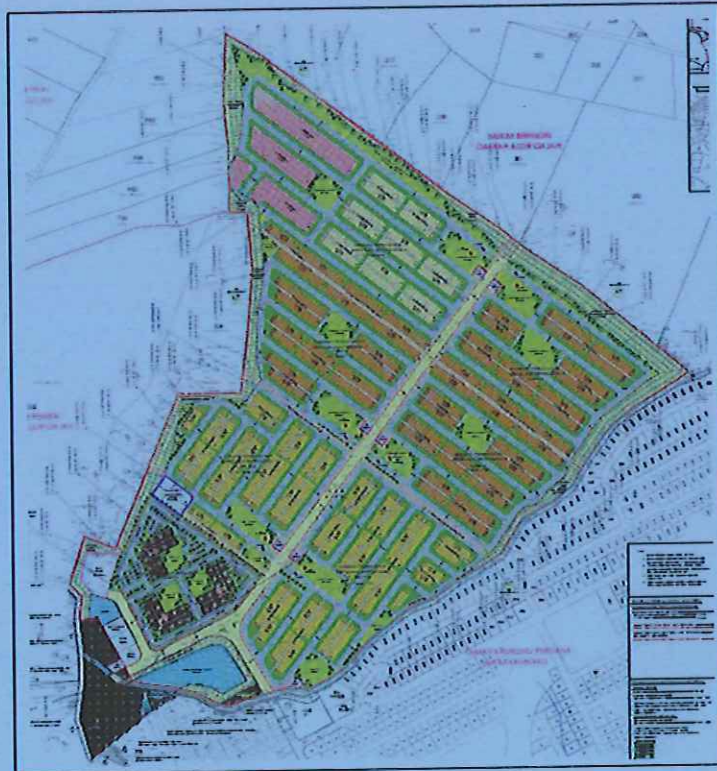


**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN
MUKIM KRUBONG, DISTRICT OF MELAKA TENGAH,
MELAKA**

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)**



October 2017

PREPARED BY :



O&L Jurutera Perunding Sdn. Bhd.
Consulting Civil, Structural & Environmental
No. 38, Jalan TU 40, Taman Tasik Utama,
Ayer Keroh, 75450 Melaka.
Tel/ Fax : 06-2322380 / 06-2327815

PROJECT PROPONENT :



PB REALTY SDN. BHD.
No.2, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka.
Tel / Fax : 06 - 337 3333 / 06 - 336 5678

EIA TEAM MEMBERS

Name	Qualification	Registration With Doe			Proposed Study Area	Signature & Date
		Category	Area/ Field	ID. No.		
A. EIA STUDY TEAM LEADER						
Datuk Ir. Othman bin Abdul Rahim	B.Sc (Hons) Civil Engineering	EIA Consultant	- Hydrology - Water Quality	C0006	31 December 2017	- Project Description & Options - Construction Methods and Process - Hydrological Regime - Water Quality - Road Network & Traffic - Mitigating Measures  23/10/17
B. EIA CONSULTANT / CPESC						
Ms. Ng Shu Chin	M.Sc (Sanitary and Environmental Engineering), Certified Professional in Erosion & Sediment Control (CPESC No. 6585)	EIA Consultant	- Hydrology - Water Quality	C0270	31 December 2017	Soil erosion  20/10/2017
C. EIA ASSISTANT CONSULTANT						
Faizah binti Othman	B. Eng (Hons) (Chemical Engineering)	Assistant Consultant	- Water Quality - Wastewater - Chemical & Industrial Processes	AC1321	Not applicable	Supervisor:  23/10/17 Datuk Ir. Othman bin Abdul Rahim  23/10/17



DECLARATION FROM PROJECT INITIATOR

Environmental Impact Assessment (EIA) Report for

**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN MUKIM
KRUBONG, DISTRICT OF MELAKA TENGAH,
MELAKA**

for

MESSRS. PB REALTY SDN. BHD.

I hereby declare that the entire EIA report is the product of the Qualified Person (i.e. the EIA Consultant) engaged by my company and all the facts stated in the Report and the accompanying information are to the best of my knowledge and believe to be true and correct, and that I have not withheld or distorted any material facts. I agree and I undertake the responsibility to implement all the pollution prevention and mitigation measures (P2M2) described in the EIA report, in the Environmental Management Plan (EMP) and in the LD-P2M2 as proposed by the EIA Consultant. I have allocated sufficient funds for the above purpose.

Name : Datuk Seri Poh Gzok Seng
Signature : 
IC/Passport No. : 631118-01-5111
Designation : Managing Director
Date : 17 October 2017
Company's Stamp : 
PB Realty Sdn. Bhd. (338851-D)
No. 2, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka.
Tel: 06-3373333 Fax: 06-3365678

PB REALTY SDN BHD (338851-D)
no.2, jalan imj 1, taman industri malim jaya
75250 melaka, malaysia
T 06.337 3333 / 06.337 5868
F 06.336 5678
www.pbrealty.com.my

DECLARATION FROM EIA STUDY TEAM LEADER

Environmental Impact Assessment (EIA) Report for

**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN MUKIM
KRUBONG, DISTRICT OF MELAKA TENGAH,
MELAKA.**

for

MESSRS. PB REALTY SDN. BHD.

I declare that the entire EIA Report is the product of my own work and the work of my team members who worked under my supervision and all the facts stated in the Report and the accompanying information are to the best of my knowledge and believe true and correct and that I have not withheld or distorted any material facts. I have briefed the Project Proponent on the content of the Report and highlighted to them all the pollution prevention and mitigating measures (P2M2) described in the EIA Report and in the Environmental Management Plan (EMP) as well as in the LD-P2M2. The Project Proponent has agreed to implement the proposed P2M2 accordingly.

Name : Datuk Ir. Othman Abdul Rahim

IC/Passport No. : 600828-71-5575

Designation : EIA Team Leader

Date : 23/10/17

Signature : 

Company's Stamp :



DECLARATION FROM EIA STUDY TEAM MEMBERS

Environmental Impact Assessment (EIA) Report for

**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN MUKIM
KRUBONG, DISTRICT OF MELAKA TENGAH,
MELAKA.**

for

MESSRS. PB REALTY SDN. BHD.

I declare the following:

- (i) I have conducted the study professionally using acceptable methodologies;
- (ii) The study findings are correct to the best of my knowledge; and have not been altered in any manner;
- (iii) The mitigating measures proposed (whenever relevant) to the best of my knowledge are reliable, practical and adequate to comply with the relevant legal requirements; and
- (iv) I shall be accountable for any misleading information in any part of this report.

Signature

: 

Official Stamp :

Name

: NG SHU CHIN

IC No/Passport

: 750620-04-5262

Position

: EIA Consultant

Date

: 20/10/17



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RINGKASAN EKSEKUTIF

Ringkasan Eksekutif

1.0 PENGENALAN

- 1.1 Laporan Penilaian Kesan Alam Sekeliling (EIA) ini disediakan bagi **Cadangan Pembangunan Perumahan di Lot 1, Mukim Krubong, Daerah Melaka Tengah, Melaka**. Projek ini terletak di Krubong, Melaka (Latitud: N 2° 19' 52.8", Longitud: E 102° 14' 28.453") dan akan dibangunkan sebagai kawasan perumahan dilengkapi dengan infrastruktur dan utiliti seperti surau, pusat komuniti, pondok keselamatan, tadika dan jalan.
- 1.2 Projek ini adalah tertakluk di bawah **Aktiviti No. 16(a)** dibawah **Jadual Pertama, Perintah Kualiti Alam Sekeliling (Aktiviti-Aktiviti Yang Di Tetapkan) (Penilaian Kesan Kepada Alam Sekeliling) 2015**. Pihak pencadang projek adalah diwajibkan untuk menyediakan dan mengemukakan Laporan EIA berpandukan kepada protokol yang telah ditetapkan oleh Ketua Pengarah Jabatan Alam Sekitar Malaysia.
- 1.3 Projek ini dicadangkan oleh Tetuan **PB Realty Sdn. Bhd.** Segala pertanyaan berkenaan dengan Projek boleh ditujukan kepada:

PB REALTY SDN. BHD. (338851-D)

No.2, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka.
(Attn : Datuk Poh Geok Siong)

Tel : 06 – 337 3333

Fax : 06 – 336 5678

- 1.4 Laporan EIA ini telah disediakan oleh pasukan perunding yang diketuai oleh **Datuk Ir. Othman Abdul Rahim**, Perunding EIA (DOE Reg. No C0006) yang

berdaftar dengan Jabatan Alam Sekitar Malaysia. Pertanyaan dan surat-menyurat berkenaan laporan ini boleh dibuat kepada:

O&L JURUTERA PERUNDING SDN. BHD. (Co. Reg. No.: 372321-V)

Consulting, Civil, Structural & Environmental Engineers,

No. 38, Jalan TU 40,

Taman Tasik Utama,

75450 Ayer Keroh, Melaka.

(Attn : Datuk Ir. Othman Abdul Rahim)

Tel : 06 – 232 2380/ 232 5215/ 253 4005

Fax : 06 – 232 7815

E-mail : oandl.melaka@gmail.com

2.0 TERMA RUJUKAN (TOR)

- 2.1 TOR bagi projek ini telah dihantar sebelum pengemukaan laporan EIA mengikut garis panduan yang terbaru yang disediakan oleh Jabatan Alam Sekitar (JAS). TOR ini telah disahkan oleh JAS pada 23hb Mac 2017.
- 2.2 Impak-impak yang akan dikaji dan diterangkan dengan lebih lanjut di dalam laporan EIA adalah gunatanah lot-lot bersebelahan, biojisim, tanah runtuh, regim hidrologi, sisa pepejal, sisa terjadal, kualiti air, kualiti bunyi, impak trafik dan kebengkalaian projek.
- 2.3 Selain daripada menjalankan tinjauan tapak, data-data sekunder seperti peta topografi, Google Earth / Google Maps dan Rancangan Tempatan dan *Local Authority Structure* akan digunakan sebagai rujukan untuk mengenal pasti gunatanah, topografi dan geologi di tapak.
- 2.4 Untuk mengenalpasti jenis tanah di tapak, beberapa sampel tanah akan diambil dan dihantar ke makmal untuk dianalisis. Antara parameter yang akan diambil adalah distribusi saiz partikel, kandungan bahan organik dan ketupatan pukal / kering. Untuk menganalisis risiko tanah runtuh, *Guideline for Erosion and*

Sediment Control in Malaysia yang diterbitkan oleh Jabatan Pengairan dan Saliran Malaysia akan digunakan sebagai rujukan.

- 2.5 Memandangkan jumlah larian air akan meningkat apabila projek dijalankan, komputasi larian air akan dilaksanakan untuk mengetahui magnitud impak tersebut. Pengiraan akan dilakukan menggunakan *Design Flood Hydrograph Estimation For Rural Catchments in Peninsular Malaysia - Hydrological Procedure No.11 (HP No. 11)* yang diterbitkan oleh *Drainage and Irrigation Division (DID), Ministry of Agriculture, Malaysia 1976*. Pengiraan yang lengkap akan dimasukkan di dalam laporan EIA.
- 2.6 Deskripsi meterologi akan dibincangkan menggunakan data meteologi daripada Batu Berendam Airport Principal Station (No. Station: 48665 – N 02°16', E 102°15') yang diperoleh daripada Jabatan Servis Meteorologi Malaysia.
- 2.7 Pemantauan kualiti air akan dijalankan dan akan dijadikan sebagai data panduan. Analisis akan dijalankan oleh makmal yang diiktiraf oleh SIRIM dan memenuhi ISO/IEC Guide 25, EN45001serta keperluan ISO 9001/2 yang lain. Data pemantauan kualiti air akan dibandingkan dengan *Class IIA of the National Water Quality Standards (NWQS)*.
- 2.8 Pengukuran bunyi akan dijalankan menggunakan *pre-calibrated precision integrating noise meter* yang diletakkan di kawasan yang akan dipilih selama 24 jam. Parameter yang akan diuji adalah L_{eq} , L_{Max} , L_{Min} and L_N of the *A – weighted sound level*. Data-data yang diperoleh akan dibandingkan dengan piawai yang dinyatakan di *Schedule 1 in Annex A of The Planning Guidelines For Environmental Noise Limits and Control*. Analisis akan dijalankan oleh makmal yang diiktiraf oleh SIRIM.
- 2.9 Pengukuran Sisa Pepejal Terampai (TSP) akan dijalankan mengikut kaedah ASTM D4096 (1993) dan analisis akan dijalankan oleh makmal yang diiktiraf oleh SIRIM. Data kualiti air yang diperoleh akan dibandingkan dengan *Malaysian Recommended Environmental Air Quality Guidelines*.

3.0 PERNYATAAN KEPERLUAN

- 3.1 Kerajaan Negeri telah mengambil strategi untuk membangunkan Melaka kepada Negeri Bandaraya menjelang tahun 2020. Untuk menjayakannya, sektor industri dan pelancongan akan dibangunkan secara intensif dan ianya akan memberi impak yang positif terhadap populasi, peluang pekerjaan dan permintaan untuk kediaman, komersial dan industri. Populasi Negeri diunjurkan akan menjadi sebanyak 960,500 orang menjelang tahun 2020.
- 3.2 Peningkatan populasi akan meningkatkan permintaan perumahan di dalam Negeri. Projek ini terletak di Mukim Krubong, Daerah Melaka Tengah. Kawasan ini adalah sesuai untuk dibangunkan sebagai kawasan perumahan kerana ianya terletak bersebelahan dengan kawasan perumahan sedia ada iaitu Taman Krubong Perdana dan kawasan-kawasan disekeliling projek juga adalah merupakan kawasan perumahan.
- 3.3 Projek ini akan melengkapi gunatanah sedia ada dan akan menjadi salah satu tarikan pertumbuhan ekonomi. Dijangkakan projek ini akan menjana lebih banyak pembangunan atau akan dijadikan sebagai permulaan bagi pembinaan di kawasan berdekatan. Projek ini juga bertujuan untuk mengelak daripada membangun di kawasan populasi yang padat kepada kawasan luar bandar yang berpotensi untuk dibangunkan.

4.0 PILIHAN PROJEK

- 4.1 Pilihan-pilihan yang diambil kira bagi projek ini adalah ketiadaan projek, pilihan tapak, pilihan tatatur dan pilihan kaedah pembinaan.
- 4.2 Pilihan ketiadaan projek adalah pilihan yang wajib untuk dinilai bagi semua projek yang memerlukan laporan EIA. Bagi kebanyakan projek yang terletak diluar Kawasan Sensitif Alam Sekitar (KSAS) seperti kawasan banjir, kawasan cerun curam dan sebagainya, kebiasaannya projek tersebut akan memberi manfaat

kepada populasi serantau selepas penyiapan projek. Memandangkan projek ini terletak di luar kawasan KSAS dan gunatanah sedia ada di tapak projek adalah pokok getah dan kelapa sawit, projek ini dijangka akan memberi manfaat kepada populasi serantau serta Negeri dan Negara.

- 4.3 Jika pilihan untuk tidak menjalankan projek dipilih, tiada manfaat yang akan diperolehi. Penilaian antara pilihan “ketiadaan projek” dengan pilihan “kewujudan projek” dari segi sosial, ekonomi dan manfaat terhadap alam sekitar adalah seperti di **Jadual 1**.

Jadual 1: Perbezaan Antara Pilihan Ketidadaan Projek Dengan Pilihan Pembinaan Projek

No.	Pilihan Ketidadaan Projek	Pilihan Kewujudan Projek
1.	Tanah akan kekal sebagai ladang getah dan kelapa sawit dengan pendapatan sederhana.	Pembangunan yang teratur akan ditubuhkan dan nilai tanah sedia ada akan meingkat.
2.	Hasil pendapatan sederhana kepada Negeri.	Pendapatan kepada Negeri yang lebih tinggi akan diraih melalui kutipan cukai tanah dan aktiviti perniagaan.
3.	Paras bunyi bising sedia ada akan kekal.	Paras bunyi bising akan meningkat akibat dari peningkatan lalu lintas kenderaan semasa pembinaan dan urbanisasi selepas penyiapan projek.
4.	Kualiti air ambien sedia ada akan kekal.	Peningkatan pepejal terampai secara jangka pendek akibat dari aktiviti pembinaan dan peningkatan bahan pencemar udara akibat dari urbanisasi seperti peningkatan jumlah kenderaan dan populasi.
5.	Kualiti air sungai kekal sama.	Peningkatan pengaliran efluen ke dalam sungai, tetapi impaknya adalah tidak

No.	Pilihan Ketiadaan Projek	Pilihan Kewujudan Projek
		signifikan kerana STP akan disediakan untuk merawat sisa kumbahan sebelum dilepaskan.
6.	Isi padu air larian dan kadar penyusupan semulajadi kekal sama.	Peningkatan air larian dan pengurangan kadar penyusupan. Ianya dijangka akan menjadi signifikan akibat pengaruh saiz tapak projek. Langkah tebatan adalah sangat penting untuk megurangkan impak.
7.	Sosio-ekonomi di kawasan tersebut kekal sama.	Pembangunan ini akan meningkatkan perniagaan yang akan memberi manfaat kepada ekonomi dan populasi setempat.
8.	Ekologi semulajadi di tapak kekal sama.	Perubahan ekosistem dijangka akan terjadi akibat dari pembangunan projek. Projek ini melibatkan pembersihan tapak semasa peringkat pembinaan yang akan memberi imapak kepada alam sekeliling. Walaubagaimanapun, impak ini tidak akan menjadi signifikan jika langkah-langkah tebatan yang sepatutnya dilaksanakan.

4.4 Tapak yang dicadangkan adalah sesuai untuk dijalankan pembangunan atas sebab-sebab berikut:

- i. Walaupun terletak dipinggir kawasan Melaka Tengah, kawasan yang dicadangkan terletak di kawasan membangun dan Kerajaan sedang mengalihkan pembangunan jauh dari kawasan bandar. Oleh itu, pembangunan kawasan perumahan yang dicadangkan adalah dikira melengkapinya gunatanah sedia ada.

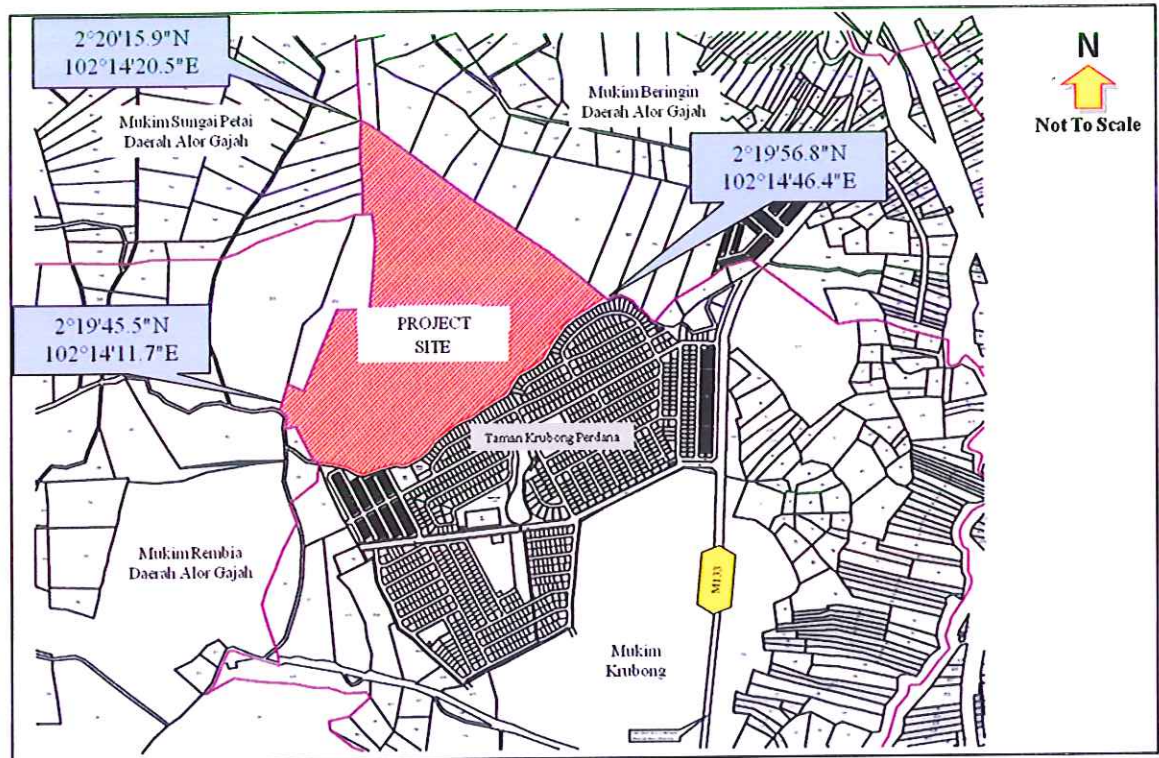
- ii. Konsep pembangunan yang dicadangkan oleh pemilik projek adalah unik dan boleh dijadikan sebagai pemangkin untuk meunisasikan kampung-kampung yang tidak teratur untuk menjadi komuniti yang berorganisasi dilengkapi dengan kemudahan asas.
- iii. Projek ini boleh diakses menggunakan Jalan M133 yang menghubungkan Lebuhraya SPA dan Parit Melana.
- iv. Kemudahan awam dan infrastruktur seperti elektrik, bekalan air dan telekomunikasi telah tersedia kerana wujudnya beberapa kawasan penempatan yang berdekatan.

4.5 Pilihan tatatur adalah sangat penting bagi projek pembangunan tanah. Tiada banyak perbezaan antara tatatur awal dan tatatur akhir. Projek yang dicadangkan terletak bersebelahan dengan kawasan perumahan sedia ada iaitu Taman Krubong Perdana. Oleh itu, tatatur akhir tidak akan mengakibatkan kebimbangan terhadap alam sekitar. Tambahan pula, pembangunan yang dicadangkan akan melengkapi gunatanah sedia ada yang berdekatan.

4.6 Terdapat banyak pilihan kaedah pembinaan yang boleh digunakan. Kaedah yang dipilih hendaklah menjaga / mengurangkan pencemaran alam sekitar sepanjang tempoh pembinaan.

5.0 PENGHURAIAN PROJEK

5.1 Projek ini terletak di Lot 1, Mukim Krubong, Daerah Melaka Tengah, Melaka. Tapak projek ini boleh diakses dari serata Negeri melalui rangkaian jalan sedia ada. Akses utama ke tapak projek adalah melalui Jalan M133 yang menghubungkan Lebuhraya SPA dan Parit Melana yang terletak di bahagian utara projek. **Rajah 1** menunjukkan pelan tapak projek.



Rajah 1: Pelan Tapak Projek.

- 5.2 Tapak projek adalah seluas 152.25 ekar. Ladang kelapa sawit dan getah memenuhi kawasan tapak. Keadaan tapak adalah beralun dan aras tanah adalah dari 11.174m hingga 62.545m di atas paras laut (MSL). Tapak projek juga terletak di dalam kawasan tadahan Sg. Melaka. Sg. Melaka terletak di 1km di arah timur projek dan ianya mengalir ke arah utara-selatan.
- 5.3 Projek ini akan dibangunkan sebagai kawasan perumahan. Komponen yang dicadangkan adalah kediaman (terdiri daripada teres dan rumah berkembar, banglo dan flat mampu milik) dan kemudahan asas dan fasiliti. **Rajah 2** menunjukkan pelan tatatur projek.



Rajah 2: Pelan Tatatur

- 5.4 Komponen projek dikategorikan kepada dua iaitu kediaman dan kemudahan asas. Peratusan dan keluasan bagi setiap pembangunan adalah seperti di **Jadual 2**.

Jadual 2: Perincian Pembangunan yang Dicadangkan

Komponen Projek	Lot / Unit	Luas (Ekar)	Peratusan (%)
Infrastruktur			
Rizab jalan	-	16.27	10.68
Kawasan lapang / "Gili-gili"	-	2.60	1.71
Kawasan lapang	-	0.29	0.20
Kolam takungan	-	3.01	1.98
Utiliti rizab jalan	-	1.09	0.72
Rizab surau	-	0.21	0.14
Rizab tadika	-	0.13	0.08
Rizab pusat komuniti	-	0.26	0.17
Rizab cerun	-	5.02	3.30
Rizab longkang	-	0.07	0.04

Komponen Projek	Lot / Unit	Luas (Ekar)	Peratusan (%)
Tangki air & tapak tangki sedutan	1	0.94	0.61
Pencawang utama (PPU) dan stetsen suis utama (SSU)	2	0.67	0.44
Pencawang elektrik	7	0.45	0.30
RORO / BKS sementara	-	-	-
Jumlah (A)	10	31.01	20.37
Kediaman			
Fasa A	-	-	-
Fasa A1: Lot Teres 2 Tingkat (20' x 70')	75	2.77	1.82
Fasa A2: Lot Teres 2 Tingkat (20' x 70')	77	2.82	1.85
Fasa A3: Lot Teres 2 Tingkat (20' x 70')	69	2.51	1.65
Fasa B (Strata Title)	-	20.19	13.26
Fasa B1: Lot Teres 2 Tingkat (22' x 70')	65	-	-
Fasa B2: Lot Teres 2 Tingkat (22' x 70')	124	-	-
Fasa B3: Lot Teres 2 Tingkat (22' x 70')	64	-	-
Kawasan lapang / kawasan lanskap	-	-	-
Pondok pengawal	1	-	-
Dewan komuniti / Bilik MC	1	-	-
Kawasan cerun	-	-	-
Parkir pelawat	3	-	-
Jalan berturap	-	-	-
Fasa C (Strata Title)	-	22.55	14.81
Fasa C1: Lot Teres 2 Tingkat (22' x 70')	61	-	-
Lot Teres 2 Tingkat (22' x 72')	58	-	-
Fasa C2: Lot Teres 2 Tingkat (22' x 72')	90	-	-
Kawasan lapang / kawasan lanskap	-	-	-
Pondok pengawal	1	-	-
Dewan komuniti / Bilik MC	1	-	-
Kawasan cerun	-	-	-
Parkir pelawat	3	-	-
9m utility rizab jalan	-	-	-
Jalan berturap	-	-	-
Fasa D (Strata Title)	-	34.81	22.86
Fasa D1: Lot Teres 2 Tingkat (22' x 70')	23	-	-
Lot Teres 2 Tingkat (22' x 72')	41	-	-
Fasa D2: Lot Teres 2 Tingkat (22' x 72')	82	-	-
Fasa D3: Lot Teres 2 Tingkat (22' x 72')	82	-	-
Fasa D4: Lot Banglo 2 Tingkat ($\pm 5,000\text{ft}^2$)	2 54	-	-
Fasa D5: Lot Berkembar 2 Tingkat (40' x 80')	42 41	-	-
Fasa D6: Lot Teres 2 Tingkat (22' x 70')	-	-	-
Lot Teres 2 Tingkat (22' x 72')	-	-	-

Komponen Projek	Lot / Unit	Luas (Ekar)	Peratusan (%)
Kawasan lapang / kawasan lanskap	1	-	-
Pondok pengawal	1	-	-
Dewan komuniti / Bilik MC	-	-	-
Kawasan cerun	3	-	-
Parkir pelawat	-	-	-
9m utility rizab jalan	-	-	-
Jalan berturap			
	-	20.04	13.16
Fasa E (Strata Title)	94	-	-
Fasa E1: Lot Teres 2 Tingkat (22' x 70')	66	-	-
Fasa E2: Lot Teres 2 Tingkat (22' x 70')	76	-	-
Fasa E3: Lot Teres 2 Tingkat (22' x 70')	-	-	-
Kawasan lapang / kawasan lanskap	1	-	-
Pondok pengawal	1	-	-
Dewan komuniti / Bilik MC	-	-	-
Kawasan cerun	3	-	-
Parkir pelawat	-	-	-
Jalan berturap	-	-	-
Fasa F	-	-	-
Fasa F1: Lot Teres 2 Tingkat (20' x 70')	75	2.64	1.74
Fasa F2: Lot Teres 2 Tingkat (20' x 70')	92	3.34	2.20
Fasa G	-	9.56	6.28
3 blok flat mampu milik 10 tingkat (termasuk surau, tadika dan bilik MC)	567	-	-
Kawasan lapang / kawasan lanskap	-	-	-
Pondok pengawal	1	-	-
Rumah sampah (RCP)	3	-	-
Jalan berturap	-	-	-
Parkir	1,251	-	-
Jumlah (B)	-	121.24	79.63
Jumlah Keseluruhan		152.25	100.00

5.5 Perlaksanaan projek akan dimulakan dengan pembersihan tapak dan kerja-kerja tanah. Seterusnya pembinaan jalan akses dan aktiviti cerucuk (jika ada) untuk pembinaan asas akan dijalankan. Kemudian, kerja-kerja pembangunan akan dijalankan selepas platform untuk pembinaan bangunan telah siap.

5.6 Pembersihan tapak dan kerja tanah akan dijalankan melalui 3 fasa dan setiap fasa terdiri daripada kawasan seluas 50 ekar. Bagi pembinaan kawasan unit kediaman,

ianya akan dijalankan mengikut fasa yang ditunjukkan di dalam pelan tatatur di **Rajah 2**. Keseluruhan projek akan mengambil masa selama 3 tahun untuk disiapkan.

- 5.7 Keseluruhan projek akan menampung jumlah populasi sebanyak 10,300 orang.
- 5.8 Punca bekalan air adalah dar Loji Rawatan Air Bertam II yang terletak di sebelah tenggara projek. Anggaran keperluan air adalah sebanyak 2.92MLD.
- 5.9 Projek ini akan menyediakan 7 unit pencawang TNB. Pencawang ini akan mendapatkan bekalan elektrik daripada stesen yang terdekat yang akan ditentukan oleh pihak TNB setelah pemilik projek mengemukakan permohonan yang dikehenaki. Jumlah keperluan elektrik yang dijangkakan adalah 7,244kW/hari.
- 5.10 Fasiliti telekomunikasi akan dibekalkan daripada stesen ibu sawat yang terdekat yang akan ditentukan oleh Telekom Malaysia setelah permohonan dikemukakan. Bekalan sedia ada dijangka mempunyai talian yang mencukupi untuk menampung permintaan tambahan. Selain dari itu, syarikat telefon selular akan membekalkan servis telefon. Oleh itu, fasiliti telefon bagi pembangunan ini adalah mencukupi. Jangkaan permintaan telefon adalah sebanyak 4,046 talian.
- 5.11 Bagi sisa kumbahan semasa pembinaan, fasiliti sanitari sementara akan disediakan oleh penggerak projek bagi memastikan sisa kumbahan dari kem pekerja tidak akan dilepaskan ke aliran air yang berdekatan dan mencemarkan kawasan hiliran. Longkang parit sementara dan perangkap mendak hendaklah dibina untuk mengalirkan ladang ke perangkap mendak sebelum dilepaskan ke laluan air yang berdekatan semasa kerja tanah dijalankan.
- 5.12 Air kumbahan yang akan dihasilkan adalah sebanyak 2.32MLD. Projek ini akan menggunakan Loji Rawatan Kumbahan (STP) MTH508 yang sedia ada yang terletak di kawasan perumahan bersebelahan iaitu Taman Krubong Perdana untuk merawat efluen dari tapak projek. STP tersebut hendaklah dinaiktaraf untuk menampung efluen berlebihan dari projek ini dan rekabentuk hendaklah memenuhi segala piawaian *Standard 'A' of the New Sewage Treatment System*

yang dinyatakan di dalam *Environmental Quality (Sewage) Regulations 2009*. STP sedia ada direka untuk menampung penduduk (PE) sebanyak 8,800. Jadi, kapasiti STP hendaklah dinaiktaraf untuk menampung PE sebanyak 19,100. Efluen yang telah dirawat akan disalurkan ke longkang utama dan akan mengalir ke Sg. Ayer Hitam.

- 5.13 Sisa pepejal semasa pembinaan akan mengandungi biojisim dari ladang kelapa sawit dan getah, pokok renek dan sisa domestik dari kuarters pekerja. Sisa domestik dan pokok getah / kelapa sawit yang tidak boleh digunakan secara komersial boleh dibuang ke tapak pelupusan sampah, dijual kepada pihak ketiga atau ditanam di kawasan hijau yang ditetapkan di tapak projek.
- 5.14 Anggaran sisa pepejal yang akan dihasilkan semasa fasa operasi boleh dibuat menggunakan kadar 1.09kg/orang/hari bagi sisa domestik (Sumber: *Rusdin Laiman et al.*, 2005). Penghasilan sisa pepejal setelah penyiapan projek adalah sebanyak 11,227tan/hari. Sisa pepejal yang dihasilkan akan dikutip oleh kontraktor sampah persendirian dan akan dibuang di tapak pelupusan sampah yang telah diluluskan oleh Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam (SWCorp).

6.0 KEADAAN ALAM SEKITAR SEDIA ADA

- 6.1 Topografi tapak adalah beralun. Aras yang lebih tinggi (62.545m MSL) terletak di bahagian utara tapak projek manakala aras yang lebih rendah (11.74m MSL) terletak di bahagian barat tapak projek.
- 6.2 Berdasarkan '*Geological Survey Map*', karakter geologi di tapak adalah *Devenian*. Jenis batuan di kawasan ini adalah *phyllite*, *schist* dan *slate*. *Conglomerate*, *chert* dan *rare volcanic* juga boleh didapati di kawasan ini.
- 6.3 Berdasarkan '*Reconnaissance Soil Map*' Negeri Melaka, jenis siri tanah yang terdapat dalam kawasan ini ialah siri Gajah-Mati-Muncung-Melaka.

- 6.4 Sampel tanah telah diambil di 3 lokasi (S1 hingga S3). Berdasarkan data persampelan tanah tersebut, didapati peratusan bagi partikel tanah bagi kesemua sampel adalah 9% - 36% tanah liat, 18% - 45% lumpur, 5% - 19% pasir dan 0% - 68% batu kerikil. Peratusan bagi bahan organik di dalam kesemua sampel adalah 0.5% - 1.9% dan berat bagi kesemua sampel adalah $1.404 - 1.947 \text{ Mg/m}^3$.
- 6.5 Sebahagian daripada tapak terletak di dalam kawasan tadahan Sg. Jenuang yang merupakan salah satu kawasan tadahan Sg. Melaka. Kawasan yang selebihnya terletak di dalam kawasan tadahan Sg. Ayer Hitam. Sg. Jenuang mengalir ke arah tenggara merentasi kawasan pokok kelapa sawit dan petempatan dan bertemu dengan Sg. Melaka. Anak sungai Sg. Ayer Hitam pula boleh dijumpai di bahagian timur projek dan mengalir ke arah selatan sehingga bertemu dengan Sg. Jeram.
- 6.6 Tapak projek adalah bebas dari kejadian banjir semulajadi. Tambahan pula, kawasan tapak yang paling rendah akan dijadikan sebagai kolam rekreasi yang juga akan bertindak sebagai kolam tahanan bagi memastikan kawasan hilir tapak adalah bebas dari banjir.
- 6.7 Data meteorologi telah diperolehi daripada Stesen Utama Jabatan Kajicuaca (No Stesen 48665 - N02°16 E102°15') di Lapangan Terbang Batu Berendam, Melaka dan juga daripada data sekunder. Berdasarkan data hujan dari tahun 1968 – 2017, purata hujan tahunan bagi Negeri Melaka adalah kira-kira 2,187.26 mm dengan purata hujan harian 200 hari. Musim tengkujuh adalah pada bulan November ke bulan Desember.
- 6.8 Informasi tentang kualiti air telah dijalankan di 7 lokasi (W1 hingga W7). Persampelan air telah dilakukan pada 26 Oktober 2016 di dalam parit yang sedia ada di sekeliling tapak Projek. Berdasarkan daripada pemantauan tersebut, kebanyakan parameter yang dikesan adalah dibawah Kelas IIA kecuali COD, BOD₅, Fe dan NH₃-N.
- 6.9 Kualiti udara ambien telah dikaji dengan menggunakan *High Volume Sampler* di tiga (3) lokasi (A1 hingga A3) untuk menentukan Jumlah Zarah Terampai (*Total*

Suspended Particulate, TSP). Keputusan yang diperolehi menunjukkan bahawa kualiti udara persekitaran adalah baik dan menepati piawaian “*Recommended Malaysian Air Quality Guidelines*”, iaitu $260\mu\text{g}/\text{m}^3$. Kepekatan Zarah-Zarah Terampai yang dikesan di lokasi persampelan A1, A2 dan A3 ialah $57\mu\text{g}/\text{m}^3$, $60\mu\text{g}/\text{m}^3$ dan $55\mu\text{g}/\text{m}^3$

- 6.10 Kadar bunyi bising telah direkodkan pada waktu siang, petang dan malam di tiga (3) lokasi (N1 hingga N3) pada 25 Oktober 2016 hingga 27 Oktober 2016. Purata bacaan LAeq pada waktu siang dan petang adalah dibawah LAeq yang dibenarkan iaitu 60dB(A). Manakala purata LAeq pada waktu malam telah melebihi paras yang ditetapkan iaitu 50dB(A) di semua lokasi persampelan. Mengikut rekod, punca bunyi bising yang direkodkan oleh kakitangan persampelan pada waktu malam adalah disebabkan oleh bunyi dari kenderaan yang melepasi lokasi persampelan, bunyi dari serangga, bunyi anjing menyalak dan suara azan yang dilaungkan di surau berdekatan..
- 6.11 Kawasan tapak projek dipenuhi dengan pokok kelapa sawit yang sudah matang dan pokok getah yang masih produktif. Gunatanah di sekeliling tapak adalah ladang kelapa sawit, ladang getah dan kebun buah.
- 6.12 Projek ini terletak di dalam Mukim Krubong, Daerah Melaka Tengah. Berdasarkan bacian tahun 2010, sebanyak 13,517 orang telah direkodkan di Mukim Krubong dan merupakan 13% daripada populasi keseluruhan di Daerah Melaka Tengah. Jumlah isi rumah di Mukim Krubong adalah sebanyak 3,212.
- 6.13 Bagi komposisi etnik pula, jumlah populasi yang direkodkan adalah berdasarkan kewarganegaraan Malaysia sahaja. Melayu adalah kumpulan etnik terbesar di Mukim Krubong iaitu seramai 8,501 orang (63%), diikuti dengan kaum Cina iaitu seramai 3,198 orang (24%), kaum India seramai 1,075 orang (8%), Bumiputera lain seramai 67 orang (0.5%) dan 28 orang (0.2%) dari kumpulan entnik yang lain.
- 6.14 Ekonomi di kawasan ini pada asasnya adalah agrikultur getah dan kelapa sawit sebagai penanaman utama dan penanaman buah-buahan adalah sumber

pendapatan kedua bagi penduduk setempat. Pembangunan ini dijangka akan menaiktaraf kehidupan penduduk dan peningkatan jumlah penduduk yang akan bekerja di sektor komersial dan industri.

6.15 Data trafik telah diperolehi dari laporan Kajian Impak Trafik (TIA) yang disediakan oleh O&L Jurutera Perunding Sdn. Bhd. Berdasarkan laporan TIA tersebut, pengiraan trafik telah dilakukan dari pukul 6.00 pagi hingga 10.00 malam di Jalan M133 dan Jalan Krubong Perdana Utama / Kampung Lanjut Manis (*Junction A*).

6.16 Berdasarkan laporan TIA tersebut, *peak hour volume* bagi *AM peak* dan *PM peak* di *Junction A* tidak melepasi kapasiti bagi *uninterrupted flow facilities*. *Level of Service (LOS)* bagi simpang 4 berlampu isyarat di Jalan Krubong Perdana Utama / Kampung Lanjut Manis adalah di bawah had yang ditetapkan kecuali bagi kenderaan ke kanan dari Jalan M133 menghala ke simpang Taman Krubong Perdana semasa *PM peak* (LOS F).

7.0 PENLAIAN KESAN DAN LANGKAH TEBATAN.

7.1 Aktiviti-aktiviti projek yang dijangka berpotensi untuk memberi kesan terhadap alam sekeliling telah dibahagikan kepada empat fasa iaitu pra-pembinaan, pembinaan, operasi dan projek terbengkalai. Impak-impak ini telah dinilai dan langkah-langkah tebatan telah dicadangkan untuk mengawal dan mengurangkan impak-impak tersebut. Garis panduan di dalam *Environmental Impact Assessment Guidelines For Housing and New Township Development* yang diterbitkan oleh Jabatan Alam Sekitar telah digunakan.

7.2 Impak-impak berpotensi dan langkah-langkah tebatan adalah seperti di dalam **Jadual 3**.

Jadual 3: Impak-Impak Berpotensi Dan Langkah-Langkah Tebatan

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Hakisan tanah dan mendapan.	- Kerja-kerja pembersihan tapak. - Kerja-kerja pembinaan.	- Berdasarkan penilaian risiko hakisan tanah dan mendapan, hakisan tanah semasa fasa pembinaan tanpa langkah-langkah tebatan adalah 66,016.76tan/tahun. Risiko hakisan tanah meningkat kepada 6 kali ganda daripada keadaan asal. - Hasil mendapan semasa pra-pembinaan adalah 190tonne/storm event. Jika pembersihan tapak dijalankan dalam satu fasa tanpa <i>best management practices</i>	Ketara	-Langkah tebatan berdasarkan <i>conceptual Erosion and Sediment Control Plan</i> (ESCP) hendaklah dijalankan. - BMP haruslah dijalankan di tapak sepanjang tempoh pembinaan projek.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Kestabilan cerun	- Kerja-kerja pembersihan tapak. -Kerja-kerja pembinaan.	(BMP), hasil mendapatkan mungin akan meningkat kepada 14 kali ganda iaitu sebanyak 2,749tan.		
		- Tanah runtuh akan terjadi jika rekabentuk cerun yang betul dan langkah-langkah keselamatan tidak diimplementasi. -Jumlah tanah dan bahan-bahan organik yang banyak akan memasuki sungai akibat dari tanah runtuh dan seterusnya akan mengurangkan kualiti air dan habitat bagi ikan dan hidupan liar.	Ketara	- Rekabentuk cerun yang betul dan langkah-langkah berjaga-jaga hendaklah diimplementasi.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Regim hidrologi	-Perubahan gunatanah. -Sistem perparitan yang lebih efisien semasa pembinaan jalan berturap dan parit monsun akan mengalirkan air larian ke longkang <i>outlet</i>.	- Penambahan <i>impervious area</i> yang akan meningkatkan air larian. -Kawasan hilir akan menerima peningkatan aliran air yang akan menyebabkan banjir kilat atau pembentukan kawasan pembalakan air.	Rendah (anak sungai di hilir projek mampu mengambil peningkatan air larian)	- Penyediaan <i>storm water detention pond</i> dan penyelenggaraan harus dibuat untuk memastikan ianya berfungsi dengan baik.
Penjanaan sisa pepejal	i. Semasa fasa pembinaan: - Biojisim daripada pembersihan tapak. - Sisa daripada kem pekerja. - Sisa / lebihan daripada kerja-kerja pembinaan.	- Menyebabkan masalah sisa pepejal jika tidak dilupuskan dengan cara yang betul. - Menyebabkan masalah kesihatan kepada pekerja dan orang awam di kawasan yang berdekatan. -Menyediakan habitat bagi vektor penyakit → membahayakan kesihatan orang awam	Ketara	i. Semasa fasa pembinaan: - Biojisim yang terhasil daripada pembersihan tapak yang tidak boleh digunakan lagi sebagai mulsa hendaklah dipotong kepada saiz yang senang untuk diurus, dikutip dan dibawa keluar. - Biojisim dari kelapa sawit / getah boleh dijual untuk tujuan komersil seperti bahan api-bio, pengganti arang, produk pembinaan dan lain-lain. - Sisa yang dihasilkan di kem pekerja hendaklah dikutip dan dibuang di tapak pelupusan yang dibenarkan. - Sisa yang dihasilkan hendaklah

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
		dan ekosistem di kawasan persekitarannya.		diasingkan dan sisa yang boleh diguna semula haruslah dipertimbangkan bagi tujuan meminimalkan jumlah sisa. - Sisa cecair seperti minyak dan gris, bahan kimia dan lain-lain hendaklah diasingkan dari sisa pepejal sebelum dibuang ke tapak pelupusan sampah.
	ii. Semasa fasa operasi -Dijangka sisa pepejal yang akan dihasilkan adalah sebanyak 11.23tan/hari. -Pengutipan sisa yang tidak teratur.	- Menimbulkan masalah kesihatan dan habitat untuk vektor penyakit. - Sampah yang terkumpul akan merosakkan pemandangan dan menimbulkan bau busuk.	Rendah	ii. Semasa fasa operasi: - Sisa hendaklah diasingkan mengikut peraturan-peraturan di bawah <i>Solid Waste and Public Cleansing Management Act 2007 (Act 672)</i>. - Pihak pengurusan kediaman hendaklah memasang rawatan sisa <i>on-site</i> (seperti penggunaan mesin pencerna makanan) bagi sisa makanan dari dapur supaya sisa makanan boleh dirawat tanpa dihantar ke pusat pelupusan. - Penggunaan semula dan kitar semula sisa haruslah dipertimbangkan bagi mengurangkan jumlah sisa.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Kualiti air.	i. Semasa fasa pembinaan: - Aktiviti pembersihan tanah dan kerja-kerja tanah. - Penghasilan tenaga dan stim dari penjana dan peralatan lain yang menggunakan bahan bakar fosil. - Pembuangan sisa pembinaan.	- Air larian yang berlebihan yang mengalir bersama dengan kelodak akan meningkatkan kekeruhan dan kepekatan pepejal terampai di dalam sungai. - Minyak enjin yang telah digunakan yang dibuang ke dalam longkang akan menyebabkan pencemaran yang teruk. - Sisa cecair daripada tapak pembinaan seperti minyak pelincir dan bahan-bahan kimia dibuang di dalam longkang, lama kelamaan akan mengalir ke dalam sungai.	Ketara	i. Semasa fasa pembinaan: - Penyediaan perangkap mendak / kelodak / penapis. - Penyediaan longkang dan benteng sementara. - Tandas yang mencukupi / kemudahan kebersihan untuk kem pekerja. - Penyediaan <i>secondary containment</i> .

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
	ii. Semasa fasa operasi -Sebanyak 2,317.50m ³ air sisa akan dijana dengan influen sebanyak 566.50kg BOD ₅ /hari dan 700.40kg SS/hari.	- Jika efluen tersebut tidak dirawat, ianya akan menyebabkan pencemaran air yang teruk.	Diabaikan	ii. Semasa fasa operasi: - STP sedia ada yang terletak di kawasan perumahan bersebelahan iaitu Taman Krubong Perdana akan digunakan untuk merawat air sisa kumbahan. STP sedia ada tersebut haruslah dinaik taraf bagi memastikan ianya boleh menampung lebihan sisa kumbahan yang akan dijana.
Kualiti udara ambien.	i. Semasa fasa pembinaan: - Penyediaan tapak. - Pergerakan kenderaan. -Aktiviti pembinaan.	- Akan mengurangkan kualiti air - Akan memberi impak kepada kesihatan dan penglihatan.	Rendah	i) Semasa fasa pembinaan: - Operasi pelepasan. -Penyediaan had laju trafik. -Penyediaan fasiliti pembasuhan tayar. -Kaedah pengangkutan bahan yang sesuai. -Penggunaan kaedah yang betul dan bahan-bahan yang mesra alam sekitar.
	ii. Semasa fasa operasi - Kenderaan keluar-masuk ke tapak	Peningkatkan pencemaran udara	Rendah	ii) Semasa fasa operasi: - Pencemaran udara semasa fasa operasi adalah tidak signifikan kerana projek yang dicadangkan tidak melibatkan apa-apa aktiviti industri yang akan menjana perlepasan gas.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Bunyi bising	i. Semasa aktiviti pembinaan: - Bunyi daripada mesin dan peralatan.	- Impak bunyi bising semasa kerja tanah dan pembinaan adalah pada jangka masa pendek dan terhad kepada tempoh kerja. - Akan mempengaruhi tahap bunyi di persekitaran.	Rendah	ii. Semasa fasa pembinaan: - Mengehadkan tempoh bekerja kepada waktu siang sahaja dan aktiviti pembinaan adalah tidak dibenarkan semasa waktu cuti. - Mengawal kelajuan kenderaan masuk ke dalam tapak projek. - Penghadang haruslah dipasang sebelum pembinaan bermula.
	ii. Semasa fasa operasi: - Kenderaan yang keluar masuk daripada tapak projek. - Peningkatan trafik akibat dari pertumbuhan populasi.	- Akan mengganggu ketenteraman di persekitaran tapak.	Rendah	ii. Semasa fasa operasi: - Lanskap di tapak akan bertindak sebagai penghadang bunyi.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Impak sosio-ekonomi	i. Semasa fasa pembinaan: - Aktiviti pembinaan - Penggunaan pekerja asing.	-Komuniti awam di sekeliling akan terdedah kepada pencemaran udara (habuk) dan pencemaran bunyi. - Jika pembangunan melibatkan pekerja asing, ianya akan mengakibatkan masalah sosial.	Rendah	- Penggerak projek harus memastikan kontraktor mereka menyediakan penginapan yang sesuai dengan fasiliti tandas yang bersih dan mencukupi untuk pekerja. - Menguatkuasakan pengawalan yang secukupnya terhadap pekerja, terutamanya pekerja asing supaya tiada masalah sosial akan timbul. - Menyediakan staf pengurusan yang profesional dan mencukupi semasa pembinaan.
	ii. Semasa fasa operasi: - Penyiapan pembangunan	-Ianya dijangka akan menghasilkan impak yang positif untuk orang awam kerana pembangunan ini akan mewujudkan peluang pekerjaan. -Menghasilkan lebih banyak impak sosio-ekonomi yang positif.	Diabaikan	
Komponen biologi dan ekologi	- Pemusnahan flora dan fauna	- Pelupusan habitat.	Rendah	- Kerja-kerja di tapak haruslah dilakukan bermula dari jalan utama hingga ke dalam. - Pokok dan rumput harus dibiarkan

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
akuatik				seboleh mungkin untuk memelihara kepelbagaian flora dan fauna. -Program lanskap dan penanaman semula harus dibuat dengan cepat bagi mengelakkan degradasi tanah. - Sumber air bagi hidupan liar tidak boleh diganggu.
Impak trafik	i. Semasa fasa pembinaan: -Kenderaan pembinaan	- Meningkatkan trafik jalan raya.	Sederhana	i) Semasa fasa pembinaan: - Aktiviti pengangkutan dan kenderaan berat yang keluar masuk dari tapak projek hendaklah dijadualkan luar daripada waktu puncak.
	ii. Semasa fasa operasi: - Trafik yang dijana oleh pembeli / penyewa / pemilik rumah.	- Meningkatkan trafik jalan raya. - Mengakibatkan kesesakan lalu lintas.	Sederhana	ii) Semasa fasa operasi: - Lorong harus ditambah di <i>Junction A</i> di Jalan M133. - <i>Roundabout</i> atau lampu isyarat harus disediakan di jalan keluar-masuk utama. - Jalan M133 haruslah diselenggara bagi menampung penambahan trafik dan memastikan keselamatan pengguna jalan raya setelah projek disiapkan.

Isu-isu	Punca Impak	Impak Berpotensi	Magnitud Impak Berpotensi (Ketara / Sederhana / Rendah / Diabaikan)	Langkah Tebatan
Projek terbengkalai	-Terbengkalai semasa kerja-kerja pembinaan.	- Akan memberi impak terhadap kualiti air dan sistem sungai di sekeliling tapak. - Akan meninggalkan struktur bangunan separuh siap dan bahan-bahan pembinaan yang tidak terurus. - Menimbulkan kesan sosio-ekonomi yang buruk terhadap penduduk setempat. -Mewujudkan habitat yang sesuai untuk pembiakan haiwan perosak dan vektor penyakit serta menyediakan tempat untuk tingkah laku anti-sosial.	Ketara	-Pelan projek terbengkalai yang sewajarnya haruslah disediakan untuk memastikan semua langkah-langkah tebatan dijalankan. -Jika projek terbengkalai semasa pembinaan, semua peralatan harus dialihkan daripada tapak dan penanaman semula harus dibuat. -Bagi sisa terjadual dan sisa pepejal / cecair di tapak, ianya hendaklah dibuang dengan cara yang sepatutnya di kawasan yang dibenarkan.

8.0 PELAN ALAM SEKITAR (EMP)

- 8.1 EMP haruslah merangkumi Program Pengawasan Alam Sekitar, Unit Pengurusan Alam Sekitar dan Pelan Respon Kecemasan. Fungsi utama bagi komponen-komponen ini adalah untuk mengkhususkan tanggungjawab setiap pihak di dalam perancangan, pengawasan dan akujanji untuk mengambil langkah tebatan yang telah dicadangkan semasa fasa pembinaan dan fasa operasi.
- 8.2 *Land Disturbance Pollution Prevention and Mitigating Measures (LD-P2M2)* harus disediakan dan dikemukakan sebagai salah satu bahagian di dalam EMP dan mestilah berpandukan *Guidance Document for the Preparation of LD-P2M2*.
- 8.3 Pengawasan *baseline* yang telah dibuat di dalam EIA ini dan yang akan dibuat di dalam EMP kelak serta di dalam cadangan pengawasan haruslah memenuhi kesemua jenis pengawasan di bawah:-
- a.) Pengawasan Prestasi (PM) – pengawasan *baseline* yang akan menentukan keadaan alam sekitar semasa di tapak;
 - b.) Pengawasan Pematuhan (CM) – pengawasan yang dilakukan untuk mengetahui kepatuhan terhadap piawaian alam sekitar yang dikehendaki; dan
 - c.) Pengawasan Impak (IM) – pengawasan alam sekitar yang dilakukan bagi mengetahui magnitude impak dari pembangunan.
- 8.4 Semasa fasa pembinaan, pemantauan bagi kualiti air, kolam perangkap mendak / kelodak, kualiti udara ambien dan tahap bunyi bising haruslah dijalankan. Butiran mengenai pemantauan tersebut adalah seperti di bawah.

Jadual 4: Butiran Program Pemantauan

Program Pemantauan	Parameter	Kekerapan Pemantauan
Kualiti air	Pepejal terampai, pH, BOD ₅ , COD, DO, Ammoniacal Nitrogen as N, <i>E.Coli</i> , logam	Sekali sebulan.

Program Pemantauan	Parameter	Kekerapan Pemantauan
	berat dan minyak & gris.	
Kolam perangkap mendak / kelodak	Jumlah pepejal terampai (TSS).	Sekali sebulan.
Kualiti udara ambien	Jumlah zarah terampai (TSP).	Suku tahunan atau lebih awal sekiranya dikehendaki oleh JAS.
Tahap bunyi	L_{eq} , L_{max} , L_{min} and L_n secara berterusan untuk tempoh 24 jam.	Suku tahunan atau lebih awal sekiranya dikehendaki oleh JAS. Semasa aktiviti penanaman cerucuk, disarankan pemantauan dijalankan sebanyak 4 kali.

- 8.5 Semasa fasa operasi, efluen dari loji rawatan kumbahan hendaklah diambil sebulan sekali sebelum projek diserahkan kepada IWK. Parameter yang dicadangkan adalah suhu, pH, *BOD₅*, *COD*, *SS*, *O&G*, *Ammonical Nitrogen (enclosed water body)*, *Nitrate (enclosed water body)* dan *Phosphorous (enclosed water body)*. Kualiti air dijangka mempunyai impak yang sangat minima. Jadi, tiada pemantauan bagi kualiti air akan dijalankan. Bagi pemantauan kualiti udara ambien dan tahap bunyi, ianya boleh dijalankan sekiranya dikehendaki oleh JAS. Parameter bagi pemantauan kualiti udara adalah Jumlah Zarah Terampai (TSP) manakala L_{eq} , L_{max} , L_{min} and L_n bagi tahap bunyi haruslah dijalankan secara berterusan selama 24 jam sekiranya dikehendaki oleh JAS.

9.0 DAPATAN KAJIAN

- 9.1 Berdasarkan dari kajian EIA ini, impak utama yang perlu dititikberatkan ialah hakisan tanah dan kualiti dan kuantiti air. Impak ini akan member kesan yang sangat kritikal semasa implementasi projek terutamanya semasa kerja-kerja tanah.

Namun begitu, impak-impak ini boleh dibendung jika langkah-langkah tebatan dilaksanakan dengan betul.

- 9.2 Pembangunan tapak Projek sebagai kawasan perumahan dianggap pilihan yang paling sesuai. Penyiapan Projek akan memberi impak positif kepada sosio-ekonomi di kawasan tersebut serta kepada Negeri dengan menggunakan tanah yang sedia ada untuk mengelak dari perbandaran tidak terkawal dan masalah kesesakan jalan raya akibat dari perkembangan populasi dan ekonomi. Faedah terhadap ekonomi dan sosial yang diperoleh daripada pelaksanaan Projek adalah lebih besar jika “pilihan *No-Project*” atau lain-lain alternatif Projek dipilih.
- 9.3 Dengan perancangan yang teliti dan amalan pembinaan dan pengurusan yang baik, Projek ini tidak akan mengakibatkan impak alam sekitar yang signifikan terhadap kawasan sekeliling dan perlaksanaanya akan menyumbang kepada pembangunan Negeri.

EXECUTIVE SUMMARY

Executive Summary

1.0 INTRODUCTION

- 1.1 The Environmental Impact Assessment (EIA) report is prepared for **The Proposed Housing Development On Lot 1 In Mukim Krubong, District Of Melaka Tengah, Melaka**. The project site which is located at Krubong, Melaka (Latitude: N 2° 19' 52.8", Longitude: E 102° 14' 28.453"), is planned to be developed into a residential area with basic infrastructure and utilities, including a *surau*, community centre, guard house, kindergarten and a road network.
- 1.2 The proposed Project is a prescribed activity that falls under **Activity 16** i.e. housing development covering an area of 50 hectares and more in the **First Schedule, Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015**. The Project initiator is required to prepare and submit an Environmental Impact Assessment (EIA) report to ensure the Environmental Impact Assessment is undertaken, consonant with the protocols established by the Director General of the Department of Environment (DOE), Malaysia.
- 1.3 This project is initiated by **Messrs. PB Realty Sdn. Bhd.** Any enquiries regarding the Project may be directed to:

PB REALTY SDN. BHD. (338851-D)

No.2, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka.
(Attn : Datuk Poh Geok Siong)

Tel : 06 – 337 3333

Fax : 06 – 336 5678

- 1.4 The EIA report is prepared and submitted by an EIA study team led by **Datuk Ir. Othman Abdul Rahim**, an EIA Consultant registered with the Department of

Environment (DOE Reg. No. C0006). Enquiries and correspondence pertaining to this report can be made to:

O&L JURUTERA PERUNDING SDN. BHD. (Co. Reg. No.: 372321-V)

Consulting, Civil, Structural & Environmental Engineers,

No. 38, Jalan TU 40,

Taman Tasik Utama,

75450 Ayer Keroh, Melaka.

(Attn : Datuk Ir. Othman Abdul Rahim)

Tel : 06 – 232 2380/ 232 5215/ 253 4005

Fax : 06 – 232 7815

E-mail : oandl.melaka@gmail.com

2.0 TERMS OF REFERENCE (TOR)

- 2.1 The TOR has been prepared prior to the preparation of the EIA report in accordance with the latest EIA guidelines issued by the Department of Environment (DOE). This TOR has been endorsed by the DOE on 23rd March 2017.
- 2.2 The potential impacts to be studied and detailed out in the EIA report are landuse of neighbouring lots, biomass, soil erosion, hydrological regime, solid waste, scheduled waste, water quality, air quality, noise level, traffic impact and abandonment.
- 2.3 Besides conducting a visit to the site and observation of the nearby areas, secondary resources such as topography maps, Google Earth / Map and the Local Authority Structure and Local Plans will be used as references to complete the landuse exercise as well as to identify the topography and geological character of the site.
- 2.4 In order to determine the soil type at the site, a few samples of soil shall be taken at the project site and shall be sent to laboratory for analysis. The parameters to be analysed include Particle Size Distribution, Organic Matter Content and Bulk Density / Dry Density. To assess the soil erosion risk, Guideline for Erosion and Sediment

Control in Malaysia published by the Department of Irrigation and Drainage Malaysia, 2010 will be referred to.

- 2.5 Since the amount of surface runoff is expected to increase once the project has started, runoff computation will be performed in the EIA to see the magnitude of the impact. The calculation will be done using the Design Flood Hydrograph Estimation For Rural Catchments in Peninsular Malaysia - Hydrological Procedure No.11 (HP No. 11) published by Drainage and Irrigation Division (DID), Ministry of Agriculture, Malaysia 1976. Detail calculation will be included in the EIA report.
- 2.6 The meteorological description will be deliberated using the meteorological data from Batu Berendam Airport Principal Station (No. Station: 48665 – N 02°16', E 102°15') obtained from Malaysian Meteorological Service Department.
- 2.7 Water quality monitoring will be done to obtain a baseline data. All analyses shall be undertaken by SIRIM certified commercial laboratory which meet the requirements of ISO/IEC Guide 25, EN45001 and the relevant requirements of ISO 9001/2. The monitoring results will be compared to Class IIA of the National Water Quality Standards (NWQS).
- 2.8 Noise measurement shall be carried out using a pre-calibrated precision integrating noise meter stationed at the selected measurement points for 24 hours at each point. The parameters to be tested include L_{eq} , L_{Max} , L_{Min} and L_N of the A – weighted sound level. The results will then be compared with the standard as specified in Schedule 1 in Annex A of The Planning Guidelines For Environmental Noise Limits and Control. All analyses shall be undertaken by SIRIM certified commercial laboratory.
- 2.9 The measurement of Total Suspended Particulate (TSP) shall be carried out in accordance to the ASTM D4096 method released in the year 1993 and the analysis shall be undertaken by a SIRIM certified commercial laboratory. The monitoring results will then be compared to the standard as specified in Malaysian Recommended Environmental Air Quality Guidelines.

3.0 STATEMENT OF NEED

- 3.1 The Melaka Government has adopted a strategy of developing the State into a City-State by the year 2020. It aims to achieve this mainly by intensively developing the industrial and tourism sectors which will have a positive impact on population, job opportunities and demand for residential, commercial and industrial properties. The population for the state is projected to rise to 960,500 persons by the year 2020.
- 3.2 As such, the increase of the population will subsequently leads to an increase in housing demand in the State. The Project is located in Mukim Krubong, District of Melaka Tengah. The proposed site is suitable to be developed into a residential area as it is strategically located adjacent to an existing housing area i.e. Taman Krubong Perdana and most of the nearby areas are housing areas / settlements.
- 3.3 The Project is envisaged to complement the existing land use and would become one of the attractions for economic growth. It is predicted to generate more development or as a stepping stone for more development within the area. The project is also intended to divert development away from the densely populated area towards the countryside which has the potential to be developed. This is also to moderate and ensure an even balance of economic growth in all the three districts in Melaka.

4.0 PROJECT OPTIONS

- 4.1 The project options which have been taken into consideration for this project are no-project option, site option, layout option and construction method option.
- 4.2 No-Project option is a compulsory option that needs to be evaluated for all types of projects that require the preparation and submission of EIA report. For most of the physical development project which are not located within or near to an Environmental Sensitive Area (ESA), i.e., natural flood plain, steep slope, etc. the proposed project will always benefit the regional population after the completion. As the project site is not located within or adjacent to an ESA and the existing land use of the site which is mainly covered with rubber and oil palm plantation, the proposed

project is anticipated to generate benefits not only to the regional population, but the State and Nation as well.

- 4.3 On the other hand, if No-Project option is adopted, all benefits that are going to be generated by the project would be denied. A comparison of “No – project” option and “With – project” option from the aspects of social, economical and environmental benefits are summarised in **Table 1.1**.

Table 1.1: Comparison of No – Project and With – Project Options

No	No – Project Option	With – Project Option
1.	Land will remain as rubber and oil palm plantation with moderate income.	A well-planned development will be established and the monetary value of the existing land will increase.
2.	There will be moderate income to the State.	Higher income to the State derived from taxation of land and business activities of the development.
3.	Existing Noise level remains the same.	Noise levels will increase due to an increase in vehicular traffic during construction and urbanisation after completion.
4.	Existing ambient air quality will remain the same.	Short-term increase of suspended particulate during the construction and increase of air pollutants due to urbanisation, viz., additional vehicle volume and population.
5.	River water quality remains the same.	Increase of effluent flow into the river yet the impact is not expected to be significant as a Sewerage Treatment Plant is provided to treat all domestic wastewater before discharge.
6.	The volume of surface runoff and natural infiltration rate remains the	Increase in surface runoff and decrease in infiltration. It is expected to be significant

No	No – Project Option	With – Project Option
	same.	due to the size of the project. Mitigating measures are important to reduce the impact.
7.	Socio-economy of the area remains the same.	The development will generate increased business that will benefit the regional economy and local populace.
8.	The natural ecology of the site remains the same.	Some changes are expected in the ecosystem arising from the development. The proposed project involves land clearing during construction stage, which has an impact to the environment. However, these impacts might be insignificant, if proper mitigating measures are in place.

4.4 The site is considered suitable for the proposed project due to the following reasons:

- i. Although located on the outskirts of Melaka Tengah, the proposed location is situated in a developing area as the Government is diverting the development away from the city. Thus, the proposed development can be seen as complementing the existing land use as it provides a well-planned residential area.
- ii. The development concept proposed by the project proponent is unique and could act as an initial catalyst to unionise the scattered villages in order to form a well-organised community with the basic facilities provided.
- iii. The project is easily accessible and is located beside the state road M133 which connects Lebuhraya SPA and Parit Melana.

- iv. Public utility services and infrastructure, such as electricity, water supply and telecommunications are readily available at the site as there are a few existing settlements within the area.

4.5 Layout option is a very important option to be considered for land development project. By comparing the initial and final layouts of the project, there is no significant difference between it. Since the proposed housing development is located next to an existing residential area i.e. Taman Krubong Perdana, the proposed final layout is not foreseen to have any significant environmental concern. In fact, the proposed development will complement the current landuse near the site.

4.6 There are many available construction method options which can be implemented to develop the proposed project. The options to be implemented must always be able to protect / minimise environmental degradation throughout the construction period.

5.0 PROJECT DESCRIPTION

5.1 The project site is located on Lot 1 in Mukim Krubong, District of Melaka Tengah, Melaka. The proposed site is accessible from all parts of the State through the existing road network. The main access to the project site is from the State Road M133 which stretches adjacent to the site from north to south connecting Lebuhraya SPA (Sg. Udang – Paya Rumput – Ayer Keroh) and Parit Melana. **Figure 1** shows the site plan of the Project.

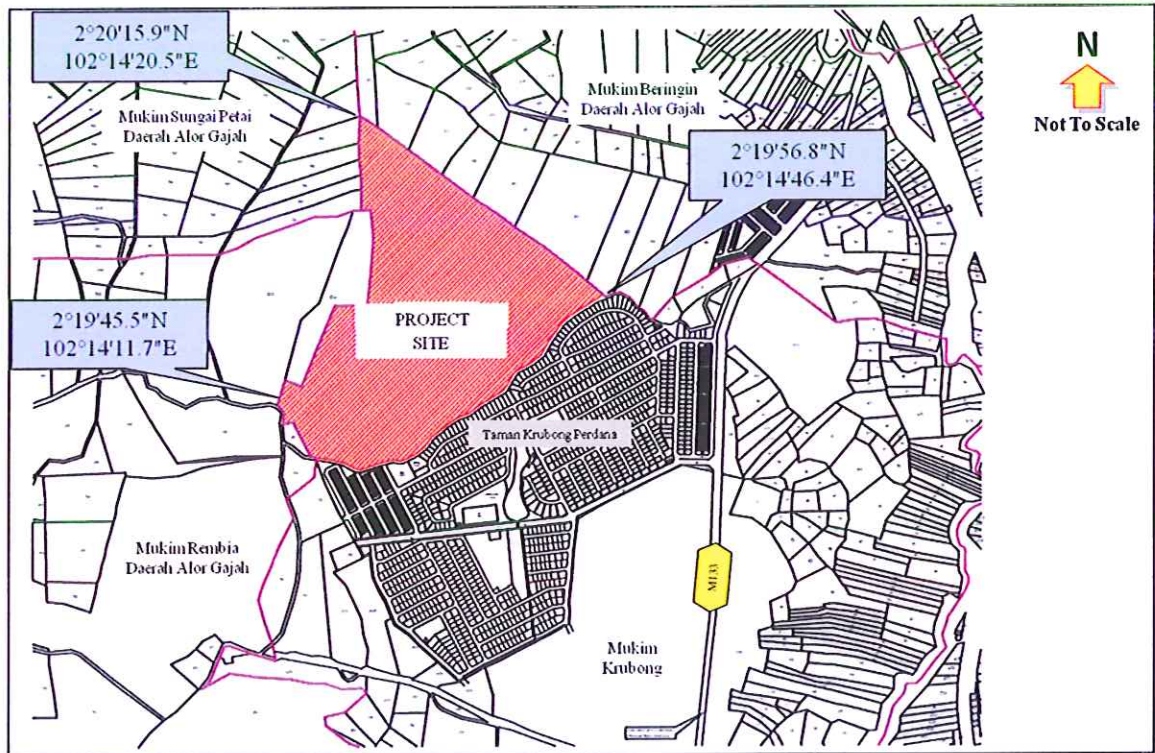


Figure 1: Site Plan of the Project

- 5.2 The project site comprises of a total area of 152.25 acres. It is presently mostly covered with oil palm and rubber plantation. The site is generally undulating with original ground levels ranging from 11.174m to 62.545m above Mean Sea Level (MSL). The project site is situated within Sg. Melaka river catchment. Sg. Melaka is located about 1 km to the east of the project site and it flows in a north-south direction.
- 5.3 The proposed project is intended to be developed into a residential area. The types of components proposed are residential (consisting of terrace and semi-detached houses, bungalows and affordable flats) and basic infrastructures and facilities. **Figure 2** shows the layout plan of the proposed development.



Figure 2: Layout Plan

5.4 The components proposed for the project can briefly be grouped into two main categories, viz., residential and basic infrastructure. The percentage and acreage for each development category are summarised in **Table 2**.

Table 2: Details Of The Proposed Development

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
Infrastructure			
Road reserve	-	16.27	10.68
Open space / "Gili-gili"	-	2.60	1.71
Open space	-	0.29	0.20
Detention pond	-	3.01	1.98
Utility route reserve	-	1.09	0.72
<i>Surau</i> reserve	-	0.21	0.14
Kindergarten reserve	-	0.13	0.08
Community centre reserve	-	0.26	0.17
Slope reserve	-	5.02	3.30
Drainage reserve	-	0.07	0.04
Water tank & suction tank site	1	0.94	0.61

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
Main Distribution Substation (PPU) & Main Switch Station (SSU)	2	0.67	0.44
Electrical substation	7	0.45	0.30
RORO / Temporary BKS	-	-	-
Sub-Total (A)	10	31.01	20.37
Residential			
Phase A	-	-	-
Phase A1: 2- Storey Terrace Lots (20' x 70')	75	2.77	1.82
Phase A2: 2- Storey Terrace Lots (20' x 70')	77	2.82	1.85
Phase A3: 2- Storey Terrace Lots (20' x 70')	69	2.51	1.65
Phase B (Strata Title)	-	20.19	13.26
Phase B1: 2- Storey Terrace Lots (22' x 70')	65	-	-
Phase B2: 2- Storey Terrace Lots (22' x 70')	124	-	-
Phase B3: 2- Storey Terrace Lots (22' x 70')	64	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
Paved road	-	-	-
Phase C (Strata Title)	-	22.55	14.81
Phase C1: 2- Storey Terrace Lots (22' x 70')	61	-	-
2- Storey Terrace Lots (22' x 72')	58	-	-
Phase C2: 2- Storey Terrace Lots (22' x 72')	90	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
9m Utility route reserve	-	-	-
Paved road	-	-	-
Phase D (Strata Title)	-	34.81	22.86
Phase D1: 2- Storey Terrace Lots (22' x 70')	23	-	-
2- Storey Terrace Lots (22' x 72')	41	-	-
Phase D2: 2- Storey Terrace Lots (22' x 72')	82	-	-
Phase D3: 2- Storey Terrace Lots (22' x 72')	82	-	-
Phase D4: 2-Storey Bungalow Lots ($\pm 5,000\text{ft}^2$)	2	-	-
	54	-	-
Phase D5: 2- Storey Semi-D Lots (40' x 80')	42	-	-
	41	-	-
Phase D6: 2- Storey Terrace Lots (22' x 70')	-	-	-

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
2- Storey Terrace Lots (22' x 72')			
Open space / landscape area	1	-	-
Guard house	1	-	-
Community hall / MC room	-	-	-
Slope area	3	-	-
Visitors Car Park	-	-	-
9m Utility route reserve	-	-	-
Paved road			
	-	20.04	13.16
Phase E (Strata Title)	94	-	-
Phase E1: 2- Storey Terrace Lots (22' x 70')	66	-	-
Phase E2: 2- Storey Terrace Lots (22' x 70')	76	-	-
Phase E3: 2- Storey Terrace Lots (22' x 70')	-	-	-
Open space / landscape area	1	-	-
Guard house	1	-	-
Community hall / MC room	-	-	-
Slope area	3	-	-
Visitors Car Park	-	-	-
Paved road			
Phase F	-	-	-
Phase F1: 2- Storey Terrace Lots (20' x 70')	75	2.64	1.74
Phase F2: 2- Storey Terrace Lots (20' x 70')	92	3.34	2.20
Phase G	-	9.56	6.28
3 blocks of 10-storey affordable flats (includes <i>surau</i> , kindergarten and MC room)	567	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Garbage house (RCP)	3	-	-
Paved road	-	-	-
Parking	1,251	-	-
Sub-Total (B)	-	121.24	79.63
Overall Total		152.25	100.00

- 5.5 The implementation of the project is planned to start with site clearing and earthwork activities. Construction of the access road and piling activities (if any) for the foundation of the proposed building are expected to be the second stage of the development. Building works is anticipated to be the subsequent components to be carried out, after the proposed platform for the building construction is ready.

- 5.6 The site clearing and earthworks will be done in three different phases with each phase consisting of approximately 50 acres of land. As for the construction of the proposed residential units, it will be done in phases as per stated in the layout plan in **Figure 2**. The entire project is expected to be completed within 3 years from the commencement date.
- 5.7 The entire project has been planned to cater for a population of approximately 10,300 people.
- 5.8 The main water source for the Project will be from the Bertam Treatment Plant II, which is located at the southeast of the site. The estimation of the total water demand projected by the design engineer is about 2.92 MLD.
- 5.9 The proposed Project has a provision for seven units of TNB substations. The substations will tap electricity from the nearest main station to be determined by TNB once the Project proponent has submitted the necessary application. The total demand projected is about 7,244kW/day.
- 5.10 The telecommunication facilities would be supplied from the nearest exchange station to be identified by the Telekom Malaysia once the application form has been submitted. The available supply is expected to have sufficient lines to cater for the additional demand. Apart from this, the cellular phone companies will also be supplying telephone services and thus there will be adequate telephone facilities for the development. The estimated telephone demand is about 4,046 lines.
- 5.11 For wastewater management during construction, temporary sanitary facilities will be provided by the project proponent to ensure that wastewater from the workers camp will not be discharged directly into the nearest receiving watercourse and pollute the downstream water. Temporary earth drains and silt traps will need to be constructed to flow the surface runoff into the silt traps before discharging to the existing watercourse during earthworks.

- 5.12 The total sewage generation from the Project has been estimated to be approximately 2.32 MLD. This project will use the existing MTH508 Sewerage Treatment Plant (STP) located at the adjacent housing area i.e. Taman Krubong Perdana to treat the effluent from the project site. The STP will need to be upgraded to cater for the additional effluent from this project and the design shall meet the requirements of Standard 'A' of the New Sewage Treatment System stipulated in the Environmental Quality (Sewage) Regulations 2009. The existing STP was designed to cater for 8,800 PE, hence the capacity of the STP is to be upgraded to cater for a total of 19,100 PE. The treated effluent will be discharged into the main drain and flow directly into Sg. Ayer Hitam.
- 5.13 Solid waste during construction will contain mainly biomass from the oil palm and rubber plantation, shrubs and domestic waste from the workers quarters. Domestic waste and the felled oil palms / rubber trees which are not commercially usable can either be disposed off at the landfill dumps, sold to third party or buried at the allocated green area within the project site.
- 5.14 An estimation of the solid waste generation during the operational phase of the project can be made by basing a rate of 1.09 kg/person/day for domestic wastes (Source : *Rusdin Laiman et al.*, 2005). The solid waste generation upon the full completion of the project is estimated to be about 11,227kg/day. The solid waste generated will be collected by the privatised garbage contractors engaged by the local authority and disposed at the designated landfill site as approved by Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam (SWCorp).

6.0 EXISTING ENVIRONMENT

- 6.1 The topography of the site can be described as undulating. The higher level within the elevation of 62.545m MSL could be found at the northern area of the site. The levels decrease towards the west until it reaches the lowest elevation of 11.74m MSL.

- 6.2 According to the Geological Survey Map, the main geological character of this area is Devonian. The rock types in this category are phyllite, schist and slate. Some interbeds of conglomerate, chert and rare volcanics are also available within this category.
- 6.3 From the Reconnaissance Soil Map of Negeri Melaka, the type of soil within the site is designated as Gajah-Mati-Muncung-Melaka
- 6.4 In addition to the desk study, soil samples were taken at three (3) selected locations (S1 to S3). From the result of the soil property tests, the percentage for each type of particle from all soil samples gathered are 9% - 36% clay, 18% - 45% silt, 5% - 19% sand and 0% - 68% gravel. Meanwhile, the percentage of organic matter and unit weight in Mg/m^3 for all samples tested are 0.5% - 1.9% and 1.404 - 1.947 Mg/m^3 respectively.
- 6.5 A portion of the proposed site is located within Sg. Jenuang catchment area which is the sub-catchment area of Sg. Melaka while the rest of the site lies within Sg. Ayer Hitam catchment area. Sg. Jenuang flows in a southeast direction through the oil palm plantation and settlements before meeting Sg. Melaka. On the other hand, tributaries of Sg. Ayer Hitam which can be found at the east of the project site flows in a south direction to meet with Sg. Jeram.
- 6.6 The site could be considered as free from any possibility of natural flood. In addition, as proposed in the development layout, the lowest lying area will be transformed into a recreation pond which will also serve as a retention pond to ensure downstream areas would be totally free from any flooding
- 6.7 The meteorological data was obtained from Batu Berendam Airport Principal Station (No. Station: 48665 – N 02°16', E 102°15') of the Malaysian Meteorological Service Department and from secondary resources. Based on the rainfall data from 1968 - 2017, the annual mean rainfall for Melaka is about 2,187.26 mm with the annual mean raindays of 200 days. For the period monitored, the wettest month of the year falls on the month of November to December.

- 6.8 Information on water quality was analysed at seven (7) locations (W1 to W7). The water samples were collected on 26th October 2016 from the existing drain surrounding the Project site. From the monitoring result, most of the parameters detected are within the Class IIA limit except for COD, BOD₅, Fe and NH₃-N.
- 6.9 Ambient air quality was measured using High Volume Sampler at three (3) locations (A1 to A3) for Total Suspended Particulate (TSP). The results obtained indicate that the ambient air quality is relatively well below the Recommended Malaysian Air Quality Guidelines of 260µg/m³. The concentration of TSP detected at sampling location A1, A2 and A3 are 57µg/m³, 60µg/m³ and 65µg/m³ respectively.
- 6.10 Noise levels were recorded during daytime, evening time and night time at three (3) locations (N1 to N3) on 25th October to 28th October 2016. The average Leq readings recorded at all monitoring stations are well within the maximum permissible sound level of 60 dB(A) during daytime and evening time. In contrast, the average Leq readings recorded at all monitoring stations have exceeded the permissible sound level of 50 dB(A) during night time. Based on the record of site observation annotated by the sampling personnel from the laboratory, the noise levels which have exceeded the permissible sound level during night time are most probably contributed by the noise from vehicles passing by, noise from insects, noise from dogs barking and the sound of *azan* from a nearby *surau*.
- 6.11 At present, the Project site is entirely covered by the matured oil palm trees and rubber trees that are still productive. The land use at the surrounding of the site is mostly oil palm plantation, rubber estate and fruit farms.
- 6.12 This project is located within Mukim Krubong, District of Melaka Tengah. Based on the year 2010 census, a total of 13,517 people were recorded in Mukim Krubong, which is about 13% of the overall population in District of Melaka Tengah. The total number of households in Mukim Krubong is about 3,212.
- 6.13 As for the ethnic composition, the total population recorded is only based on Malaysian citizenship and excluded Non-Malaysian citizens. Malay is the largest

ethnic group in Mukim Krubong with 8,501 people (63%), followed by Chinese with 3,198 people (24%), Indian with 1,075 people (8%), other Bumiputera with 67 people (0.5%) and 28 (0.2%) from other ethnic groups.

- 6.14 The economy of the area is basically agricultural with rubber and oil palm being the major crop and fruit cultivation as another source of income to the local populace. This development in the vicinity will upgrade the standard of living for the residents from the increasing number of the population will be employed in the commercial and industrial sectors.
- 6.15 The data on traffic volume was obtained from the Traffic Impact Assessment (TIA) report which was prepared by O&L Jurutera Perunding Sdn. Bhd. Based on the TIA report, the traffic count was conducted from 6.00 am to 10.00 pm at State Road M133 and Jalan Krubong Perdana Utama / Kampung Lanjut Manis (**Junction A**).
- 6.16 Based on the TIA report, the peak hour volume for both AM peak and PM peak at Junction A did not exceed the capacity for uninterrupted flow facilities. The LOS for the signalised 4-legged junction at Jalan Krubong Perdana Utama / Kampung Lanjut Manis is still within the acceptable limit except for the right turn from State Road M133 towards Taman Krubong Perdana junction during PM peak which falls under LOS F.

7.0 EVALUATION OF IMPACTS AND MITIGATING MEASURES

- 7.1 The Project activities expected to have potential impact on the environment were broadly classified into four categories, viz., pre-construction, construction, operation and project abandonment. The environmental components which are likely to induce potentially significant impacts are identified for analysis, discussion and assessment. In arriving at decisions on environmental impacts, the guidelines given in the Environmental Impact Assessment Guidelines For Housing and New Township Development published by the DOE are applied..

7.2 The potential significant impacts and mitigating measures are described in **Table 3**.

Table 3: Potential Significant Impact And Mitigating Measures

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Erosion and sediment	-Land clearing. -Construction works.	-Based on the erosion and sediment risk assessment, the amount of soil erosion during construction stage without mitigating measures is 66,916.76 tonnes/year. The erosion risk increases 6 folds from the existing environment.	Severe	-Control measures based on the conceptual ESCP shall be followed. - Best management practices (BMPS) shall be carried out onsite throughout the construction period of the project development

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
		- The sediment yield of the Project site during pre-development stage is 190 tonnes per storm event. If total land clearing is carried out in one phase without any BMPs, the potential sediment yield will increase 14 folds to 2,749 tonne.		

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Slope Stability	-Land clearing. -Construction works.	- The development will cause landslide if no proper slope design and precaution is implemented. - Large amounts of earth and organic materials will enter streams as sediment as a result of this landslide and erosion activity, thus reducing the potability of the water and quality of habitat for fish and wildlife.	-Severe	- Proper slope design and precautions shall be implemented. - Provision of proper drainage.

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Hydrological regimes	-Changes in landuse. - Higher efficiency of the drainage system through the construction of paved roadside and monsoon drains that will efficiently channel runoff out of the project site into the outlet drains.	- Create an additional impervious area that would increase the surface runoff. - The downstream area may feel the impact of the increased flows which would result in flash flood or formation of water-logging areas.	Low (the downstream waterways are able to cater the increased discharge)	- Provision of the storm water detention ponds and regular maintenance shall be done to ensure the function could be performed satisfactorily.
Solid waste generation	i. During construction phase: - Biomass from site clearing -Waste from labour camp / base camps. - Construction waste / surplus from construction activity	- Create solid waste problems if it is not properly planned or disposed off. - result in unsanitary conditions giving rise to health hazards to the workers and residents neighbouring the project site. -Providing habitats for disease vectors→	Severe	i. During construction phase: - Biomass generated from the site clearing and cannot be used as mulching for green should be cut into manageable sizes, collected and transported out. - The biomass from the oil palm / rubber can be sold and used for commercial applications like bio-fuel, coal replacement, building products and many others. - Waste generated by the workers camp shall be collected and disposed off at the

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
		jeopardize the public's safety and the ecosystem of the surrounding areas.		approved landfill site. - Waste generated should be sorted out and reuse of usable material should be taken into consideration to reduce the volume of waste. - Liquid wastes such as oil and grease, chemical solutions etc. shall be separated from the solid waste before disposed off to the designated landfill site.
	ii. During operational phase: -Estimated solid waste generated is 11.23tonnes/day -Improper and unorganized collection of waste.	- Create health hazard and habitats for disease vectors. -The rubbish accumulation will create eyesore and bad odor.	Low	ii. During operational phase: - The separation of waste shall be done as per the regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672). - The management of the residential area to set-up an on-site waste treatment (such as using food compost or food digester) for food waste from kitchens so that the food waste can be treated at site without the need to be sent to the landfill - Reuse and recycling of waste should also be considered to reduce the volume of

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Water quality	i. During construction phase: -Activities during land clearing and earthwork. - Production of power and steam from generators and other equipment during the construction phase involving the combustion of fossil fuels. -Disposal of construction waste.	- Excess runoff flows together with sediment along the way to the receiving waters will increase the turbidity of the stream and the concentration of suspended solids in the water. - Used engine oil is often poured “down the drain” and its concentration in a small area may cause severe localised pollution.	Severe	waste. i. During construction phase: - Provision of silt/ sedimentation traps / filter. - Provision of earth drains and earth bunds. - Adequate toilets / sanitary facilities for workers camp. - Provision of secondary containment.

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
		-Liquid waste from construction sites such as lubrication oil and chemicals, if discharged down the drains or down slope, will eventually end up in the river.		
	ii. During operational phase: -2,317.50 m ³ of wastewater will be generated with the corresponding influent load of 566.50kg of BOD ₅ /day and 700.40 kg of SS/day.	- If the effluent is not treated, it will impose a major pollution to the receiving watercourse.	Low	ii. During operational phase: - An existing STP which is located at the adjacent housing area i.e. Taman Krubong Perdana will be used to treat the wastewater from the development. The existing STP will need to be upgraded to ensure that it can cater for the additional wastewater
Ambient air quality	i. During construction phase: - Site preparation. - Vehicular movements. -Construction activities.	- Reduce air quality. - Impacts health and visibility.	Low	i) During construction phase: -Water dampening operation. -Speed limit for moving traffic. -Provision of tyre washing facility. -Proper approach on transporting construction material. -Proper method and environmental friendly material.

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
	ii. During operational phase: - Vehicles ingressing and eggressing the project site	- Increase the air pollution levels.	Low	ii) During operational phase: - Air pollution during operational phase is not likely to be significant as the proposed project does not involve any industrial activities which generate gaseous emission.
Noise level	i. During construction phase: - Noise from machineries and equipment.	- Noise impacts during earthworks and construction are mainly short term and confined to the period of works. - Will influence noise levels in the area.	Low	i. During construction phase: - Limit working hours to daylight hours only and construction activities are not allowed on rest day. - Controlling the speed of the vehicles entering the project site. - Hoarding should be placed as the first stage prior to the commencement of the construction.
	ii. During operational phase: - Vehicles arriving and leaving the Project site. - Increase in traffic generated by population growth.	- Have an indirect impact on the tranquility of the surrounding area.	Low	ii. During operational phase: - Landscape around the site would act as noise barrier.

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Socio-economic impact	i. During construction phase: - Construction activities. - Use of immigrant labour.	- Local residents may be subjected to air (dust) and noise pollution of the area. - Result in some social problems, which will affect the well-being of the local populace.	Low	- Project Proponent should ensure that their contractors provide suitable accommodation with adequate sanitary and toilet facilities for the workers. - Enforce sufficient control over the workers, especially immigrant labour so that no social problems will arise. - Having adequate and professional site management staff during construction.
	ii. During operational phase: - Completion of the development.	- It is expected to result in many positive impacts for the locals as the development will create employment opportunities. - Yield more positive socio-economic benefits.	Negligible	

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
Biological component and aquatic ecology	- Removal of flora and fauna.	- Habitat loss.	Low	- To commence construction works from the main road towards the inner areas. - Trees, shrubs and grass should be left untouched wherever possible so as to preserve the flora and fauna diversities. - Landscaping programs and revegetation must be carried out rapidly to prevent further land degradation. - The water source for wildlife in the area must not be disrupted.
Traffic Impact	i. During construction phase: - Construction vehicles.	- Generate an increase in road traffic.	Moderate	i. During construction phase: - Material transportation and heavy vehicles ingressing and egressing the site to be scheduled away from the peak hours.
	ii. During operational phase: - Traffic generated by the buyers/owners/tenants who reside in the residential area.	- Generate an increase in road traffic. - Cause traffic congestion.	Moderate	ii. During operational phase: - More lanes should be added at Junction A on State Road M133. - Having either roundabout or signalisation at the main access. - Proper maintenance of the State Road M133 as to accommodate the anticipated

Issue	Source of Impact	Potential Impact	Magnitude of Significant Potential Impact (Severe / Moderate / Low / Negligible)	Mitigating Measures
				traffic growth and the safety of the road user after the completion of the development.
Abandonment	-Abandonment during construction.	- Impact the existing water quality and the surrounding river system - Leave behind half completed structures and unmanaged construction materials. -Create adverse socio-economic impacts to the general populace. - Create a suitable habitat for harboring pests and disease vectors; and a potential site for indulgence in anti-social behavior.	Severe	- A proper abandonment plan shall be prepared appropriately to ensure all measures are taken care off. - If the abandonment occurs during construction, all equipments shall be removed from the site and re-vegetation shall also be considered. - For any scheduled wastes and solid / liquid wastes available at the site, they must be disposed off in the correct manner at the specified approved areas.

8.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

- 8.1 An EMP shall consist of an Environmental Monitoring Programme, Environmental Management Unit and Emergency Response Plan. The main function of these components is to allocate the responsibility of each party for planning, monitoring and undertaking the mitigating measures proposed during the construction and operation stages.
- 8.2 Land Disturbance Pollution Prevention and Mitigating Measures (LD-P2M2) shall be prepared and submitted as part of the EMP and shall be in accordance to the requirements and specifications stipulated in the Guidance Document for the Preparation of LD-P2M2.
- 8.3 The baseline monitoring conducted in this EIA and to be conducted for the EMP later as well as the following monitoring programme proposal shall cover all the three types of monitoring stated below:
- a.) Performance Monitoring (PM) – baseline monitoring which will identify the current environmental conditions at the site;
 - b.) Compliance Monitoring (CM) – environmental monitoring conducted to check the compliance to the stipulated environmental standards; and
 - c.) Impact Monitoring (IM) – environmental monitoring conducted to check the magnitude of the impacts from the development activities to the environment.
- 8.4 During construction phase, monitoring for surface water quality, silt traps / sediment pond discharge, ambient air quality and noise level shall be done. Details of the monitoring are as follow:

Table 4: Details of the Monitoring Programme

Monitoring Programme	Parameters	Frequency of Monitoring
Surface water Quality	Total Suspended Solid, pH value, BOD ₅ , COD, DO, Ammoniacal Nitrogen, <i>E.Coli</i> , <i>Total Coliform</i> and Oil & Grease	Once per month.
Silt traps / sediment pond discharge	Total suspended solid (TSS).	Once per month.
Ambient air quality	Total Suspended Particulate (TSP).	Quarterly interval or earlier should it be required by the DOE.
Noise level	L_{eq} , L_{max} , L_{min} and L_n continuously for 24-hour duration.	Quarterly interval or earlier should it be required by the DOE.

8.5 During operation phase, effluent from the sewerage treatment plant would need be taken monthly during the operational phase of the project before hand over to IWK. The proposed parameters to be tested are temperature, pH value, BOD₅, COD, SS, O&G, Ammonical Nitrogen (enclosed water body), Nitrate (enclosed water body) and Phosphorous (enclosed water body). The surface water quality is envisaged to have very minimal impact. Thus, no water quality monitoring is proposed during the operational phase. As for the ambient air quality monitoring and noise level monitoring, it can be carried out should it be required by the DOE. Parameter for the air quality monitoring should be TSP while L_{eq} , L_{max} , L_{min} and L_n should be carried out continuously for 24-hour duration for noise level measurement should it is required by the DOE.

9.0 STUDY FINDINGS

9.1 Based on the study, the main environmental impacts that need high attention are the soil erosion and the water quality and quantity. These two impacts are foreseen to be critical during the project implementation especially during earthwork activities.

Nevertheless, with proper mitigating measures in place, the impacts shall be able to be controlled and alleviated.

- 9.2 The development of the site into a residential area is considered as the most suitable option for the project site. The completion of the project will have a positive impact on the socio-economy of the area as well as the State, by utilising the available land with a compatible development in order to prevent the formation of unmanageable urban sprawl and congestion as a result of the continuous population and economic growth. The environmental and social benefits accruing from its implementation are far greater than if the 'No-Project option' or other project alternatives are chosen..
- 9.3 With careful planning and good construction and management practices, the Project will not bring about any significant adverse environmental impacts on the surroundings but rather its implementation will contribute to the development of the State in general.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

1.1 Project Title

This Environmental Impact Assessment (EIA) Report has been prepared for:

**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN MUKIM KRUBONG,
DISTRICT OF MELAKA TENGAH,
MELAKA.**

Hereinafter, it will be known as ‘The Project’. The project site which is located at Krubong, Melaka (Latitude: N 2° 19’ 52.8”, Longitude: E 102° 14’ 28.453”), is planned to be developed into a residential area with basic infrastructure and utilities, including a *surau*, community centre, guard house, kindergarten and a road network. **Figure 1.1** shows the project location. The total development area is approximately 152.25 acres of land (61.61 ha.). The project is described in detail in **Chapter 5**.

The proposed project is a prescribed activity that falls under **Activity 16** i.e. housing development covering an area of 50 hectares and more in the **First Schedule, Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015**. The project initiator is required to prepare and submit an Environmental Impact Assessment (EIA) report to ensure the Environmental Impact Assessment is undertaken, consonant with the protocols established by the Director General of the Department of Environment (DOE), Malaysia.

The proposed development is also in line with “Rancangan Tempatan Daerah Melaka Tengah 2015”. **Figure 1.2** shows the Proposal Map of “Rancangan Tempatan Daerah Melaka Tengah 2015”.

1.2 Project Initiator

This project is initiated by **Messrs. PB Realty Sdn. Bhd.** Any enquiries regarding the project may be directed to :

Majlis Perbandaran

SKALA
1 in : 1,400 m

PETUNJUK

- Tanah Lapang dan Rekreasi
- Pertanian
- Hutan
- Infstruktur dan Utiliti :
- Bekalan Elektrik
- Bekalan Air
- Pembentungan
- Pengangkutan :
- Kemudahan Pengangkutan

MAJLIS BANDARAYA MELAKA
Gedung Majlis
No. 1, Jalan Tun Razak - Ayer
Hang Tuah Jaya, 75450
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MAJLIS BANDARAYA MELAKA

ANDAKATA MELAK
Grafia Makmur
No. 1 Jalan Tun Razak - A
Bangi, Kuala Lumpur 43600

<http://www.mba.org>

PB REALTY SDN. BHD. (338851-D)

No.2, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka.
(Attn : Datuk Poh Geok Siong)

Tel : 06 – 337 3333

Fax : 06 – 336 5678

1.3 Consultant

An environmental study team associated by multi-discipline specialists led by **Datuk Ir. Othman Abdul Rahim**, an EIA Consultant registered with the Department of Environment (DOE Reg. No. C0006) has been appointed to carry out the Environmental Impact Assessment (EIA) Study. Enquiries and correspondence pertaining to this report can be made to:

O&L JURUTERA PERUNDING SDN. BHD. (Co. Reg. No.: 372321-V)

Consulting, Civil, Structural & Environmental Engineers,
No. 38, Jalan TU 40,
Taman Tasik Utama,
75450 Ayer Keroh, Melaka.
(Attn : Datuk Ir. Othman Abdul Rahim)

Tel : 06 – 232 2380/ 232 5215/ 253 4005

Fax : 06 – 232 7815

E-mail : oandl.melaka@gmail.com

1.4 Objectives of The EIA Study

The proposed project is located within an existing oil palm estate and rubber plantation. Land-use transformations will be significant once the development is completed. This EIA study is directed towards providing a comprehensive evaluation of these impacts and recommending suitable mitigation measures to alleviate those impacts that have potentially negative effects on the physical, biological or socio-economic environment. In this respect, the main objectives of the EIA study are:

- i. To describe the existing environment and resources used, based on existing data and other reports relating to the climate, hydrology and meteorological resources relevant to the proposed project;
- ii. Assess the extent of short term as well as long term environmental impacts which are likely to occur during both the construction and operational phases of the project based on the existing available information;
- iii. Provide advice on appropriate cost effective mitigation measures, which can be applied to limit adverse impacts to tolerable levels so that irreparable damage to the environment in the local and regional context does not occur;
- iv. Analyse the effectiveness of the proposed land-use transformation in protecting the environment as well as to ascertain impacts associated with earthworks and drainage arrangements;
- v. Provide an independent assessment on environmental issues connected with the proposed project to the project proponent and the relevant authorities for information and consideration; and
- vi. Propose to the project proponent an initial guidance for environmental surveillance and monitoring during construction and operation of the project.

The assessment of the environmental impact will be following the procedures laid down in DOE's Handbook of Environmental Impact Assessment Guidelines.

CHAPTER 2

TERMS OF REFERENCE

2.0 TERMS OF REFERENCE

2.1 Introduction

This Terms of Reference (TOR) is written as part of the preparation of the Environmental Impact Assessment (EIA) for:

**THE PROPOSED HOUSING DEVELOPMENT ON LOT 1 IN MUKIM KRUBONG,
DISTRICT OF MELAKA TENGAH,
MELAKA.**

The TOR has been prepared prior to the preparation of the EIA report in accordance with the latest EIA guidelines issued by the Department of Environment (DOE). The purpose of the TOR includes:

- i. To describe with enough details to understand the scope of the significant project work components;
- ii. To list and describe potential significant environmental impacts that will be affected by the project works or components which will need to be covered in detail in the EIA;
- iii. To outline alternative solutions that will be studied or described to justify that the project will result in the least environmental impacts;
- iv. To list out standards, criteria, methodologies etc. that will be used to assess the environmental impacts to be investigated; and
- v. To outline possible mitigation measures or best management practices from similar projects that may be used to address the environmental impacts on this project.

The endorsement of the TOR by the DOE has been received in a letter dated 23rd March 2017 as attached in **Appendix I**.

2.2 Project Initiator

This Project is initiated by **Messrs. PB Realty Sdn. Bhd.** Any enquiries regarding the Project may be directed to :

PB REALTY SDN. BHD. (338851-D)

No.2, Jalan IMJ 1,

Taman Industri Malim Jaya,

75250 Melaka.

(Attn : Datuk Poh Geok Seng)

Tel / Fax : 06 – 337 3333 / 06 – 336 5678

2.3 Project Consultants

An environmental study team associated by multi-discipline specialists led by **Datuk Ir. Othman Abdul Rahim**, an EIA Consultant registered with the Department of Environment (DOE Reg. No. C0006) has been appointed to carry out the Environmental Impact Assessment (EIA) Study. Enquiries and correspondence pertaining to this report can be made to:

O&L JURUTERA PERUNDING SDN. BHD. (Co. Reg. No.: 372321-V)

Consulting, Civil, Structural & Environmental Engineers,

No. 38, Jalan TU 40,

Taman Tasik Utama,

75450 Ayer Keroh, Melaka.

(Attn : Datuk Ir. Othman Abdul Rahim)

Tel : 06 – 232 2380/ 232 5215/ 253 4005

Fax : 06 – 232 7815

E-mail : oandl.melaka@gmail.com

Table 2.1 shows the list of team members who are involved in the EIA study.

Table 2.1 : List of EIA Team Members

Name	Qualification	Registration With DOE			Proposed Study Area
		Category	Area/ Field	ID. No.	
A. EIA STUDY TEAM LEADER					
Datuk Ir. Othman bin Abdul Rahim	B.Sc (Hons) Civil Engineering	EIA Consultant	- Hydrology - Water Quality	C0006	31 December 2017 - Project Description & Options - Construction Methods and Process - Hydrological Regime - Water Quality - Road Network & Traffic - Mitigating Measures
B. EIA CONSULTANT / CPESC					
Ms. Ng Shu Chin	M.Sc (Sanitary and Environmental Engineering), Certified Professional in Erosion & Sediment Control (CPESC No. 6585)	EIA Consultant	- Hydrology - Water Quality	C0270	31 December 2017 Soil erosion
C. EIA ASSISTANT CONSULTANT					
Faizah binti Othman	B. Eng (Hons) (Chemical Engineering)	Assistant Consultant	- Water Quality - Wastewater - Chemical & Industrial Processes	AC1321	Not applicable - Water Quality - Wastewater

2.4 Project Description & Scope

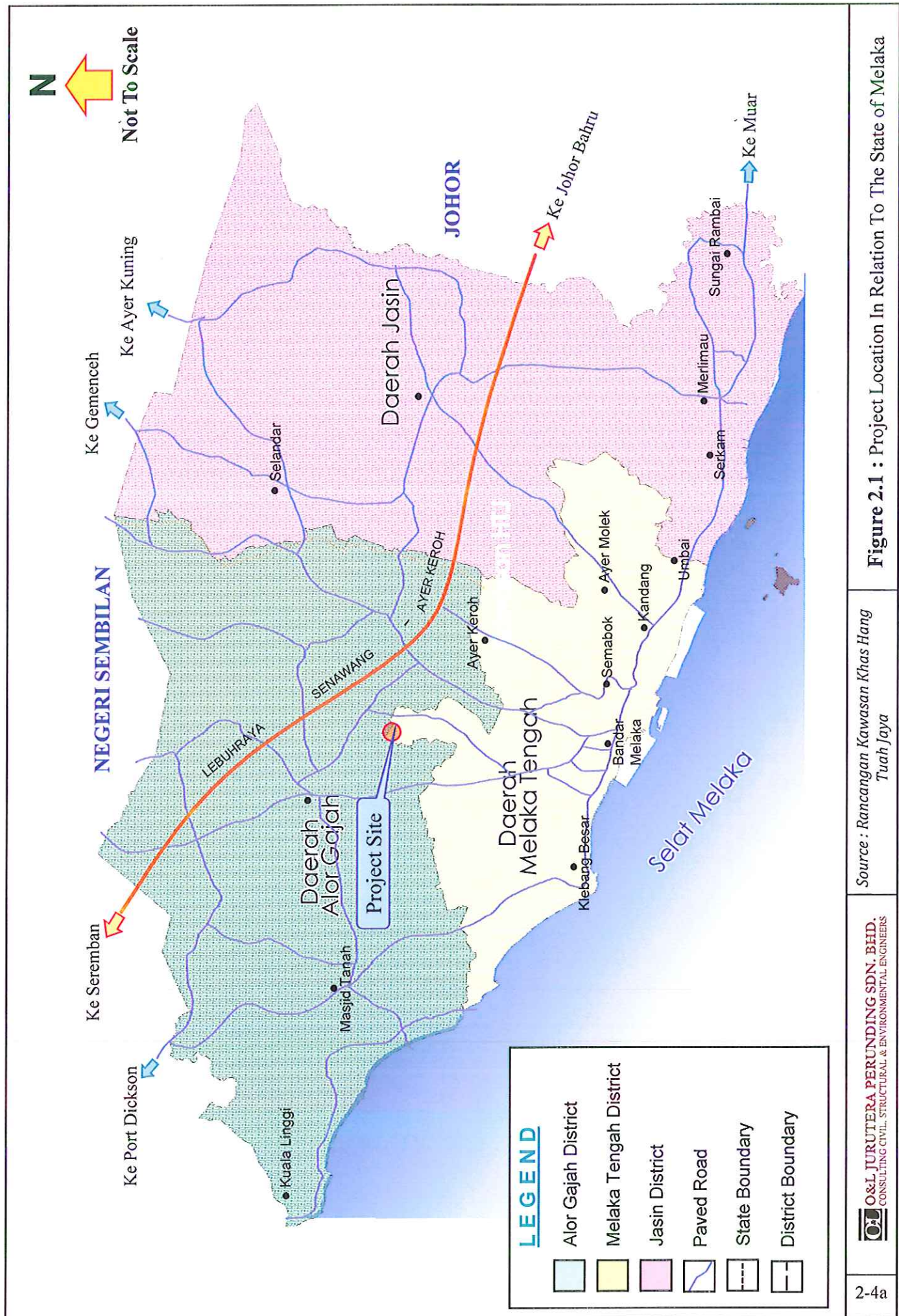
The project site is located on Lot 1 in Mukim Krubong, District of Melaka Tengah, Melaka (Latitude: N 2° 19' 52.8", Longitude: E 102° 14' 28.453"). The site is presently mostly covered with rubber and oil palm plantation and is generally undulating with original ground levels ranging from 11.174m to 62.545m above Mean Sea Level (MSL). **Figure 2.1** shows the location of the project site in relation to the State of Melaka while **Figure 2.2** shows the site plan.

The project consists of residential development with basic infrastructure and utilities, including a *surau*, community centre, guard house, kindergarten and a road network. The total development area is approximately 152.25 acres of land (61.61 ha.).

Since the proposed project is a prescribed activity that falls under **Activity 16** i.e. housing development covering an area of 50 hectares and more in the **First Schedule, Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015**, the project initiator is required to prepare and submit an Environmental Impact Assessment (EIA) report to ensure the EIA is undertaken, consonant with the protocols established by the Director General of the Department of Environment (DOE), Malaysia.

The project may be implemented in phases (location) subject to the project proponent's strategy in sales, marketing and the economic condition. For each phase, the implementation would have the following components (the planning and design are excluded);

- i. Survey for boundaries and engineering data information.
- ii. Site clearing and felling of trees, etc.
- iii. Perimeter drains and silt trap / sedimentation pond construction.
- iv. Earthworks – land profiling, slopes, cutting, filling and compaction works.
- v. Building works – piling, foundation, formworks, reinforcement, concreting, steelworks, etc.
- vi. Infrastructure (STP and TNB substation must be in the first phase) – sewerage reticulation, STP, water reticulation, electrical and telecommunication, drainage and road works.
- vii. Architectural, mechanical and electrical works – within building and road reserve.



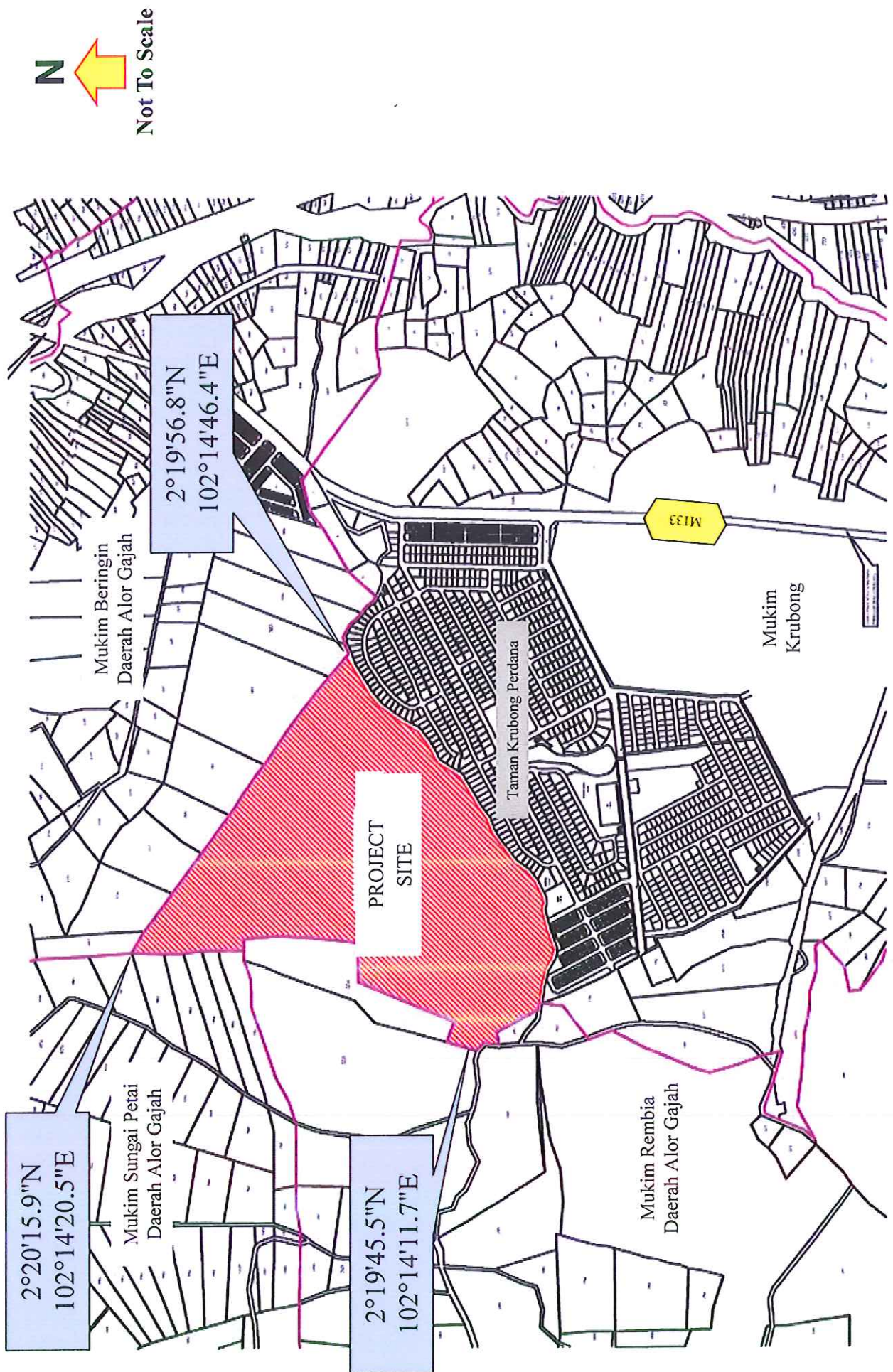


Figure 2.2 : The Site Plan Of Project Site

- viii. Landscaping works.

2.5 Alternatives Consideration

This section shall outline alternative solutions which will be studied or described to justify that the project will result in the least environmental impacts. The following are options that will be taken into consideration and will be further detailed out in this EIA:

- i. No-Project option – a comparison between “No-Project” and “With-Project” will be done to see the impacts and the advantages / disadvantages of having the project;
- ii. Layout option – to consider and study the most suitable arrangement of the project layout in order to prevent / minimise environmental degradation;
- iii. Minimising site clearing and earthworks by phasing (location);
- iv. Construction method and best construction practices.

2.6 Significant Environmental Impacts & Study Boundaries

The potential impacts to be studied and detailed out in the EIA report are as follow;

- i. Landuse of neighbouring lots - impact from the project to the neighbouring lots as well as the impact from the neighbouring lots to the project inclusive of the impact on the water intake will be identified. The nearest neighbouring development i.e Taman Krubong Perdana is as shown in **Figure 2.3**.
- ii. Biomass – production of biomass from site clearing activity. The affected flora and fauna from the site clearing activity shall be studied as well.
- iii. Soil erosion – site clearing and massive earthwork activities will lead to soil erosion. A soil erosion study will be carried out by a Certified Professional in Erosion and Sediment Control (CPESC) and it shall include soil test analysis, soil loss and sediment loss computation.

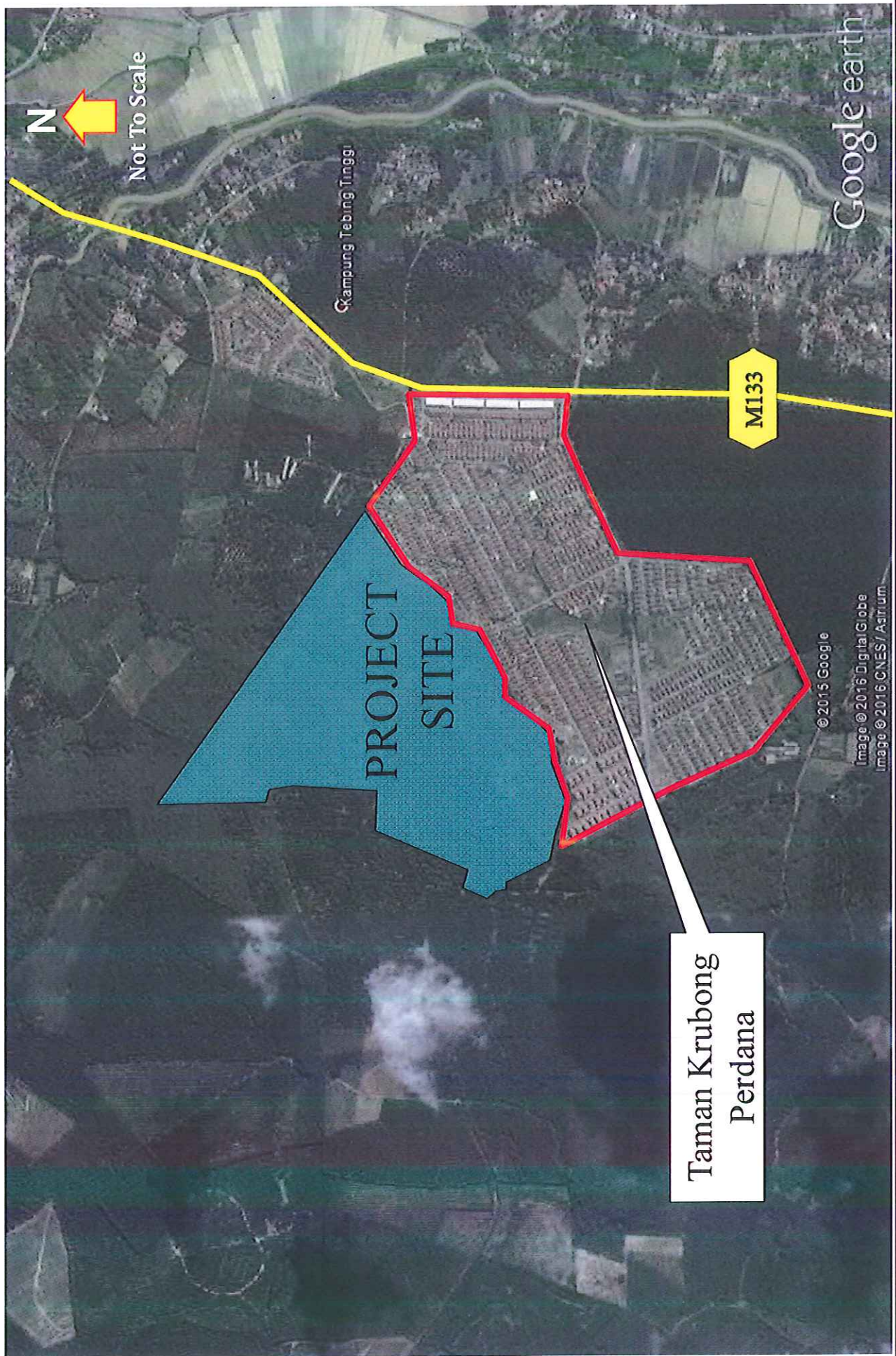


Figure 2.3: Nearest Neighboring Development

Source : Google Earth

- iv. Hydrological regime – changes in landuse at the site might result in additional impervious area which will consequently increase the amount of surface runoff, and affect the water quality at the surrounding area.
- v. Solid waste - expected to be generated during the construction phase and operational phase when residents and property owners / tenants move in to stay.
- vi. Scheduled waste – generated from the usage of oil / chemicals for construction / operation (including machineries / equipment mobilization) purposes.
- vii. Water quality – impacts on the water quality during each phase of the construction and operation for the proposed development will be identified. Identification whether the site is located at the upstream or downstream of water intake point will be carried out. If the site is located at downstream of water intake, water quality modelling is not needed. Baseline data of the existing water quality at the site before any development is made will also be carried out.
- viii. Air quality – expected to be impacted during construction phase. A baseline monitoring will be conducted to determine the existing air quality at the site before the development starts.
- ix. Noise level - arise during site preparation, earthworks and infrastructure construction, haulage operations and buildings erection. A noise level monitoring will be done to obtain baseline data for the existing noise level at the site.
- x. Traffic impact - during construction phase, the construction traffic including mobilisation of machineries and equipment will affect the tranquillity of the nearby residential area while during operational phase, the increase of traffic to the project site will have an impact to the nearby roads and community. Traffic Impact Assessment (TIA) which has been conducted by O & L Jurutera Perunding Sdn. Bhd. will be included in the EIA report.
- xi. Abandonment - the abandonment of the proposed project would definitely create an adverse impact on the environment. However, the severity of the impact strongly depends on the stage of development. The impact severity shall be further deliberated in the EIA.

2.7 Assessment Standard & Methodologies

Landuse, Topography & Geological Character

Besides conducting a visit to the site and observation at the nearby areas, secondary resources such as topography maps, Google Earth / Map and the Local Plans will be used as references to complete the landuse exercise as well as to identify the topography and geological character of the site.

Soil Type Determination & Soil Loss Computation

In order to determine the soil type at the site, a few samples of soil shall be taken at the project site and shall be sent to laboratory for analysis. The parameters to be analysed include Particle Size Distribution, Organic Matter Content and Bulk Density / Dry Density.

To assess the soil erosion risk, Guideline for Erosion and Sediment Control in Malaysia published by the Department of Irrigation and Drainage Malaysia, 2010 will be referred to. The basic equation to be used is based on the updated Universal Soil Loss Equation (USLE) developed by Wischmeier & Smith (1962). The updated USLE, which is also known as Revised Universal Soil Loss Equation (RUSLE) has been applied and recognised worldwide as one of the fundamental approaches that is widely acceptable and practical for the estimation of sheet and rill erosion. Detail calculation and assessment will be included in the EIA report.

Hydrology

Since the amount of surface runoff is expected to increase once the project has started, runoff computation will be performed in the EIA to see the magnitude of the impact. The calculation will be done using the Design Flood Hydrograph Estimation For Rural Catchments in Peninsular Malaysia - Hydrological Procedure No.11 (HP No. 11) published by Drainage and Irrigation Division (DID), Ministry of Agriculture, Malaysia 1976. Detail calculation will be included in the EIA report.

Besides calculating the amount of surface runoff, this section will also take into consideration flooding issue that might be present at the site or the nearby areas. Information on flooding areas will be obtained from the Department of Irrigation & Drainage (DID) for assessment and analysis.

Meteorology

The meteorological description will be deliberated using the meteorological data from Batu Berendam Airport Principal Station (No. Station: 48665 – N 02°16', E 102°15') obtained from Malaysian Meteorological Service Department.

Baseline monitoring

Water Quality Monitoring

As mentioned in **Section 2.6**, water quality monitoring will be done to obtain a baseline data. The parameters to be tested and analysis method are as listed in **Table 2.2** below. All analyses shall be undertaken by SIRIM certified commercial laboratory which meet the requirements of ISO/IEC Guide 25, EN45001 and the relevant requirements of ISO 9001/2.

Table 2.2: Parameters To Be Tested & Standard Method For Laboratory Analysis

PARAMETER	METHODS
pH Value	APHA 4500-H ⁺ B, 2005
Biochemical Oxygen Demand @ 5 days at 20 °C	APHA 5210 B/APHA 4500-O G, 2005
Chemical Oxygen Demand	APHA 5220 C, 2005
Suspended Solids	APHA 2540 D, 2005
Mercury as Hg	APHA 3112 B, 2005
Cadmium as Cd	APHA 3111 B, 2005
Chromium as Cr ⁶⁺	APHA 3500-Cr D, 2005
Arsenic as As	APHA 3114 C, 2005
Cyanide as CN	OSRMA P.456
Lead as Pb	APHA 3120 B, 2005
Chromium Total as Cr	APHA 3500-Cr D, 2005
Copper as Cu	APHA 3120 B, 2005
Manganese as Mn	APHA 3120 B, 2005
Nickel as Ni	APHA 3120 B, 2005
Tin as Sn	APHA 3114 C, 2005

PARAMETER	METHODS
Zinc as Zn	APHA 3120 B, 2005
Boron as B	APHA 3120 B, 2005
Iron as Fe	APHA 3120 B, 2005
Phenol	APHA 5530 B,C, 2005
Salinity	APHA 209 B (14th)
Sulphide as S ²⁻	APHA 4500-S ²⁻ F, 2005
Oil & Grease	APHA 5520 B, 2005
Ammoniacal Nitrogen as NH ₃ -N	APHA 4500-NH ₃ B & F, 2005
Dissolved Oxygen	APHA 4500-O G, 2005
<i>E.coli</i> count	In-House Method-Micro-02 (Based on APHA 9222 G)
Total Coliform Count	In-House Method-Micro-01 (Based on APHA 9222 B)
Temperature	APHA 2550 B, 2005

The monitoring results will be compared to Class IIA of the National Water Quality Standards (NWQS).

Noise Level Monitoring

Noise measurement shall be carried out using a pre-calibrated precision integrating noise meter stationed at the selected measurement points for 24 hours at each point. The parameters to be tested include L_{eq} , L_{Max} , L_{Min} and L_N of the A – weighted sound level. The results will then be compared with the standard as specified in Schedule 1 in Annex A of The Planning Guidelines For Environmental Noise Limits and Control. All analyses shall be undertaken by SIRIM certified commercial laboratory.

Air Quality Monitoring

The measurement of Total Suspended Particulate (TSP) shall be carried out in accordance to the ASTM D4096 method released in the year 1993 and the analysis shall be undertaken by a SIRIM certified commercial laboratory. The monitoring results will then be compared to the standard as specified in Malaysian Recommended Environmental Air Quality Guidelines.

Others

For other impacts that will be investigated, secondary resources will be used. The secondary resources to be referred to include Population and Housing Census of Malaysia, 2010 to assess the socio-economy impact, approved EIA reports, Traffic Impact Assessment (TIA) report by O&L Jurutera Perunding Sdn. Bhd. etc.

2.8 Consideration of Concurrent Projects

The on-going development located near to the project site is owned by Paduwan Development Sdn. Bhd. The development is located approximately 1.5km south-east from the project site. The potential impact arising from the project site to the neighbouring project site and vice versa will be assessed.

2.9 Study Timeline

The study inclusive of the TOR and the EIA is expected to be completed within 6 months. **Figure 2.4** shows the timeline detail breakdown:

ID	Task Name	Duration	Start	Finish	February	March	April	May	June	July
1	TOR Preparation	3 wks	Wed 01-02-17	Tue 21-02-17						
2	TOR Submission & Approval	5 wks	Wed 22-02-17	Tue 28-03-17						
3	EIA Preparation	55 days	Wed 29-03-17	Tue 13-06-17						
4	Soil Erosion Study by CPE	6 wks	Wed 29-03-17	Tue 09-05-17						
5	Baseline Monitoring	4 wks	Wed 29-03-17	Tue 25-04-17						
6	Runoff Computation	1 wk	Wed 29-03-17	Tue 04-04-17						
7	Data gathering & analysis	3 wks	Wed 10-05-17	Tue 30-05-17						
8	Report-writing	2 wks	Wed 31-05-17	Tue 13-06-17						
9	EIA Submission & Approval	5 wks	Wed 14-06-17	Tue 18-07-17						

Project: TOR & EIA Timeline Date: Tue 28-02-17	Task	Milestone	External Tasks
	Split	Summary	External Milestone
	Progress	Project Summary	Deadline
Page 1			

Figure 2.4: Timeline of Studies

2.10 Possible Mitigation Measures

Issue	Possible Mitigating Measures / Best Management Practices (BMPs)
Soil erosion	<u>During construction phase</u> -Proper Selection of land clearing period and duration. -Soil investigation and planning. -Instant re-vegetation and turfing. -Terracing and retaining walls. -Installation of sediment / silt fence. -Temporary earth drains and bunds. -Provision of silt / sedimentation traps. -Filling and stockpile materials which are subjected to erosive force shall be properly located within the project site and covered. -Preparation of Erosion & Sediment Control Plan (ESCP) whenever it is needed and practical to be implemented on-site. -Non-construction measures or actions for the BMPs should be referred and adopted whenever and wherever possible.
Hydrological regime	<u>During operational phase</u> -Vegetation at site. -Terracing and retaining walls wherever needed. <u>During construction phase</u> -Proper temporary internal drainage system shall be constructed and maintained at all times. <u>During operational phase</u> -Proper internal drainage system shall be constructed and maintained at all times. -Provision of detention pond.
Solid waste generation	<u>During construction phase</u> -Proper handling of biomass e.g. biomass generated can be used as mulching for green OR cut into manageable sizes, collected and transported out OR can be sold and used for commercial applications. -Waste generated shall be collected and disposed off at the approved landfill site. -Any reusable or recyclable waste should be segregated as to enable recycling and waste minimisation to take place. -Any open burning and illegal dumping to the adjacent land is strictly prohibited. <u>During operational phase</u> -Collection of solid waste shall be performed by the privatised garbage contractors appointed by SW/corp. -Wet solid waste from kitchen shall be separated from other solid waste. - Adequate garbage bins shall also be provided at public areas.

Issue	Possible Mitigating Measures / Best Management Practices (BMPs)
	- Waste generated should be sorted out as per the regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672) which requires solid waste to be segregated at source. - Reuse or recycling of garbage should be taken into consideration.
Scheduled waste generation	<u>During construction phase</u> -The waste oils shall be stored in 200L drums and shall be collected by licensed scheduled waste contractor approved by DOE for recycling or disposal. -Temporary storage of the scheduled waste shall have an impermeable floor, bunded and covered with a simple structure of roofing to protect the container from the weather. - The storage area for schedule waste shall be enclosed on at least 3 sides, have adequate ventilation, be covered to prevent from rainfall from entering, be arranged so that incompatible materials are appropriately separated and have a signboard set up with the word DANGER <u>During operational phase</u> No significant impact is expected. Nevertheless, proper handling and disposal of scheduled waste is required should there be any usage of scheduled waste during operational phase.
Water quality	<u>During construction phase</u> -Provision of silt/ sedimentation traps. -Temporary drains and earth bunds. -Adequate toilets / sanitary facilities for workers camp. -Provision of secondary containment. <u>During operational phase</u> - Proper management of used oil from the oil interceptor or grease traps. - Proper sewerage treatment plant.
Ambient air quality	<u>During construction phase</u> -Water dampening operation. -Control the speed limit for moving traffic. -Provision of tyre washing facility. -Proper approach on transporting construction material. -Proper method and environmental friendly material. -Provision of hoarding

Issue	Possible Mitigating Measures / Best Management Practices (BMPs)
	<u>During operational phase</u> -Air pollution during operational phase is not likely to be significant as the proposed project does not involve any industrial activities which generate gaseous emission.
Noise level	<u>During construction phase</u> - Limit working hours to daylight hours only and construction activities are not allowed on rest day. - Controlling the speed of the vehicles entering the project site. - Hoarding should be placed as the first stage prior to the commencement of the construction. - Driven pile will produce higher noise level compared to jack-in / injection pile and bore pile. Hence, suitable piling method shall be adopted to prevent or reduce noise pollution (if there is any piling works). <u>During operational phase</u> When fully completed, the main source of noise interference would be from the additional traffic entering and leaving the development, which is not expected to be significant. Landscape around the site would also act as noise barrier.
Socio-economic impact	<u>During construction phase</u> -Project Proponent should ensure that their contractors provide suitable accommodation with adequate sanitary and toilet facilities for the workers. - Enforce sufficient control over the workers, especially immigrant labour so that no social problems will arise. - Having adequate and professional site management staff during construction. <u>During operational phase</u> No significant negative impact is expected during operational phase.
Flora and Fauna	<u>During construction phase</u> -It is necessary for the construction works to commence from the main road towards the inner areas to allow for gradual migration of the threatened species into the nearby estate. -Trees, shrubs and grass should be left untouched wherever possible so as to preserve the flora and fauna diversities. -Pollution of wildlife water source must be prevented to guarantee a "safe" water hole for the faunal species. <u>During operational phase</u> -Establish landscaped facilities which will provide supplemental habitats and food sources for the birds and small mammals that would be beneficial to the fauna.
Traffic Impact	<u>During construction phase</u> -Haulage activities, material transportation and heavy vehicles ingressing and egressing the site to be scheduled away from the commuter peak hours.

Issue	Possible Mitigating Measures / Best Management Practices (BMPs)
	-The allocation of warning signboards as a warning of heavy vehicles access and egress shall also be adopted at the road near to the entrance of the project site during construction stage. <u><i>During operational phase</i></u> -Will be based on the recommendation in Traffic Impact Assessment (TIA) prepared by O&L Jurutera Perunding Sdn. Bhd.
Abandonment	- A proper abandonment plan shall be prepared appropriately to ensure all measures are taken care off.

CHAPTER 3

STATEMENT OF NEED

3.0 STATEMENT OF NEED

The Melaka Government has adopted a strategy of developing the State into a City-State by the year 2020. It aims to achieve this mainly by intensively developing the industrial and tourism sectors which will have a positive impact on population, job opportunities and demand for residential, commercial and industrial properties. The population for the state is projected to rise to 960,500 persons by the year 2020 as shown in the table below:

Table 3.1 : Population Estimates & Projection For The State of Melaka

POPULATION				
2000	2005	2010	2015	2020
646,600	737,300	823,600	889,000	960,500

Source: The Official Portal of Department of Statistics Malaysia

As such, the increase of the population will subsequently leads to an increase in housing demand in the State.

The Project is located in Mukim Krubong, District of Melaka Tengah. The proposed site is suitable to be developed into a residential area as it is strategically located adjacent to an existing housing area i.e. Taman Krubong Perdana and most of the nearby areas are housing areas / settlements. It is located about 5 km road distance from the Krubong Industrial Area which will be able to serve the need for accommodation for the industrial workers. The Project is envisaged to complement the existing land use and would become one of the attractions for economic growth. It is predicted to generate more development or as a stepping stone for more development within the area.

Apart from the provision of housing area, the project is also intended to divert development away from the densely populated area towards the countryside which has the potential to be developed. This is also to moderate and ensure an even balance of economic growth in all the three districts in Melaka. **Figure 3.1** shows the densely populated areas in Melaka.

The proposed project has been conceived to achieve the following objectives :-

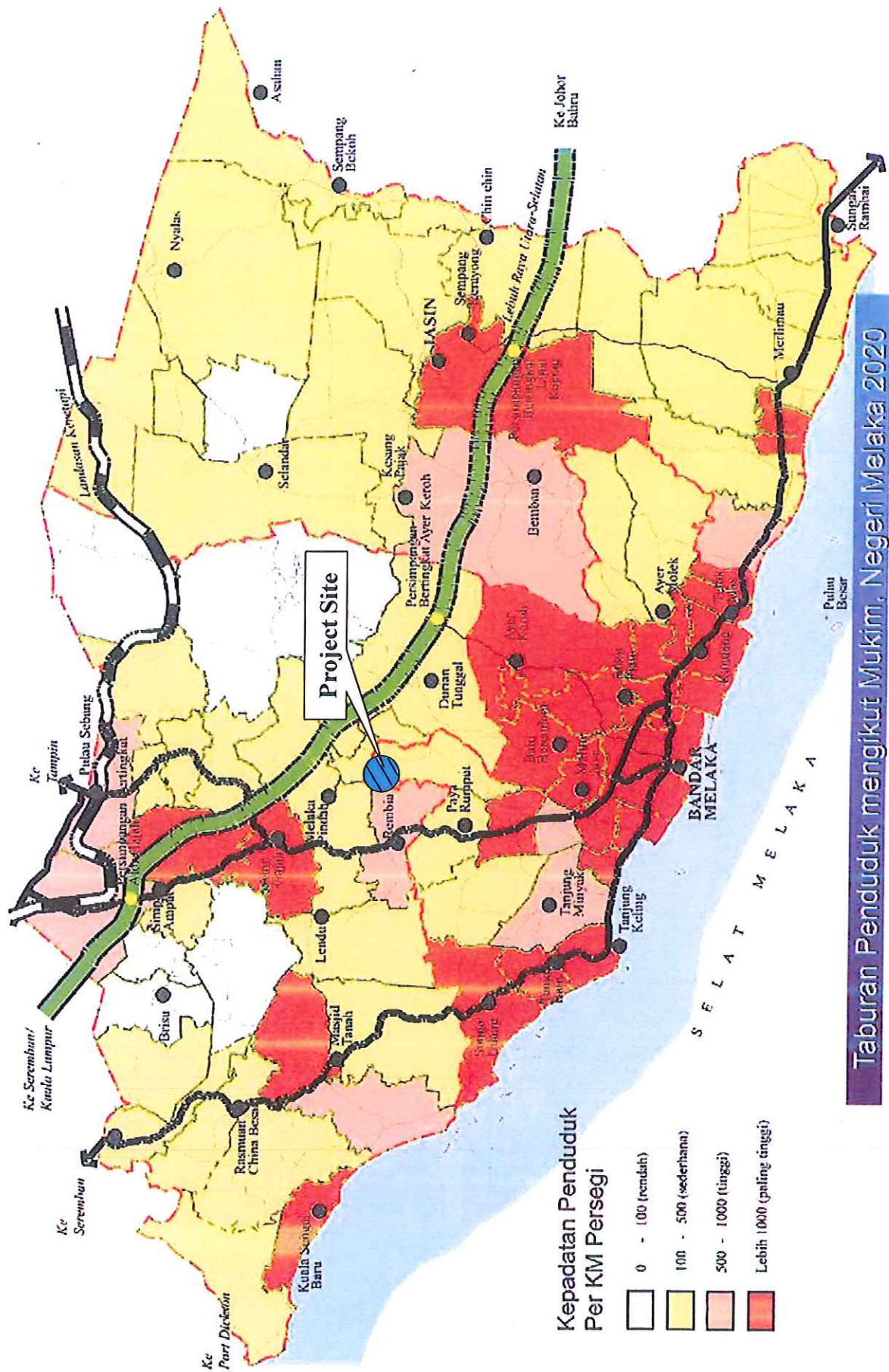


Figure 3.1 : Densely Populated Areas in Melaka

Source : Rancangan Struktur Negeri Melaka

- a) To provide a new pro-environment bias residential development area with a well planned concept in a green and natural environment;
- b) To provide a quality and affordable development area for the local populace especially the middle income groups in the State;
- c) To fully utilize the available space for environmental sustainable development; and
- d) To generate higher income to the State by boosting the monetary value of the existing land.

CHAPTER 4

PROJECT OPTIONS

4.0 PROJECT OPTIONS

Project options considered and evaluated during the planning process are one of the key elements to be documented in the EIA report. In this chapter, the details of the various project options which have been taken into consideration will be discussed and deliberated in detail. The principle feature of each option, including the advantages and disadvantages of the proposed options will be discussed as to attest that the project has been planned adequately during the planning process.

The project options which have been taken into consideration for this project are as follows;

- No-Project option;
- Site option;
- Layout option; and
- Construction method option.

4.1 No-Project Option

No-Project option is a compulsory option that needs to be evaluated for all types of projects that require the preparation and submission of EIA report. For most of the physical development project which are not located within or near to an Environmental Sensitive Area (ESA), i.e., natural flood plain, steep slope, etc. the proposed project will always benefit the regional population after the completion. As the project site is not located within or adjacent to an ESA and the existing land use of the site which is mainly covered with rubber and oil palm plantation, the proposed project is anticipated to generate the following benefits not only to the regional population, but the State and Nation as well.

- i) Creation of a new housing area which is self-sufficient and designed according to standards necessary to sustain quality living that complement to the

surrounding land use could enhance the economic potential of the region in the State and Nation;

- ii) Ensure the population and economic growth are consistent with the environmental conservation and not at the cost of environmental protection;
- iii) Provide better options and more affordable houses for the local populace and in due course of residing the unplanned sparse or scattered human settlements;
- iv) Generate higher income for the State and Nation deriving from taxation of land and business activities;
- v) Increase employment opportunities during the construction stage and boost up the monetary value of the existing land which will benefit the local populace;
- vi) Avoid the formation or creation of unmanageable urban sprawl and congestion as a result of the continuous population and economic growth; and
- vii) Sustainably utilise the available land with a compatible development in order to ensure the continuous growth of the socio-economy of the State.

On the other hand, if No-Project option is adopted, all benefits that are going to be generated by the project would be denied. A comparison of “No – project” option and “With – project” option from the aspects of social, economical and environmental benefits are summarised in **Table 4.1**.

Table 4.1: Comparison of No – Project and With – Project Options

No	No – Project Option	With – Project Option
1.	Land will remain as rubber and oil palm plantation with moderate income.	A well-planned development will be established and the monetary value of the existing land will increase.
2.	There will be moderate income to the State.	Higher income to the State derived from taxation of land and business activities of the development.

No	No – Project Option	With – Project Option
3.	Existing Noise level remains the same.	Noise levels will increase due to an increase in vehicular traffic during construction and urbanisation after completion.
4.	Existing ambient air quality will remain the same.	Short-term increase of suspended particulate during the construction and increase of air pollutants due to urbanisation, viz., additional vehicle volume and population.
5.	River water quality remains the same.	Increase of effluent flow into the river yet the impact is not expected to be significant as a Sewerage Treatment Plant is provided to treat all domestic wastewater before discharge.
6.	The volume of surface runoff and natural infiltration rate remains the same.	Increase in surface runoff and decrease in infiltration. It is expected to be significant due to the size of the project. Mitigating measures are important to reduce the impact.
7.	Socio-economy of the area remains the same.	The development will generate increased business that will benefit the regional economy and local populace.
8.	The natural ecology of the site remains the same.	Some changes are expected in the ecosystem arising from the development. The proposed project involves land clearing during construction stage, which has an impact to the environment. However, these impacts might be insignificant, if proper mitigating measures are in place.

4.2 Site Option

The site is considered suitable for the proposed project due to the following reasons:

- i. Although located on the outskirts of Melaka Tengah, the proposed location is situated in a developing area as the Government is diverting the development away from the city. Thus, the proposed development can be seen as complementing the existing land use as it provides a well-planned residential area.
- ii. The development concept proposed by the project proponent is unique and could act as an initial catalyst to unionise the scattered villages in order to form a well-organised community with the basic facilities provided.
- iii. The project is easily accessible and is located beside the state road M133 which connects Lebuhraya SPA and Parit Melana.
- iv. Public utility services and infrastructure, such as electricity, water supply and telecommunications are readily available at the site as there are a few existing settlements within the area.
- iii. The proposed project is compatible and complements the surrounding land use which is mostly residential. Moreover, the proposed location is expected to offer a serene and tranquil environment as it is located a distance from the urban centre.

4.3 Layout Option

Layout option is a very important option to be considered for land development project. The orientation of the proposed components is one of the principal factors that will decide on the extent of the potential impact. For example, a high-rise building located on the steep slope or an industrial land situated immediately next to a residential area for a newly proposed township.

In this section, the evolvement of the project layout or how the initial proposed layout had changed to the final layout submitted for the authority's approval will be clearly illustrated for each submission. The project layout that had been prepared and discussed before the coming up of the final layout are illustrated in **Figure 4.1**. The final layout is given in **Figure 4.2**. Comparing these two layouts, there is no significant difference between them except on the slope reserve. Allocation of slope reserve is of high importance due to the fact that the site is located on an undulating area. Sufficient slope reserve is provided in the final layout (as shown in **Figure 4.2**) to ensure a gentler and safer slope. Since the proposed housing development is located next to an existing residential area i.e. Taman Krubong Perdana, the proposed final layout is not foreseen to have any significant environmental concern. In fact, the proposed development will complement the current landuse near the site.

4.4 Construction Method Option

There are many available construction method options which can be implemented to develop the proposed project. The options to be implemented must always be able to protect / minimise environmental degradation throughout the construction period. This shall include usage of precast structure such as slabs, beams and columns which have been manufactured in a controlled environment i.e. factory hence has less environmental impact during its installation at the project site. Mechanisation shall also be adopted whenever possible to ensure quality consistency and minimise environmental degradation. Shall there be any piling works during the construction, it is suggested that suitable piling method be adopted to prevent emission of black smoke from the machinery which will pollute the air. Besides that, it is also advised that Green Building Index (GBI) system is adopted to assess and improve environmental attributes of the proposed development.



	BL UNIT	BL LOT	KELUASAN		%
			M2	EKAR	
			62200m ²	1537ek	9.83
			29752m ²	7.35ek	4.70
			5024m ²	1.24ek	0.80
			496m ²	0.12ek	0.08
			1000m ²	0.25ek	0.16
			1000m ²	0.25ek	0.16
			1000m ²	0.25ek	0.16
			43244m ²	10.68ek	6.83
			618m ²	0.15ek	0.09
		1	3751m ²	0.93ek	0.60
		1	3305m ²	0.82ek	0.53
Pangrehan 20x45		6	1766m ²	0.44ek	0.28
Pangrehan 30x-20x45		1			
2 x 11'					
		9			
BERPENGAWAL		4			
20 x 70	940 Unit				
40 x 60	94 Unit				
50 x 60	2 Unit				
	4 Unit				
	4 Unit				
20 x 70		474			
	1046 Unit	478			
MLK:					
40% = 606 Unit		1			
	648 Unit				
	3 Unit				
274 P3					
10 P3					
245 P3					
		479			
	1168 Unit				
		488	532966m ²	136.41ek	100

CHAPTER 5

PROJECT DESCRIPTION

5.0 PROJECT DESCRIPTION

5.1 Location

The project site is located on Lot 1 in Mukim Krubong, District of Melaka Tengah, Melaka. The proposed site is accessible from all parts of the State through the existing road network. The main access to the project site is from the State Road M133 which stretches adjacent to the site from north to south connecting Lebuhraya SPA (Sg. Udang – Paya Rumpit – Ayer Keroh) and Parit Melana. Taman Krubong Perdana is situated to its south and a low-cost housing estate, Taman Inang Sari is situated to its east. Lebuhraya SPA lies approximately 5 km from the southern boundary of the project site. The approximate road distances separating the site from the existing urban areas / landmarks in Melaka are;

- 20.0 km north of Melaka City
- 14.0 km northwest of Ayer Keroh Toll Plaza
- 11.0 km north of Batu Berendam Airport

The project location and the site plan are as shown in **Figure 2.1** and **Figure 2.2** respectively in **Chapter 2**.

5.2 Site Description

The project site comprises of a total area of 152.25 acres. It is presently mostly covered with oil palm and rubber plantation. The site is generally undulating with original ground levels ranging from 11.174m to 62.545m above Mean Sea Level (MSL).

Currently, the project site is accessible from State Road M133 via the existing tracks within the site which are used for palm oil fruit / rubber collection. In terms of hydrology, the project site is situated within Sg. Melaka river catchment. Sg. Melaka is located about 1 km to the east of the project site and it flows in a north-south direction.

5.3 Development Proposal

The proposed project is intended to be developed into a residential area. The types of components proposed are residential (consisting of terrace and semi-detached houses, bungalows and affordable flats) and basic infrastructures and facilities. **Figure 4.2** in **Chapter 4** shows the layout plan of the proposed development.

5.3.1 Project Components

Generally, the components proposed for the project can briefly be grouped into two main categories, viz., residential and basic infrastructure. The proposed residential can be further divided into smaller groups based on the proposed built-up area as well as the design for each category, i.e. semi-detached, terrace and flats. The percentage and acreage for each development category are summarised in **Table 5.1** and the details for each category of development proposed are deliberated in the following section.

Table 5.1: Details Of The Proposed Development

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
Infrastructure			
Road reserve	-	16.27	10.68
Open space / "Gili-gili"	-	2.60	1.71
Open space	-	0.29	0.20
Detention pond	-	3.01	1.98
Utility route reserve	-	1.09	0.72
Surau reserve	-	0.21	0.14
Kindergarten reserve	-	0.13	0.08
Community centre reserve	-	0.26	0.17
Slope reserve	-	5.02	3.30
Drainage reserve	-	0.07	0.04
Water tank & suction tank site	1	0.94	0.61
Main Distribution Substation (PPU) & Main Switch Station (SSU)	2	0.67	0.44
Electrical substation	7	0.45	0.30
RORO / Temporary BKS	-	-	-
Sub-Total (A)	10	31.01	20.37
Residential			
Phase A	-	-	-
Phase A1: 2- Storey Terrace Lots (20' x 70')	75	2.77	1.82
Phase A2: 2- Storey Terrace Lots (20' x 70')	77	2.82	1.85
Phase A3: 2- Storey Terrace Lots (20' x 70')	69	2.51	1.65

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
Phase B (Strata Title)	-	20.19	13.26
Phase B1: 2- Storey Terrace Lots (22' x 70')	65	-	-
Phase B2: 2- Storey Terrace Lots (22' x 70')	124	-	-
Phase B3: 2- Storey Terrace Lots (22' x 70')	64	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
Paved road	-	-	-
Phase C (Strata Title)	-	22.55	14.81
Phase C1: 2- Storey Terrace Lots (22' x 70')	61	-	-
2- Storey Terrace Lots (22' x 72')	58	-	-
Phase C2: 2- Storey Terrace Lots (22' x 72')	90	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
9m Utility route reserve	-	-	-
Paved road	-	-	-
Phase D (Strata Title)	-	34.81	22.86
Phase D1: 2- Storey Terrace Lots (22' x 70')	23	-	-
2- Storey Terrace Lots (22' x 72')	41	-	-
Phase D2: 2- Storey Terrace Lots (22' x 72')	82	-	-
Phase D3: 2- Storey Terrace Lots (22' x 72')	82	-	-
Phase D4: 2-Storey Bungalow Lots ($\pm 5,000\text{ft}^2$)	2	-	-
2- Storey Semi-D Lots (40' x 80')	54	-	-
Phase D5: 2- Storey Terrace Lots (22' x 70')	42	-	-
2- Storey Terrace Lots (22' x 72')	41	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
9m Utility route reserve	-	-	-
Paved road	-	-	-
Phase E (Strata Title)	-	20.04	13.16
Phase E1: 2- Storey Terrace Lots (22' x 70')	94	-	-
Phase E2: 2- Storey Terrace Lots (22' x 70')	66	-	-
Phase E3: 2- Storey Terrace Lots (22' x 70')	76	-	-
Open space / landscape area	-	-	-

Project Component	Lot / Unit	Land Area (Acres)	Percentage (%)
Guard house	1	-	-
Community hall / MC room	1	-	-
Slope area	-	-	-
Visitors Car Park	3	-	-
Paved road	-	-	-
Phase F	-	-	-
Phase F1: 2- Storey Terrace Lots (20' x 70')	75	2.64	1.74
Phase F2: 2- Storey Terrace Lots (20' x 70')	92	3.34	2.20
Phase G	-	9.56	6.28
3 blocks of 10-storey affordable flats (includes <i>surau</i> , kindergarten and MC room)	567	-	-
Open space / landscape area	-	-	-
Guard house	1	-	-
Garbage house (RCP)	3	-	-
Paved road	-	-	-
Parking	1,251	-	-
Sub-Total (B)	-	121.24	79.63
Overall Total		152.25	100.00

a) Infrastructure

Infrastructure will occupy 31.01 acres of the land at the proposed site. It will include road reserve, detention pond, electrical substation and also facilities such as *surau* and kindergarten for the residents of the housing area as stated in **Table 5.1**.

b) Residential

Residential development is the main component of the project. It will eventually occupy 121.24 acres or 79.63% of the project area. The residential area will consist of four types of housing development i.e. terrace lots, semi-detached lots, bungalow lots and affordable flats with a total of 2,020 residential units.

5.3.2 Implementation Schedule

The implementation of the project is planned to start with site clearing and earthwork activities. These include putting up metal hoarding along the main road, constructing wash trough, temporary road, silt trap, temporary drains etc. Construction of the access

road and piling activities (if any) for the foundation of the proposed building are expected to be the second stage of the development. Building works is anticipated to be the subsequent components to be carried out, after the proposed platform for the building construction is ready.

The site clearing and earthworks will be done in three different phases with each phase consisting of approximately 50 acres of land. As for the construction of the proposed residential units, it will be done in phases as shown in **Figure 5.1**. The entire project is expected to be completed within 3 years from the commencement date.

5.4 Population Equivalent (PE) Estimation

The entire project has been planned to cater for a population of approximately 10,300 people. The number of people estimated based on the proposed components are shown in **Table 5.2**.

Table 5.2 : Estimated Population With The Proposed Development

Component	Total unit / area	Population Equivalent (P.E.)	Total P.E.
Residential units	2,020 units	5 PE / house	10,100
Surau	150 persons	0.2 PE/person	30
Kindergarten	80 persons	0.2 PE/person	16
Community Centre	1,176m ²	3/100m ² gross area	35
Guard House (5 units)	92.74m ²	3/100m ² gross area	3
Community Halls (4 units)	148.64m ²	3/100m ² gross area	4
TOTAL			10,188 (say 10,300 PE)

5.5 Supporting Infrastructure

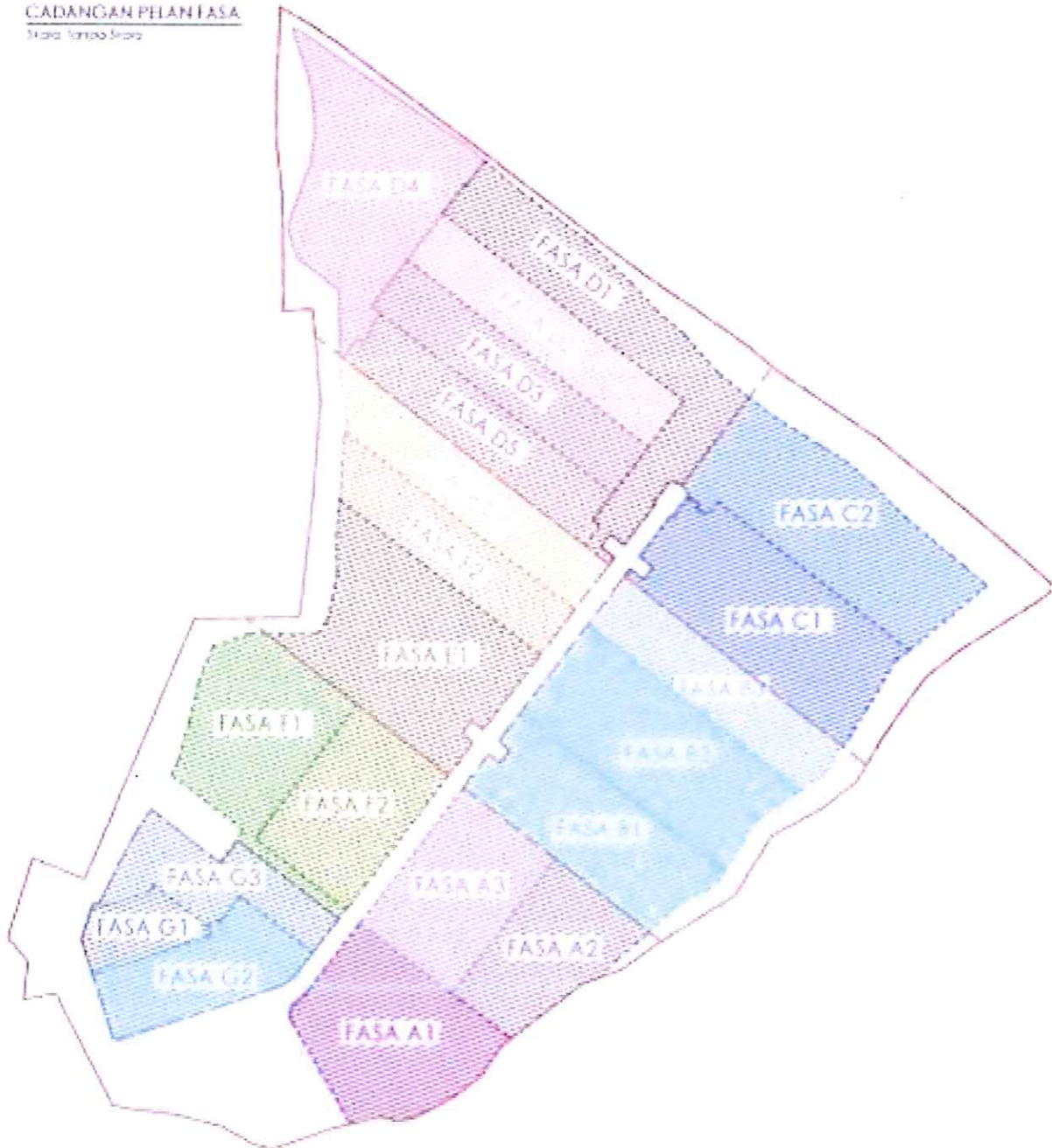
5.5.1 Water Supply

The main water source for the Project will be from the Bertam Treatment Plant II, which is located at the southeast of the site. The plant is producing about 44 MGD (200 MLD) of water (Source: SAMB) and it is expected to have sufficient supply to cater for



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CADANGAN PELAN FASA
Skala Tanpa Saiz



the additional demand. The estimation of water demand projected by the design engineer is tabulated in **Table 5.3** and the total demand projected is about 2.92 MLD.

Table 5.3: Details of Water Demand

Development Phases	Water Demand (litre/day)
A1, G1	316,900.0
A2, A3	228,000.0
B1, B2, B3	380,057.4
C1, C2, G2	583,157.4
D1, D2, D3	342,000.0
D4, D5	209,057.4
E1, E2, E3	354,557.4
F1, F2, G3	509,285.8
TOTAL	2,923,015.4

5.5.2 Electricity

The proposed Project has a provision for seven units of TNB substations. The substations will tap electricity from the nearest main station to be determined by TNB once the Project proponent has submitted the necessary application. The preliminary electricity demand projection is given in **Table 5.4** and the total demand projected is about 7,244kW/day. The locations of the existing TNB substations in the State are illustrated in **Figure 5.2**.

Table 5.4: Details of Electricity Demand

Component	Total unit	Demand Estimation	Total Demand (kW)
2-Storey Terrace	1,397	4kW/unit	5,588
2-Storey Bungalow	2	12kW/unit	24
2-Storey Semi-D	54	7kW/unit	378
Flats	567	2kW/unit	1,134
Management	3	40kW/unit	120
TOTAL			7,244

5.5.3 Telecommunication

The telecommunication facilities would be supplied from the nearest exchange station to be identified by the Telekom Malaysia once the application form has been submitted. The available supply is expected to have sufficient lines to cater for the additional demand. Apart from this, the cellular phone companies will also be supplying telephone services and thus there will be adequate telephone facilities for the development. The preliminary estimation of telephone lines needed for the development is tabulated in **Table 5.5** and the estimated demand is about 4,046 lines. **Figure 5.3** shows the location of the existing exchange stations in Melaka.

Table 5.5: Details of Telephone Line Demand

Component	Total unit / area	Total Demand (Lines)
2-Storey Terrace	1,397	2,794
2-Storey Bungalow	2	4
2-Storey Semi-D	54	108
Flats	567	1,134
Management	3	6
TOTAL		4,046

5.6 Waste Management

5.6.1 Wastewater Management

a) Construction Phase

Temporary sanitary facilities will be provided by the project proponent to ensure that wastewater from the workers camp will not be discharged directly into the nearest receiving watercourse and pollute the downstream water.

During earthworks, temporary earth drains and silt traps will need to be constructed to flow the surface runoff into the silt traps before discharging to the existing watercourse.

b) Operational Phase

The total sewage generation from the Project has been estimated to be approximately 2.32 MLD. The calculation of the sewage generation is as shown below:

$$\begin{aligned}\text{Total PE} \times 225 \text{ litre/PE} &= \text{total estimated sewage generation} \\ 10,300 \times 225 \text{ litre/PE} &= 2,317,500 \text{ litre/day (2.32 MLD)}\end{aligned}$$

Note:

* Based on 225 litre/PE.

This project will use the existing MTH508 Sewerage Treatment Plant (STP) located at the adjacent housing area i.e. Taman Krubong Perdana to treat the effluent from the project site. The STP will need to be upgraded to cater for the additional effluent from this project and the design shall meet the requirements of Standard 'A' of the New Sewage Treatment System stipulated in the Environmental Quality (Sewage) Regulations 2009. The existing STP was designed to cater for 8,800 PE, hence the capacity of the STP is to be upgraded to cater for a total of 19,100 PE. The Sewerage System Plan is as shown in **Figures 5.4** and **Figure 5.5**. The treated effluent will be discharged into the main drain and flow directly into Sg. Ayer Hitam.

5.6.2 Solid Waste Management

a.) Construction Phase

Solid waste during construction will contain mainly biomass from the oil palm and rubber plantation, shrubs and domestic waste from the workers quarters. Domestic waste and the felled oil palms / rubber trees which are not commercially usable can either be disposed off at the landfill dumps, sold to third party or buried at the allocated green area within the project site. Details on the solid waste during construction phase will be deliberated in **Chapters 7** and **8**.

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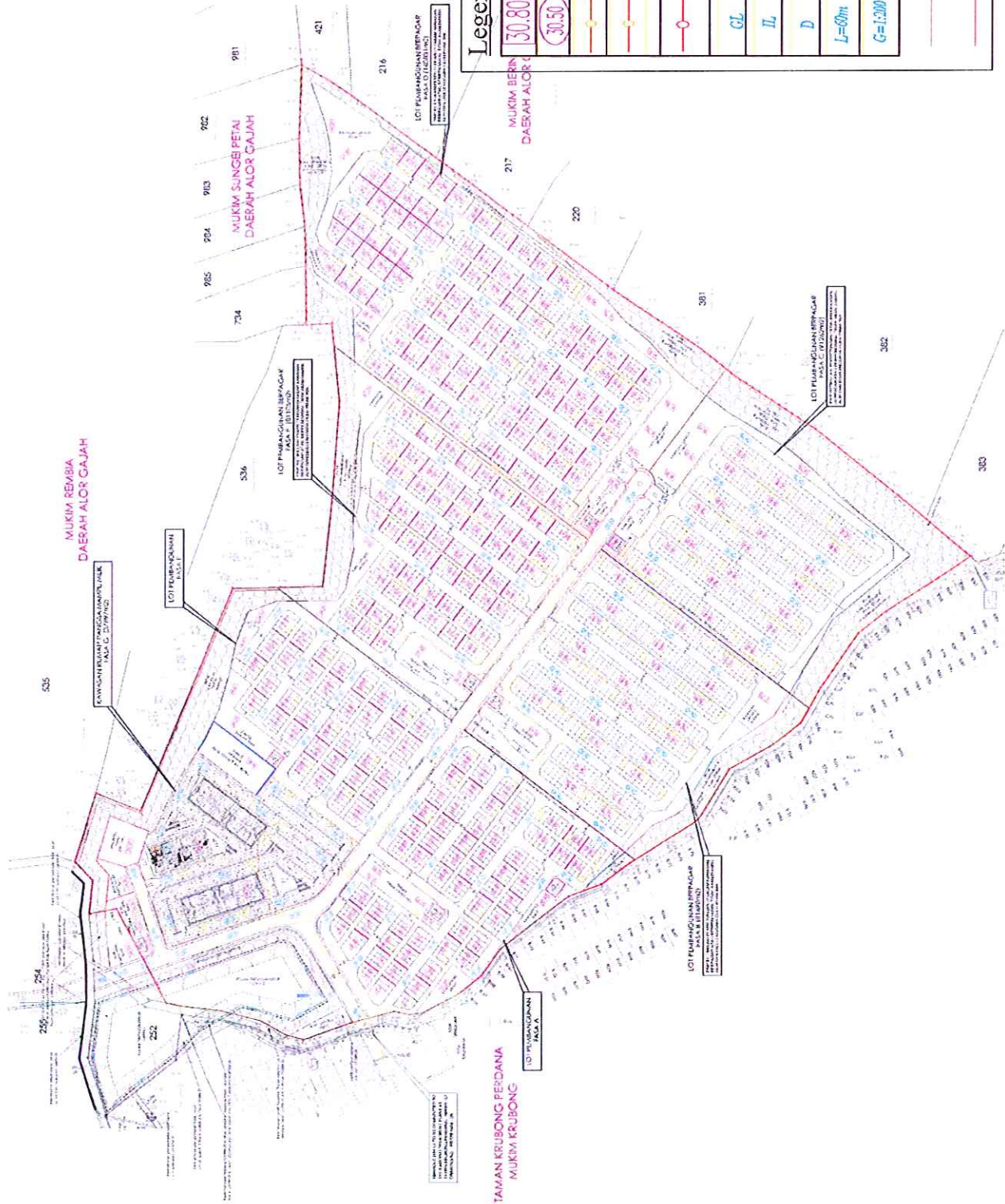
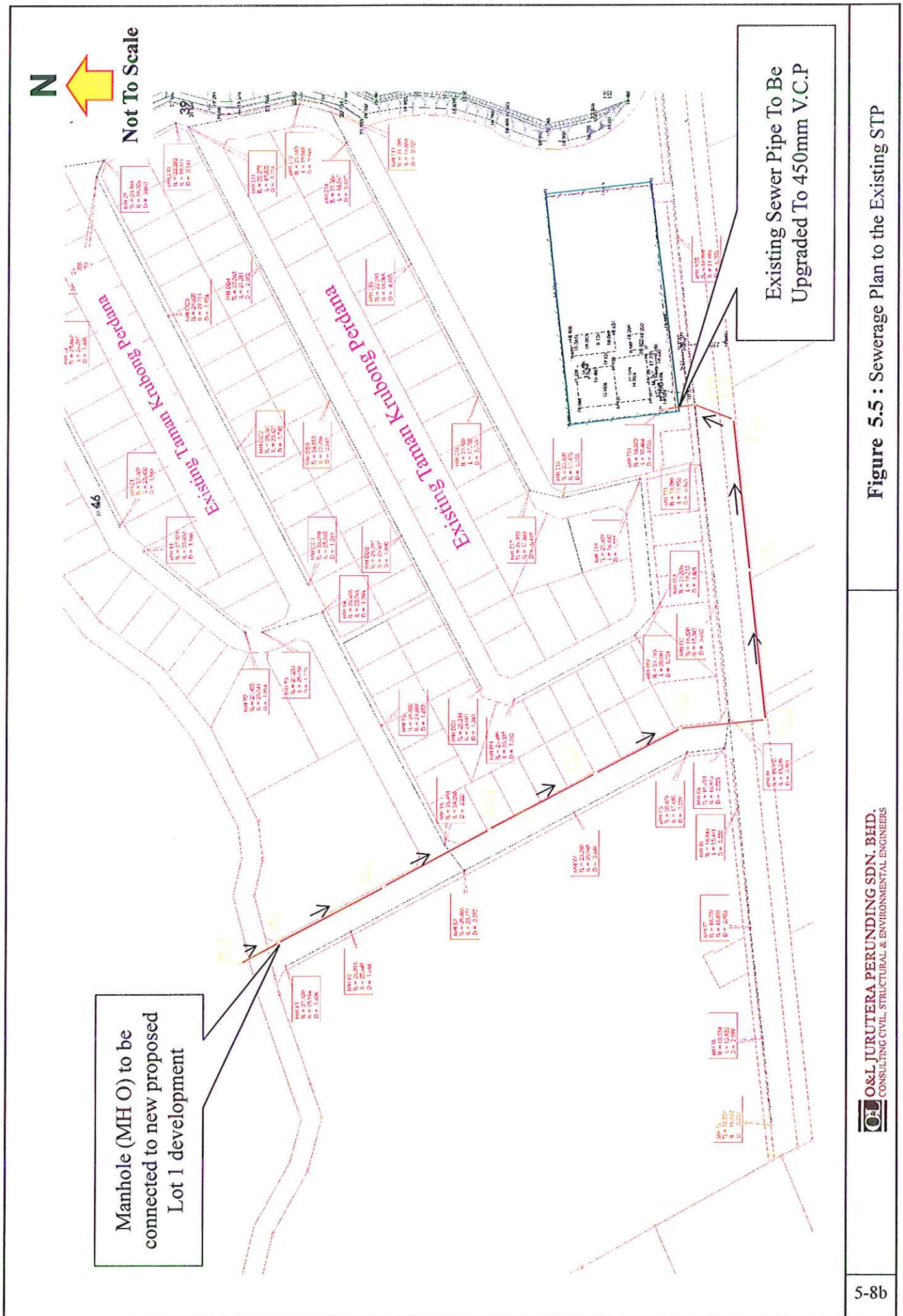


Figure 5.4 : Sewerage Plan at the Project Site



b.) Operational Phase

An estimation of the solid waste generation during the operational phase of the project can be made by basing a rate of 1.09 kg/person/day for domestic wastes (Source : *Rusdin Laiman et al.*, 2005). The solid waste generation upon the full completion of the project is estimated to be about 11,227kg/day. The calculation for the solid waste generation is as below:

$$\begin{aligned}\text{Total PE} \times 1.09 \text{ kg/person/day} &= \text{total estimated solid waste generation} \\ 10,300 \times 1.09 \text{ kg/person/day} &= 11,227 \text{ kg/day}\end{aligned}$$

Note:

* Based on waste generation rate of 1.09 kg/person/day

Based on the information available on the official website of National Solid Waste Management Department, majority of the solid waste comes from food waste (i.e. approximately 45% of the generated solid waste is actually food waste). Hence in this case, the food waste expected to be generated will be about 5,052kg/day. As per the normal practice, the solid waste generated will be collected by the privatised garbage contractors engaged by the local authority and disposed at the designated landfill site as approved by “Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam” (SWCorp).

CHAPTER 6

EXISTING ENVIRONMENT

6.0 EXISTING ENVIRONMENT

6.1 Introduction

As a prelude to assessing the potential impacts of the Project, the existing environment has been studied and documented in this chapter. Information in this chapter was obtained from field surveys and secondary data sources. Components of the environment described include topography, geology and soils, and meteorological characteristics. Land use and human activities were assessed within a radius of 5 km from the project site. Other environmental data including surface water quality, ambient air quality, noise level, flora and fauna were gathered and recorded during the field survey.

6.2 Location

The proposed project involves the transformation of oil palm and rubber plantation into a housing area. The development is proposed on approximately 152.25 acres of land on Lot 1 in Mukim Krubong, District of Melaka Tengah. The proposed project is located adjacent to Mukim Paya Rumput to its southwest and Mukim Belimbing to its east. Mukim Beringin is located at the north of the site while Mukim Batu Berendam is at the south of the site. **Figure 6.1** shows the main entrance of the project site.

The proposed site is accessible from all parts of the State through the existing road network. The State Road M133 stretches adjacent to the site from north to south. Taman Krubong Perdana is situated to its south and a low-cost housing estate, Taman Inang Sari is situated to its east. Lebuhraya SPA (Sg. Udang – Paya Rumput – Ayer Keroh) lies approximately 5 km from the southern boundary of the Project site while Ayer Keroh Interchange for the North-South Expressway is located about 14 km road distance from the Project site through the Lebuhraya SPA. The approximate road distances separating the site from the existing urban areas in Melaka are;



Figure 6.1 : Proposed Entrance to the Project Site

- 20.0 km north of Melaka City
- 11.0 km north of Batu Berendam Airport
- 14.0 km north-west of Ayer Keroh Toll Plaza

Figure 6.2 shows the location of the site on the landuse map and its surrounding in 5 km radius. Table 6.1 details the land use within a distance of 5 km from the Project site.

Table 6.1: Land Use within 5 km Radius from The Site

Radius (Km)	Existing Land Use
0-1	<u>North</u> Oil palm and rubber plantations can be found within this area. <u>East</u> This area consist of rubber plantation, durian farm and housing area i.e. Taman Krubong Perdana, Kampung Tebing Tinggi and Taman Inang Sari. <u>South</u> Taman Krubong Perdana is found within this region. KYZ Furniture factory can be found at the west of Taman Krubong Perdana. <u>West</u> Rubber and oil palm plantation cover this region.
1-2	<u>North</u> There are a few housing development located within this area which are Taman Seri Tuah, Kampung Beringin and Kampung Panchor. State road M17 and M133 can also be found within this area. Oil palm plantation covers the rest of this region.

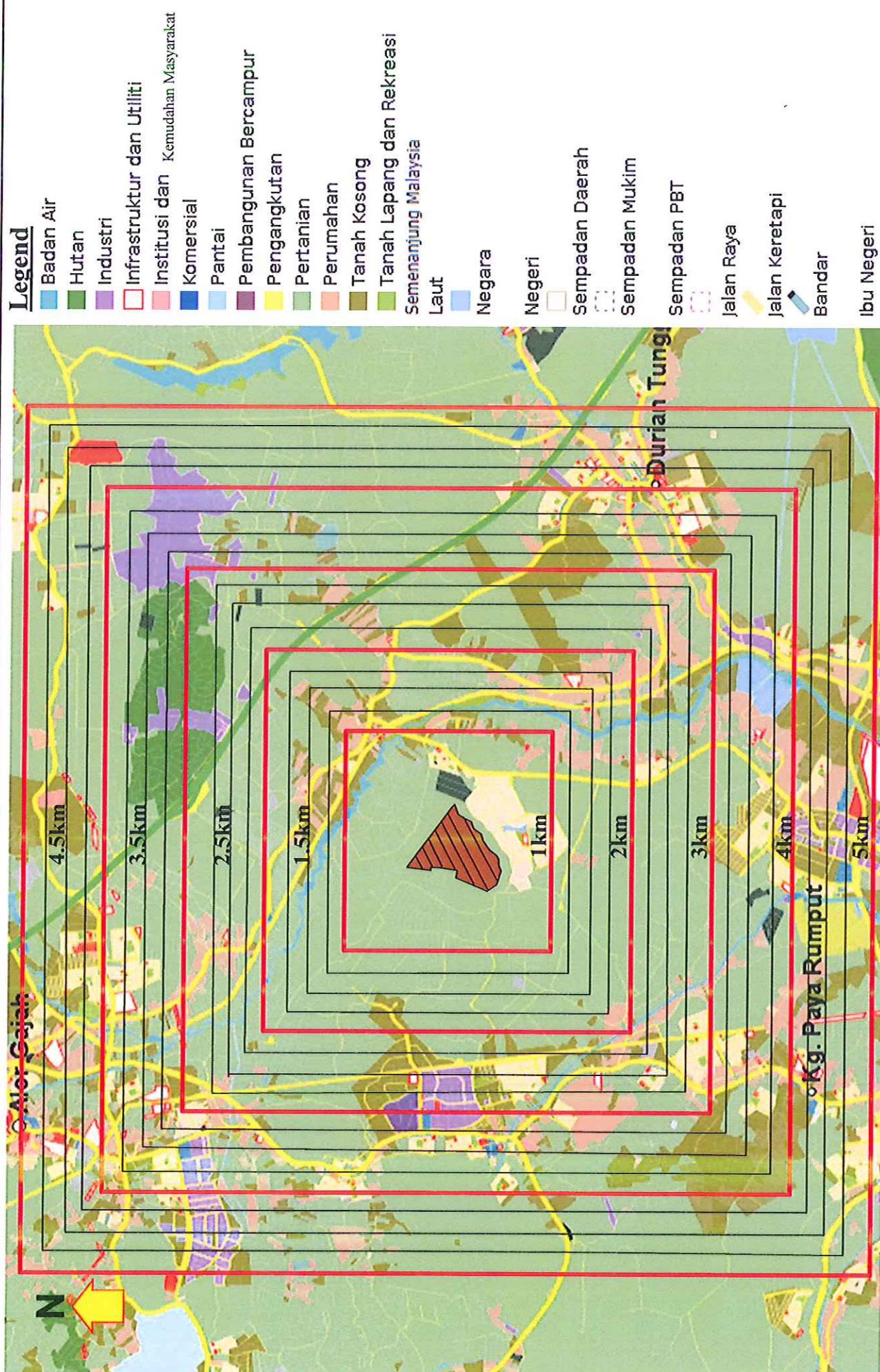


Figure 6.2: Landuse Map

Source: i-plan Semenanjung Malaysia (2016)

Radius (Km)	Existing Land Use
	<u>East</u> Kg. Tebing Tinggi, Kg. Lanjut Manis and Kg. Tanah Merah are found within this area. <u>South</u> Oil palm plantation and Taman Krubong Permai can be found within this area. <u>West</u> Oil palm plantation covers the rest of this region.
2-3	<u>North</u> Settlement that is found here is Kg. Panchor. Projek Perusahaan Cendawan Tiram Kelabu and State Road M17 are also found within this area. <u>East</u> Housing developments that are found here are Kg. Harmoni Belimbing Dalam and Taman Belimbing Setia. SK Belimbing Dalam, SK Parit Melana, and Tabika Kemas Kg. Belimbing Dalam can also be found within this area. <u>South</u> Taman Krubong Permai is located within this region. Oil palm plantation and rubber plantation covers the rest of this area. <u>West</u> Taman Rembia Perkasa is found here. Rembia Industrial Park is also found within this area where SunPower factory i.e. SunPower Malaysia Manufacturing Sdn. Bhd. is located . Oil palm plantation

Radius (Km)	Existing Land Use
	and rubber plantation covers the rest of this region.
3-4	<u>North</u> Settlement that is found within this distance is Kg. Ulu Melaka Pindah. Road State M17, Expressway E2 and Rest and Service (RnR) Ayer Keroh can also be found within this region. <u>East</u> Housing developments that are found within this distance are Taman Belimbing Setia and Taman Merak Emas. State Road M17 and Expressway E2 stretches across this area and oil palm plantation covers the rest of this region. <u>South</u> There are a few settlements found in this area which are Taman Krubong Indah, Taman Krubong Jaya and Kampung Sungai Badau. <u>West</u> The housing developments within this area are Taman Seri Pelangi, Taman Maim, and Taman Rembia Utama. Besides that, SK Rumbia is also found in this region.
4-5	<u>North</u> Taman Sri Pengkalan Indah, Taman Melaka Pindah, Taman Melaka Perdana, Kg. Balai, Taman Samarinda, Kg. Ulu Melaka Pindah and Rumah Awan Seri Pengkalan are located here. State Road M8 and Expressway E2 are also found in this area. Oil palm plantation covers the rest of this region. <u>East</u> There are three housing developments that are found in this area

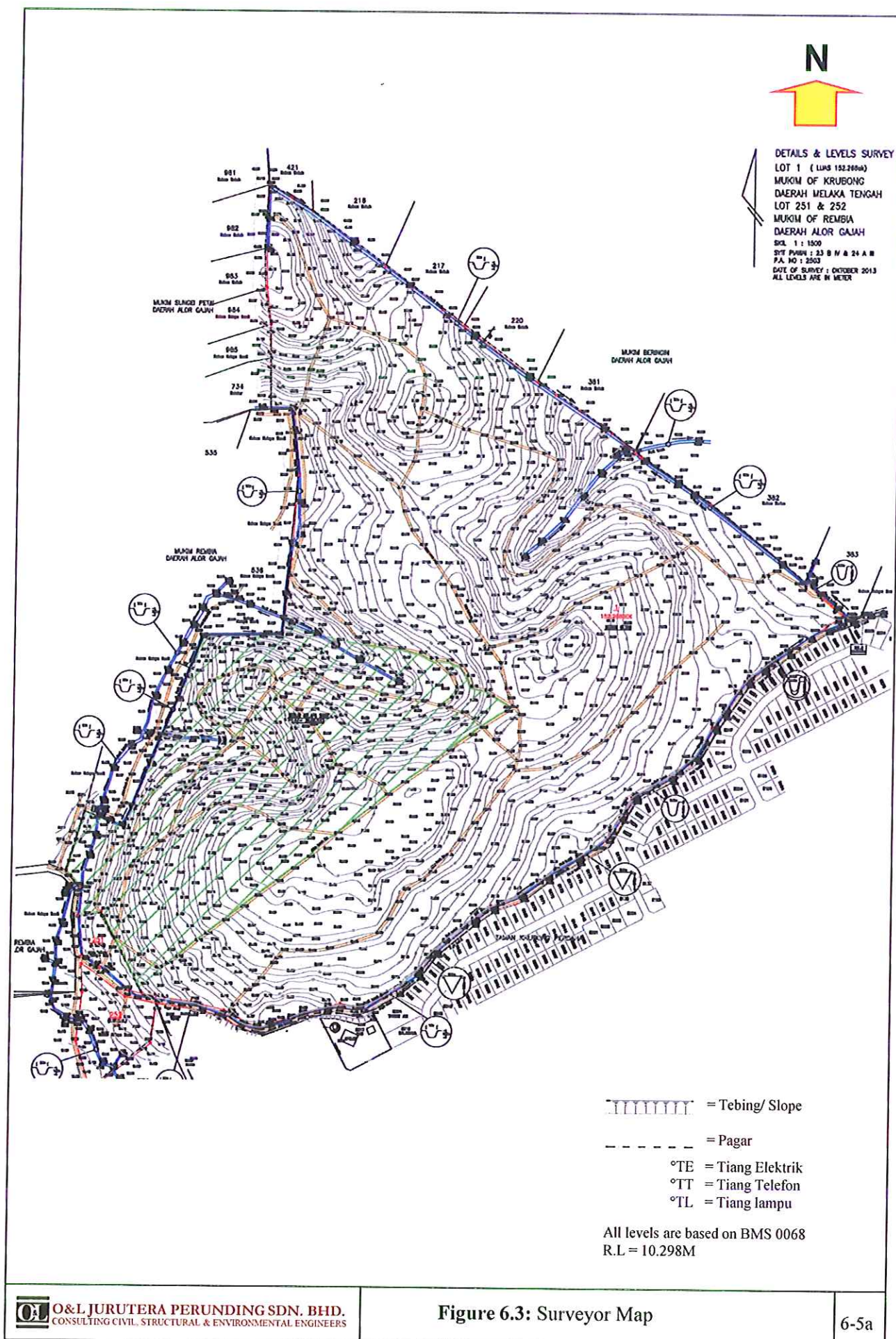
Radius (Km)	Existing Land Use
	which are Taman Taman Merak Emas, Taman Merak, and Kg. Padang Kerbau. Oil palm plantation covers the rest of this region. <u>South</u> Settlements that are found here are Kg. Krubong and Kg. Padang Siapong. Madrasah Kampung Ladang, Madrasah Darul Taqwa, Kawasan Perindustrian Krubong and Stadium Hang Jebat are located within this area. Sungai Melaka, State Road M133 and Lebuhr SPA are also found in this area. <u>West</u> Taman Rembia Utama, Klinik Desa Sungai Petai is also found within this area. Besides that, Federal Road 19 (Lebuhr AMJ) passes through this area. Oil palm plantation covers the rest of this region.

6.3 Topography

With the available spot-levels from the survey drawing, the topography of the site can be described as undulating. The ground levels at the project site vary from the lowest level of 11.174m MSL to the highest level of 62.545m MSL. The higher level within the elevation of 62.545m MSL could be found at the northern area of the site. The levels decrease towards the west until it reaches the lowest elevation of 11.74m MSL. The available spot-levels of the site are demarcated on the land survey map of the Project in **Figure 6.3**.

6.4 Geological Character

A desk study on the geological character of the Project site was carried out based on the Geological Survey Map published by the Director-General of Geological Survey, Malaysia in 1985. Based on the survey map, the geology of Project site is mainly underlain by sedimentary and metamorphic rocks of Devonian period.



Generally, the sedimentary and metamorphic rocks types of Devonian period are phyllite, schist and slate. Some interbeds of conglomerate, chert and rare volcanics are also available within this category. The Geology Survey Map referred is shown in **Figure 6.4**.

6.5 Soil Type

The type of soil within the Project site was determined by referring to the Reconnaissance Soil Map of Negeri Melaka prepared by the Soil Resources Management and Conservation Division, Department of Agriculture, Peninsular Malaysia. According to the type of soil series defined in the map, the Project site is designated as having the Gajah-Mati-Muncung-Melaka series. The Reconnaissance Soil Map used to determine the type of soil series presence within the site is given in **Figure 6.5**.

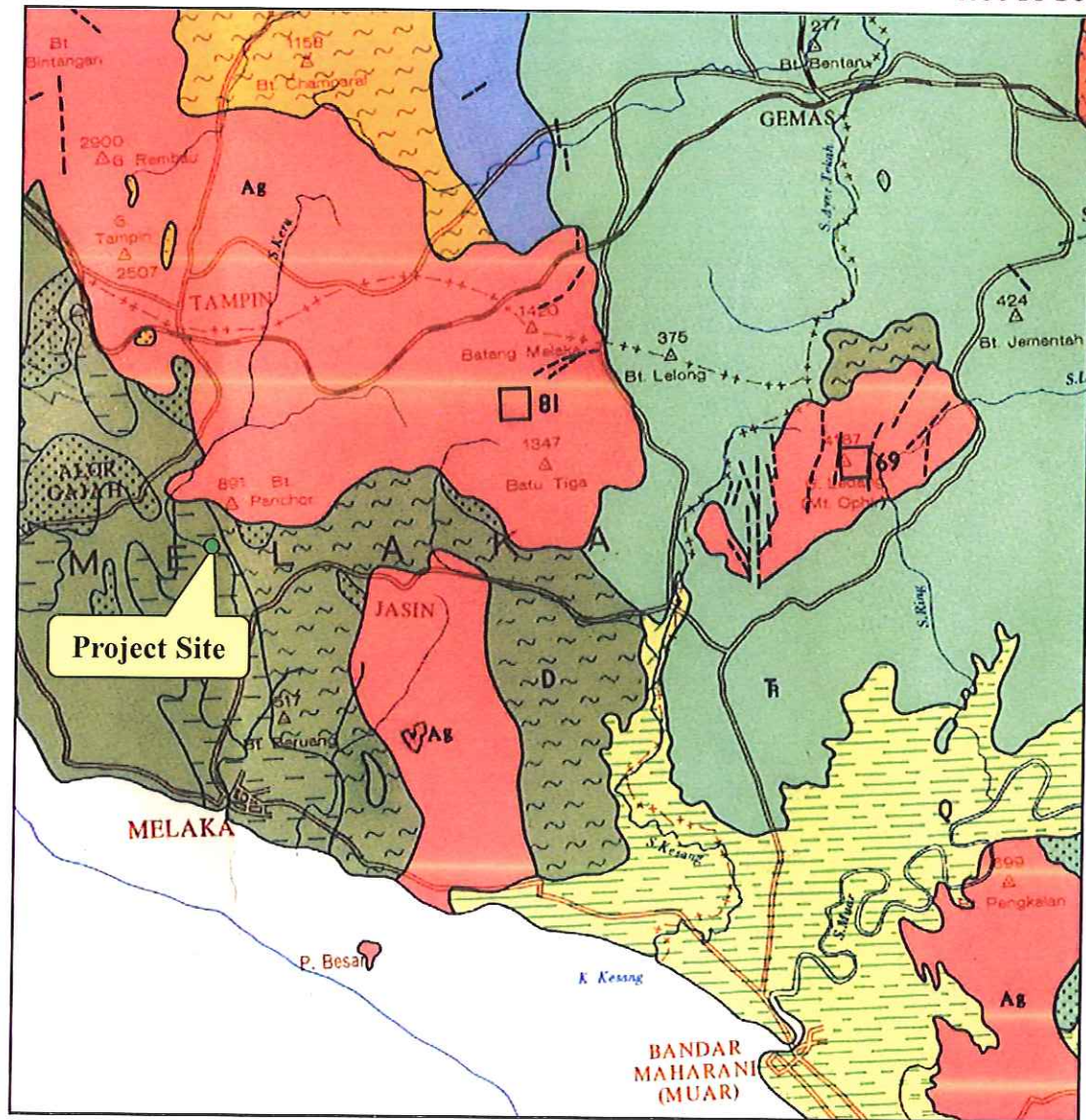
In addition to the desk study, soil samples were taken at three (3) selected locations (S1 to S3) as shown in **Figure 6.6**. Several soil properties tests were chosen as to gather more detail information on the existing soil types which are also needed for the soil erosion assessment in the following section. The soil property tests report prepared by the laboratory is attached as **Appendix II**. The summary of the soil property tests result is given in **Table 6.2**.

Table 6.2: The Summary of Soil Property Tests Results

Sample	Type of Particle (%)				Organic Matter (%)	Unit Weight (Mg/m ³)
	Clay	Silt	Sand	Gravel		
S1	36	45	19	0	0.9	1.404
S2	19	31	16	34	0.5	1.553
S3	9	18	5	68	1.9	1.947

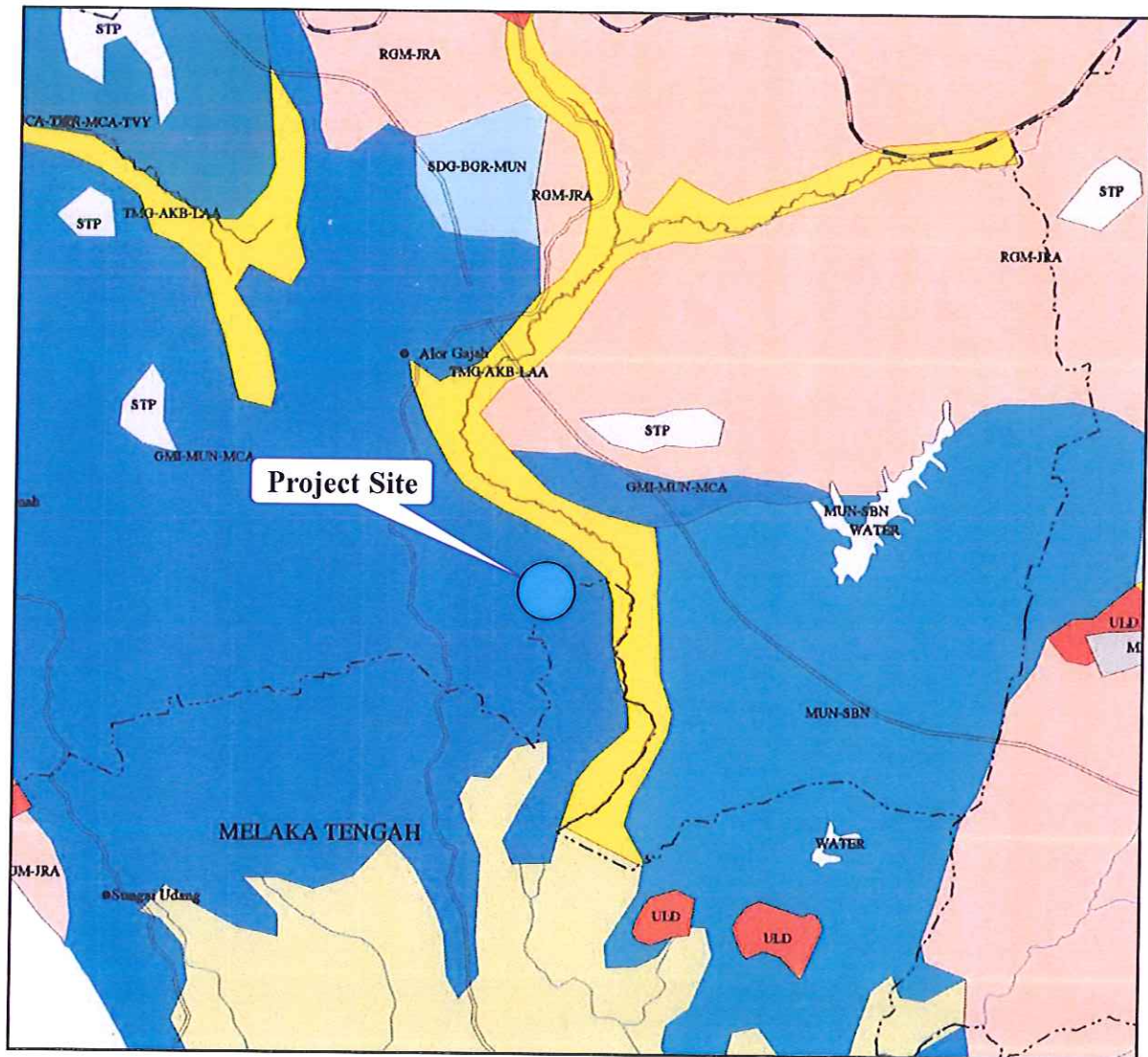
From the result of the soil property tests, the percentage for each type of particle from all soil samples gathered are 9% - 36% clay, 18% - 45% silt, 5% - 19% sand and 0% - 68% gravel. Meanwhile, the percentage of organic matter and unit weight in Mg/m³ for all samples tested are 0.5% - 1.9% and 1.404 - 1.947 Mg/m³ respectively.

N
Not To Scale





Not To Scale



Project site :



Gajah Mati-Muncung-Melaka



Figure 6.6: Soil Sampling Locations

6.6 Hydrology

6.6.1 Channel Characteristic and Drainage Pattern

A portion of the proposed site is located within Sg. Jenuang catchment area which is the sub-catchment area of Sg. Melaka while the rest of the site lies within Sg. Ayer Hitam catchment area. Sg. Jenuang flows in a southeast direction through the oil palm plantation and settlements before meeting Sg. Melaka. On the other hand, tributaries of Sg. Ayer Hitam which can be found at the east of the project site flows in a south direction to meet with Sg. Jeram (refer to **Figure 6.7**).

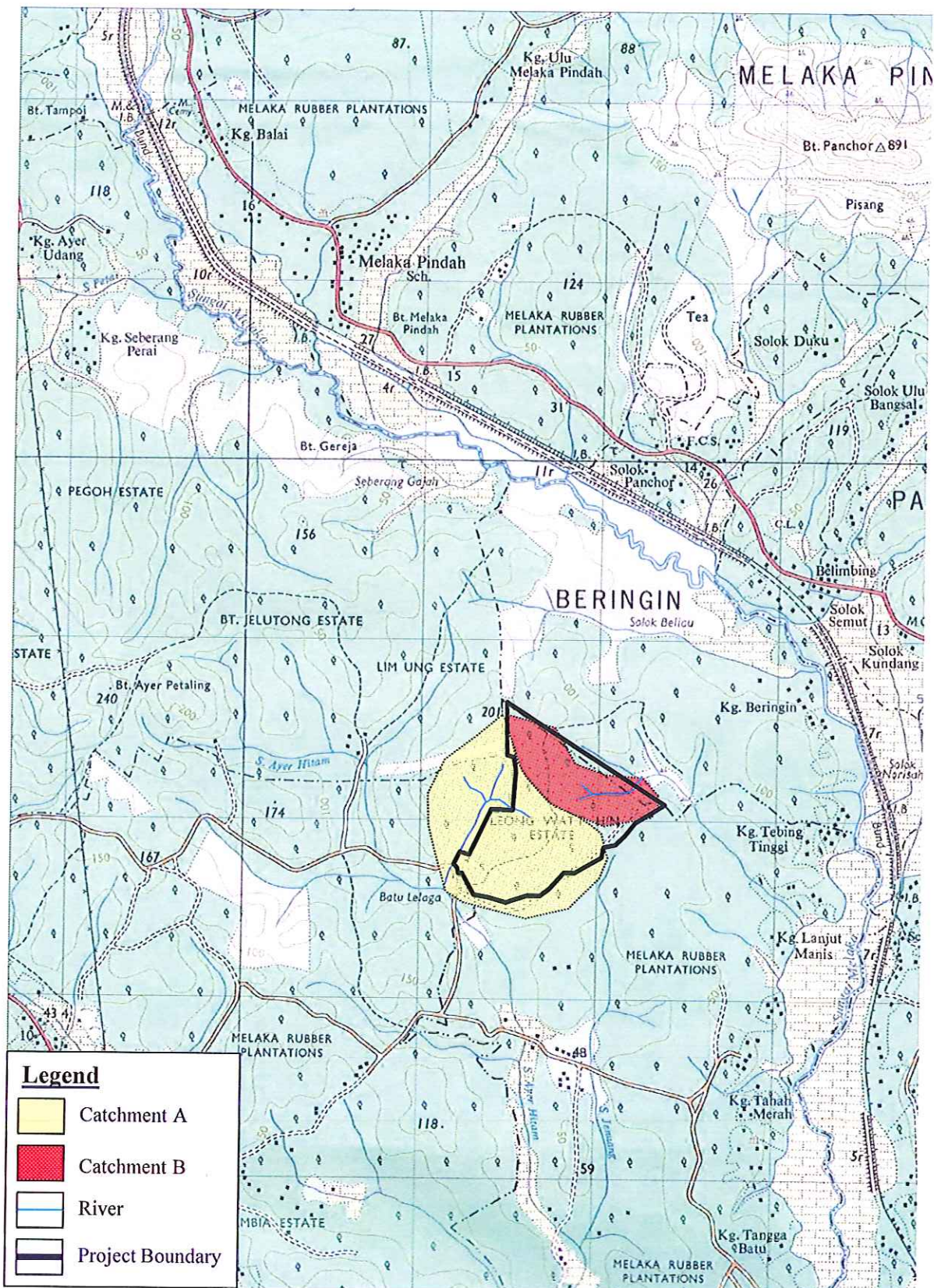
6.6.2 Flooding

Figure 6.8 shows the flooding area reported in Melaka. Based on **Figure 6.8**, the site could be considered as free from any possibility of natural flood.

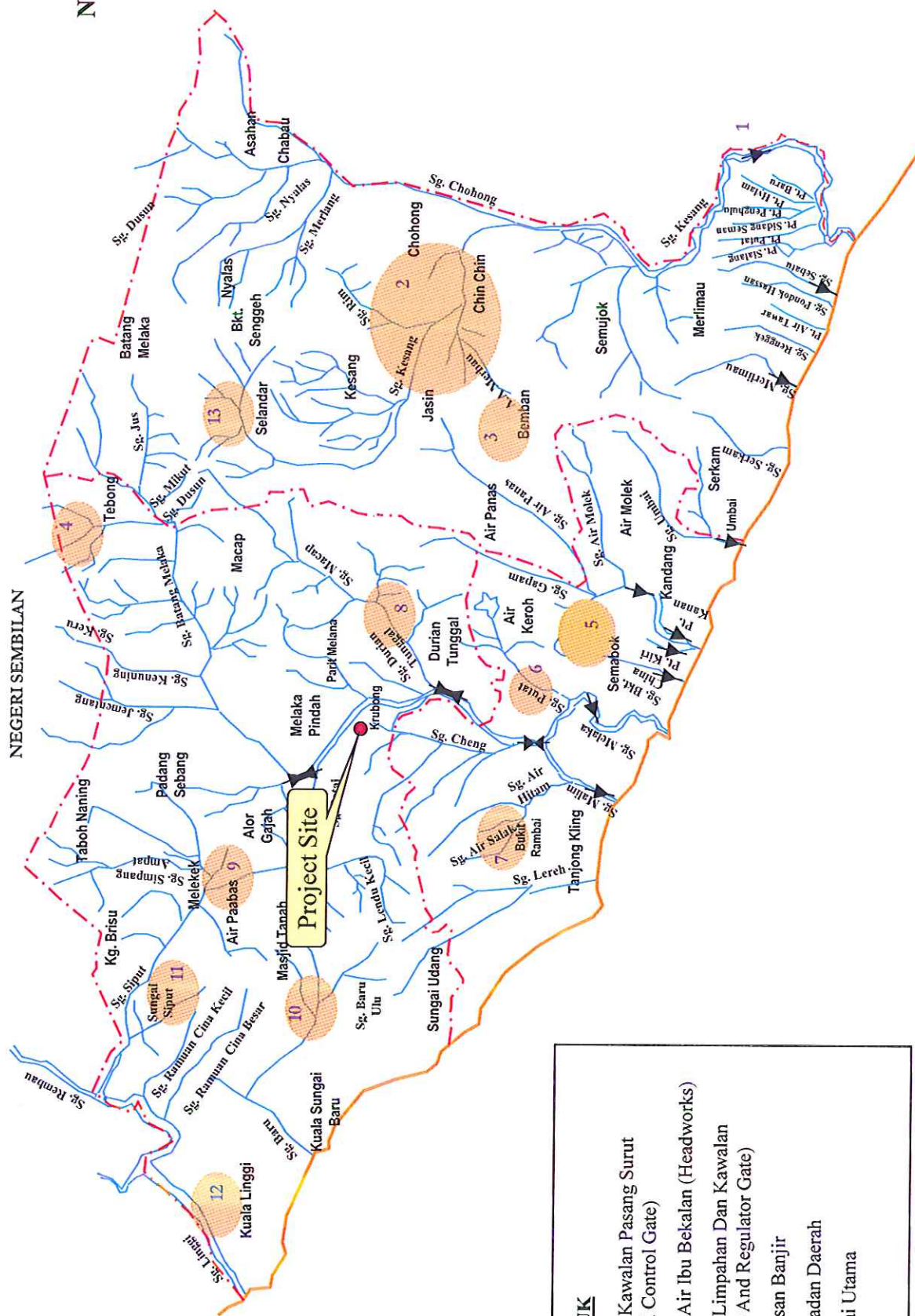
In addition, as proposed in the development layout, the lowest lying area will be transformed into a recreation pond which will also serve as a retention pond to ensure downstream areas would be totally free from any flooding.

6.7 Meteorology

The meteorological description in this section is deliberated using the meteorological data from Batu Berendam Airport Principal Station (No. Station: 48665 – N 02°16', E 102°15') obtained from Malaysian Meteorological Service Department. The station is located about 8km at the south of the project site and there are no physical barriers between these two locations. Therefore, the meteorological data from the station can be used to elaborate the weather conditions at the Project site. The meteorological data obtained is attached in **Appendix III**. **Figure 6.9** summarises the weather conditions at the site and the elaboration of the weather conditions is given in the following paragraph.



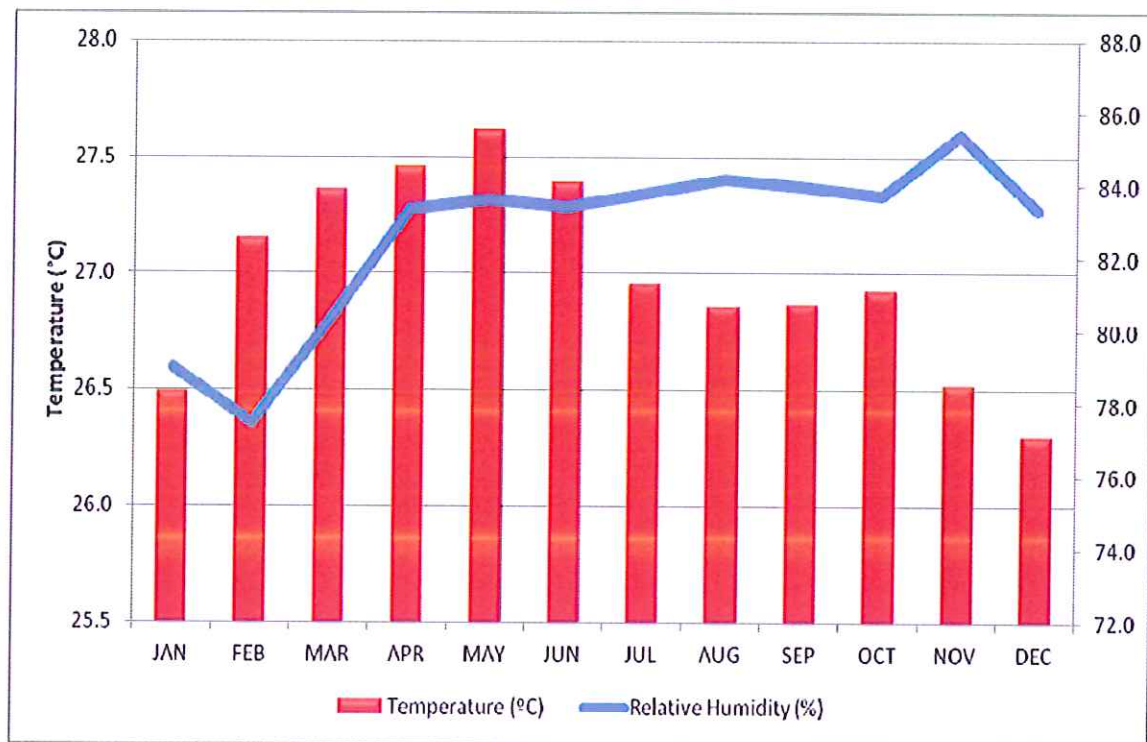
N
Not To Scale



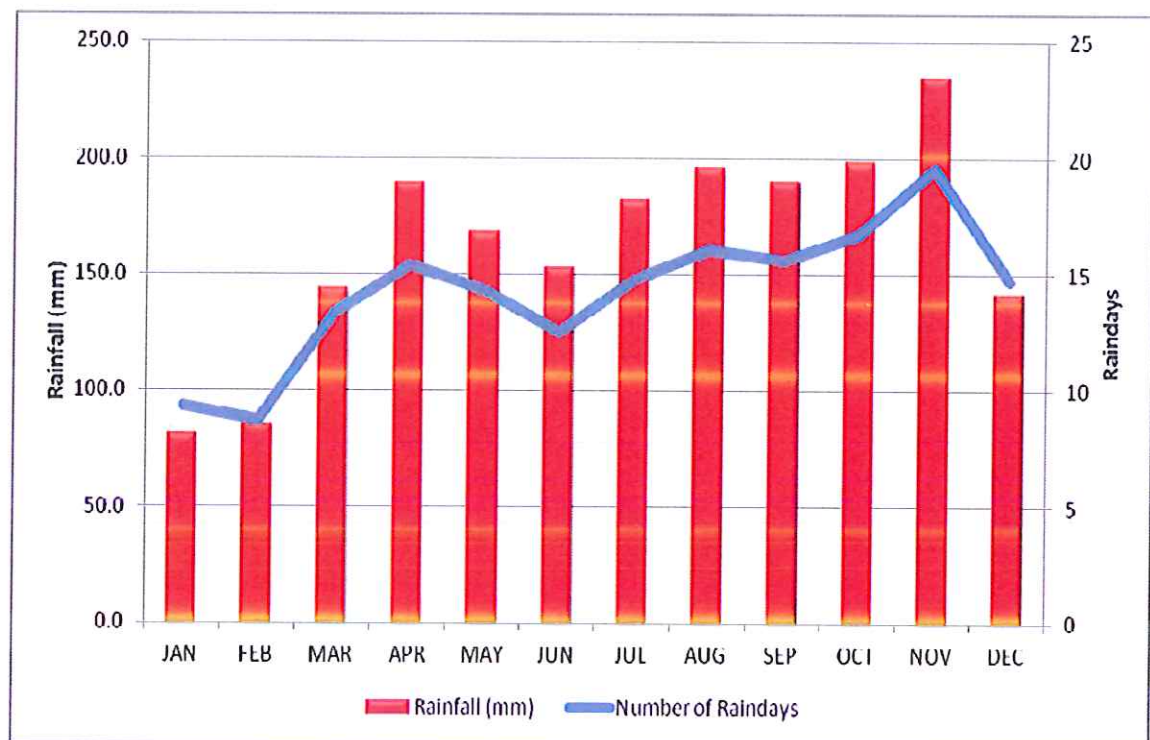
PETUNJUK

- Pintu Kawalan Pasang Surut (Tidal Control Gate)
- Pintu Air Ibu Bekalan (Headworks)
- Pintu Limpahan Dan Kawalan (Weir And Regulator Gate)
- Kawasan Banjir
- Sempadan Daerah
- Sungai Utama
- Parit

Mean 24-hour Temperature and Relative Humidity for Melaka



Mean Rainfall and No. of Raindays for Melaka



6.7.1 Rainfall

Based on the rainfall data from 1968 - 2014, the annual mean rainfall for Melaka is about 1,965.6 mm with the annual mean rain days of 171 days. For the period monitored, the wettest month of the year falls on the month of November which recorded a mean value of 234.5 mm with the highest corresponding rain days of 24 days. Meanwhile, the driest month occurs in January with an average rainfall of 81.8 mm (corresponding rain days of 9 days). For the period monitored, the highest rainfall was in the year 1984 with annual amount of 2,618.2 mm and the lowest rainfall was in the year 2013 with annual amount of 1,389.0 mm. The highest recorded rain day was 224 days in year 1984 and the lowest recorded rain day was 140 days in year 1997. **Table 6.3** shows the summary of meteorological data for Melaka from 1968 – 2014 (47 years).

Table 6.3: Summary of Meteorological Data For Melaka From 1968 – 2014 (47 years)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature (°C)													
• 24-hour Mean	26.5	27.1	27.4	27.5	27.6	27.4	27.0	26.9	26.9	26.9	26.5	26.3	27.0
• Mean Daily Maximum	31.7	32.9	33.1	32.7	32.3	31.9	31.4	31.3	31.4	31.7	31.4	31.1	31.9
• Mean Daily Minimum	23.0	23.4	23.7	23.9	24.0	23.7	23.3	23.2	23.3	23.5	23.4	23.2	23.5
• Highest Maximum	35.2	37.8	37.2	37.3	38.0	35.1	35.7	35.0	34.5	35.6	34.4	34.6	38.0
• Year of Highest Maximum	1998 1985	2005	1990 1998	1998	1998	1986	2004 1998	1986	2001	1998	2014	2002	1998
• Lowest Minimum	20.1	19.7	19.6	21.0	21.0	19.5	20.1	20.4	20.7	20.9	20.6	19.8	19.5
• Year of Lowest Minimum	1991 1972	1992	1971	1981	1986	1981	2014	1982 1990	1974	1973	1976	1973	1981
24-hour Mean Relative Humidity (%)	79.0	77.5	80.4	83.4	83.6	83.4	83.8	84.2	84.0	83.7	85.4	83.3	82.6
Rainfall (mm)													
• Mean	81.8	85.6	144.4	189.5	168.4	152.7	182.1	195.9	190.0	198.9	234.5	141.8	1,965.6
• Highest	270.6	279.0	360.6	391.2	426.7	466.7	471.7	490.6	407.0	347.5	424.6	362.5	2,618.2
• Year of Highest	2011	1984	1984	1968	1994	1979	2002	1998	1995	1981	1969	1992	1984
• Lowest	4.7	0.0	33.8	13.4	25.2	26.7	50.4	75.2	72.8	64.3	98.5	16.1	1,389.8
• Year of Lowest	1974	2014	1972	1998	1972	1991	1972	1981	1997	2002	1983	1979	2013
Number of Raindays (day)													
• Mean	9	9	13	15	14	13	15	16	16	17	20	15	171
• Highest	21	17	21	22	21	22	23	23	20	22	24	25	224
• Year of Highest	1984	1988 1984	1994 2009	1982 2003	1993 1994	1970	1975	1998	2001 1986 1974 1988	1973 2007	1981 1982 2011	1991	1984
• Lowest	2	0	5	5	6	5	10	9	9	10	13	5	140
• Year of Lowest	1976 1982	2014	1972 1983	1998	2000	1985 2012	1997 1972	1997	1997	2002	1992	1979	1997

However, it is observed that there have been some changes to the weather pattern within the past few years. Hence, it is wise that the latest weather conditions be highlighted in this report.

The meteorological data for the year 2015 to 2017 is extracted from a secondary resource. **Table 6.4** shows the average rainfall amount and the number of rain days from 2015 to 2017 and is illustrated in **Figure 6.10**.

Table 6.4: Average Rainfall Amount and the Number of Raindays from 2015 – 2017

Year / Parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Rainfall (mm)												
2015	191.13	54.98	205.45	213.84	118.79	113.08	141.29	112.46	73.82	114.18	176.22	241.35
2016	133.65	122.17	69.99	146.44	158.75	79.94	128.69	76.93	58.82	101.41	295.7	259.4
2017	340.2	242.5	255.9	279.2	198.3	87	135.5	N/A	N/A	N/A	N/A	N/A
Number of Raindays (day)												
2015	27	17	26	30	30	29	30	31	22	20	30	31
2016	31	24	25	27	28	25	24	25	22	26	30	29
2017	28	28	30	30	31	28	31	N/A	N/A	N/A	N/A	N/A

Source: World Weather Online Website (<https://www.worldweatheronline.com/melaka-weather-averages/melaka/my.aspx>)

Table 6.4 and **Figure 6.10** show that the wettest month throughout year 2015 to 2016 is between November to December with an average rainfall amount of 241.35mm during December 2015 and 295.7mm during November 2016. As for 2017, the wettest month recorded by far is during January 2017 with an average rainfall amount of 340.2mm.

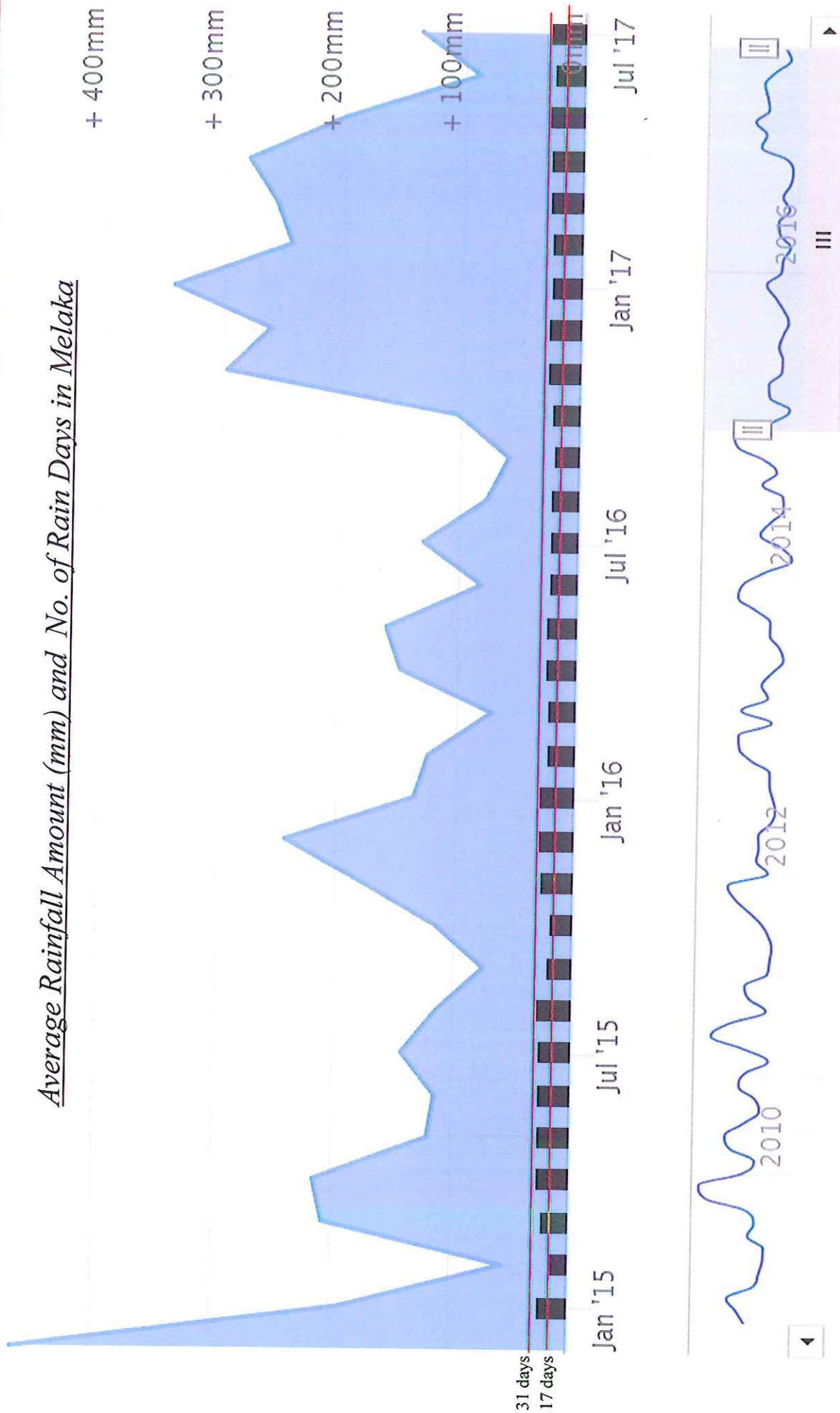
6.7.2 Humidity

Based on **Table 6.3**, it is observed that the annual 24-hour mean relative humidity is about 82.6% with the lowest and highest monthly 24-hour mean relative humidity recorded in the month of February and November with value of 77.5% and 85.4% respectively.

6.7.3 Temperature

The annual average 24-hour mean temperature recorded for Melaka from 1968 - 2014 is 27.0°C with the highest mean 24-hour temperature recorded falls in the month of May

Average Rainfall Amount (mm) and No. of Rain Days in Melaka



● Rain (mm) ● Days

Source: World Weather Online

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CONSULTING CIVIL, STRUCTURAL & ENVIRONMENTAL ENGINEERS

Figure 6.10 : Average Rainfall Amount and No. of Rain Days in Melaka (Year 2015-2017)

with value of 27.6°C. Meanwhile, the lowest mean 24-hour temperature falls in the month of December with value of 26.3°C. The average maximum and minimum mean daily temperature are 31.9°C and 23.5°C respectively. For the period monitored, the highest maximum temperature recorded was 38.0°C in year 1998 and the lowest minimum temperature recorded was 19.5°C in year 1981.

6.7.4 Wind Characteristics

An examination of the annual windrose for Melaka as shown in **Figure 6.11** indicates that the dominant wind is blowing from Northeast (26.9%). The percentage of calm conditions occurrences for Melaka is about 20% of the time. Closer examination of the surface wind speed frequency for the identified station indicates that the dominant wind speed range category is from 0.3 m/s to 1.5 m/s with frequency of 33.9%.

6.8 Surface Water Quality

The water quality monitoring was conducted on 26th October 2016 in various selected locations at the Project site. There were a total of 7 sampling locations (W1, W2, W3, W4, W5, W6, and W7) selected around the Project site where there are waterways. However, the sampling was not done for W3, W4, W5 and W6 because there was no presence of water at the sampling locations. The sampling locations are as shown in **Figure 6.12**. The coordinates and description of the location of the sampling points are tabulated in **Table 6.5**.

Table 6.5: The Coordinate and Description of Water Sampling Locations

Point	Description of Location	Coordinates
W1	Mukim Krubong, District of Melaka Tengah and Mukim Rembia, District of Alor	N 02.321233 E 102.238874
W2		N 02.326942 E 102.236652
W3		N 02.327392 E 102.240029
W4		N 02.332583 E 102.246090

WIND ROSE SUMMARY MALACCA

TIME : 24-HOURS
1968 - 2014

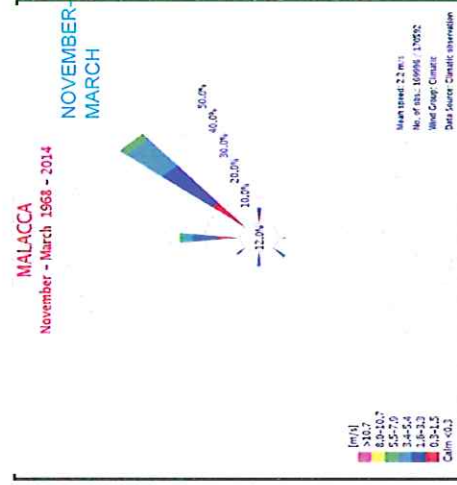
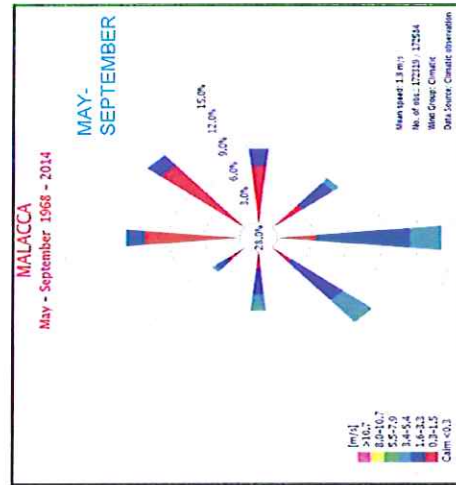
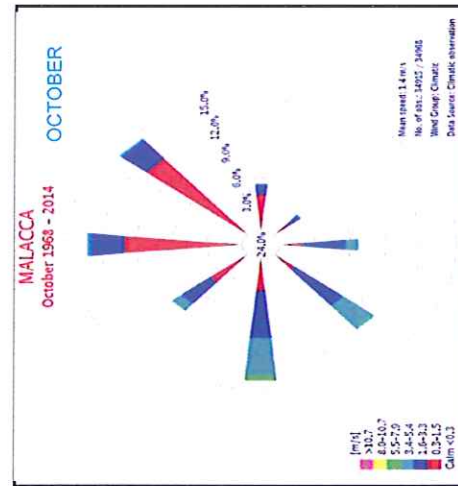
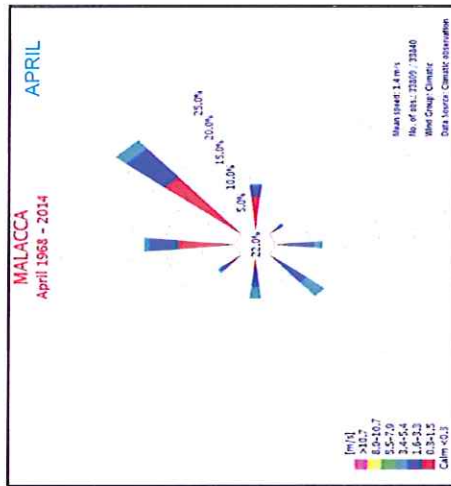
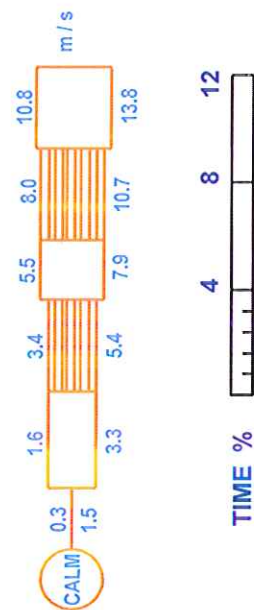
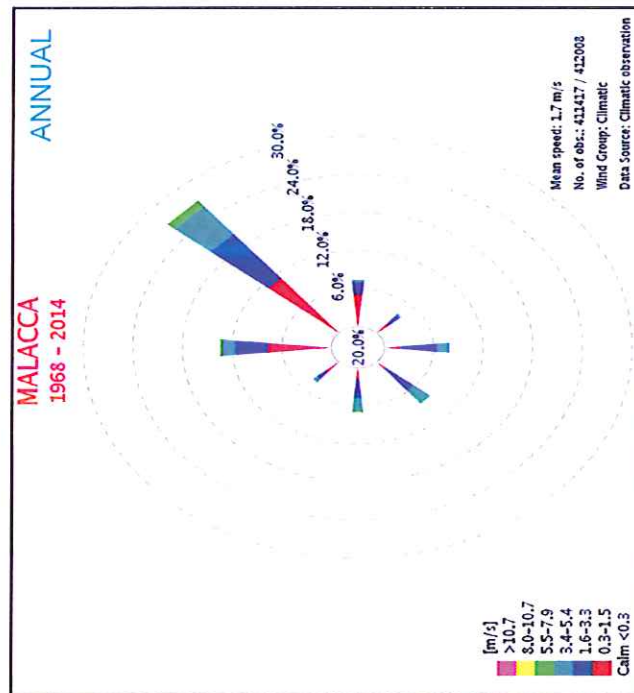


Figure 6.11 : Wind Roses Diagram

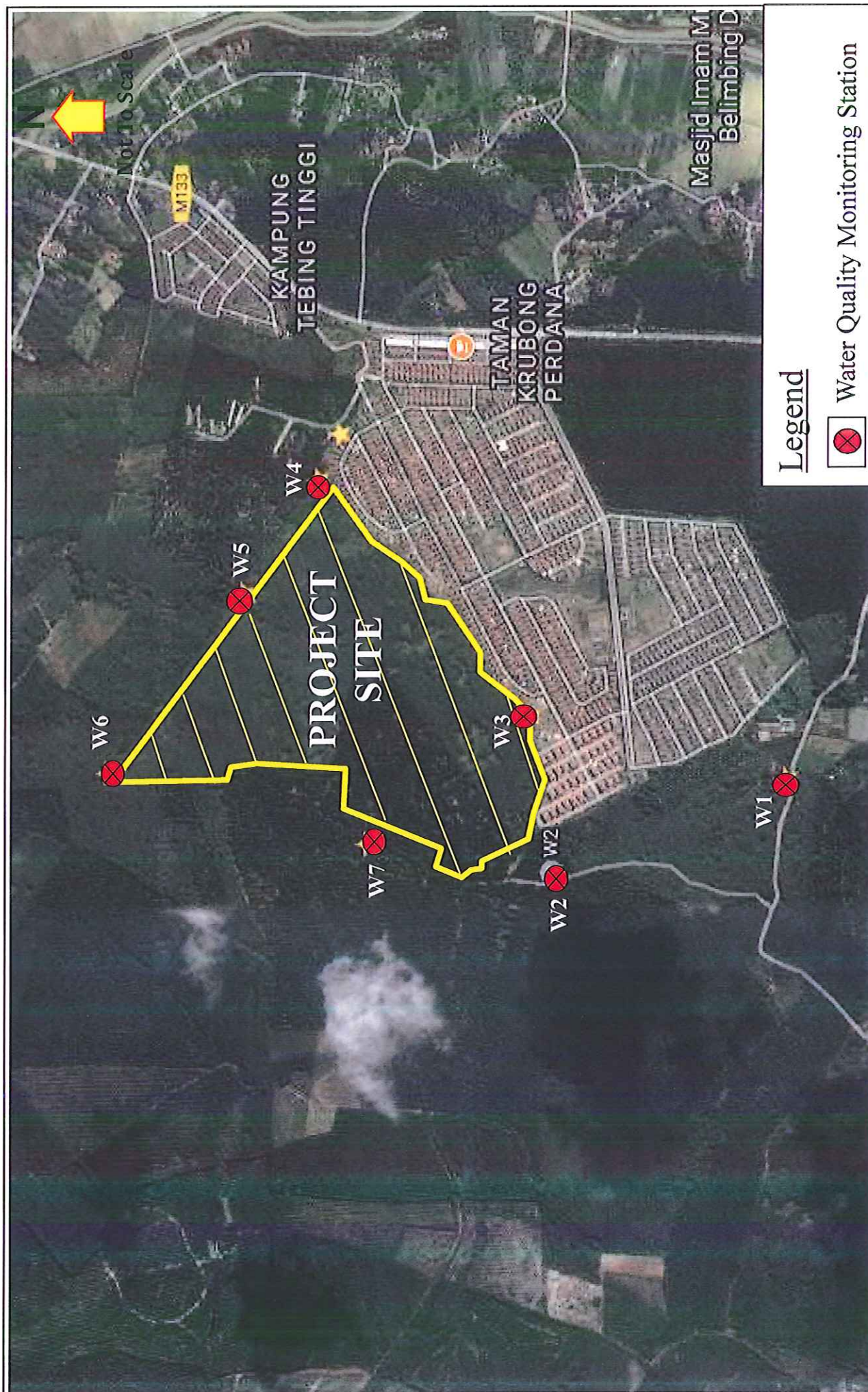


Figure 6.12: Surface Water Monitoring Location.

Source: Google Maps.

W5	Gajah, Melaka project site	N 02.334421 E 102.243345
W6		N 02.337689 E 102.239031
W7		N 02.331403 E 102.237344

Several parameters were chosen for analysis by the Consultant and the monitoring report prepared by the accredited laboratory is attached as **Appendix IV**. The results obtained were used to compare with the Class IIA limit of the Interim National Water Quality Standards (INWQS) for Malaysia as to succeed a closer proximity on the existing surface water quality in the vicinity of the Project site. The appraisals of the chosen parameters are deliberated in the following paragraph and the analysis results obtained are presented in **Table 6.6**.

Table 6.6: Surface Water Quality Analysis Result

Parameter	Units	Results							Class IIA
		W1	W2	W3	W4	W5	W6	W7	
Date Collected		26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	-
Time Collected		2.10pm	1.58pm	1.17pm	12.30pm	12.48pm	12.55pm	1.44pm	-
Temperature (<i>In-situ</i>)	°C	28	27	*	*	*	*	28	Normal ± 2
pH value (<i>In-situ</i>)	mg/l	6.9	6.6	*	*	*	*	7.0	6.0-9.0
Dissolved Oxygen (<i>In-situ</i>)	mg/l	5.0	4.9	*	*	*	*	4.7	5-7
Biochemical Oxygen Demand @ 5 days at 20°C	mg/l	5	5	*	*	*	*	3	3
Chemical Oxygen Demand	mg/l	29	29	*	*	*	*	ND(<1)	25
Total Suspended Solids	mg/l	26	22	*	*	*	*	8	50
Mercury as Hg	mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	0.001
Cadmium as Cd	mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	0.01
Chromium as Cr ⁶⁺	mg/l	ND (<0.02)	ND (<0.02)	*	*	*	*	ND (<0.02)	0.05
Arsenic as As	mg/l	ND (<0.01)	ND (<0.01)	*	*	*	*	ND (<0.01)	0.05
Cyanide as CN	mg/l	ND (<0.02)	ND (<0.02)	*	*	*	*	ND (<0.02)	0.02
Lead as Pb	mg/l	ND (<0.006)	ND (<0.006)	*	*	*	*	ND (<0.006)	0.05
Chromium (Total) as Cr	Mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	NR
Copper as Cu	mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	0.02
Manganese as Mn	mg/l	0.008	0.008	*	*	*	*	ND (<0.003)	0.10
Nickel as Ni	mg/l	0.049	0.013	*	*	*	*	ND (<0.006)	0.05
Tin as Sn	mg/l	ND (<0.01)	ND (<0.01)	*	*	*	*	ND (<0.01)	NR
Zinc as Zn	mg/l	0.027	0.152	*	*	*	*	0.036	5.0

Parameter	Units	Results							Class IIA
		W1	W2	W3	W4	W5	W6	W7	
Date Collected		26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	26/10/16	-
Time Collected		2.10pm	1.58pm	1.17pm	12.30pm	12.48pm	12.55pm	1.44pm	-
Boron as B	mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	1.0
Iron as Fe	mg/l	2.713	1.900	*	*	*	*	0.763	1.0
Phenol	mg/l	ND (<0.001)	ND (<0.001)	*	*	*	*	ND (<0.001)	0.01
Sulphide as S ²⁻	mg/l	ND (<0.1)	ND (<0.1)	*	*	*	*	ND (<0.01)	0.05
Oil & Grease	mg/l	ND (<1)	ND (<1)	*	*	*	*	ND (<1)	0.04; N
Ammoniacal Nitrogen as (NH ₃ -N)	mg/l	7.2	ND (<0.1)	*	*	*	*	ND (<0.1)	0.3
Total Coliform count	CFU/100ml	3,100	2,900	*	*	*	*	2,600	100
E.coli count	CFU/100ml	245	56	*	*	*	*	37	5000

Note:

1. Class II A means National Water Quality Standards for Malaysia, Class IIA
2. NR means No Recommendation
3. ND means Not Detected.
4. < means Less than
5. N means Free from visible film sheet, discoloration and deposits
6. * means No sample was collected due to no discharge from the point

According to the results shown in **Table 6.6**, most of the parameters detected are within the Class IIA limit except for COD, BOD₅, Fe and NH₃-N. COD and BOD₅ that have exceeded the limit of 25mg/l and 3mg/l respectively were detected at points W1 and W2. The high concentration of COD and BOD₅ are an indication of poor water quality in the existing drains.

As for Fe, it is found that the results for Fe at W1 and W2 have exceeded the Class IIA INWQS limit of 1.0mg/l. Fe is found naturally in the soil. Since the sample was taken from the earth drain, it is believed that the Fe in the soil might have deposited into the water.

NH₃-N has exceeded the stipulated limit of 0.3mg/l at point W1. NH₃-N can be found in fertilizers. Since the Project site is an oil palm plantation, it is believed that the residue of the fertilizers used for the oil palm trees might have contributed to the deposition of NH₃-N at W1 during runoff.

6.9 Ambient Air Quality

Ambient air sampling and monitoring using High Volume Sampler was conducted at an open space, within 1 km radius around the project site where it can well represent the whole area of the proposed site. The location of the sampling location is shown in **Figure 6.13**. The coordinates and the descriptions of the sampling points are given in **Table 6.7**.

Table 6.7: The Coordinates and Description of Ambient Air Sampling Locations

Location	Description	Coordinate
A1	At the boundary of the Project Site	N 02° 19' 38.6" E 102° 14' 24.3"
A2	Near KYZ Furniture factory	N 02° 19' 15.3" E 102° 14' 23.0"
A3	Near to Taman Krubong Perdana	N 02° 19' 53.6" E 102° 14' 52.9"



The monitoring report prepared by the accredited laboratory is attached as **Appendix IV** and the monitoring results obtained at the sampling locations were used to compare with the Malaysian Recommended Air Quality Guidelines as presented in **Table 6.8**.

Table 6.8: Ambient Air Quality Monitoring Results

Sampling location	Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)	Malaysian Recommended Air Quality Guidelines
A1	57	260 $\mu\text{g}/\text{m}^3$ (24 hours averaging time)
A2	60	
A3	65	

From the monitoring results, the concentration of the Total Suspended Particulate (TSP) monitored at the monitoring locations are well below the Recommended Malaysian Air Quality Guidelines of 260 $\mu\text{g}/\text{m}^3$. Hence, the ambient air quality at the surrounding of the Project site is relatively clean.

6.10 Noise Level

Noise level measurements were carried out at three (3) locations near to the boundary of the Project site using the ACE Sound Level Meter. The frequency of measurement was 24-hours continuously for a specific allotted period, viz., day, evening and night. The measurements were carried out from 25th October to 28th October 2016. The locations where the noise levels were measured are shown in **Figure 6.13**. The coordinates and descriptions of the monitoring location are given in **Table 6.9**.

Table 6.9: The Coordinates and Description of Noise Monitoring Locations

Location	Description	Coordinate
N1	At the boundary of the Project Site	N 02° 19' 38.6" E 102° 14' 23.8"
N2	Near KYZ Furniture factory	N 02° 19' 15.5" E 102° 14' 22.5"
N3	Near to Taman Krubong Perdana	N 02° 19' 53.3" E 102° 14' 53.1"

The history graphs of noise level measured are given in the monitoring report prepared by the accredited laboratory as attached in **Appendix IV**. The average readings of Leq recorded for all allotted period at the monitoring location are summarised in **Table 6.10**.

Table 6.10: The Summary of Average Readings of LAeq

Location	Date	Period	Time	Average Leq dB(A)	*Maximum Permissible Leq dB(A)
N1	26/10/16	Day Time	07:30:59	55.9	$\leq 60.0^{\#}$
	-26/10/16		19:00:12		
	26/10/16	Evening	19:02:14	55.8	$\leq 60.0^{\#}$
	-26/10/16		22:00:17		
	26/10/16	Night Time	22:02:00	51.2	$\leq 50.0^{\#}$
	-27/10/16		07:20:10		
N2	27/10/16	Day Time	07:30:59	56.8	$\leq 60.0^{\#}$
	-27/10/16		19:00:12		
	27/10/16	Evening	19:02:24	52.8	$\leq 60.0^{\#}$
	-27/10/16		22:00:26		
	27/10/16	Night Time	22:02:59	52.3	$\leq 50.0^{\#}$
	-28/10/16		07:30:10		
N3	25/10/16	Day Time	07:00:35	56.3	$\leq 60.0^{\#}$
	-25/10/16		19:00:48		
	25/10/16	Evening	19:02:51	54.7	$\leq 60.0^{\#}$
	-25/10/16		22:00:53		
	25/10/16	Night Time	22:02:59	50.1	$\leq 50.0^{\#}$
	-26/10/16		07:00:09		

Note:

- 1.) * means : Maximum Permissible Sound Level (LAeq) By Receiving Land Use For Planning And New Development, Schedule 1; Annex A: Schedule Of Permissible Sound Levels; The Planning Guidelines For Environmental Noise Limits & Control, Department of Environment.
- 2.) [#] means: Receiving Land Use Category of Urban Residential (High Density) Areas, Designated Mixed Development Areas (Residential – Commercial).

Based on the recommended guidelines as stipulated in Annex A: Schedule 1 of the “Planning Guidelines for Environmental Noise Limits and Control” for urban residential area, the average Leq readings recorded at all monitoring stations are well within the maximum permissible sound level of 60 dB(A) during daytime and evening time. In contrast, the average Leq readings recorded at all monitoring stations have exceeded the permissible sound level of 50 dB(A) during night time.

Based on the record of site observation annotated by the sampling personnel from the laboratory, the noise levels which have exceeded the permissible sound level during night time are most probably contributed by the noise from vehicles passing by, noise from insects, noise from dogs barking and the sound of *azan* from a nearby *surau*.

6.11 Biological and Ecological Environment

6.11.1 Methodology

At present, the Project site is entirely covered by the matured oil palm trees and rubber trees that are still productive. The land use at the surrounding of the site is mostly oil palm plantation, rubber estate and fruit farms.

As the Project is not located within or close to an Environmental Sensitive Area (ESA), the ecology and biological components are expected to be similar and not much different from the ecology of the predominant land use of the region. The biological components and the ecology of the site were evaluated through secondary resources. Information in this section was documented with reference to the available data in the approved environmental report prepared for the other projects within the same region or near to the Project.

6.11.2 Flora

The area was primarily planted with oil palm / rubber trees. The other plant species were mostly banana trees and shrubs, among which include the *Trema orientalis*, *Scleria spp.*,

Ficus species, Macaranga triloba, M. gigantia, Morinda citrifolia and Mallatus spp. A list of the non-tree and shrub species in the area is provided in **Table 6.11**.

Table 6.11: Non- Tree & Shrub Species of Plants in The Survey Area

Common Names	Botanical Names	Remarks
Wild ginger	<i>Globba spp</i>	oc
Keladi	<i>Colocasia spp</i>	co
Sendayan	<i>Scleria spp</i>	oc
Resam	<i>Dicranopteris linearis</i>	co
Kangkong	<i>Ipomoea aquatica</i>	co
Buffalo grass	<i>Paspalum conjugatum</i>	co

Note : co - common and regularly recorded in sampling
 oc - common but occasionally recorded in sampling (<4 plants per acre)
 ra - rarely encountered during sampling

6.11.3 Fauna

Mammals

The proposed area supports a small number of species with a majority of the animals located in the forest/shrub fringes. The wildlife species in the area are listed in **Table 6.12**.

Table 6.12: List of Mammals Observed In The Study Area

Common Names	Species	Status	Remarks
Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	Protected	co
Plantain Squirrel	<i>Callosciurus notatus</i>	Unlisted	co
Common Tree Shrew	<i>Tupaia glis</i>	Unlisted	co
Malayan Porcupine	<i>Hystrix brachyura</i>	Protected	ra

Note : co - > 2 sightings in the study area
 oc - < 2-2 sightings in the study area
 ra - < rarely encountered during sampling

The mammals within the study site comprise of at least 4 species from 3 families. The common mammalian species are the Plantain Squirrel and the Common Tree Shrew. The Common Palm Civet and the Malayan Porcupine were uncommon. Most of the small mammals were recorded close to the palm trees and the forest / shrub fringes.

Avifauna

A total of 13 species from 10 families is expected to be present in the study area. From the total of 13 species, 4 species are unlisted, 4 species are protected, and 5 species fall under the category of totally protected. The list of bird species that are expected to be present in the Project area is listed in **Table 6.13**.

Table 6.13 : List of Bird Species Found In The Study Area

Species	Common Name	Status
<i>Amaurornis phoenicurus</i>	Ruak-Ruak	Protected
<i>Lanius cristatus</i>	Brown Shrike	Totally protected
<i>Treron olax</i>	Little Green Pigeon	Protected / Game
<i>Streptopelia chinensis</i>	Spotted-necked Dove	Unlisted
<i>Geopelia striata</i>	Zebra Dove	Unlisted
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Totally Protected
<i>Centropus bengalensis</i>	Lesser Coucal	Totally Protected
<i>Acridoteres tristis</i>	Common Mynah	Unlisted
<i>Oriolus chinensis</i>	Black-naped Oriole	Totally Protected
<i>Aplonis panayensis</i>	Glossy Starling	Protected
<i>Lonchura punctulata</i>	Scally-breasted Munia	Protected
<i>Corvus splendens</i>	House Crow	Unlisted
<i>Orthotomus ruficeps</i>	Common Tailorbird	Totally Protected

Herpetofauna

Although site sampling was not carried out, the *Herpetofauna* such as amphibians and reptiles are likely to be present, judging from the pertinent condition of the waterlog and streams which courses through the Project site.

6.12 Socio-economy

6.12.1 Population and Demography

This project is located within Mukim Krubong, District of Melaka Tengah. Based on the year 2010 census, a total of 13,517 people were recorded in Mukim Krubong, which is about 13% of the overall population in District of Melaka Tengah. The total number of households in Mukim Krubong is about 3,212. The living quarters and population distribution by gender in Mukim Krubong for the year of 2010 are given in **Table 6.14**.

Table 6.14: Living Quarters and Population Distribution by Gender in Mukim

Mukim	Population			Living Quarters
	Total	Male	Female	
Mukim Krubong	13,517	7,142	6,375	4,530

Source: Population and Housing Census of Malaysia, 2010.

As for the ethnic composition, the total population recorded is only based on Malaysian citizenship and excluded Non-Malaysian citizens. Malay is the largest ethnic group in Mukim Krubong with 8,501 people (63%), followed by Chinese with 3,198 people (24%), Indian with 1,075 people (8%), other Bumiputera with 67 people (0.5%) and 28 (0.2%) from other ethnic groups.

In terms of age group, the active working population (15 – 59 years) in Mukim Krubong is shown in **Table 6.15**. It represents the largest population group as compared to the non-active working population, viz., 0 – 14 years and 60 – 75 years. From the tabulated data, the Project site is located near to a region with a substantial number of active working groups, who could financially benefit from the completion of the project.

Table 6.15: Age Distribution for District of Mukim Krubong

Mukim	Age group						Total
	0 – 14	15 - 29	30 – 44	45 - 59	60 -74	+ 75	
Mukim Krubong	4,302	3,668	2,951	1,843	578	175	13,517

Source: Population and Housing Census of Malaysia, 2010.

6.12.2 Economic Activities

Based on direct observation, the economic status of the local population can be categorised as belonging mainly to low to middle income category judging from the types of house and vehicle owned.

The main villages in the vicinity has a fully developed infrastructure and is provided with all basic facilities such as treated water, electricity, paved access roads, clinic and schools. Almost all houses are provided with the basic facilities such as attached or pour-flush toilets.

The economy of the area is basically agricultural with rubber and oil palm being the major crop and fruit cultivation as another source of income to the local populace. However, the developments in the vicinity have upgraded the standard of living for the residents and an increasing number of the populous are employed in the commercial and industrial sectors.

6.13 Road Network and Traffic Volume

The proposed project is located next to Taman Krubong Perdana, District of Melaka Tengah, Melaka. The nearest road to the project is State Road M133 which is connecting Lebuhr SPA and Parit Melana. A stretch of M133 is a four lane dual carriageway from Taman Krubong Jaya up to Taman Krubong Permai.

6.13.1 Access Road and Junction

The State Road M133 is accessible via two junctions. The accessing junctions are:

- i. State Road M133 / Lebuhraya SPA (Sg. Udang-Paya Rumpit-Ayer Keroh) junction which is located approximately 5.0 km to the South of the project site.
- ii. State Road M133 / Major State Road M17 junction which is situated approximately 2.0 km to the North East of the Project site.

The site is accessible from all parts of the State via a good network of state and federal roads and from other states through the North-South Expressway.

6.13.2 Traffic Volume

The data on traffic volume was obtained from the Traffic Impact Assessment (TIA) report which was prepared by O&L Jurutera Perunding Sdn. Bhd. Based on the TIA report, the traffic count was conducted from 6.00 am to 10.00 pm at State Road M133 and Jalan Krubong Perdana Utama / Kampung Lanjut Manis (**Junction A**). The location of the traffic count station is shown in **Figure 6.14**.

From the traffic count, the peak hour for AM Peak is from 7.00 am to 8.00 am and PM Peak is from 6.00 pm to 7.00 pm. **Table 6.16** and **Table 6.17** show the lane capacity and Level of Service (LOS) of Junction A.

Table 6.16: Summary of Lane Capacity for Existing Condition

Location	Road	Peak Hour Volume (pcu/hr)		Capacity For Uninterrupted Flow Facilities (pcu/hr)
		AM Peak	PM Peak	
State Road M133 and Jalan Krubong Perdana Utama / Kampung Lanjut Manis	State Road M133 (Towards Lebuhraya SPA)	1,341	1,156	2,800
	State Road M133 (Towards Parit Melana)	1,084	975	2,800
	Jalan Krubong Perdana Utama	428	443	8,000
	Kampung Lanjut Manis	50	45	2,800

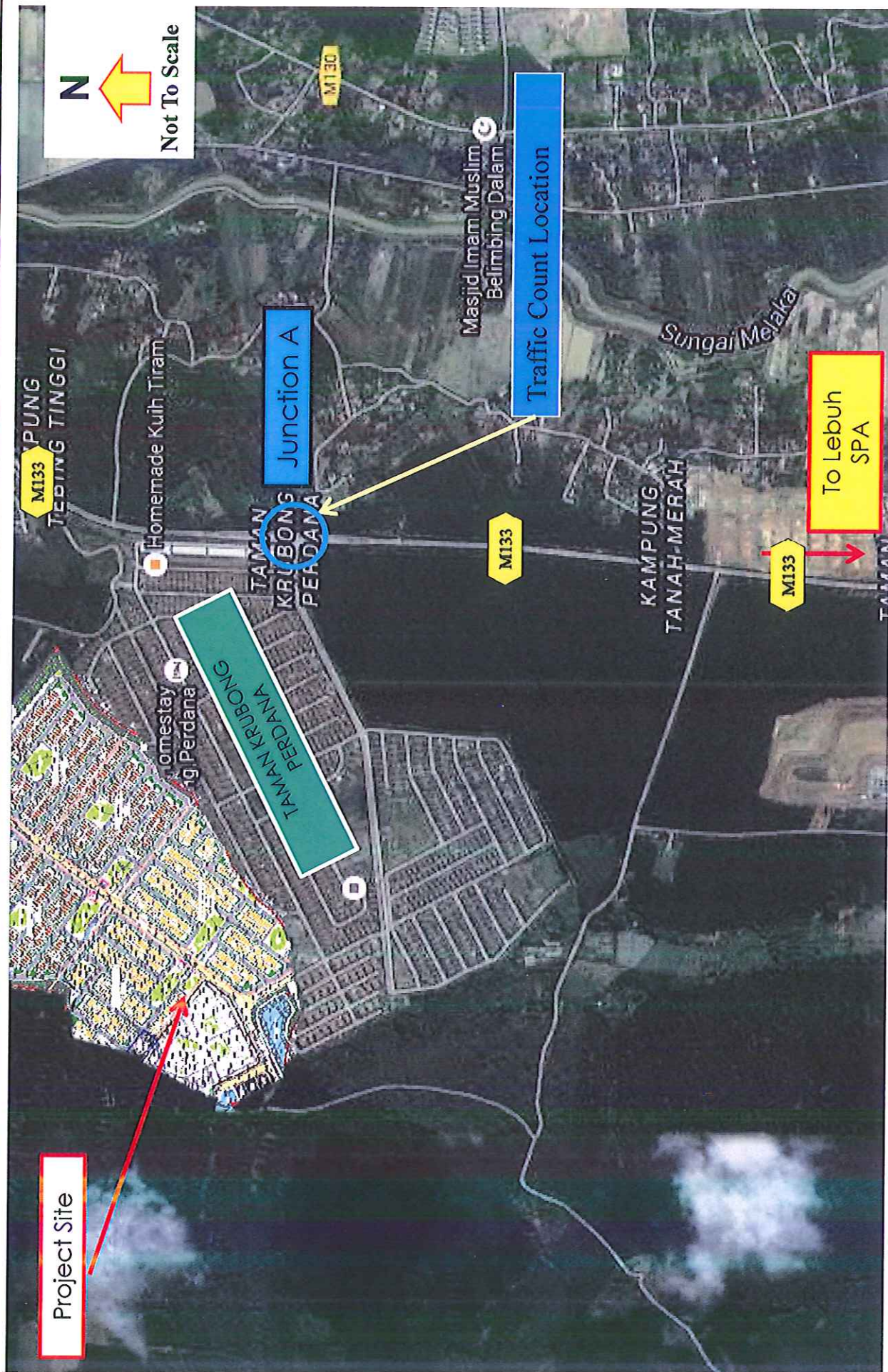


Figure 6.14 : Locations of Traffic Count

Source : Google Map

Table 6.17: Summary of Junction LOS for Existing Condition

Junction	Direction	Level of Service		Arahan Teknik (Jalan) 13/87
		AM Peak	PM Peak	
Signalised 4-legged Junction A	Straight Through from State Road M133 towards Parit Melana	C	C	D
	Straight Through from State Road M133 towards Lebuhr SPA	B	C	D
	Straight Through from Taman Krubong Perdana to Kg. Lanjut Manis	C	C	D
	Straight Through from Kg. Lanjut Manis to Taman Krubong Perdana	C	D	D
	Right Turn from State Road M133 towards Kg. Lanjut Manis	C	C	D
	Right Turn from Kg. Lanjut Manis to State Road M133	C	D	D
	Right Turn from State Road M133 towards Taman Krubong Perdana	C	F	D
	Right Turn from Taman Krubong Perdana to State Road M133	C	D	D

Based on the TIA report, the peak hour volume for both AM peak and PM peak at all junctions did not exceed the capacity for uninterrupted flow facilities. The LOS for the signalised 4-legged junction at Jalan Krubong Perdana Utama / Kampung Lanjut Manis is still within the acceptable limit except for the right turn from State Road M133 towards Taman Krubong Perdana junction during PM peak which falls under LOS F.

CHAPTER 7

EVALUATION OF IMPACTS

7.0 EVALUATION OF IMPACTS

7.1 Introduction

The implementation and operation of the project will involve activities having the potential to induce environmental impacts. In order to identify and assess all potential impacts, the project activities have been grouped into four broad categories as follows:

- Activities during the pre-construction phase
- Activities during construction phase
- Activities during operational phase
- Impacts arising from abandonment of the project

Pre-construction Phase

- Reconnaissance Survey
- Site and Soil investigation
- Related Studies (Feasibility Study and EIA study)

Construction Phase

- Site preparation & mobilisation
- Land clearing & biomass disposal
- Setting up storage area and labour camp
- Earthworks (cutting & filling) and removal of excess earth
- Transportation of construction material
- Construction of infrastructure (road, drainage, water & sewerage reticulation)
- Construction of building structures (houses, affordable flats etc.)
- Construction of public building and utilities (Sewerage Treatment Plant, community hall, detention pond etc.)
- Demobilisation & construction waste disposal
- Landscaping & final clean-up

Operational Phase

- Increase in population
- Provision of better utilities and infrastructure
- Additional traffic volume
- Additional wastewater discharge
- Additional solid waste generation and disposal
- Additional surface runoff

From the information above, the environmental components which are likely to induce potentially significant impacts are identified for analysis, discussion and assessment. In arriving at decisions on environmental impacts, the guidelines given in the Environmental Impact Assessment Guidelines For Housing and New Township Development published by the DOE are applied.

Table 7.1 gives a summary of the potential impacts of the proposed development using the impact assessment matrix. Major impacts for various environmental factors are outlined and further elaborated in the following pages.

Table 7.1 : Matrix

Environmental Components			Project Activities											
			Site Investigation			Construction						Operation and Maintenance		
			Survey	Investigation	Land Acquisition	Access Road	Site Clearing	Excavation	Drainage	Erosion Control	Utilities	Abandonment	Equipment Operation	Waste Disposal And Recovery
													Product Storage	Spills And Leaks
														Abandonment Plan
Physico-chemical	Land	Landforms												
		Soil Profile												
	Surface water	Soil Composition												
		Slope stability												
		Subsidence & Compaction												
		Seismicity												
		Flood Plains/Swamps												
Biological	Groundwater	Land use												
		Engineering and Mineral resources												
	Atmosphere	Buffer Zone												
		Water Table												
		Flow Regime												
Human	Noise	Water Quality												
		Recharge												
	Species and Population	Aquifer Characteristics												
		Existing Use												
		Visibility												
Human	Health & Safety	Intensity												
		Duration												
	Socio Economic	Frequency												
		Terrestrial Vegetation												
		Terrestrial Wildlife												
Human	Aesthetic & Culture	Other Terrestrial Fauna												
		Aquatic/Marine Fauna												
	Landforms	Fish												
		Other Aquatic/Marine Fauna												
		Landforms												
Human	Biota	Wilderness												
		Water Quality												
	Atmospheric Quality	Climate												
		Tranquility												
		Sense of Community												
Human	Community Structure	Community Structure												
		Man-Made Objects												
	Historic Places or Structure	Historic Places or Structure												
		Religious Places or Structure												
		Landscape												

- Insignificant and Excluded from Matrix
 Environmental impact that is potentially but on a temporary basis and will assume equilibrium after certain period of time
 Environmental impact that is potentially significant but about which there is insufficient data to make a reliable prediction. Close monitoring and control is recommended
 Potentially significant adverse environmental impact for which a design solution has been identified
 Residual and significant adverse environmental impact
 Significant environmental enhancement

7.2 Erosion and Sediment Risk

Soil erosion is one of the significant impacts that are likely to happen during the land clearing and construction of the Project. It will be most severe during the stages of site levelling, earthworks and prior to re-establishment of vegetation or basic infrastructure, viz., road pavement and concrete drain.

Soil erosion is a process of detachment and transportation of soil particles from their original mass by the actions of agents of erosions e.g. raindrops and flowing water. Erosion can be classified into two categories, i.e., geological erosion and accelerated erosion. The former occurs naturally, dictated by the actions of wind, water, climate and vegetation and the rates are usually low.

Accelerated erosion, on the other hand, is caused by anthropogenic activity and it is generally detrimental to the environment because of high nutrient losses and sediment outputs. Eroded land usually has lower infiltration capacity and thus leads to increased surface runoff and loss of valuable top soil which is nutrient rich. Of greater concern and importance is the negative impact on the water quality of the receiving water. Increased siltation would result in greater turbidity that could interfere with aquatic flora and fauna. Erosion of hill slopes could result in mud slides and cause instability of buildings constructed near to the slopes. This could pose a danger not only to the residents of the buildings but also those situated at the foothills.

For this project, erosion is likely to occur due to the undulating site condition. Erosion and Sediment Risk Assessment has been conducted by a Certified Professional in Erosion and Sediment Control (CPESC) and is as explained below.

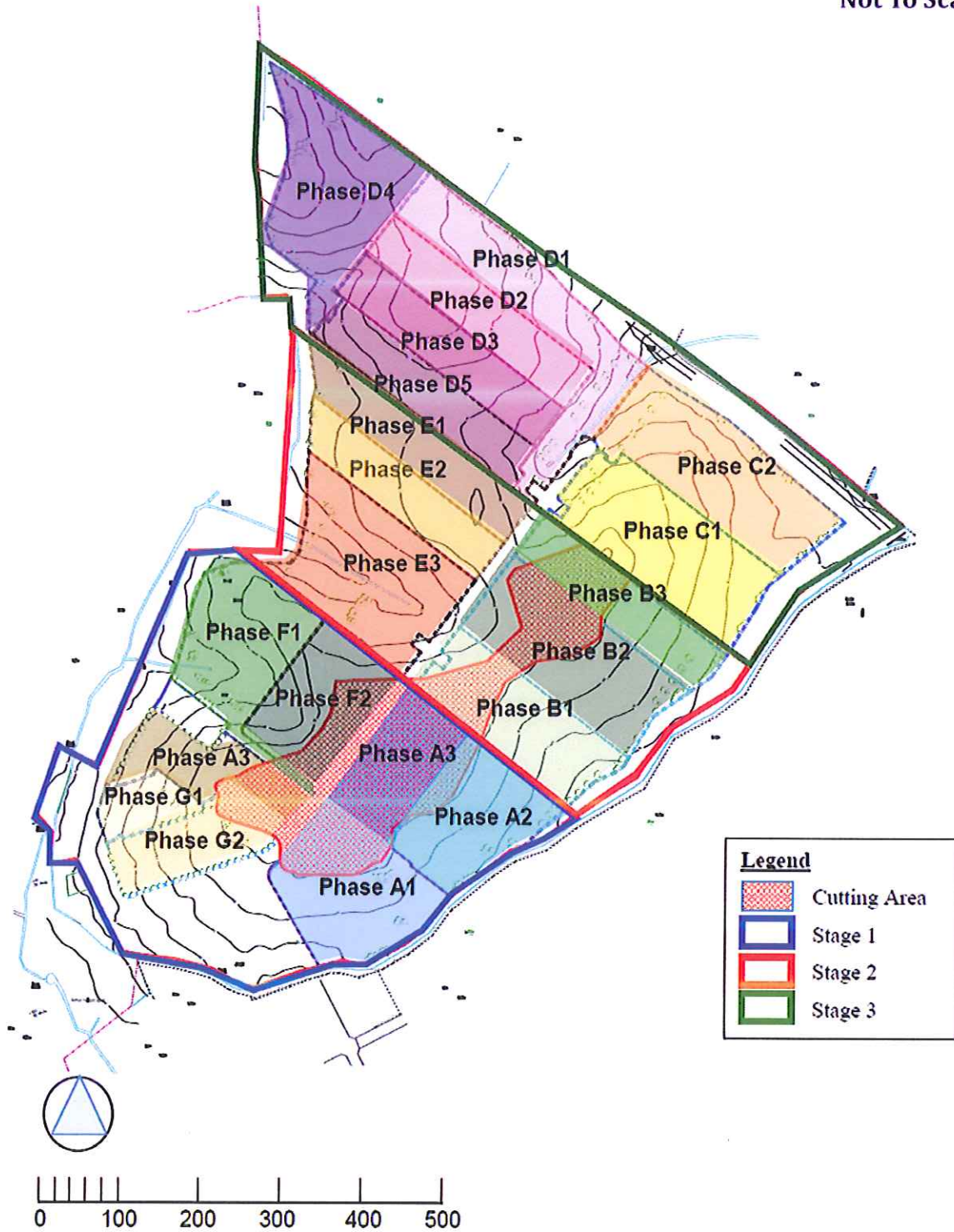
7.2.1 Erosion and Sediment Risk Assessment

Cut and Fill

Earthwork will be carried out to achieve the desired platforms of the project site. The area of cut and fill is shown in **Figure 7.1**. Earth cutting activities will be mainly carried out at the higher ground level along the centre portion of the project site. Excess



Not To Scale



material will be filled at the lower ground area. Once the platforms are achieved, surplus will be exported out of the project site for final disposal or sold to third party buyer.

The quantity of cut and fill for the site is shown in **Table 7.2**. Surplus is estimated to be 888,967.31 m³.

Table 7.2 : Quantity of Cut and Fill

Activity	Estimated Quantities
Cut	2,512,548.40 m ³
Fill	1,623,581.09 m ³
Balance	888,967.31 m ³

Source : Lead Engineering Consultant Sdn. Bhd.

According to the earthwork implementation planning provided by the project proponent, earthwork will be carried out in three (3) stages as below and illustrated in **Figure 7.1**:

Stage 1 : Site clearing and earthwork at project phases A, F and G

Stage 2 : Site clearing and earthwork at project phases B and E; and

Stage 3 : Site clearing and earthwork at project phases C and D.

Methodology

The soil erosion risk assessment is carried out based on manual assessment of the Surveyor's plan of 5m interval of the proposed project site. Assessment of soil erosion impact is carried out by using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE equation is shown below:

$$A = R * K * LS * CP$$

where A = mean annual soil loss (tonnes/ha/yr)
R = rainfall erosivity factor (MJmm/ha/hr)
K = soil erodibility factor [tonnes/ha/(MJmm/ha/hr)]
LS = combined index of slope length and slope steepness

C	=	crop cover factor
P	=	soil management practice factor

Soil erosion assessments were carried out for 3 stages of earthwork.

Calculation of the soil loss and erosion rates is carried out for five (5) scenarios as described below:

- (i) **Pre-development stage** – the existing environment. The Project site is currently covered with oil palm and rubber plantation with flat to undulating terrain.
- (ii) **Pre-bulk grading stage (worst case scenario)** – land clearing is carried out but earthwork has not started. No erosion and sediment control measures are adopted onsite.
- (iii) **Pre-bulk grading stage (with control)** – land clearing is carried out but earthwork has not started. Appropriate erosion and sediment control measures are applied onsite.
- (iv) **Post bulk grading stage (with control)** – land clearing and earthwork have been completed. Building construction is ongoing. Appropriate erosion and sediment control measures are applied onsite.
- (v) **Post Development stage** – the project site is built up with housing development and non-built up areas are landscape with vegetation.

The input parameters for RUSLE and the sources of information are summarized in **Table 7.3**.

Table 7.3 : Input Parameters and Reference Source for RUSLE Calculation

Label	Parameter	Reference Source
R Factor	Rainfall Erosivity Factor	Based on <i>Guidelines for Erosion and Sediment Control in Malaysia</i> (DID, 2010) and <i>Soil Erosion and Conservation</i> (Morgan, RPC, 2005).

Label	Parameter	Reference Source
K Factor	Soil Erodibility Factor	Based on soil test result of the Project site. Borehole data is used to determine K Factor. K Factor is calculated based on Tew Equation as stated in <i>Guidelines for Erosion and Sediment Control in Malaysia</i> (DID, 2010).
LS Factor	Combined index of Slope Length and Slope Steepness	Based on Surveyor's contour plan and <i>Guidelines for Erosion and Sediment Control in Malaysia</i> (DID, 2010).
C Factor	Crop Management Factor	Based on <i>Guidelines for Erosion and Sediment Control in Malaysia</i> (DID, 2010).
P Factor	Soil Conservation Practice Factor	Based on <i>Guidelines for Erosion and Sediment Control in Malaysia</i> (DID, 2010).

Each stage is divided into smaller parcels for computation purpose. A total of 17 parcels are demarcated as shown in **Figure 7.2**. Input data of the erosion risk assessment are shown in **Appendix V** and discussed below.

Results

An estimation of soil erosion was carried out for the existing condition as well as for during the various stages of development. Detailed results of the soil erosion study are given in **Appendix V**.

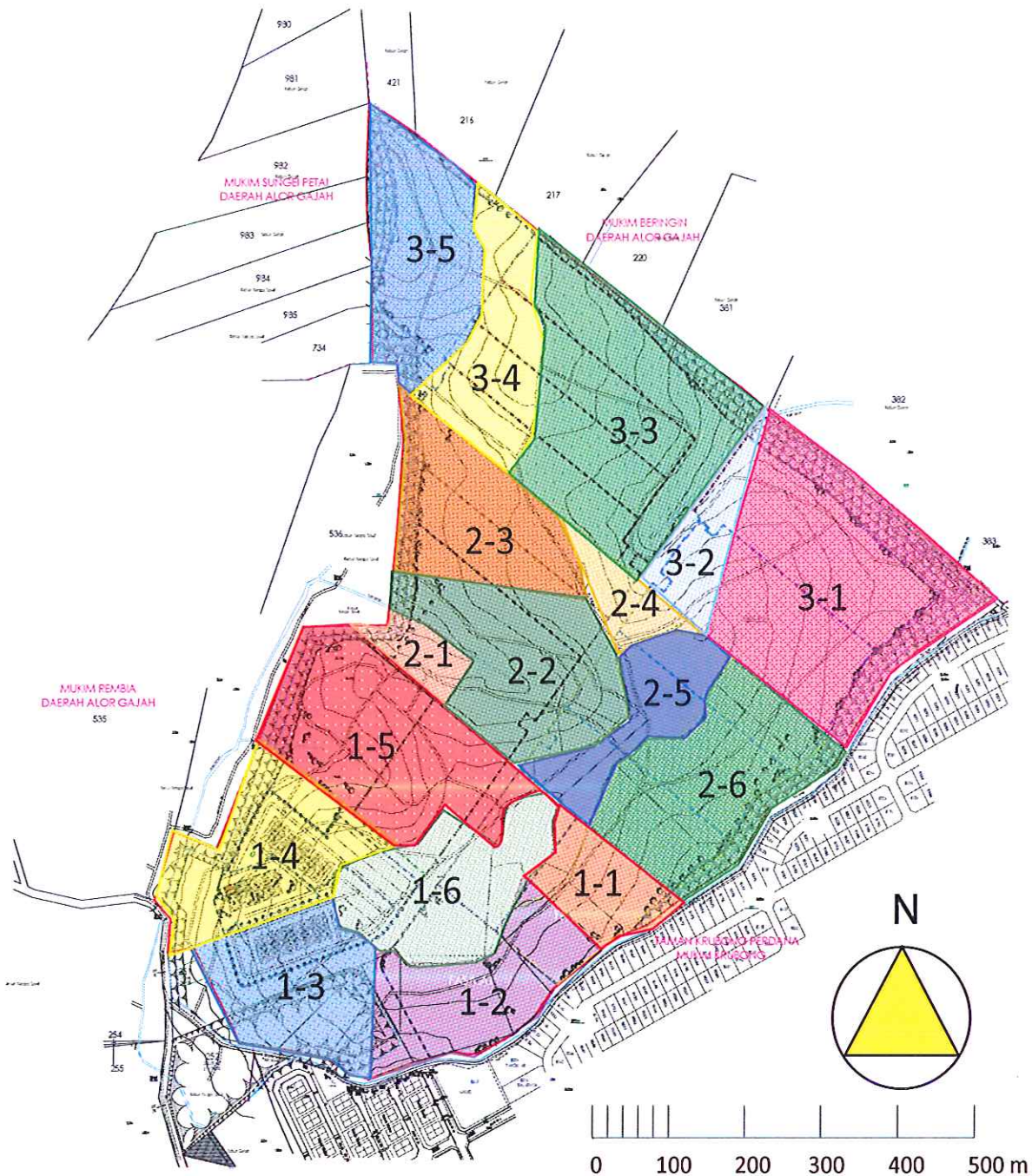
Table 7.4 tabulated the results of the soil erosion assessment for the existing environment (pre-development stage).

Table 7.4 : Erosion Rate of the Project Site during Pre-development Stage

Parcel	Area (ha)	R	K Factor	LS	CP	A (ton/ha/yr)	E (ton/yr)
1-1	1.5391	12000	0.029	4.967	0.14	241.98	372.43
1-2	3.2216	12000	0.029	2.421	0.12	101.10	325.72
1-3	3.5248	12000	0.057	3.898	0.12	319.96	1,127.79
1-4	3.8575	12000	0.029	6.444	0.14	313.97	1,211.15
1-5	5.3922	12000	0.029	3.737	0.12	156.06	841.52
1-6	3.7211	12000	0.029	0.599	0.12	25.03	93.12
2-1	0.692	12000	0.025	4.803	0.14	201.73	139.60



Not To Scale



Parcel	Area (ha)	R	K Factor	LS	CP	A (ton/ha/yr)	E (ton/yr)
2-2	4.181	12000	0.025	3.489	0.12	125.61	525.16
2-3	3.9311	12000	0.025	1.883	0.12	67.78	266.46
2-4	1.0417	12000	0.025	6.643	0.14	279.03	290.66
2-5	2.3154	12000	0.025	0.535	0.12	19.27	44.63
2-6	4.7238	12000	0.025	3.035	0.12	109.27	516.19
3-1	7.6503	12000	0.025	4.602	0.12	165.66	1,267.31
3-2	1.2031	12000	0.025	6.787	0.14	285.04	342.93
3-3	7.7881	12000	0.025	4.390	0.12	158.05	1,230.93
3-4	3.126	12000	0.025	4.775	0.14	200.56	626.94
3-5	3.7045	12000	0.025	9.307	0.14	390.90	1,448.09
Total	61.6133						10,670.63

Notes: R = Rainfall Erosivity Factor K = Soil Erodibility Factor

LS = Slope Length and Slope Factor CP = Crop Cover and Support Practice Factor

A = Erosion Rate E = Annual Erosion Risk

Table 7.4 shows that the Project site is in the category of high erosion risk (erosion rate > 100 ton/ha/yr) due to the undulating terrain and soil erodibility factor. Hence, it is imperative that the Project development is carried out in stages. Table 7.5 shows the total soil loss of each development stage.

Table 7.5 : Erosion Risk of the Project Site for Various Development Stages

No.	Development Stage	Total Soil Loss (tonne/year)
1.0	Pre-development Stage	10,670.63
2.0	Construction Stage (Pre-bulk Grading Stage, without Mitigating Measures)	66,916.76
3.0	Construction Stage (Pre-bulk Grading Stage, with Mitigating Measures)	30,133.67
4.0	Construction Stage (Post-bulk Grading Stage, with Mitigating Measures)	2,522.19
5.0	Post Development Stage	90.80

The amount of soil erosion during construction stage without mitigating measures is 66,916.76tonnes/year. The erosion risk increases 6 folds from the existing environment. The massive erosion rates represent earth movement due to the impact from undulating terrain and concentrated flow of runoff.

Erosion risk can be reduced by implementing best management practices (BMPs) to prevent and reduce erosion during the construction stage. BMPs to be implemented include earthwork in stages, installation of temporary earth drain, check dam, silt fence and sediment basin. In addition, landscaping shall be carried out at non-built up areas as soon as possible to cover up exposed land. Upon completion of the Project development, erosion risk will be very low.

7.2.2 Sedimentation Risk Assessment

Sedimentation, a consequence of soil erosion, is the delivery of eroded soil particles from the place of origin to low-lying areas, the river or the sea. Sedimentation is therefore dependent on the rate of erosion and its delivery to the water course will depend on proximity, slope profile and availability of obstructions along its path, such as trees and buffer.

Methodology

The potential sedimentation rates were calculated using the Modified Universal Soil Loss Equation (MUSLE). The MUSLE equation is shown below:

$$Y = 89.6(V.Q)^{0.56} .K. LS. C. P$$

Where

Y	=	Sediment yield for a storm event (tonne)
V	=	Volume of runoff for the storm event (m ³)
Q	=	Peak flow for the storm event (m ³ /s)
K	=	Soil erodibility factor
LS	=	Combined index of slope length and slope steepness
C	=	Crop management factor
P	=	Soil conservation practice factor

Results of Sedimentation Risk Assessment

Summary results of the sediment yield assessment for the Project development are tabulated in **Table 7.6**. Calculation of the sediment yield assessment is given in **Appendix V**.

Table 7.6 : Sediment Yield of the Project Site for Various Development Stages

No.	Development Stage	Sediment Yield (tonne)
1.0	Pre-development Stage	190.15
2.0	Construction Stage (Pre-bulk Grading Stage, without Mitigating Measures)	2,749.27
3.0	Construction Stage (Pre-bulk Grading Stage, with Mitigating Measures)	1,216.87
4.0	Construction Stage (Post-bulk Grading Stage, with Mitigating Measures)	104.69
5.0	Post Development Stage	4.62

The sediment yield of the Project site during pre-development stage is 190 tonne per storm event. If total land clearing is carried out in one phase without any BMPs, the potential sediment yield will increase 14 folds to 2,749 tonne. If BMPs are installed onsite and land clearing is carried out in phases, the sediment yield can be reduced more effectively to 1,217 tonnes (pre-bulk grading stage) and 105 tonne (post-bulk grading stage) respectively.

During the post development stage, sediment yield is further reduced to 5 tonnes per storm event. This is due to most of the land will be built-up, paved or covered with turf.

7.3 Slope Stability

Since the site is undulating and there are quite a number of slopes, there is a high chance that the development will cause landslide if no proper slope design and precaution is implemented. In the occurrence of landslide, it will affect the topography

of the earth's surface, the character and quality of rivers and streams and groundwater flow, the forests that cover much of the earth's surface, and the habitats of natural wildlife that exist on the earth's surface, including its rivers, lakes, and oceans. Large amounts of earth and organic materials will enter streams as sediment as a result of this landslide and erosion activity, thus reducing the potability of the water and quality of habitat for fish and wildlife.

7.4 Hydrological Regime

Changes in land use, particularly from the oil palm / rubber plantation into a well-planned residential would result in the creation of an additional impervious area that would increase the surface runoff. Upon the completion of the development, it is estimated that a well-planned residential with the total built-up and additional impervious areas, inclusive of roads, houses etc. will amount about more than 90% of the project area. As such, there will be an overall reduction of infiltration into the soils. Coupled with a reduced time of concentration, the eventual result would be an increase in the magnitude of peak flows from the project site.

A contributory factor to early initiation of runoff is the higher efficiency of the drainage system through the construction of paved roadside and monsoon drains that will efficiently channel runoff out of the project site into the outlet drains. Thus, while the project area will be free of flooding, the downstream area may feel the impact of the increased flows which would result in flash flood or formation of water-logging areas.

As to avoid any potential hydrological impacts to be foreseen, an estimate of the peak flows, before and after the development for the catchment areas involved (Please refer to **Figure 6.7**) is summarised in **Table 7.7**. The detailed computation is presented in **Appendix VI**.

Table 7.7: Summary of Runoff Computation For The Tributaries

Catchment	Name of Tributary	Return Period (Year)	Discharge, Q (cumecs)		
			Before	After	% Difference
A	Tributary of Sg. Ayer Hitam	100	1.74	2.15	23.6
B	Tributary of Sg. Jenuang	100	2.75	2.34	-14.9

The estimation in **Table 7.7** indicates an increase in the storm water runoff for Catchment A for 100 year return period. The existing tributary A of Sg. Ayer Hitam that is going to be utilized as the final discharge drain has a capacity of 3.57 cumecs. Based on the runoff computation, this capacity is found to be sufficient to cater for the additional storm water runoff after the development. As for tributary B (Sg. Jenuang), there will be a decrease of storm water runoff after the project completion as all the runoff from the development will be channelled into tributary A (Sg. Ayer Hitam). The capacity of tributary B is 3.26 cumecs.

As the lowland area at the downstream of the tributary A will be converted into storm water detention ponds to provide some flow attenuation for the development, the impact of the peak flow at tributary A is not expected to be severe during the operational stage. For tributary B, since there is a decrease of runoff after the development, one of the impacts that might occur due to the decrease is dry flow at tributary B which might affect the source of water for the animals at the surrounding area. However, since there are other tributaries nearby which will not be affected by this development this impact is not expected to be significant.

7.5 Solid Waste Generation

Solid wastes will be generated during the construction phase and operational phase when residents and property owners / tenants move in to stay.

7.5.1 During Construction Phase

During construction phase, solid wastes would originate from 2 sources i.e. the labour camps and the construction activities.

i. Biomass from Site Clearing

Site preparation that involves clearing and cutting off oil palm, rubber trees and undergrowth for the preparation of the proposed platform will create solid waste problems if it is not properly planned or disposed off. Biomass can be transported out and disposed of at the nearest dumping ground or it can also be reduced into chips and used as mulching for greens and other vegetation areas. Should the option of transporting out the biomass were adopted, the impacts associated will include an increase in vehicular traffic, particularly the movement of trucks which leads to an increase in traffic, delay in traffic flow and dust generation.

ii. Waste From Labour Camps / Base Camps

Waste from the labour camps would comprise mainly of domestic waste that, if not collected and disposed properly would result in unsanitary conditions giving rise to health hazards to the workers and residents neighbouring the project site. Thus, proper measures should be adopted by the Contractor to collect and dispose off the waste at the authorised dump site.

iii. Construction Waste / Surplus From Construction Activity

During construction, all types of solid and liquid waste will be generated either from the construction itself or from machinery and equipment. The hazardous wastes such as spent oil and grease, chemical solutions etc. are required to be separated from the solid waste and disposed off in a proper manner to be conducted by a licensed waste collector. The hazardous wastes which are as stipulated in the Schedule of the Environmental Quality (Scheduled Waste) Regulation 2005 need to be appropriately disposed off by a licensed waste collector as buried on-site or on-site disposal is strictly prohibited.

Construction waste is generally comprised of non-organic materials such as excess construction materials in the form of steel rods, plastic and concrete etc. which if not reused, would have to be properly disposed off-site. This is to avoid adverse impacts such as providing habitats for disease vectors e.g. mosquitoes, rats and rodents, creation of fire hazards, leaching of toxic matter and creating eyesore. Should this happen, it will jeopardise the public's safety and the ecosystem of the surrounding areas.

7.5.2 During Operational Phase

An estimate of the solid waste generation during operation of the proposed Project can be made by using the rate of 1.09 kg/person/day for domestic wastes (Source : *Rusdin Laiman et al.*, 2005) With the total number of people estimated is about 10,300 persons, the total solid waste that is expected to be generated from the Project is 11.23 tonnes/day (Please refers to **Section 5.6.2: Solid Waste Management**).

As mentioned in **Chapter 5**, majority of the solid waste comes from food waste (i.e. approximately 45% of the generated solid waste is actually food waste). Currently, solid waste is being dumped at landfills. In order to increase the lifespan of the landfills, implementing an idea of "no food waste to landfill" will be one of the ways to increase landfills' lifespan. There are a few options available to treat food waste and these options will be deliberated in **Chapter 8**.

Improper and unorganized collection of waste will not only create health hazards but habitats for disease vectors such as flies and rats. Not only will rubbish accumulate and create an eyesore to the public, but the odour will cause a nuisance to the residents.

7.6 Water Quality

There will be various impacts on the water quality during each phase of the construction and operation for the proposed development. The major activities that could cause deterioration of water quality are described below:

7.6.1 During Construction Phase

i. *Activities during land clearing and earthwork*

Excess runoff flows together with sediment along the way to the receiving waters will increase the turbidity of the stream and the concentration of suspended solids in the water. A higher turbidity will result in lesser sunlight penetrating into the water and indirectly affect the photosynthesis process of aquatic flora and fauna.

ii. *Production of power and steam from generators and other equipment during the construction phase involving the combustion of fossil fuels.*

Used engine oil is often poured “down the drain” and its concentration in a small area may cause severe localised pollution as oil and grease are not easily decomposed by bacteria. If oils and grease are not removed before the discharge of the wastewater, they can interfere with the biological life in the surface waters and create unsightly floating matters and films.

iii. *Disposal of construction waste*

Liquid wastes from construction sites such as lubrication oil and chemicals, if discharged down the drains or down the slope, will eventually end up in the river. Although the amount would be small and discharge irregular, a laissez faire attitude could exacerbate other potential problems.

7.6.2 During Operational Phase

i. *Discharge of Domestic Wastewater*

As long as the project is in operational, wastewater will be continuously generated. Wastewater, which contains fats, oil and grease are not easily decomposed by bacteria. Consequently, if oil and grease are not removed before the discharge of the waste, it will interfere with the biological life in the surface waters and create unsightly floating

matters and films. Untreated wastewater will result in pollution of the receiving waters due to the BOD uptake and depletion of dissolved oxygen.

An estimation of the total volume of wastewater and the BOD and SS loadings that will be generated and treated before being discharged into the streams are detailed below:

Total PE estimated from the development = 10,300 PE

$$\begin{aligned}\text{Wastewater produced} &= 10,300 \times 225 \text{ litre/capital/day} \div 1,000 \text{ litre/m}^3 \\ &= 2,317.50 \text{ m}^3\end{aligned}$$

$$\begin{aligned}\text{BOD}_5 \text{ at } 20^\circ \text{C} &= 10,300 \times 55 \text{ g/capital/day} \div 1,000 \text{ g/kg} \\ &= 566.50 \text{ kg/day}\end{aligned}$$

$$\begin{aligned}\text{SS} &= 10,300 \times 68 \text{ g/capital/day} \div 1,000 \text{ g/kg} \\ &= 700.40 \text{ kg/day}\end{aligned}$$

When fully developed, it is anticipated that a total of 2,317.50 m³ of wastewater will be generated per day with a corresponding effluent load of 566.50 kg of BOD₅ /day and 700.40 kg of SS/day. The effluent would contain many undesirable and potentially dangerous substances such as pathogenic bacteria and viruses. If the effluent is not treated, it will impose major pollution to the receiving watercourse. The oxygen reserve in the river will be depleted and create anaerobic conditions. Another adverse impact from indiscriminate discharge of wastewater is odour brought about by the decomposition of organic matter into pungent hydrogen sulphide gas.

The wastewater with such loading is expected to pose significant impact on the receiving watercourse. Therefore, it is crucial to ensure the wastewater will be treated to the required standard before discharge into the natural watercourse.

7.7 Ambient Air Quality

Air pollution is the presence in the atmosphere of one or more contaminants in such quantities, characteristics and duration as to make them actually or potentially injurious

to human, plant, or animal life or to property, or which unreasonably interferes with the comfortable enjoyment of life and property. From the Project activities listed in **Section 7.1**, the project activities that could cause air pollution are mainly derived from the following works.

i. *Site preparation and Earthworks*

Dust generated during the site preparation and the construction of basic infrastructure is expected to reduce the air quality over the duration of these activities. The most likely impacts will be health issues and also visibility. However, it is expected to be a short-term localised problem as it only occurs during the construction period.

ii. *Material Transportation and Vehicular Movements*

Vehicular movements during the development phase, construction of basic infrastructure and residential houses are expected to be high especially during site preparation. The emissions from the exhausts of the vehicles such as sulphur dioxide, carbon monoxide, hydrocarbons and dust generated by the moving vehicles constitute major pollutants affecting air quality.

The potential impacts of air pollutants which are likely to attend to the environment may be summarised as follows:

Impacts on human health

The major pollutants expected from the ordinary development will be Suspended Particulate Matters (SPM). SPM which is smaller than 10 µm in size is more harmful to human health than larger particles. Particulates may be generated from the burning or combustion of fossil fuels or derived from the incineration of domestic and commercial wastes as well as particulates generated by wind and vehicle movements. Generally, an acceptable guideline of exposure limits is a 24-hour value of 150 µg/m³ (PM₁₀).

Impacts on Environment

Black smoke due to incomplete combustion of fuels (especially solid fuels) and dust derived from various sources have significant visual effects on the environment. It becomes a general nuisance when deposited on cloth, food and buildings and may affect the surrounding villages.

However, as the construction would be done gradually, air pollutants from the project are expected to be insignificant and unlikely to draw any adverse impacts to the environment. **Appendix VII** shows the Recommended Malaysia Guidelines for Air Quality Standard.

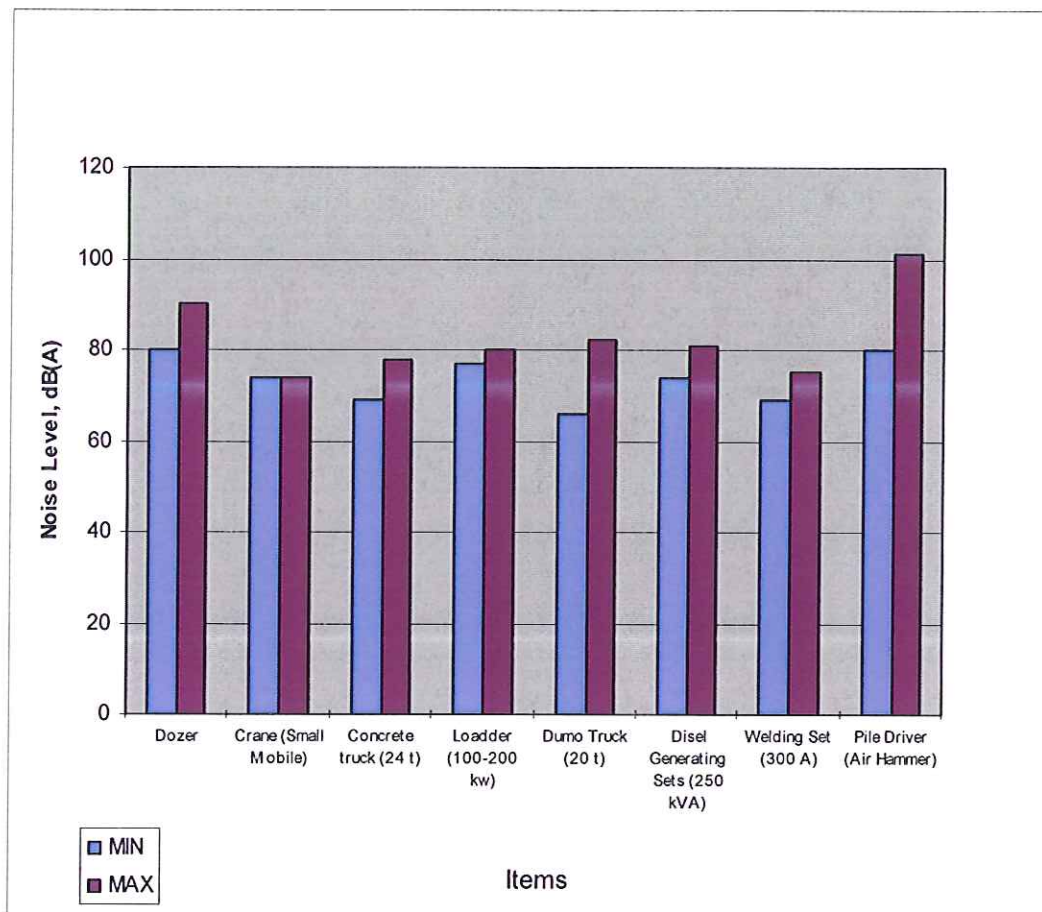
7.8 Noise Level

The major problems relating to noise will ordinarily arise during site preparation, earthworks and infrastructure construction, haulage operations and buildings erection. Noise generated by earthworks, site preparation and construction activities are mainly due to machinery and equipment. These include:-

- i. Earth moving equipment such as bulldozers, shovel trucks, backhoes and front-loaders;
- ii. Road building equipment such as scrapers, graders and compactors;
- iii. Material handling equipment such as cranes and concrete mixers;
- iv. Stationary equipment such as pumps, generators and air compressors.

Noise levels from some of these equipments mentioned can be quite high often exceeding 90 dB (A) near its source. **Figure 7.3** presents some typical sound levels of equipment likely to be used in the project activities.

The WHO Recommended Noise Exposure Limit as in **Appendix VIII** remarked that for noise of 75 dB (A) and less (8 hours exposure per day) will not have identifiable risk of hearing damage, except for prolonged exposure. However, noise emission from



the equipment is intermittent and exposure times are short. Hence the risk of hearing damage is insignificant.

Noise impacts during earthworks and construction are mainly short term and confined to the period of works. When completed, the main source of noise will be from vehicles arriving and leaving the project site.

Noise derived from motor vehicles is correlated with traffic flow rate, speed of vehicles, type of road surface and the proportion of heavy vehicles. The high proportion of heavy vehicles during the construction period is likely to influence noise levels in the area. Increased traffic generated by population growth will also have an indirect impact on the tranquillity of the surrounding areas.

7.9 Socio-Economic Impact

7.9.1 During Construction Phase

The impact during this phase is considered short-term. During the construction phase, local residents may be subjected to air (dust) and noise pollution of the area as described in the preceding foregoing paragraphs. At the same time, road traffic and the movement of construction material as well as heavy machineries may also affect the residential areas adjacent to the project site.

The use of immigrant labour may also result in some social problems, which will affect the well-being of the local populace.

However, employment opportunities may also arise during the construction phase, a majority of which will be for casual general workers. This would generate employment opportunities for people of all ages within the area.

7.9.2 During Operational Phase

No adverse socio-economic impacts are expected from the project. Being a development which seeks to enhance and protect the natural beauty and environment of the area, it would rather result in many positive impacts for the locals. Moreover, the proposed development is for residential purposes, which complements the existing condition.

The proposed project will yield more positive socio-economic benefits compared to the negative ones and the adverse impact during construction is considered short-term.

7.10 Flora and Fauna

Being an oil palm and rubber estate, the project area is mainly occupied by palm and rubber trees as well as bushes. Within the project site, there is evidence of a substantial availability of an insignificant variety of vegetation cover through the provision of green and landscaping. The project will therefore have a negligible impact on the flora. Removal of flora during the early stages could lead to serious soil erosion if left unattended. Several actions should be taken by the contractors in order to avoid soil erosion which could deteriorate the water quality at the nearby area.

The impact on existing wildlife in the area will be in the form of habitat loss and is worth mentioning below:

- a) Migration of the existing species of mammals, birds and reptiles to adjacent oil palm / rubber plantations. The tendency for overcrowding in these new habitats should be negligible.
- b) There is the possibility of abuse of the wildlife resources within and around the site by construction workers during the project duration.

7.11 Traffic Impacts

The nearest road to the project is the State Road M133 which connects Lebuhr SPA and Parit Melana. The proposed project will generate an increase in road traffic in the area during and after construction. The traffic increase during construction will generally be in the form of construction vehicles like tippers, dozers, cranes etc. which is temporary. The increase in traffic during operation will generally be from the buyers/owners/tenants who reside in the residential area. In order to assess the impact of the development during the operation, a specific Traffic Impact Assessment had been carried out.

7.11.1 Traffic Generated by The Project

Based on the Traffic Impact Assessment, the volume of traffic which is anticipated to be generated from the development is summarised in Table 7.8.

Table 7.8: Estimation of Trip Generated During AM & PM Peak

Land Use	AM Peak (pcu)		PM Peak (pcu)	
	IN	OUT	IN	OUT
Residential (Detached)	10	19	18	14
Residential (Semi Detached)	18	33	26	20
Residential (Terrace)	144	320	195	136
Residential (Apartment)	103	294	244	163
TOTAL	275	666	483	333

Based on the Trip Generation estimated for AM Peak, the total trips (pcu) generated for vehicles ingressing to and egressing from the development are 275 pcu and 666 pcu respectively. Meanwhile, total trips (pcu) of 483 pcu and 333 pcu are generated for vehicles ingressing to and egressing from the development during PM Peak.

The total vehicles estimated from the project site are expected to have a significant impact on the present State Road M133 and also at the main entrance to the project site. The high traffic volume will cause traffic congestion, noise and traffic hazards, if the traffic is not properly controlled.

7.12 Abandonment

The abandonment of the proposed project would definitely create an adverse impact on the environment. However, the severity of the impact strongly depends on the stage of development.

In an ordinary condition, construction of a residential development is usually divided into two stages, viz, construction of infrastructure and erection of structures. As the Project is planned to be converted into housing area which involve massive ground disturbance, the abandonment during this stage is expected to be very significant especially to the existing water quality and the surrounding river system.

As for those phases which involve construction of building, the abandonment of the Project shall leave behind half-completed structures and unmanaged construction materials. This would eventually create adverse socio-economic impacts to the general populace and inaesthetic repercussions, especially to the neighbouring lots. The abandoned structure would also create a suitable habitat for harbouring pests and disease vectors. Moreover, it could also result as a potential site for squatters and indulgence in anti-social behaviour. The resulting implications associated with the displacement of such incidents can be adverse.

CHAPTER 8

MITIGATION MEASURES

8.0 MITIGATION MEASURES

8.1 Introduction

Many of the predicted adverse impacts of the project on the environment, as discussed in **Chapter 7**, may be mitigated or minimised through various means. Some of these measures are:

- i. Proper planning and execution of works during construction.
- ii. Selection of up-to-date processes for the construction works to reduce noise, air pollution and environmental hazards.
- iii. Incorporation of pollution control or pollution abatement measures to reduce waste generation and other adverse impacts during the operation.

This Chapter discusses the various mitigating measures which can be taken or which can be incorporated into the development process to minimise adverse environmental impacts.

8.2 Erosion and Sediment Control

Site clearing and earthworks are anticipated to be the major cause to increase soil erosion rates during the construction period. Effective measures would have to be taken to control soil erosion and siltation, specifically after removal of vegetation during earthworks stage. Amongst these measures are:-

8.2.1 Conceptual Erosion and Sedimentation Plans (ESCP)

Conceptual Erosion and Sediment Control Plans (ESCP) are prepared for the project development. To limit the impact of soil erosion and sediment transport to the receiving water, the following temporary and permanent erosion control measures are included. The conceptual ESCP are shown in **Figure 8.1** to **Figure 8.4**.

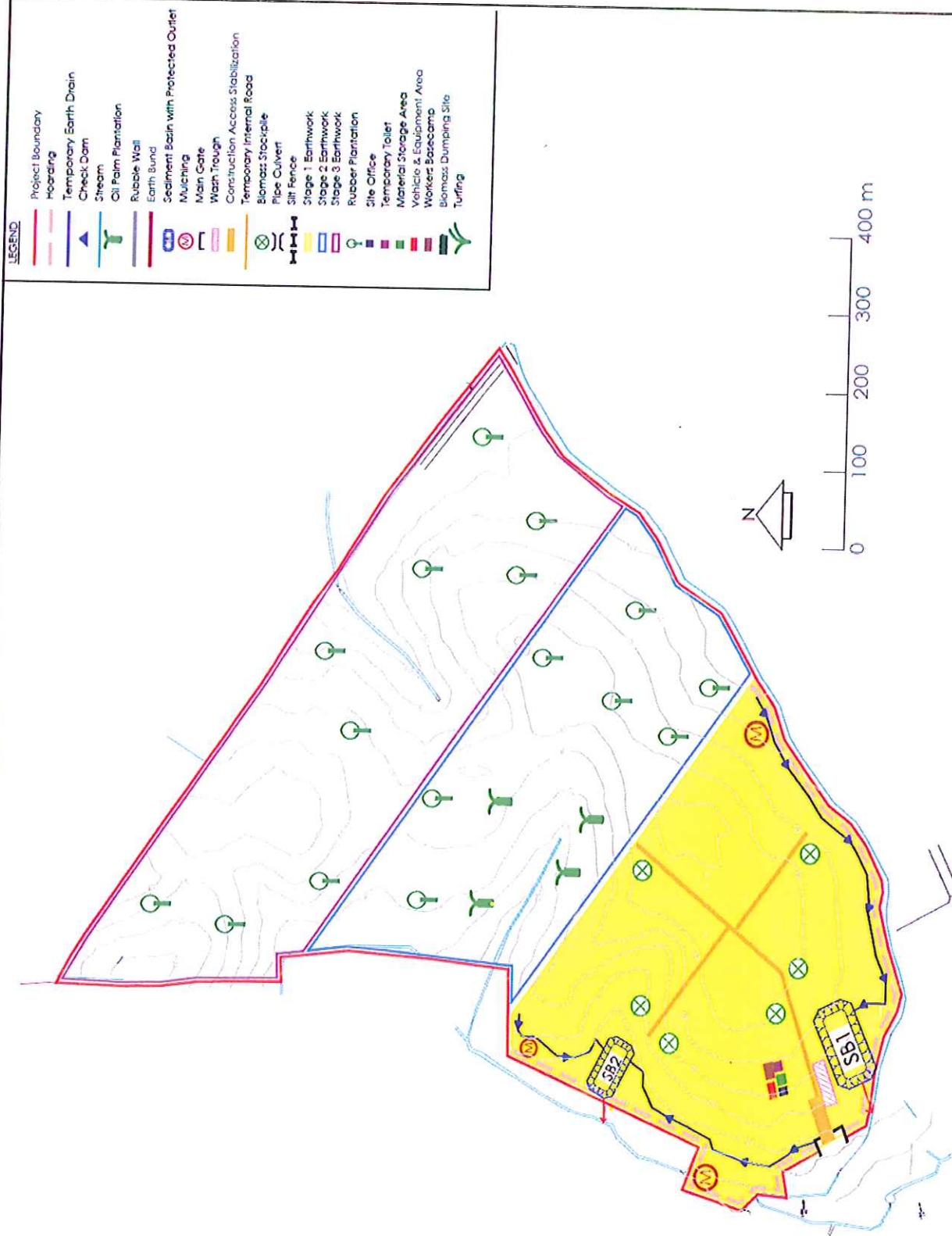


Figure 8.1 : Conceptual ESCP for Stage 1 Earthwork (Pre-bulk Grading Stage)



Figure 8.2 : Conceptual ESCP for Stage 2 Earthwork (Pre-bulk Grading Stage)

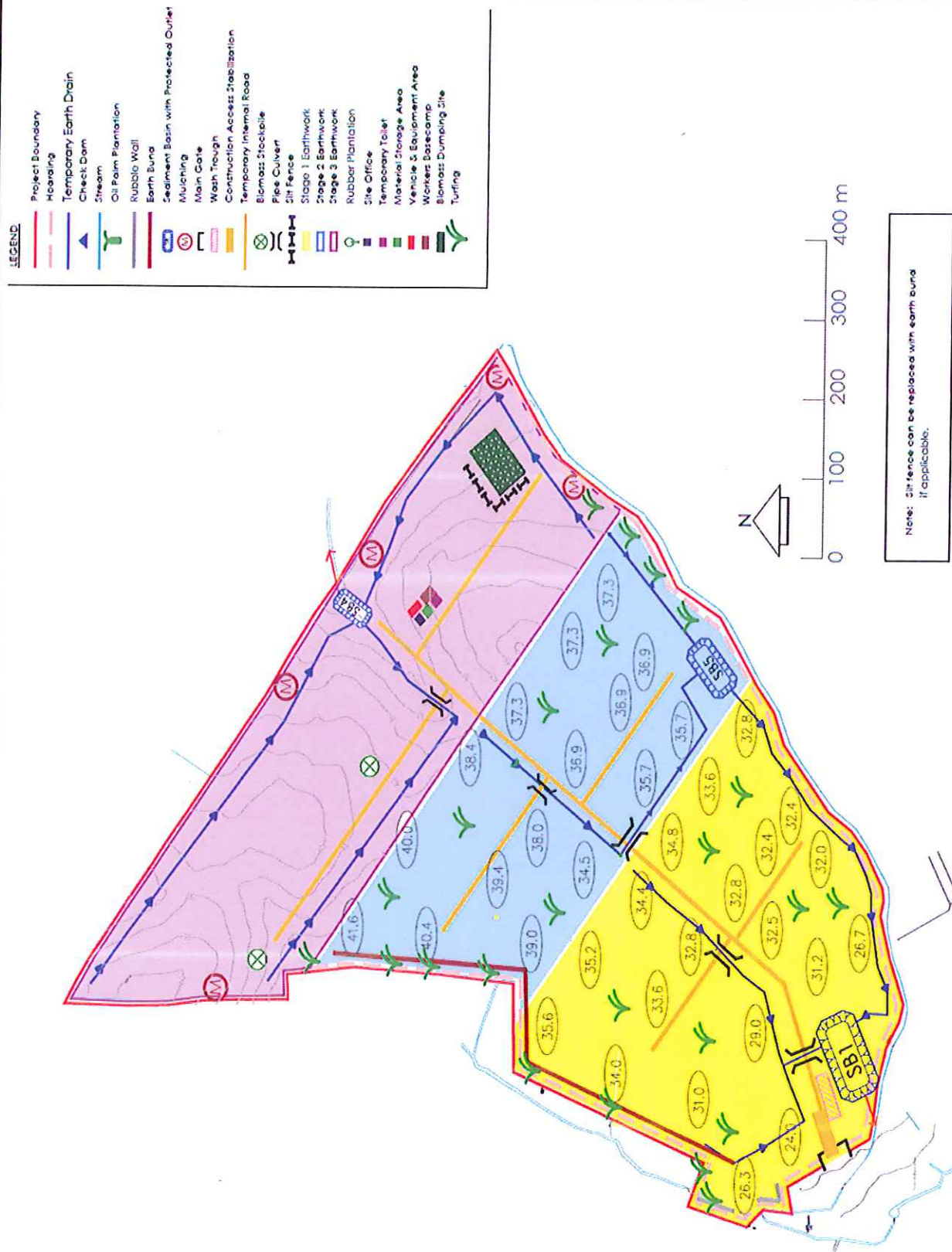


Figure 8.3 : Conceptual ESCP for Stage 3 Earthwork (Pre-bulk Grading Stage)

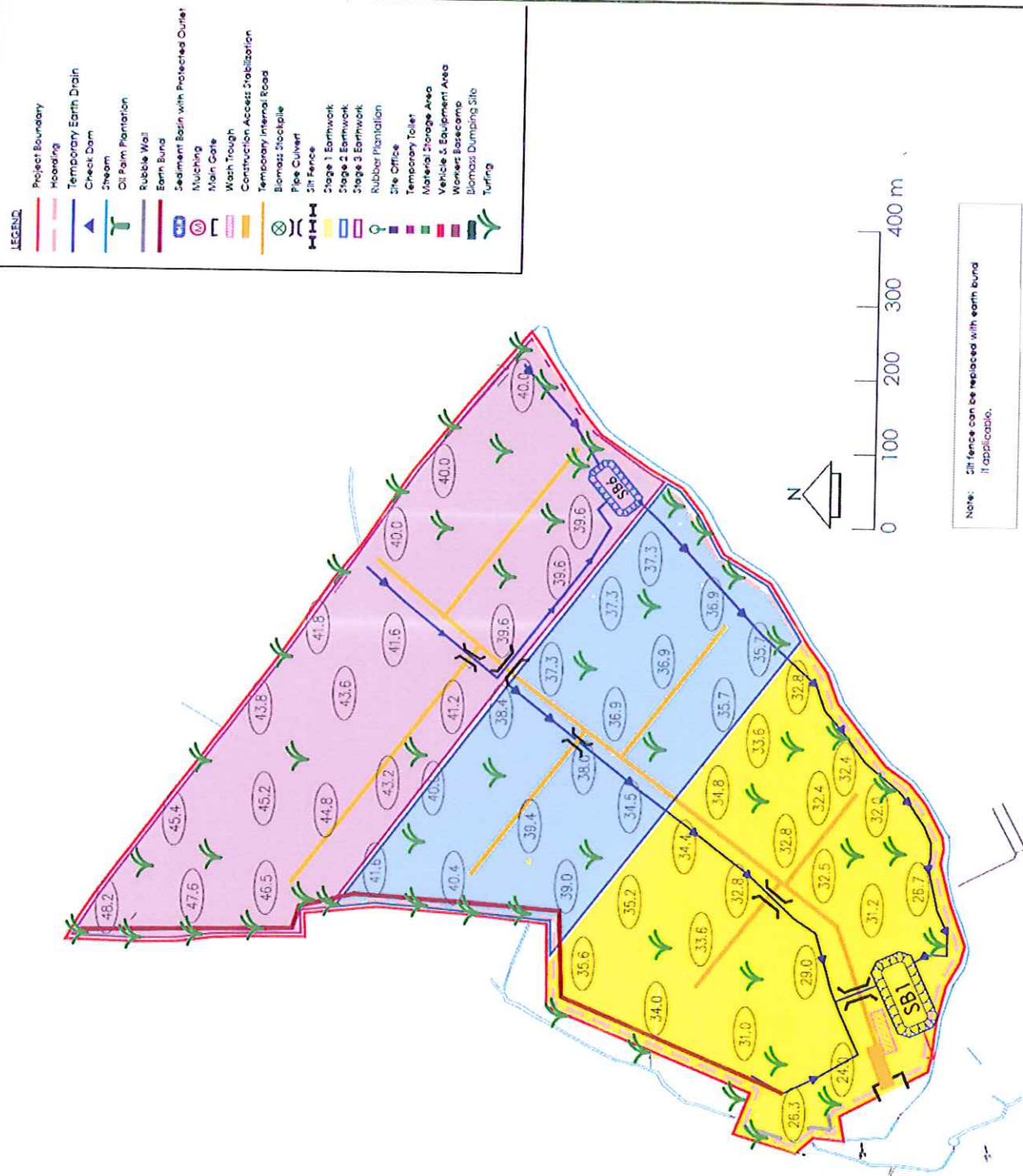


Figure 8.4 : Conceptual ESCP for Stage 3 Earthwork (Post-bulk Grading Stage)

ESCP for Pre-bulk Grading Stage (Land Clearing is Complete while Earthwork has not Commenced).

Erosion and sediment control practices shall be installed onsite before earthwork commence at each stage. The erosion and sediment control practices are discussed below:

- i. A Wash Trough shall be located at the entrance to the construction site.
- ii. Temporary Earth Drain with check dams shall be installed at the lower limit of the work area.
- iii. Perimeter Earth Bund or Silt Fence shall be established at the boundary to prevent runoff from overflowing into the neighbouring lots.
- iv. Sediment Basins shall be constructed to receive runoff from the Temporary Earth Drain. The slope bank of the Sediment Basin shall be 2(H) : 1(V).
- v. During raining episode, physical activities shall be halted and exposed slopes shall be temporarily covered by tarpaulin sheet to prevent erosion.
- vi. The Project site shall be sprayed with water at least twice a day to prevent wind blowing dust. Water bowser truck shall be used to carry out the water spraying on unpaved areas.
- vii. Temporary Stockpile may be required to store topsoil, vegetation and construction material. Stockpile shall be sited on compacted area, away from waterways such as drain and pond. The Stockpile shall have perimeter protection such as low bund made of rocks, compacted earth or sandbag.

ESCP for Post Bulk Grading Stage (Land Clearing and Earthwork has been Completed).

Upon completion of earthwork, building and infrastructure construction will be carried out. The erosion and sediment control practices are discussed below:

- i. Earth cutting at the higher elevations shall be carried out to fill the low lying areas (refer to **Figure 7.1 in Chapter 7**). Once earth extraction is completed, compaction shall be implemented and turfing shall be carried out within 14 days to cover the bare soil and prevent erosion.

- ii. During raining episode, physical activities shall be halted and exposed slopes shall be temporarily covered by tarpaulin sheet to prevent erosion.
- iii. Sediment basins shall be desilted according to the schedule of inspection and maintenance (refer to **Table 8.1**).
- iv. Monthly TSS monitoring shall be carried out at the discharge outlet of the sediment basin. Only Suspended Solid concentration not exceeding 50 mg/l can be discharged to the receiving watercourse.
- v. Weekly inspection of all BMPs shall be carried out. In addition, inspection shall be carried out after every raining episode to check the conditions of all BMPs. Immediate remedial action shall be carried out to repair any damaged BMPs.

The conceptual ESCP will be used as reference for the preparation of detailed ESCP for further submission to DID. The detailed Erosion and Sediment Control Plan (ESCP) prepared by the Professional Engineer (PE) shall be submitted to the Department of Irrigation and Drainage (DID) Melaka for comment.

8.2.2 Best Management Practices (BMPs)

The following best management practices (BMPS) shall be carried out onsite throughout the construction period of the project development.

i. Management of Land Clearing and Earthwork Activities

Land clearing within the Project site will be carried out in 3 stages sequentially. Stage 1 will be cleared, followed by earthwork. Once earthwork at stage 1 is completed, stage 2 will be cleared of vegetation and followed by cut and fill. During this period, the physical construction work at Stage 1 area can commence. In each stage, the erosion and sediment control measures shall be installed in tandem with the progress of development. These measures include stabilized entrance and wash trough, temporary hoarding, temporary earth drain, check dam, earth bund, silt fence and sediment basin. The sequence of development shall be as follow:

Parcel 1: Clearing and earthwork at Stage 1.

Parcel 2: Clearing and earthwork at Stage 2, building construction at Phase A, F and G (within Stage 1 area) can be started.

Parcel 3: Clearing and earthwork at Stage 3, building construction at Phase B and E (within Stage 2 area) can be started.

Parcel 4: Building construction at Phase C and D (within Stage 3 area) can be started

Biomass from the chopped trees can be shredded onsite and used as mulch to cover up exposed area temporarily. The remaining biomass will be disposed at proposed open space or green area (refer to **Figure 8.2** and **Figure 8.3**).

ii. Hoarding

Hoarding shall be built along the boundary of the Project site especially the area facing Taman Krubong Perdana and at the active construction area where applicable to prevent unauthorised person from trespassing into the work area. Hoarding will also prevent soil movement out of the Project site.

iii. Stabilized Construction Access

Access to the Project site will be through the southwest corner of the Project site by using the existing earth road. The entrance shall be stabilised with 10m of crushed aggregates at the junction to the earth road. A wash trough shall be established at the entrance to provide tyre washing facility. The wheels of machineries shall be cleaned by spraying with water to remove soil and earth materials before being transported out of the Project site.

iv. Temporary Drainage System and Check Dam

Temporary earth drains will be constructed within the Project area to channel overland flow from the disturbed area into the sediment basins, before discharging into the receiving water. All runoff from undisturbed areas should not be allowed to mix with runoff from the disturbed area. The drainage system should be regularly inspected and maintained, especially after each heavy downpour. Check dams shall be installed along the temporary earth drain to regulate the flow of runoff.

v. Sediment Basin

Four (4) sediment basins will be allocated to receive runoff from the temporary earth drains. Construction of the sediment basins shall be in tandem with the stages of earthwork. The sediment basins must be maintained regularly, depending on the rain conditions to achieve maximum efficiency. Inspection of the sediment basins and earth drain and other mitigation measures should be carried out after every storm event. Removal of accumulated sediment in the sediment basins may be carried out manually. The removed sediment shall be transported to the designated spoil banks for compaction.

Monthly sampling of water quality must be carried out to check the effectiveness of the mitigation measures. A maintenance log should be kept for the sediment basins, detailing the inspection and desilting work.

vi. Stockpile Area

Two types of stockpile are anticipated during the construction stage, namely, biomass stockpile and soil material stockpile. Biomass from the chopped trees can be shredded onsite and used as mulch. Temporary stockpile for topsoil and sand shall be covered with tarpaulin sheet to prevent wind from blowing up dust.

Temporary stockpiles within the Project site shall be located away from concentrated flows of storm water, drainage area and inlets. The stockpiles shall be protected from water run-on using temporary perimeter barrier such as compacted earth bund, silt fence or sandbags.

vii. Temporary Surface Cover – Mulch

Exposed land area during clearing and earthwork stage will have the highest erosion risk during the construction stage. Hence, onsite resources such as undergrowth, small woody plants and branches of vegetation can be shredded and used to as mulch to cover up exposed area temporarily. Any form of land cover will intercept rainwater and reduce erosion risk.

viii. Slope Protection

The cut slope located along the boundary of the Project site shall be levelled to the design platform level and installed with cascade drains. Slope formation at the eastern boundary of the Project site is facing the existing residential area, Taman Krubong Perdana. Thus, slope cutting shall be carried out in inward direction of the Project site to prevent potential of mud slide. Care should also be taken to ensure eroded soil and silt is not pushed out of the Project boundary towards Taman Krubong Perdana. The following measures shall be undertaken during cutting of the slope in Stage 2 and 3:

- Hoarding shall be erected at the southeast boundary of the Project site and at the active construction area facing the sensitive receptor.
- Temporary perimeter barrier such as silt fence or sandbag shall be lined along the perimeter boundary of the slope area. Temporary earth drain with check dam shall help to divert runoff from the southeast project boundary to the nearest sediment basin.
- Slope cutting shall be carried out from along the Project boundary. Earth materials shall be pushed inwards, towards the project site.
- During heavy storm episodes, the freshly exposed slopes should be covered with tarpaulin or plastic sheets. Covering of slopes will reduce erosion risk by more than 90%.

ix. Inspection, Maintenance, Reporting and Monitoring

Rain gauge shall be installed on site. Inspection of the wash trough, temporary earth drain, check dam and sediment basin shall be carried out weekly and immediately after an episode of heavy or prolonged downpour with rainfall intensity of 12.5 mm and above. Regular maintenance of the BMPs shall be carried out on a regular basis and as when required to ensure all BMPs are functioning well. Maintenance record shall be in safe keeping for checking purposes. **Table 8.1** shows the schedule of inspection and maintenance of BMPs during the construction stage.

Table 8.1: Schedule of Inspection and Maintenance

Best Management Practice (BMP)	Type of Maintenance	Frequency of Inspection	Frequency of Maintenance
Construction Access Stabilization	To repair damaged section	Weekly inspection and After each raining episode	Fortnightly (1 st week & 3 rd week of the month) or Within 48 hours of damage
Wash Trough	To remove silt and change water		
Diversion Drain	To check flow		
Temporary Earth Drain	To remove silt and check flow		
Mulching	To reapply at gap area		
Turfing	To replant at gap area		
Sediment Basin	To remove silt		
Check Dam	To remove silt and to repair damaged section		
Earth Bund	To repair damaged section		
Silt Fence	To replace damaged section		
Pipe Culvert	To replace damaged unit and to remove silt		
Stockpile	To repair damaged low bund/sandbag barrier.		

Besides, an on-line Erosion and Sediment Control (ESC) report must be prepared and submitted to DOE as follows:

- Inspection report of all the Best Management Practices (BMPs) to be filed within 24 hours after inspection in the event of rainfall exceeds 12.5 mm; and
- BMPs remedial actions report with photographs within 7 days of events.

Total Suspended Solids (TSS) shall be monitored on monthly basis at the discharge points of all sediment basins. TSS concentration from the treated effluent of sediment basins shall comply with Standard A limit of 50 mg/l. The reading of in-situ analysis for TSS and turbidity at the final discharge point of the sediment ponds within 30 minutes after rainfall shall be recorded in log sheet.

8.3 Slope Stability

Slope stability analyses have been performed by a Geotechnical Engineer to assess the safe design of the slope by the appointed consultant. In a nutshell, the proposed cut slope and fill slope geometries are found to be adequate and meet the required factor of safety as per the relevant guidelines and normal engineering practices. The Slope Stability Analysis Report is as attached in **Appendix IX**.

8.4 Hydrology and Drainage

As the capacity of the existing tributary of Sg. Ayer Hitam which will be the final discharge point of the project is found to be sufficient to cater for the additional runoff after project completion, the impact of peak flows is not expected to be severe.

Additionally, the provision of the storm water detention ponds within the project site as required by the approving authority, Jabatan Pengairan dan Saliran (JPS) shall be strictly adhered to and implemented. With the presence of the detention pond, advantages could be taken from the natural attenuation effects of the pond to reduce and control the discharge downstream. It could also avoid and prevent the capacity of the existing stream from overloading, especially during the heavy downpour. This is another preferred option and it would require the design and construction of an outlet control structure to regulate the outflows. The dimension and design of the proposed detention pond recommended by the Engineering Consultant are summarised in **Table 8.2**.

Table 8.2: The Dimension and Design of The Proposed Detention Pond

Ponding Area (acres)	Spillway (cumecs)	Final Discharge Drain	
		Capacity (cumecs)	Dimension
5.776	6.451	9.883	2.1m x 2.1m

The detention ponds would also require regular maintenance to ensure the function could be performed satisfactorily. Therefore, it is crucial to emphasise that the engineering design of the drains and detention ponds must be designed to conform to the technical specifications and requirements of Jabatan Pengairan dan Saliran (JPS).

8.5 Solid Waste

8.5.1 During Construction Phase

Solid waste management is an important topic to be discussed in order to ensure proper method and management is implemented throughout the construction and operational phases of the development. Proper management of solid waste will help to slow down the reduction of life span of landfill.

As of 1st September 2015, the Malaysian Government has made it mandatory to separate solid waste at source. The implementation is pursuant to regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672). Hence, it is compulsory for the project proponent to ensure that separation of solid waste at source is implemented throughout the construction and operational phases of the project.

i. Biomass Disposal

Based on secondary resources, a general estimation of biomass production for an oil palm / rubber plantation is approximately 200tonnes/hectare. For this development, the amount of biomass that is expected to be generated is about 12,322tonnes. Biomass (stumps, roots and undergrowth) generated from the site clearing and cannot be used as mulching for green should be cut into manageable sizes, collected and transported out. The biomass from the oil palm / rubber can be sold and used for commercial applications like bio-fuel, coal replacement, building products and many others. By doing so, it will help to solve biomass disposal problem in an environmental friendly manner. However, should the option of transporting out the biomass is adopted, it is recommended that the transportation activity be scheduled away from peak hours to avoid delay in traffic flow and dust generation.

ii. Domestic Waste from Workers Camp

Waste generated by the workers camp should be collected and disposed at any approved landfill site. Proper containers and garbage bins should be provided at the workers camp and regularly collected. Enforcement on littering shall be executed to ensure the site is in proper condition.

iii. Construction Waste / Unwanted Construction Material

One of the significant waste expected during the execution of the project is the surplus and unwanted construction materials. These materials, such as reinforcement bar, excessive concrete and plastic boards shall be disposed off at a designated landfill site. Waste generated should be sorted out and reuse of usable material should be taken into consideration to reduce the volume of waste. Liquid wastes such as oil and grease, chemical solutions etc. shall be separated from the solid waste before disposed off to the designated landfill site. A policy on waste reduction and waste recycle should be adopted by the contractors in line with the National Solid Waste Policy.

8.5.2 During Operational Phase

During operation, solid waste generated is mainly from the household and the occupants. Since the regional domestic waste collection will be managed and undertaken by the SWCorp, the solid waste generated during operation is not likely to create any significant regional impact to the environment regardless of additional waste volume to be transported out to the designated landfill site.

To ensure a clean and hygienic condition for waste collection, the separation of waste shall be done as per the regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672). Since the houses to be developed will be of strata title, it is also suggested that the management of the residential area to set-up an on-site waste treatment (such as using food composter or food digester) for food waste from kitchens so that the food waste can be treated at site without the need to be sent to the landfill. This shall greatly reduce the amount of solid waste that will be taken to the landfill and consequently will

lengthen the life span of the landfill. There are a number of ways to treat food waste such as animal feeding, composting, using anaerobic digestion which will produce biogas for electricity and biofertiliser as well as using aerobic digester i.e. food waste digester.

Reuse and recycling of waste should also be considered to reduce the volume of waste. Recycling campaigns to reduce plastics and use of paper should be encouraged and continuously promoted by the agencies or authorities whenever possible. The reduction of waste volume will not only benefit the environment but it can reduce the cost of collection and transportation.

8.6 Water Quality

8.6.1 During Construction Phase

i. Provision of Silt/ Sedimentation Traps

In order to prevent any degradation of the water quality prior to the turfing and landscaping works after the site clearing, the surface runoff should be channelled into silt traps. A typical silt trap design based on the JPS Planning and Design Procedure No. 1 - Urban Drainage Design Standards for Peninsular Malaysia is given in **Figure 8.5**. The procedure specifies the capacity of the silt trap to be designed for a capacity of 67 cu. yds. per acre of development (20,000 tonnes per sq. km) which is very much in excess of the normal erosion rates.

ii. Earth Drains and Earth Bunds

To prevent and control degradation of water quality, earth drains and earth bunds should be in placed prior to the commencement of the earthwork. Earth drains can function to intercept and divert sediment laden runoff from leaving the site. Runoff laden with sediments should be diverted into sediment trap and left to be settled before entering the receiving watercourse. It is important to specify that the earth bunds along the earth drains are to be properly sorted to prevent breaching.

Practically, the construction of the earth drains and bunds are usually incorporated with a silt/sediment trap. As the sediment laden runoff will flow naturally based on the gravity flow, the silt/ sediment traps is usually located at the lower point within the site near to the natural watercourse. These traps, after the completion of the project will eventually be converted into a detention pond or back fill with earth to form a green area.

For this project, the lower portion of the site will be converted into a detention pond. It is anticipated that the location of this pond will also be the initial location of the silt / sediment trap where the sediment laden runoff will flow. Thus, the silt/ sediment trap is expected to be located near to the existing stream. The runoff from the entire site will be channelled to a temporary earth drain which will eventually flows into a silt trap prior to be discharged into the nearby streams, viz., Sg. Ayer Hitam. The efficiency of a silt/ sediment traps should be determined through the monitoring of the suspended solid content and turbidity of the final discharge point especially during the rainy period.

iii. *Adequate Toilets / Sanitary Facilities For Workers Camp*

During the construction phase, it would be necessary to provide adequate toilets and sanitary facilities for the workers camp on site to prevent contamination of the nearby watercourse. To prevent the deterioration of the water quality due to the wastewater generated at the project site, it would be necessary to treat all wastewater discharged from the temporary wastewater treatment system to the minimum required standard stipulated in the Environmental Quality (Sewage) Regulation, 2009 before the effluent flows into the natural watercourse.

Septic tank is the common method applied to treat water during construction phase. However, septic tank will only be able to treat water up to Standard B. Nevertheless, this impact will only be temporary i.e. during construction phase only. In addition, the project site is not located at the upstream of the water intake point. Sewerage Treatment Plant (STP) will be used to treat water during the operational phase and is able to meet Standard A requirement.

iv. *Provision of Secondary Containment*

One of the potential impacts during the construction stage is the leakage of diesel, engine oil or grease from the temporary storage facilities, viz., skid tank. The temporary storage facilities should be properly maintained and located away from the natural water bodies, viz., stream or river. Secondary containment should be provided to prevent soil contamination and water pollution in case of accidental leakage or spillage. The capacity of the secondary containment should be 110% of the storage capacity kept at the temporary storage facilities. Oil trap or grease interceptor should also be incorporated in the containment structures as to prevent the contaminants from being directly discharge into the receiving water. A typical detail of a secondary containment structure is shown in **Figure 8.6**.

8.6.2 During Operational Phase

To ensure the domestic wastewater meets the required Standard A before being discharged, sufficient sewerage treatment should be provided to the entire project. All sewerage including sewerage from bathroom and kitchen, except for surface runoff, shall be channelled into the treatment plant before being discharged into the drainage system.

i. *Sewerage Treatment Plant*

In order to mitigate the impact on the additional wastewater generated during the operational phase, a sewerage treatment plant should be constructed and properly located within the proposed project site. However, for this project, an existing STP which is located at the adjacent housing area i.e. Taman Krubong Perdana will used to treat the wastewater from the development (refer to **Section 5.6.1 in Chapter 5**). The existing STP will need to be upgraded to ensure that it can cater for the additional wastewater. It must be designed in accordance to the Guideline For Developers: Sewerage Treatment Volume IV, 2nd Edition published by the Department of Sewerage Services, Malaysia and to satisfy with the following regulations as well as conditions:

- a) Ability to treat domestic sewage and wastewater to required standard as stipulated in the Environmental Quality (Sewage) Regulation, 2009, and
- b) Does not produce or have the potential to produce noxious odours which would be offensive to the residents and public.

The above requirements in (a) general and (b) in particular rule out the use of oxidation ponds or ditches and those systems having aeration tanks exposed to the atmosphere. Mechanically operated 'closed' systems will be acceptable. The proposed system will have to be approved by the Indah Water Konsortium (IWK).

8.7 Air Pollution Control

Various ways and methods are available for the control of air pollutants which shall be briefly described in the following paragraphs. The control methodologies can be discussed in relation to the stages of development, viz, construction and operational as below.

8.7.1 During Construction Phase

i. Water Dampening Operation

Vehicular movements, particularly during mobilization of machineries and material transportation give rise to significant fugitive dust when vehicles are egressing and ingressing the project area. Dust generation is due to the force of wheels on the road surface, which causes pulverisation of surface material. Control of dust is best done by ensuring the particles adhere to each other and do not become separated easily. This could be done by water dampening operation on the exclusive access to ensure that this road remain slightly wet during use. Water dampening operations are best to be carried out using a water tanker equipped with a sprinkler nozzle. Using the sprinkler nozzle, water droplets could be scattered more thoroughly on the road surface without giving rise to an over dampened situation that might create another problem to the surrounding road system, viz., muddy road.

ii. Speed Limit of The Moving Traffic

Since dust generation is also affected by truck speed, a speed limit of the moving traffic in the project site should be imposed. It is recommended that the speed of the moving traffic within the Project site should be restricted to 25 km/hr and this could also ensure the safety within the project site. Signboards indicating the maximum permissible speed limit should be in place and enforcement on the speed limit shall be practiced by the project management.

iii. Tyre Washing Operation

If the trucks need to be moved outside the project site into public roads, tyre washing operation should be adopted at the entrance / exit to the project site. Tyre washing facility should include a high-pressure water jet system and a sump for the collection of washings, settling basin, sediment disposal and water recycling. A typical layout plan of a suitable tyre washing system which could be adopted by the Project Proponent is shown in **Figure 8.7**.

iv. Proper Approach on Transporting Construction Material

Apart from clearing up the tyres, it is also recommended that all trucks carrying construction materials and transporting earth must be covered securely with canvas before moving out from the Project site.

v. Proper Method and Environmental Friendly Material

During construction, air pollution could also arise from piling activities utilizing diesel hammers, which will not only emit gaseous but diesel droplets into the atmosphere. The method and machinery applied in the construction works should be properly considered and selected. Should the piling system designed is required only for shallow piled foundation; drop hammer should be used instead of diesel hammer. Use of diesel hammer will not only emit gaseous but diesel droplets into the atmosphere. Although the effect is temporary, it will adversely affect the residential

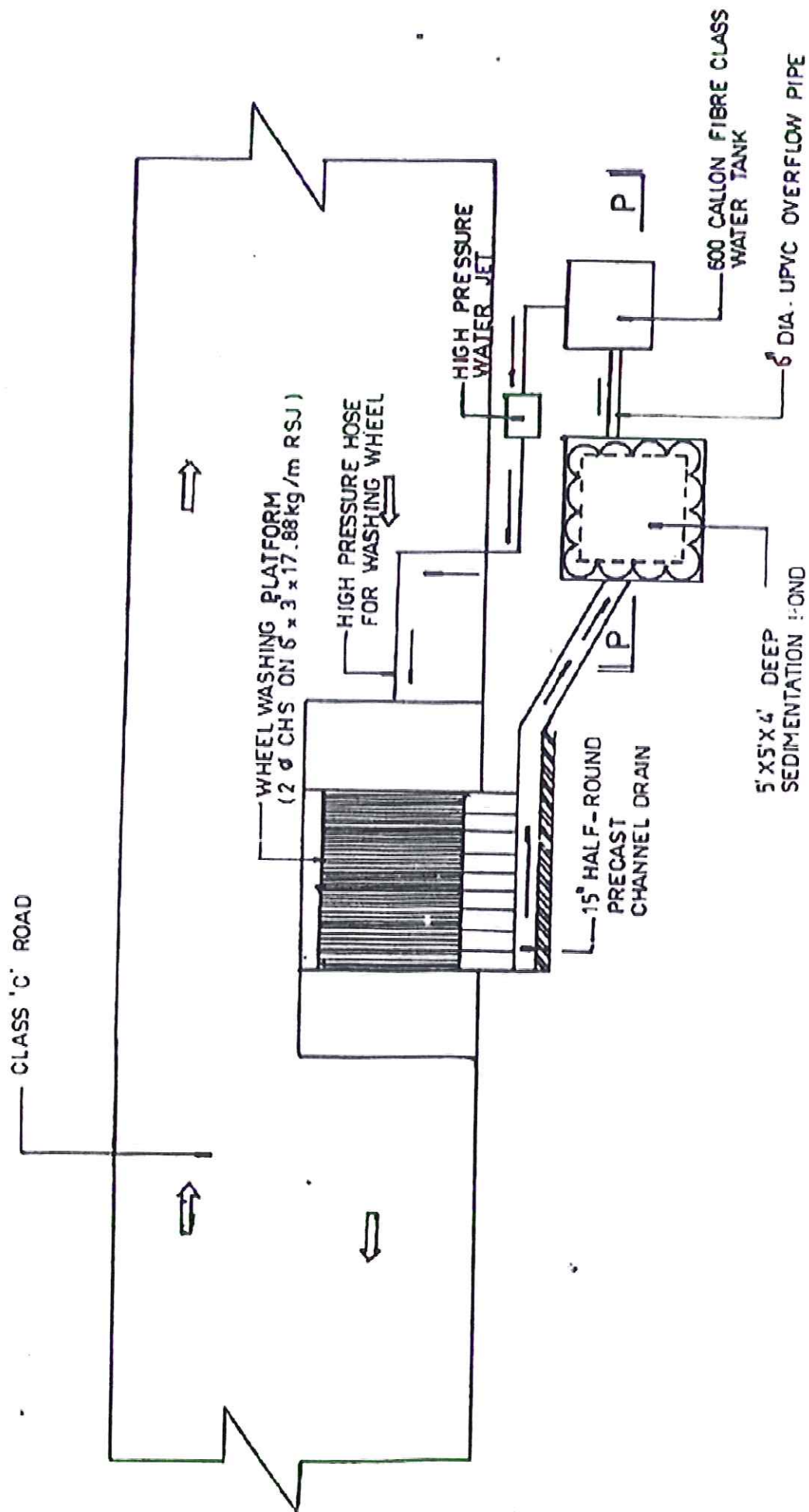


Figure 8.7 : Tyre Washing System

area in the vicinity. Therefore, the drop hammer method, which is more environmental friendly, should be adopted if shallow piled foundation is required.

On top of emission from the selected piling method, the usage of cement during the construction activity is also significant. Cement dust is another pollutant of the atmosphere at construction sites. The use of site mixes cement for the project should be avoided as much as possible. Ready-mixed concrete should be used if it is readily available in the locality.

8.7.2 During Operational Phase

Gaseous emissions during operational phase are not likely to be significant as the proposed project does not involve any industrial activities which will generate gaseous emissions. Vehicles ingressing and egressing the project site are likely to increase the air pollution levels. However, the increase is not expected to be significant.

8.8 Noise Abatement Measures

Noise interference is an environmental problem that is best to control at source. There are many ways to control a static noise source, should it become annoyance to the surrounding environment. However, as for a dynamic source of noise interference such as vehicles movement, the practical methods to control the noise level are often difficult. The available methods to control and reduce noise interference related to the stages of development, viz., construction and operation can briefly be discussed as below.

8.8.1 During Construction Phase

i. Limit on the Working Hours

Working hours for the construction activities should be limited to daylight hours only especially, for those activities like piling and rock crushing which generate much

noise. It is highly recommended that the construction activities should only be allowed from 8.00 am to 6.00 pm and not allowed on a rest day e.g. Sunday or public holidays in consideration of the residential area and nearby villages.

ii. Vehicles Speed Limit Restriction

Noise level generated from the increase of construction traffic is expected to be significant. However, the impact could be reduced by controlling the speed of the vehicles entering and leaving the Project site. To mitigate excessive noise generated from the Project site, it is also recommended that the speed of the vehicles within the Project site to be restricted at a maximum speed of 25 km/hr.

iii. Provision of Proper Hoarding

Proper hoarding should be placed as the first stage of works, prior to the commencement of construction. The material used should be an absorbent type e.g. plywood so as to absorb excessive noise from the construction activities. A proper selected hoarding should be able to attenuate at 20 dB(A) so as to ensure the noise level generated can be kept at 60 dB(A). The height of the hoarding should not be less than 2 meters.

8.8.2 During Operational Phase

When fully completed, the main source of noise interference would be from the additional traffic entering and leaving the development, which is not expected to be significant. Landscape around the site would also act as noise barrier.

8.9 Socio-Economic Impact

During the construction phase, the Project Proponent should ensure that their contractors provide suitable accommodation with adequate sanitary and toilet facilities for the workers and enforce sufficient control over them, especially immigrant labour so that no social problems will arise.

Due consideration to the above, the Project Proponent during the project planning stage shall have adequate numbers and budget allocation for professional site management staff during construction stage. Proper allocation of professional manpower will ensure the potential social problems will be tackled at the early stage without causing any undesirable social reactions.

8.10 Ecology Protection Measures

To ensure the development would have the lowest degree of environmental impact to the existing ecosystem, the following measures are recommended.

- i. Most of the wildlife and birds will escape into the surrounding estate upon commencement of site preparation. However, resident invertebrates and amphibians will probably perish with demolition of their existing habitats. To ensure that migration will take place naturally, it is necessary for the construction works to commence from the main road towards the inner areas. This will allow for the gradual migration of the threatened species into the nearby estate.
- ii. Trees, shrubs and grass should be left untouched wherever possible so as to preserve the flora and fauna diversities.
- iii. Landscaping programs and revegetation must be carried out rapidly to prevent further land degradation. It would be advisable to replant the species of trees or shrubs to enrich the existing wildlife population and to encourage the continuity of their presence. The establishment of landscaped facilities will provide supplemental habitats and food sources for the birds and small mammals that would be beneficial to the fauna.
- iv. The water source for wildlife in the area must not be disrupted. Backfill of the natural detaining watercourse must not be practiced at anytime to ensure adequate water supply to the resident wildlife. Pollution of the water source must be prevented to guarantee a “safe” water-hole for the faunal species.

8.11 Traffic Impact

The proposed project is located next to Taman Krubong Perdana, District of Melaka Tengah, Melaka. The nearest road to the project is the State Road M133 which connects Lebuhr SPA and Parit Melana. The proposed project will generate an increase in road traffic in the area during and after construction especially at the main entrance to the project site as shown in **Figure 6.1** in **Chapter 6**. To mitigate excessive traffic generated during construction phase, it is recommended that the material transportation and heavy vehicles ingressing and egressing the site to be scheduled away from the peak hours.

As shown in **Chapter 7**, the project is anticipated to generate a total of about 941 vehicles during AM Peak and 816 vehicles during PM Peak. The additional volume is significant and has potential to create traffic congestion, especially during peak hours. Therefore, it is incumbent for the project proponent to ascertain any junction, which leads vehicles to the project site is properly designed and constructed. It is to ascertain that the safety of traffic ingressing and egressing the project is secured.

Based on the recommendations in the Traffic Impact Assessment (TIA) report, the impacts foreseen for the project could be attenuated with the following measures.

- i.) It is highly recommended that more lanes are added at Junction A on State Road M133. Upgrading the junction with more lanes would give a better Level of Service (LOS) compared to the existing junction geometry.
- ii.) Having either roundabout or signalisation at Junction B i.e. the main access produces acceptable LOS. Hence, it is up to the authorities to choose which is more practical and cost effective.

Notwithstanding to the above, it is also crucial to ensure proper maintenance of the State Road M133 as to accommodate the anticipated traffic growth and the safety of the road user after the completion of the development.

8.12 Abandonment

A proper abandonment plan shall be prepared appropriately to ensure all measures are taken care off. If the abandonment occurs during construction, all equipments shall be removed from the site and revegetation shall also be considered. For any scheduled wastes and solid / liquid wastes available at the site, they must be disposed off in the correct manner at the specified approved areas.

CHAPTER 9

**ENVIRONMENTAL
MANAGEMENT PLAN**

9.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The main objective of the EMP is to outline and to ensure that the mitigating measures recommended in the EIA report are incorporated into the final project planning and implemented on the ground. Normally, an EMP will require the project proponent and the implementing body to undertake the following actions and responsibilities.

- a.) Allocate administrative responsibilities for planning and management of environmental requirements;
- b.) Responsibility to execute mitigating actions by the project manager and the contractors;
- c.) Implement a monitoring and auditing programme to check the effectiveness of the mitigating measures and to modify or further improve to redress the impacts;
- d.) Appoint relevant expertise or consultants to assist if in-house capability is not available;
- e.) Ensure that the recommended mitigating measures are incorporated in the detail design, contract documents and works via a method statement of each type of works; and
- f.) Allocate adequate budget for implementing the EMP.

An EMP shall consist of an Environmental Monitoring Programme, Environmental Management Unit and Emergency Response Plan. The main function of these components is to allocate the responsibility of each party for planning, monitoring and undertaking the mitigating measures proposed during the construction and operation stages.

9.1 Land Disturbing Pollution Prevention & Mitigation Measures (LD-P2M2)

Preparation of the EMP shall be in accordance to the new EIA guidelines which includes the need to prepare Land Disturbance Pollution Prevention and Mitigating Measures (LD-P2M2). Based on the soil erosion study explained in **Chapter 7** and **Chapter 8**, the proposed project will have a significant impact in terms of erosion since the site is huge and is situated on an undulating area. Nevertheless, the impact can be mitigated by implementing the measures stated in **Chapter 8**. LD-P2M2 shall be prepared and submitted as part of the EMP and shall be in accordance to the requirements and specifications stipulated in the Guidance Document for the Preparation of LD-P2M2.

9.2 Environmental Monitoring Programme

Environmental monitoring comprises of three types of monitoring as follows:

- a.) Performance Monitoring (PM) – baseline monitoring which will identify the current environmental conditions at the site;
- b.) Compliance Monitoring (CM) – environmental monitoring conducted to check the compliance to the stipulated environmental standards; and
- c.) Impact Monitoring (IM) – environmental monitoring conducted to check the magnitude of the impacts from the development activities to the environment.

The baseline monitoring conducted in this EIA and to be conducted for the EMP later as well as the following monitoring programme proposal shall cover all the three types of monitoring stated above.

9.2.1 During Construction Phase

i. Surface Water Quality Monitoring

The proposed locations for the surface water quality monitoring during the construction period are shown in **Figure 9.1**. One grab sample should be taken by the project proponent at each monitoring location once a month during the construction period. The samples taken should be sent for analysis by an accredited laboratory and the results should be submitted to the Department of Environment (DOE), Melaka for information and record. The parameters tested should include Total Suspended Solid, pH value, BOD₅, COD, DO, Ammoniacal Nitrogen, *E.Coli*, *Total Coliform* and Oil & Grease.

ii. Silt traps/ Sediment Pond Discharge Monitoring

Total Suspended Solid (SS) monitoring at the silt traps / sediment pond should be carried out by the project proponent to ensure the effectiveness of the siltation prevention measures during the construction phase. Water sample shall be taken at the outlet of the silt trap or sediment pond once a month throughout the construction period or more frequently, should it be required by the DOE. Samples taken shall be sent for analysis at an accredited laboratory and the results shall be submitted to the Department of Environment (DOE) Melaka, for information and record.

iii. Air Quality Monitoring

Air quality monitoring for Total Suspended Particulate (TSP) is preferably within the vicinity of the site, which can closely represent the project site as shown in **Figure 9.2**. Sampling works shall be taken at quarterly interval or earlier should it be required by the DOE. It shall be initiated upon the onset of the earthworks and the results should be submitted to the DOE for record and information.

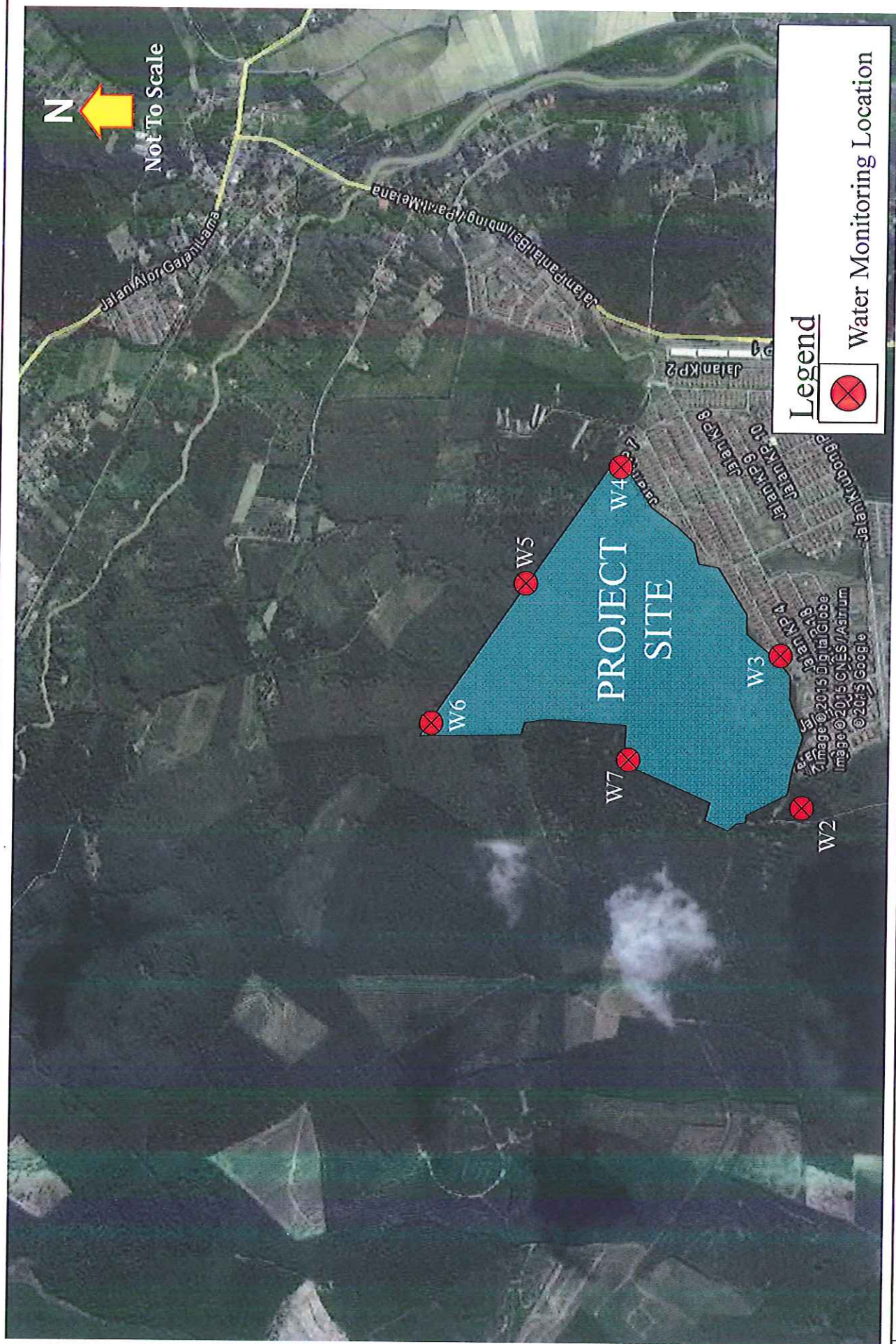


Figure 9.1: Proposed Surface Water Monitoring Locations.

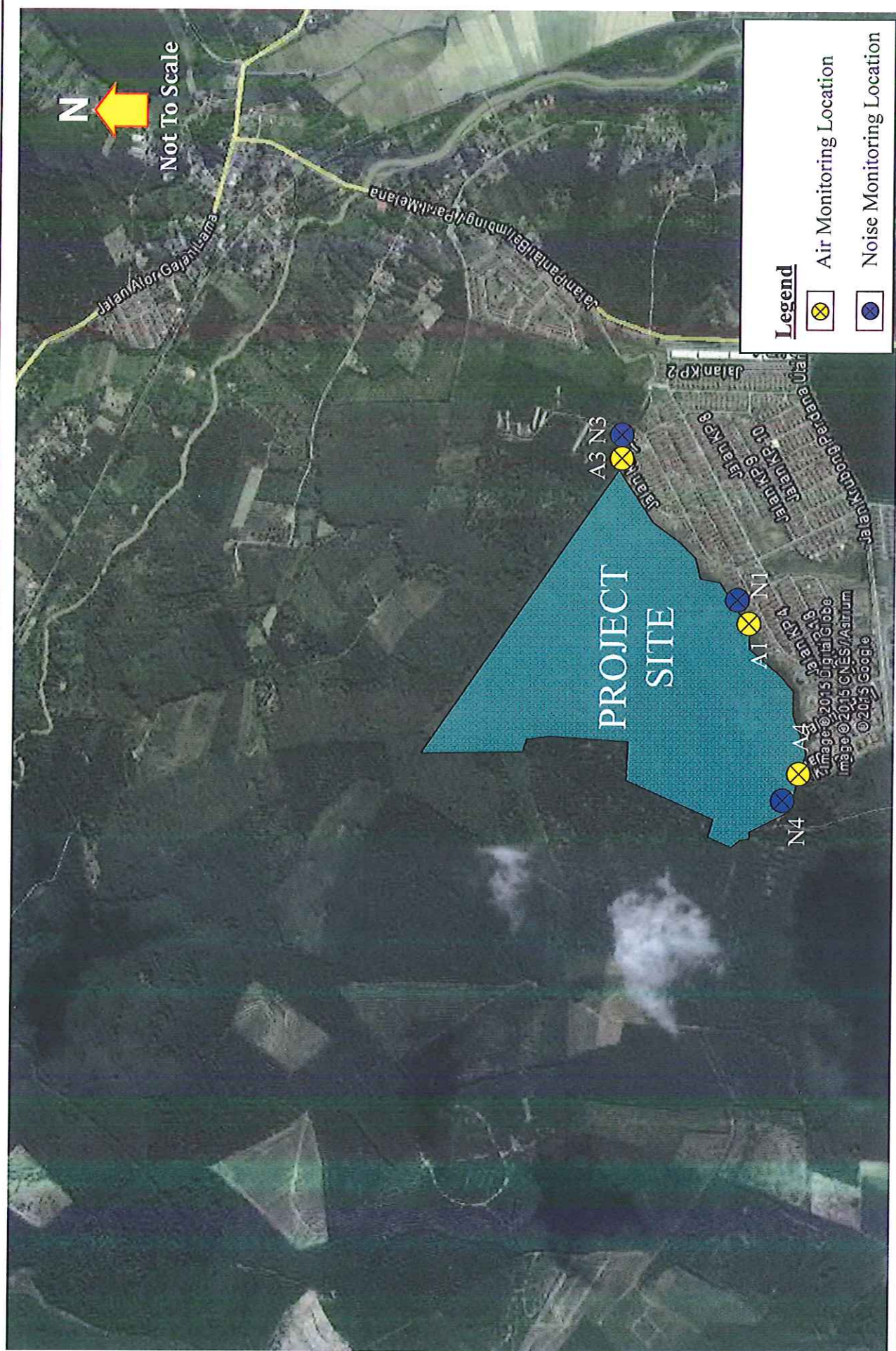


Figure 9.2: Proposed Air and Noise Monitoring Locations

iv. *Noise Level Monitoring*

The noise level monitoring shall be carried out at quarterly interval or earlier should it required by the DOE. Parameters to be measured should include L_{eq} , L_{max} , L_{min} and L_n for continuously 24-hours duration. **Figure 9.2** indicates the location for noise level measurement.

9.2.2 During Operational Phase

i. *Monitoring for Effluent from Sewerage Treatment Plant*

Effluent from the sewerage treatment plant would need be taken monthly during the operational phase of the project before hand over to IWK. The proposed parameters to be tested are:

Insitu parameter : Temperature and pH value

Other parameters : BOD₅, COD, SS, O&G, Ammonical Nitrogen
(enclosed water body), Nitrate (enclosed water
body) & Phosphorous (enclosed water body)

ii. *Surface Water Quality Monitoring*

The river water quality is envisaged to have very minimal impacts during the full operational phase. Thus, no monitoring is proposed during the operational phase of the entire Project.

iii. *Air Quality and Noise Level Monitoring*

Air and noise monitoring can be carried out within the project boundary should it be required by the DOE. Parameter for the air quality monitoring should be TSP while L_{eq} , L_{max} , L_{min} and L_n should be carried out continuously 24-hours duration for noise level measurement should it be required by the DOE.

9.3 Environmental Management Unit (EMU)

The EMU proposed is shown in **Figure 9.3**. The functions of the EMU are to :

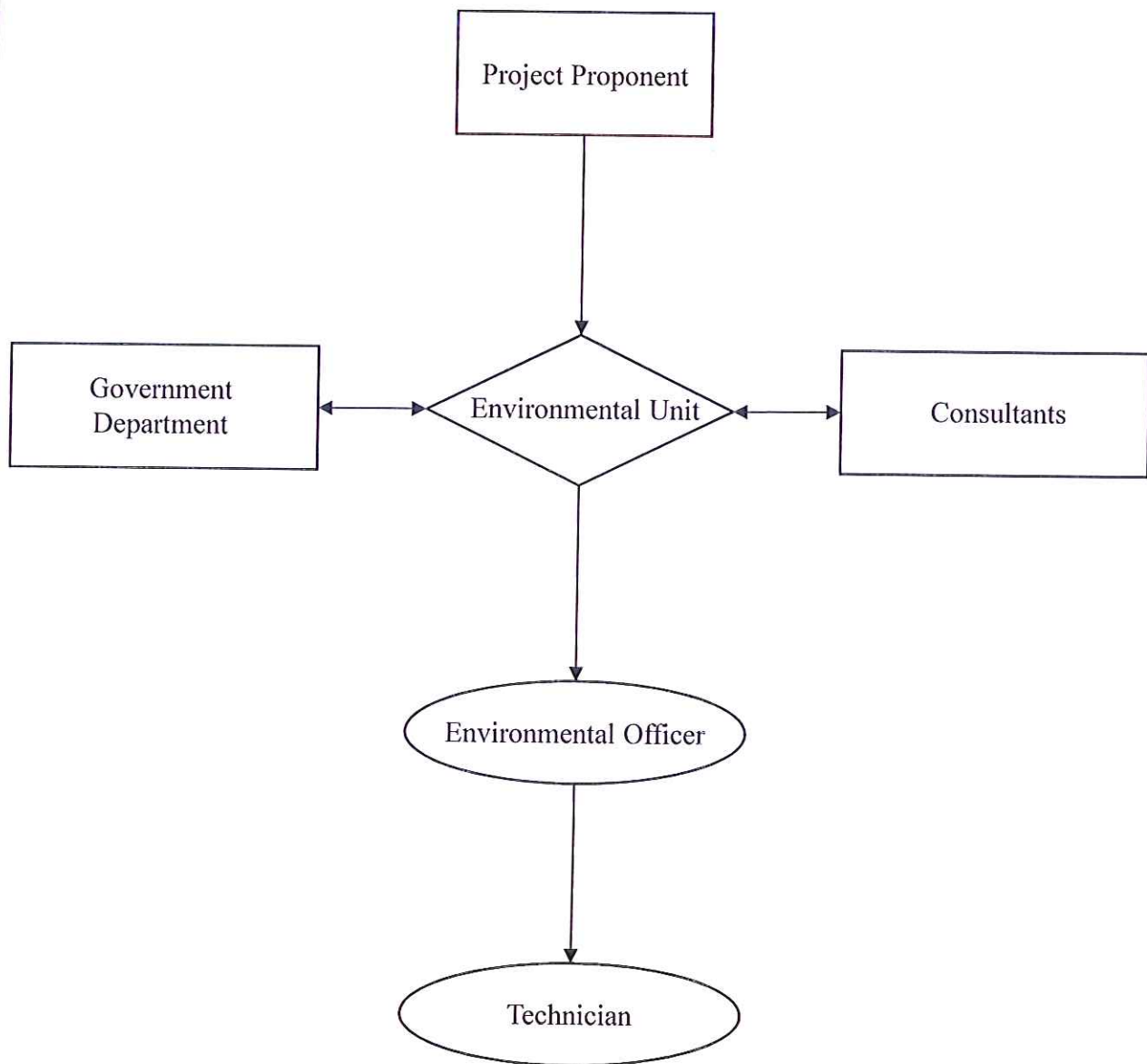
- i. Implement all the mitigating measures proposed throughout the construction and operational phases of the project.
- ii. Carry out environmental auditing.
- iii. Advise the project proponent on all matters pertaining to the environment.
- iv. Review project operation from time to time in order to keep ahead of all statutory requirements.
- v. Liaise with authorities on issues concerning pollution from the proposed development.

Environmental Officer

An environmental officer is a person who must be conversant with environment related practices and principles. The environmental officer will also be responsible for all the activities of the Environmental Management Plan. The environmental officer will normally be assisted by a technician. The technician of the Environmental Management Unit will assist the environmental officer, especially in sampling, carrying out pollution survey, reporting and some standard office work.

Environmental Auditing

Environmental auditing should be carried out at quarterly interval during construction phase and conclude after full completion of the project. Environmental auditing will provide an 'early warning' and ensure the environmental problems are detected as well as confined in the early stage before it reaches the epidemic proportion.



9.4 Emergency Response Plan (ERP)

Despite an organization's best efforts, the possibility of accidents and other emergency situations still exists. Emergency Response Plan (ERP) is an action plan to reduce, prevent or minimise the environmental impact when an unexpected situation take place or the recommended mitigation does not function accordingly. An effective ERP should have the following:-

- i. good system, administration and management to achieve excellent safety performance;
- ii. efficient planning of facilities, design and operating standards to reduce the potential accidents in the workplace;
- iii. emergency preparedness and response procedure to prevent accidents and to ensure safety of workers;
- iv. safety drill to familiarise the workforce with sequence of actions, handling of safety equipment and evacuation procedures in the event of accident;
- v. provision of safety guidelines, fire-fighting and rescue/ team services; and
- vi. liaison and networking with other rescue teams.

CHAPTER 10

STUDY FINDINGS

10.0 STUDY FINDINGS

The EIA study has identified the likely impacts on the environment as well as various measures to mitigate or control these impacts. Various alternatives for the project development have been considered in **Chapter 4** including the 'No-Project option' as detailed in **Table 4.1**.

In a nutshell, based on the study done, the two main environmental impacts that need high attention are the soil erosion and the water quality and quantity. These two impacts are foreseen to be critical during the project implementation especially during earthwork activities. Nevertheless, with proper mitigation measures in place, the impacts shall be able to be controlled and alleviated.

The development of the site into a residential area is considered as the most suitable option for the project site. The completion of the project will have a positive impact on the socio-economy of the area as well as the State, by utilising the available land with a compatible development in order to prevent the formation of unmanageable urban sprawl and congestion as a result of the continuous population and economic growth. The environmental and social benefits accruing from its implementation are far greater than if the 'No-Project option' or other project alternatives are chosen.

With careful planning and good construction and management practices, the project will not bring about any significant adverse environmental impacts on the surroundings but rather its implementation will contribute to the development of the State in general.

PLATES



The Proposed Project site



Taman Inang Sari located at 500m east from the Project site



Taman Krubong Perdana located adjacent to the Project site



Vegetation that can be found at 900m south from the Project site



KYZ Furniture factory that can be found at 900m south from the Project site



Taman Krubong Permai located at 2km south from the Project site



Proposed access junction



SK Parit Melana located at 2.5km east from the Project site



Rembia Industrial Park that is located at 3km west from the Project site



Kg. Panchor located at 2.8km west from the Project site



Taman Rembia Utama located at 4km west from the Project site



Klinik Desa Sungai Petai located at 4km west from the Project site

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