating days: 25 days per month

Production per day = 8,000 / 25 = 320 m^3/day

Based on truck capacity of 30 m^3: Number of truck trips = 11 trucks per day or 22 trips per day

Maximum no of trips along main logging road is 22 per day

Annex 2.3: Runoff Calculation

Rational Method: $Q = C \times i \times A/360$

Q = Runoff Rate, m^3/sec
C = Runoff Coefficient
i = Precipitation Intensity, mm/hr
A = Watershed Area, ha

Runoff Coefficient, C

0.5 for slope less than 30 percent
0.7 for slope more than 30 percent

Precipitation Intensity, *i*

Based on Time of Concentration, T_c = Overland Time + Channel Flow Time

Overland Time: From Nomograph
Channel Flow Time: Manning Equation, $V = (1.49 \times r^{2/3} \times s^{1/2})/n$
V = Velocity in ft/sec; r = Hydraulic radius, ft
s = Average streambed slope in decimals
n = Manning roughness coefficient

I_{30} = 100 mm/hr (assumed for Sabah)

Note: All calculations by computer software HAESTAD Flowmaster

Annex 2.4: Water Quality Data

Date: 05 Jun & 03 Jul 2002, 27 Mar & 02 Apr 2003 and 06 to 10 Sep 2004

Location: See Figure A1.2

Sample	*Locality*	*DescrITPion*	*Background Condition*
W1	Sg Sapulut	Downstream of project site	Jungle/Secondary forest
W2	Sg Siliawan	Downstream of project site	Jungle/Secondary forest
W3	Sg Pinangah	Downstream of project site	Secondary forest
W4	Sg Saburan	Downstream of project site	Secondary forest
W5	Sg Saburan	Upstream of project site	Secondary forest
W6	Sg Sansiang	Upstream of project site	Secondary forest
W7	Sg Sansiang	Middle of project site	Jungle/Secondary forest
W8	Sg Tibow	Upstream of project site	Jungle/Secondary forest
W9	Sg Sansiang	Downstream of project site	Jungle/Secondary forest
W10	Sg Simatuoh	Downstream of project site	Secondary forest
W11	Sg Beliar	Downstream of project site	Secondary forest
W12	Sg Salung	Downstream of project site	Secondary forest
W13	Sg Sinikaluan	Downstream of project site	Secondary forest
W14	Sg Logongon	Downstream of project site	Secondary forest
W15	Tributary of Sg Sapulut	Downstream of project site	Secondary forest

Project Status: No logging operation

Equipment: Sampling bottles

Methodology: Water samples collected by grab sampling technique and analysed by accredited laboratory (Jabatan Kimia Malaysia).

Weather condition:

Date	*Weather*	*Wind*	*Rain*
05/06/02	Sunny	Calm	Nil
03/07/02	Sunny	Calm	Nil
27/03/03	Cloudy	Wind	Heavy
02/04/03	Cloudy	Calm	Moderate
06/04/04	Cloudy	Calm	Low
07/04/04	Sunny	Calm	Nil
08/04/04	Sunny	Calm	Nil
10/04/04	Sunny	Calm	Low

Table A2.4: Water Quality Data of the Project Site

Parameter	**Unit**	**Results**				**Limits**
		W1	***W2***	***W3***	***W4***	***Class IIB***
Sample No		FM - W1	FM - W2	FM - W3	FC – W3	
Location		Sg Sapulut (D/S)	Sg Siliawan (D/S)	Sg Pinangah (D/S)	Sg Saburan (D/S)	
Co-ordinates		04° 42' 13" N 116° 30' 19" E	04° 43' 05" N 116° 31' 47" E	04° 47' 32" N 116° 35' 48" E	04° 42' 21" N 116° 36' 45" E	
Sampling Date		08/09/04	10/09/04	10/09/04	10/06/02	
Sampling Time		10:20 hrs	10:15 hrs	12:10 hrs	14:43 hrs	
Weather		Sunny	Sunny	Sunny	Sunny	
Condition		Wet	Dry	Dry	Dry	
Turbidity	NTU	3.2	6.8	2.3	39	*50*
Suspended Solids	mg/L	***211***	27	15	8	*50*
Oil & Grease	mg/L	1	< 1	< 1	< 0.5	*N*

Note: Class IIB (Raw water supply) of the Proposed Interim National Water Quality Standards for Malaysia

Table A2.4: Water Quality Data of the Project Site (continued)

Parameter	**Unit**	**Results**				**Limits**
		W5	***W6***	***W7***	***W8***	***Class IIB***
Sample No		SD - W2	FM - W6	SD - W3	JS - W5	
Location		Sg Saburan (U/S)	Sg Sansiang (U/S)	Sg Sansiang (D/S)	Sg Tibow (D/S)	
Co-ordinates		04° 43' 14" N 116° 44' 03" E	04° 40' 37" N 116° 50' 33" E	04° 37' 37" N 116° 44' 56" E	04° 35' 28" N 116° 49' 59" E	
Sampling Date		02/04/03	07/09/04	02/04/03	03/07/02	
Sampling Time		-	11:40 hrs	14:15 hrs	11:40 hrs	
Weather		-	Sunny	Cloudy	Sunny	
Condition		-	Dry	Wet	Dry	
Turbidity	NTU	NM	< 2	< 2	26	*50*
Suspended Solids	mg/L	NM	2	31	3	*50*
Oil & Grease	mg/L	NM	< 1	< 0.5	< 0.5	*N*

Notes: Class IIB (Raw water supply) of the Proposed Interim National Water Quality Standards for Malaysia
NM – Not measured (due to access problem)

Table A2.4: Water Quality Data of the Project Site (continued)

Parameter	**Unit**	**Results**				**Limits**
		W9	***W10***	***W11***	***W12***	***Class IIB***
Sample No		FM - W9	FM - W10	FM - W11	SD - W4	
Location		Sg Sansiang (D/S)	Sg Simatuoh (D/S)	Sg Beliar (D/S)	Sg Salung (D/S)	
Co-ordinates		04° 39' 22" N 116° 36' 38" E	04° 40' 08" N 116° 33' 20" E	04° 28' 03" N 116° 34' 03" E	04° 34' 37" N 116° 27' 25" E	
Sampling Date		07/09/04	06/09/04	08/09/04	27/03/03	
Sampling Time		12:20 hrs	15:36 hrs	12:15 hrs	14:55 hrs	
Weather		Sunny	Cloudy	Sunny	Cloudy	
Condition		Dry	Rain	Dry	Wet	
Turbidity	NTU	< 2	2.7	< 2	< 2	*50*
Suspended Solids	mg/L	9	7	36	***99***	*50*
Oil & Grease	mg/L	< 1	< 1	< 1	1	*N*

Note: Class IIB (Raw water supply) of the Proposed Interim National Water Quality Standards for Malaysia

Table A2.4: Water Quality Data of the Project Site (continued)

	Unit	***Results***			***Limits***
		W13	***W14***	***W15***	***Class IIB***
Sample No		SD - W6	SD- W5	FM - W15	
Location		Sg Sinikalaun (D/S)	Sg Logongon (D/S)	Tributary of Sg Sapulut (D/S)	
Co-ordinates		04° 33' 53" N 116° 26' 46" E	04° 33' 47" N 116° 26' 31" E	04° 39' 18" N 116° 36' 32" E	
Sampling Date		27/03/03	27/03/03	07/09/04	
Sampling Time		15:03 hrs	15:10 hrs	12:35 hrs	
Weather		Cloudy	Cloudy	Sunny	
Condition		Wet	Wet	Dry	
Turbidity	NTU	< 2	< 2	3.7	*50*
Suspended Solids	mg/L	11	***280***	11	*50*
Oil & Grease	mg/L	< 0.5	***1***	< 1	*N*

Note: Class IIB (Raw water supply) of the Proposed Interim National Water Quality Standards for Malaysia

ANNEX 3: List of References

Annex 3.1: List of References

Annex 3.1: List of References

Acres, B.D *et. al* (1975). *The Soil of Sabah – South-Western Districts (Land Resources Study 20, Vol.4 & Vol. 5)*. Ministry of Overseas Development, England.

Billington, D.R. (1979). *Soil Erosion & Logging – A Review Paper*. Jabatan Perhutanan, Sabah.

Canter, L.W. (1977). *Environmental Impact Assessment*. Mc Graw-Hill, U.S.A.

Chai, D.N.P. & Uebehor, K. (1995). *Incorporating Environmental Impact Assessment into Sustainable Forest Management*. Kota Kinabalu.

Collenette, P (1965). *The Geology and Mineral Resources of Pensiangan and Upper Kinabatangan Area, Sabah*. British Territories of Borneo Geological Survey. Memoir 12.

Committee on Selected Biological Problems in the Humid Tropics (1982). *Ecological Aspects of Development in the Humid Tropics*. National Academy Press. U.S.A.

Davies, A.G. & Payne, J. (1982). *A Faunal Survey of Sabah*. World Wildlife Fund Malaysia, Kuala Lumpur.

Dix, H.M. (1981). *Environmental Pollution*. John Wiley & Sons Ltd., New York.

Earl of Cranbrook & Edwards, D.S. (1994). *A Tropical Rainforest: The Nature of Biodiversity in Borneo at Belalong, Brunei*. Sun Tree Publishing. Singapore.

Eastman, J.R. (1992) IDRISI Ver 4.0 User's Guide. Massachusetts, U.S.A.

Fox, J.E.D. (1970). *Preferred Check-List of Sabah Trees*. Forestry Department, Sandakan.

Goldman, S.J., Jackson, K. & Burstynsky, T.A. (1986). *Erosion and Sedimentation Control Handbook*.

Government of Malaysia (1974; Amends 1985 & 1996). *The Environmental Quality Act*. Kuala Lumpur.

Henry B. Cyran (1985). *The Asian Way With Herbs*. Child & Henry Publishing Pty Ltd., Australia.

Inger R.F. & Chin P.K. (1962). *The Fresh Water Fishes of North Borneo*. Chicago Natural History Museum. U.S.A.

Inger R.F. & Tan F. L. (1996). *The Natural History of Amphibians and Reptiles in Sabah*. Natural History Publication (Borneo) Sdn Bhd, Kota Kinabalu.

Innoprise Corporation Geographics Information Systems (2002). *Maliau Basin Conservation Area Map. Scale 1:250,00*. Kota Kinabalu.

Jabatan Alam Sekitar (DOE) (1995). *A Handbook of Environmental Impact Assessment Guidelines*. Kuala Lumpur.

Jabatan Alam Sekitar (DOE) (1996). *Guidelines for the Prevention & Control of Soil Erosion & Siltation in Malaysia*. K Lumpur.

Jabatan Perlindungan Alam Sekitar (JPAS) (2000). *A Handbook for Environmental Impact Assessment (EIA) in Sabah*. Kota Kinabalu.

Jabatan Perlindungan Alam Sekitar (JPAS) (2001). *EIA Guidelines for Logging and Forest Clearance Activities*. Kota Kinabalu.

Jabatan Pemetaan Negara (1970, 1979, 1978 & 1980). – *4/116/5 Lumiri*, *4/116/1 Pendawan, 4/116/3 Matiku , 4/116/4 Gunung Lutong, 4/116/5 Silom, 4/116/6 Pensiangan, 4/116/7 Bandakao, 4/116/8 Tambulanan,4/116/9 Kabu, 4/116/10 Kuala Temalasak, 4/116/11 Sinua*. Scale 1:50,000. Kota Kinabalu.

Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia (1997). *Garis Panduan Perancangan JPBD 15/97: Pemeliharaan Topografi Semulajadi Dalam Perancangan dan Pembangunan Fizikal*. Kuala Lumpur.

Jabatan Perangkaan Malaysia (2000). *Taburan Penduduk Mengikut Kawasan Pihak Berkuasa Tempatan*. Jabatan Perangkaan Malaysia (Sabah), Kota Kinabalu.

Jabatan Perhutanan Sabah (1992). *Natural & Plantation Forests Map. Scale 1:1,270,00*.Sandakan

Jabatan Perhutanan Sabah (2001). *Ex-Licences Within FMU. No. 14 Map. Scale 1: 200,00*. Sandakan

Jabatan Perhutanan Sabah (1992). *Senarai Lesen-Lesen Beroperasi Dalam FMU. 14 Setakat 05.12.2001 Map. Scale 1:250,00*. Sandakan

Jabatan Pertanian Sabah (1991). *Estimated Hectareges by Crops, Sabah*. Kota Kinabalu.

Jabatan Tanah dan Ukur (1975). *Peta Daerah Pensiangan.* Scale 1:213,000. Kota Kinabalu.

James A. Lee (1985). *The Environment, Public Health and Human Ecology*. The Johns Hopkins University Press, London.

Jones, J.R. (1994). *TOSCA Ver 2.1 Reference Guide*. Massachusetts, U.S.A.

Krenkel, P.A. and Novotny, V. (1980). *Water Quality Management*. Academic Press Inc., U.S.A.

Lembaga Jurutera Malaysia (2002). *Total Forest Fire Management.* Buletin Ingenieur pp 42 – 50 Vol 14 1/4 March 2002. Kuala Lumpur.

Lohuji, P.L. & Taumas, R. (1998). *Buku Panduan Operasi RIL Khusus Kepada Penggunaan Trak Skidder*. Jabatan Perhutanan Sabah. Sandakan.

Marsh, Clive. W. (1995). *Danum Valley Conservation Area Management Plan*. Yayasan Sabah. Kota Kinabalu.

Maryati Mohamad et al. (1998). *Maliau Basin Scientific Expedition*. Universiti Malaysia Sabah. Kota Kinabalu.

Mohamad Mohsin A.K. & Ambak M.A. (1983). *Freshwater Fishes of Peninsular Malaysia*. Universiti Pertanian Malaysia.

Mohamad Sabtu et al. (1980). *Hakisan Tanah & Pengawalannya*. Jabatan Pertanian Semenanjung Malaysia. K Lumpur.

Morgan, R.P.C. (1979). *Soil Erosion*. Longman Inc., New York.

O'riodran, T. (1996). *Environmental Science for Environmental Management*. Longman, England.

Rau, J.G. and Wooten, D.C (1980). *Environmental Impact Analysis Handbook*. Mc Graw-Hill, New York.

Sale, J.B. (1994). *Management Plan for Tabin Wildlife Reserve*. Sabah Wildlife Department. Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Survey Plan of Proposed Areas A, B, C and D, Sapulut Forest Development Sdn Bhd*. Scale 1:25,000. Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Compartment Map. Scale 1:50,000.* Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Land Use Map. Scale 1:50,000.* Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Natural Vegetation Type Map. Scale 1:50,000.* Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Slope Classification Map. Scale 1:50,000.* Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (undated). *Soil Association Map. Scale 1:50,000*. Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (1994). *Landsat TM Satelite Map of FMU 14. Scale 1:220,000.* Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (1997). *Sustainable Forest Management Licence Agreement Forest Management Unit No. 14 (SFMLA No. 04/97)*. The Government of the State of Sabah. Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (2004). *Medium-Term Forest Management Plan (January 1, 2004 – December 31, 2013) Forest Management Unit No. 14 (SFMLA No. 04/97)*. Kota Kinabalu.

Sapulut Forest Development Sdn Bhd (2003). *Annual Work Plan (January 1, 2004 – December 31, 2004) Forest Management Unit No. 14 (SFMLA No. 04/97)*. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2000). *Environmental Impact Assessment (EIA) Report Proposed Forest Logging of 1,000 Hectares on Part of Sapulut Forest Reserve by Hasil Berlian Sdn Bhd at Kalabakan. Sabah.* Hasil Berlian Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2001). *Environmental Impact Assessment (EIA) Report Forest Logging of 1,000 Hectares at Sapulut Forest Reserve by Nadi Harta Berhad at Kalabakan. Sabah.* Nadi Harta Berhad. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2001). *Environmental Impact Assessment (EIA) Report Forest Logging of 1,000 Hectares at Sapulut Forest Reserve by Usahawan Prihatin (S) Sdn Bhd at Kalabakan. Sabah.* Usahawan Prihatin (S) Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2002). *Environmental Impact Assessment (EIA) Report Forest Logging of 2,000 Hectares by Sanforco Sdn Bhd on behalf of Jennie Sinin & 2 Peserta and Seng Ah Loi & 2 Peserta within Sapulut Forest Reserve, Sapulut. Sabah.* Sanforco Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2002). *Environmental Impact Assessment (EIA) Report Forest Logging of 3,000 Hectares by Sanforco Sdn Bhd on behalf Sohon Singh & 2 Peserta, Layak Maju Enterprise and Saliko Sdn Bhd within Sapulut Forest Reserve, Kalabakan. Sabah*. Sanforco Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2002). *Environmental Impact Assessment (EIA) Report Forest Logging of Projek Membina Jalan Sapulut – Kalabakan, Sabah by Konsortium F.A. – Irama Duta*. Konsortium F.A. – Irama Duta. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2003). *Environmental Impact Assessment (EIA) Report Forest Logging of 4,790 Hectares by Sapulut Forest Development within Sapulut Forest Reserve, Sapulut. Sabah.* Sapulut Forest Development Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2003). *Environmental Impact Assessment (EIA) Report Forest Logging of 11,800 Hectares by Sapulut Forest Development within Sapulut Forest Reserve, Sapulut. Sabah.* Sapulut Forest Development Sdn Bhd. Kota Kinabalu.

Sinoh Environmental Sdn Bhd (2004). *Environmental Impact Assessment (EIA) Report Forest Plantation of 2,811 Hectares by Sapulut Forest Development within Sapulut Forest Reserve, Sapulut. Sabah*. Sapulut Forest Development Sdn Bhd. Kota Kinabalu.

State Government of Sabah (1974). *The Soils of Sabah –Pensiangan NB 50 - 14*. Scale 1:250,000. United Kingdom.

State Government of Sabah (1963). *Fauna Conservation Ordinance.* Sabah.

State Government of Sabah (1968 & Amendments). *Forest Enactment*. Sabah.

State Government of Sabah (1996). *Conservation of Environment Enactment*. Sabah.

State Government of Sabah (1997). *Wildlife Conservation Enactment*. Sabah.

State Government of Sabah (1998). *Water Resources Enactment*. Sabah.

State Government of Sabah (2002). *Environment Protection Enactment*. Sabah.

Subramanya, K. (1995). *Engineering Hydrology*. 2nd Ed. McGraw Hill, New Delhi.

Treshow, M. (1984). *Air Pollution and Plant Life*. John Wiley & Sons Ltd., U.K.

Turk, A., Turk, J., Wittes J.T. & Wittes, R.E. (1978). *Environmental Science*. W.B. Saunders Company. U.S.A..

Twort, A.C; Hoather, R.C. & Law F.M. (1974). *Water Supply*. Second Edition. Edward Arnold Publishers Ltd., London.

Wallingford, HR. (1995). *CALSITE Ver 3.1 Calibrated Simulation of Transported Erosion User Manual*. Wallingford, U.K.

Whittow, G.C. (1983). *Malaysian Wildlife*. Eastern Universities Press (M) Sdn. Bhd. Singapore.

World Health Organisation (1993). *Assessment of Sources of Air, Water and Land Pollution*. WHO. Geneva.

Wood, S. Jr (1977). *Heavy Construction - Equipment and Methods*. Prentice-Hall Inc, U.S.A.

WWF (1992). *Sabah Conservation Strategy*. The World Wide Fund for Nature Malaysia. Kuala Lumpur.

Wycherley, P.R. (1969). *Conservation in Malaysia*. UNESCO/NS/3357/66. Switzerland.

Yayasan Sabah & WWF Malaysia (1989). *Expedition to Maliau Basin, Sabah April – May 1988*. Final Report. Kota Kinabalu.

Yin, E.H . (1985). Third Edition. *Geological Map of Sabah*. Geological Survey of Malaysia, Scale 1:500,000. Kota Kinabalu.

ANNEX 4: ToR & Activities Undertaken by the EIA Consultant

Annex 4.1: List of Consultations
Annex 4.2: Copy of Letters
Annex 4.3: EIA Terms of Reference

Annex 4.1: List of Consultations

- Jabatan Air Sabah
  1. Bahagian Nabawan (Juruteknik Air Daerah)
- Jabatan Hidupan Liar Sabah
  1. Bahagian Kota Kinabalu (Pegawai Hidupan Liar)
  2. Bahagian Keningau (Pegawai Penguasa)
- Jabatan Kerja Raya
  1. Bahagian Nabawan (Pegawai Kerja Daerah)
- Jabatan Muzium Negeri Sabah
  1. Bahagian Kota Kinabalu (Penolong Seksyen Arkeologi)
- Jabatan Pengairan & Saliran Sabah
  1. Bahagian Keningau (Jurutera)
  2. Bahagian Sook (Pegawai Pengairan & Saliran)
- Jabatan Perkhidmatan Perubatan
  1. Klinik Kesihatan Nabawan (Inspektor Kesihatan)
- Jabatan Perhutanan
  1. Bahagian Tibow (Pegawai Perhutanan Daerah)
  2. Bahagian Nabawan (Pegawai Perhutanan)
- Jabatan Perikanan Sabah
  1. Bahagian Nabawan (Penguasa Perikanan Daerah)
- Jabatan Pertanian
  1. Bahagian Nabawan (Pegawai Pertanian)
- Kementerian Pembangunan Luar Bandar
  1. Bahagian Kota Kinabalu (Penolong Pembantu Setiausaha Tetap)
- Maliau Basin Management Committe
  1. Secretary
- Pejabat Daerah
  1. Bahagian Nabawan (Penolong Pegawai Daerah)
  2. Bahagian Nabawan (Ketua Anak Negeri Mukim Sapulut)
- Pejabat Hal Ehwal Anak Negeri
  1. Bahagian Kota Kinabalu (Ketua Kerani)
- Pejabat Kesihatan
  1. Bahagian Nabawan (Penolong Pegawai Kesihatan Persekitaran)
- Pusat Biodiversiti Sabah
  1. Bahagian Sandakan (Pegawai Perhutanan)
- WWF - Malaysia
  1. AREAS Project Manager
  2. Consultant to "Heart Borneo" and AREAS Programmes
- Penduduk Kampung
  1. Jabatan Perhutanan's Tibow District Office
  2. Kg Tataluan
  3. Kg Labang
  4. Kg Simatuoh
  5. Kg Ampulos
  6. Kg Tonomon
  7. Kg Bigor
  8. Sapulut Township
  9. Kg Agis
  10. Kg Salong
  11. Kg Sinikalaun
  12. Kg Sikait
  13. Kg Pagalungan
  14. Kg Sasandukon
  15. Kg Sibuah
  16. Kg Saliko
  17. Kg Kakutar

Annex 4.2: Copy of Letters

EIA

- Sinoh Environmental Sdn Bhd on EIA – Scoping Note (29 July 2004)
- Jabatan Perlindungan Alam Sekitar on approval to submit SEIA – ToR (12 August 2004)
- Sinoh Environmental Sdn Bhd on SEIA - ToR (24 August 2004)
- Jabatan Perlindungan Alam Sekitar on additional data for SEIA – ToR (29 September 2004)
- Sinoh Environmental Sdn Bhd on Final SEIA - ToR (04 October 2004)
- Jabatan Perlindungan Alam Sekitar on approval of Final SEIA – ToR (29 September 2004)

Supporting Letters

- Jabatan Kerja Raya Nabawan (01 September 2004)
- Jabatan Perlindungan Alam Sekitar (21 September 2004)
- Jabatan Perikanan Nabawan (27 September 2004)
- Jabatan Air Nabawan (30 September 2004)
- Jabatan Hidupan Liar Nabawan (30 September 2004)
- WWF - Malaysia (30 September 2004)
- WWF - Malaysia (05 October 2004)
- Maliau Basin Management Committee (25 October 2004)

Annex 4.3: Terms of Reference