



CASUARINA PANGKOR SDN.BHD.

EIA FOR “CADANGAN MEROBOH DAN MEMBINA SEMULA PUSAT PERANGINAN PERSISIRAN PANTAI YANG MENDUNGSI 56 UNIT VILLA, 148 UNIT BILIK HOTEL, KEMUDAHAN-KEMUDAHAN LAIN SEPERTI KOLAM RENANG, DEWAN, RESTORAN, KELAB REKREASI DAN SUKAN, PENCAWANG ELEKTRIK BESERTA SEBUAH LOJI RAWATAN KUMBAHAN DI ATAS LOT 10991-11054, 12318-12329, 12331-12332, 12334-12347, PT13222, PT13223 DAN SEBAHAGIAN REZAB JALAN DI TELUK DALAM, PULAU PANGKOR, MUKIM LUMUT, DAERAH MANJUNG, PERAK DARUL RIDZUAN”



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TABLE OF CONTENTS

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

FOR THE PROPOSED

“CADANGAN MEROBOH DAN MEMBINA SEMULA PUSAT PERANGINAN PERSISIRAN PANTAI YANG MENGANDUNGI 56 UNIT VILLA, 148 UNIT BILIK HOTEL, KEMUDAHAN-KEMUDAHAN LAIN SEPERTI KOLAM RENANG, DEWAN, RESTORAN, KELAB REKREASI DAN SUKAN, PENCAWANG ELEKTRIK BESERTA SEBUAH LOJI RAWATAN KUMBAHAN DI ATAS LOT 10991-11054, 12318-12329, 12331-12332, 12334-12347, PT13222, PT13223 DAN SEBAHAGIAN REZAB JALAN DI TELUK DALAM, PULAU PANGKOR, MUKIM LUMUT DAERAH MANJUNG, PERAK DARUL RIDZUAN”

RINGKASAN EKSEKUTIF

		<u>M/S</u>
RE.1	Pengenalan	RE-1
RE.2	Perancang Projek dan Pihak Berkaitan	RE-2
RE.3	Keperluan Undang-Undang	RE-2
RE.4	Kenyataan Keperluan dan Pilihan	RE-3
	RE.4.1 Kenyataan Keperluan	RE-3
	RE.4.2 Faktor Pemilihan	RE-4
	RE.4.3 Cadangan	RE-5
RE.5	Latar Belakang Projek	RE-5
	RE.5.1 Lokasi Projek	RE-5
	RE.5.2 Konsep Projek	RE-6
	RE.5.3 Pelan Cadangan dan Komponen Guna Tanah	RE-6
	RE.5.4 Aktiviti Projek	RE-7

	RE.5.5	Jangkamasa Pembangunan Projek	RE-8
RE.6		ALAM SEKITAR SEDIA ADA	RE-9
	RE.6.1	Geologi dan Tanah	RE-9
	RE.6.2	Topografi	RE-9
	RE.6.3	Hidrorologi	RE-10
	RE.6.4	Meteorologi dan Perubahan Cuaca	RE-10
	RE.6.5.	Kualiti Semasa Alam Sekitar	RE-10
	RE.6.6	Flora dan Fauna	RE-12
	RE.6.7	Guna Tanah	RE-12
	RE.6.8	Sosio Ekonomi	RE-13
	RE.6.9	Trafik dan Pengangkutan	RE-13
RE.7		IMPAK ALAM SEKITAR DAN LANGKAH KAWALAN	RE-14
	RE.7.1	Fasa Pembinaan	RE-14
		RE.7.1.1 Hakisan Tanah dan Pemendapan	RE-14
		RE.7.1.2 Kestabilan Cerun	RE-18
		RE.7.1.3 Air Larian	RE-19
		RE.7.1.4 Kualiti Air	RE-19
		RE.7.1.5 Pengurusan Sisa Kumbahan	RE-20
		RE.7.1.6 Kualiti Udara	RE-20
		RE.7.1.7 Kualiti Tahap Kebisingan dan Getaran	RE-21
		RE.7.1.8 Pengurusan Sisa Pepejal	RE-22
		RE.7.1.9 Impak Ekologi	RE-23
		RE.7.1.10 Sosio Ekonomi	RE-23
		RE.7.1.11 Trafik dan Pengangkutan	RE-24
		RE.7.1.12 Keselamatan dan Kesihatan	RE-25
	RE.7.2	Fasa Operasi	RE-25
		RE.7.2.1 Hakisan Tanah dan Mendapan	RE-25
		RE.7.2.2 Air Larian Permukaan	RE-26
		RE.7.2.3 Kualiti Air	RE-26
		RE.7.2.4 Kualiti Udara	RE-27
		RE.7.2.5 Kualiti Bunyi	RE-28
		RE.7.2.6 Pengurusan Sisa Pepejal	RE-27
		RE.7.2.7 Impak Ekologi	RE-28
		RE.7.2.8 Sosio Ekonomi	RE-29

	RE.7.2.9 Trafik dan Pengangkutan	RE-29
RE.8	PEMANTAUAN DAN PENGURUSAN ALAM SEKITAR	RE-30
RE.9	KESIMPULAN	RE-31

Senarai Jadual

Jadual RE.1	Komponen Guna Tanah	RE-6
Jadual RE.2	Model Risiko Hakisan dengan Langkah Mitigasi	RE-17

EXECUTIVE SUMMARY

		<u>Page</u>
ES.1	INTRODUCTION	ES -1
ES.2	PROJECT PROPONENT AND CONSULTANTS	ES -2
ES.3	LEGAL REQUIREMENT	ES -2
ES.4	STATEMENT OF NEED AND OPTIONS	ES -3
	ES.4.1 Statement of Need	ES -3
	ES.4.2 Options	ES -3
	ES.4.3 Recommendations	ES-4
ES.5	PROJECT DESCRIPTION	ES -5
	ES.5.1 Project Location	ES -5
	ES.5.2 Project Concept	ES -5
	ES.5.3 Proposed Layout and Land Use Components	ES -5
	ES.5.4 Project Activities	ES -7
	ES.5.5 Project Development Timeline	ES -8
ES.6	EXISTING ENVIRONMENT	ES -8
	ES.6.1 Geology and Soil	ES -8
	ES.6.2 Topography	ES -9
	ES.6.3 Hydrology	ES -9
	ES.6.4 Climate and Metrology	ES -9
	ES.6.5. Baseline Environmental Quality	ES -10

	ES.6.6	Terrestrial Flora and Fauna	ES -10
	ES.6.7	Land Use	ES -11
	ES.6.8	Socio-Economic	ES -11
	ES.6.9	Transportation and Traffic	ES -11
ES.7		ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	ES -12
	ES.7.1	Construction Phase	ES -12
		ES.7.1.1 Soil Erosion and Sedimentation	ES -12
		ES.7.1.2 Runoff and Flood Risk	ES -16
		ES.7.1.3 Water Quality	ES -17
		ES.7.1.4 Sanitation	ES -18
		ES.7.1.5 Air Quality	ES -19
		ES.7.1.6 Noise and Vibration Quality	ES -20
		ES.7.1.7 Solid Waste Management	ES -20
		ES.7.1.8 Ecological Impact	ES -21
		ES.7.1.9 Socio Economics	ES -22
		ES.7.1.10 Transportation and Traffic	ES -23
		ES.7.1.11 Safety and Health	ES -24
	ES.7.2	Operational Phase	ES -25
		ES.7.2.1 Soil Erosion and Sedimentation	ES -25
		ES.7.2.2 Stormwater Management	ES -25
		ES.7.2.3 Water Quality	ES -26
		ES.7.2.4 Air Quality	ES -27
		ES.7.2.5 Solid Waste Management	ES -27
		ES.7.2.6 Ecological Impacts	ES -28
		ES.7.2.7 Socio-Economics	ES -29
		ES.7.2.8 Traffic and Transportation	ES -29
ES.8		ENVIRONMENTAL MANAGEMENT AND MONITORING	ES -30
ES.9		CONCLUSION	ES -31

List of Tables

Table ES.1	TDCR Land Use Components	ES-6
Table ES.2	Erosion Risk Analysis after Implementation of Mitigation Measures	ES-14
Table ES.3	Summary of Environmental Impacts and Mitigation Measures	ES-32

List of Figures

Figure ES.1	Key Plan and Location Plan of the TDCR
Figure ES.2	Aerial view of TDCR Project Site
Figure ES.3	Access road to TDCR Project Site
Figure ES.4	TDCR Layout Plan
Figure ES.5	Baseline Water Quality Monitoring Locations
Figure ES.6	Surrounding Land Use within 5 km radius
Figure ES.7	Existing Road Network
Figure ES.8	Slope Analysis Map

RINGKASAN EKSEKUTIF

RINGKASAN EKSEKUTIF

RE.1 PENGENALAN

Penilaian Kesan Alam Sekitar atau *Environmental Impact Assessment* (EIA) ini disediakan bertujuan untuk:

“Cadangan Meroboh dan Membina Semula Pusat Peranginan Persisiran Pantai yang Mengandungi 56 Unit Villa, 148 unit Bilik Hotel, Kemudahan-Kemudahan Lain Seperti Kolam Renang, Dewan, Restoran, Kelab Rekreasi dan Sukan, Pencawang Elektrik Beserta Sebuah Loji Rawatan Kumbahan di atas Lot 10991-11054, 12318-12329, 12331-12332, 12334-12347, PT13222, PT13223 dan Sebahagian Rezab Jalan di Teluk Dalam, Pulau Pangkor, Mukim Lumut Daerah Manjung, Perak Darul Ridzuan” for Messrs. Casuarina Pangkor Sdn.Bhd.

Seperti yang dinyatakan didalam dokumen, projek ini dikenali dengan nama Resort Persisiran Pantai Teluk Dalam atau disingkatkan menjadi TDCR.

Pembangunan projek TDCR ini terletak di latitude 4°14'49.59" Utara dan longitude 100°33'29.42" Timur. Ianya terletak di bahagian utara Pulau Pangkor dan berhampiran dengan Lapang terbang Pulau Pangkor (STOL) dan Kg Teluk Dalam di bahagian barat dan Bukit Batu Puteh di bahagian timur tapak projek. Tempoh masa untuk sampai ke lokasi TDCR projek adalah selama 10 minit daripada jetti Pulau Pangkor. Ia boleh diakses melalui Jalan Pasir Bogak dari arah barat tapak TDCR projek atau Jalan Besar dari arah timur TDCR tapak projek.

Pelan kunci dan Pelan Lokasi disediakan didalam **Figure ES.1**.

RE.2 PERANCANG PROJEK DAN PIHAK BERKAITAN

Penggerak Projek untuk projek ini adalah:

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Individu untuk dihubungi: Datoq Aminuddin Md Desa (CEO)

Perancang Bandar Projek adalah Tetuan Urban Scale Sdn Bhd, untuk arkitek adalah Tetuan S&A Architects Sdn.Bhd, C&S Engineering adalah Tetuan NMI & Associates Sdn.Bhd., untuk M&E Engineering Consultant adalah Tetuan Jurutera Perunding JBI (M&E) Sdn Bhd.

Kerja ukur untuk projek TDCR dijalankan oleh Tetuan Jurutera Perunding Services (Ipoh) Sdn.Bhd. Kajian keatas Kesan Trafik, *Traffic Impact Assessment* (TIA) telah dijalankan oleh perunding trafik, Tetuan Runding Trafik MAG Technical & Development. dan Kajian Kesan keatas Alam Sekitar, *Environmental Impact Assessment* (EIA) ini disediakan oleh Konsultan Alam Sekitar, Tetuan Erinco Sdn. Bhd.

RE.3 KEPERLUAN UNDANG-UNDANG

Kajian EIA ini disediakan untuk memenuhi keperluan dibawah *Section 34A of The Environmental Quality Act 1947 (Amendment 1987) and the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987.*

Projek ini dikenalpasti sebagai *Prescribed Activity* atau Aktiviti yang telah diluluskan dibawah aktiviti 17 (a) seperti dibawah:

- Aktiviti 17 (a) : Pembinaan kemudahan-kemudahan tempat peranginan atau hotel-hotel yang mempunyai lebih daripada 80 bilik di kawasan pantai.

Penilaian Awal Tapak (PAT) telah diluluskan menerusi surat bernombor rujukan AS(B) A91/110/621/017 Jld 34 (4) bertarikh 30hb September 2015.

RE.4 KENYATAAN KEPERLUAN DAN PILIHAN

RE.4.1 KENYATAAN KEPERLUAN

Pembangunan projek TDCR terletak di Mukim Lumut, Daerah Manjung. Merujuk kepada Rancangan Tempatan Daerah Manjung (Pengubahan) 2020, pembangunan TDCR yang dicadangkan tertakluk di bawah blok perancangan 8:Pulau Pangkor dan sub-blok 8.1.1: Teluk Dalam.

Rancangan tempatan telah meletakkan beberapa strategi pembangunan bagi mencapai matlamat dan objektif pembangunan di seluruh Negeri Perak. Strategi pembangunan ini boleh dibhagikan kepada beberapa sektor yang merangkumi socio, ekonomi, perbandaran, luar bandar, fizikal dan alam sekitar, Pangkor socio ekonomi dan infrastruktur, utiliti dan kemudahan awam. Strategi yang berkaitan untuk pembanguna Pulau Pangkor adalah seperti berikut:

- i) Untuk membangunkan Pulau Pangkor sebagai pusat pelancongan antarabangsa
- ii) Untuk memelihara Pulau Pangkor sebagai kawasan sensitif pelancongan dan alam sekitar.
- iii) Untuk mewartakan Pulau Pangkor sebagai khazanah negara

Berdasarkan strategi pembangunan yang telah dirancang oleh kerajaan setempat dan kerajaan negeri untuk memproposikan Pulau Pangkor sebagai kawasan pelancongan, pembanguna projek Teluk Dalam Coastal Resort (TDCR) ini mampu untuk menyediakan peluang berikut:

- Pembangunan ini akan menjadi pemangkin untuk transformasi Pulau Pangkor
- Meningkatkan peluang untuk memajukan dan meningkatkan lagi pembangunan di Pulau Pangkor sebagai kawasan komersial, kediaman and perkhidmatan.
- Membentuk kesinambungan aktiviti ekonomi dan peluang pekerjaan dimana ia penting untuk peningkatan ekonomi Negara dan setempat.
- Meningkatkan nilai hartanah melalui pembangunan kawasan perumahan kos tinggi..
- Pembangunan hartanah akan melahirkan sumber baru pendapatan melalui pembelian dan kutipan cukai.

- Keindahan alam semulajadi di pesisiran pantai Teluk Dalam menjadi tarikan utama pelancong untuk mengunjungi Pulau Pangkor.
- Menggalakkan aktiviti pelancongan di pulau Pangkor

RE.4.2 FAKTOR PEMILIHAN

PEMBANGUNAN DIJALANKAN

Faktor positif yang mempengaruhi penghasilan projek cadangan TDCR, adalah seperti berikut:

- Penghasilan peluang pekerjaan dan perniagaan ketika fasa pembinaan dan operasi;
- Cadangan pembangunan projek ini akan menggalakkan aktiviti pelancongan di Pulau Pangkor
- Kerajaan negeri dapat meningkatkan perolehan pendapat melalui pembayaran cukai tanah dan cukai pintu.
- Cadangan pembangunan ini mampu memberi tarikan yang baru untuk pelancong mengunjungi Pulau Pangkor dengan penyediaan kemudahan penginapan dan fasiliti yang moden dan selesa.
- Populasi setempat akan menikmati kemudahan infrastruktur yang telah dinaiktaraf melalui nilai haratanah yang tinggi, secara tidak langsung meningkatkan pertumbuhan ekonomi kawasan.
- Cadangan pembangunan ini akan memberi impak yang positif terhadap pemilik tanah, pemaju, pihak berkuasa tempatan dan kerajaan negeri dalam aspek socio ekonomi.

TIADA PEMBANGUNAN

Sekiranya cadangan projek TDCR tidak dibangunkan, resort sediaada di tapak projek akan terbiar. Ini akan mengurangkan bilangan pelancong mengunjungi Pulau Pangkor.

Sekiranya cadangan pembangunan tidak dijalankan, ia memberi impak terutamanya dari segi socio ekonomi yang mana ia akan menipiskan peluang pekerjaan dan mengurangkan aktiviti pelancongan di Pulau Pangkor.

RE.4.3 CADANGAN

Untuk cadangan projek ini adalah sangat digalakkan supaya TDCR projek boleh dilaksanakan kerana ia memberi banyak manfaat kepada semua pihak.

RE.5 LATAR BELAKANG PROJEK

RE.5.1 LOKASI PROJEK

Projek Telok Dalam Coastal Resort (TDCR) ini terletak dalam 4 km radius dari jeti Pulau Pangkor. Ia terletak di bahagian paling utara Pulau Pangkor, di Semenanjung Malaysia. Tapak projek TDCR terletak berhampiran dengan Lapangan Terbang Pulau Pangkor (STOL) di arah barat dan Bukit Batu Puteh di arah timur. Ia dikelilingi oleh Selat Melaka di bahagian utara tapak projek. Jumlah keluasan projek ini adalah 41.94 ekar atau 16.97 hektar. Projek TDCR terletak di koordinat berikut:

- Latitud : diantara 4°14'49.75"N dan 4°14'49.50"N
- Longitud : diantara 100°33'23.59"E dan 100°33'33.88"E

Pemandangan dari arah udara untuk TDCR ditunjukkan dalam **Figure ES.2**. Tapak projek boleh diakses melalui Lebuhraya Utara-Selatan dari kedua-dua arah Utara dan Selatan.

Utara:

- a) Daripada Lebuhraya Utara Selatan (E1) melalui simpang keluar Changkat Jering (Exit 146): melalui Jalan Kuala Trong A101 ke Jalan Persekutuan 60 (Jalan Changkat Jering-Sri Manjung-Kampung Roh).
Anggaran jarak daripada simpang keluar Changkat Jering ialah 116km. alternative, ia juga boleh diakses dengan mengambil keluar tol Jelapang (~90 km).

Selatan:

- a). Daripada Lebuhraya Utara Selatan (E1) melalui simpang keluar Bidor (Exit 130): Ke Jalan Persekutuan 5 dan melalui Jalan Persekutuan 60 (Jalan Changkat Jering-Sri Manjung-Kg Koh) dan melepasi Seri Manjung yang akan bersambung dengan Jalan Persekutuan 18 (Jalan Iskandar Shah) ke Terminal Jeti Lumut.

Anggaran jarak dari simpang keluar Tol Bidor ke Terminal Jeti Lumut ialah 111 km, Alternati juga boleh keluar melalui tol Gopeng dengan anggaran jarak perjalanan ialah 86km.

Laluan ke TDCR tapak projek ditunjukkan dalam gambarajah **Figure ES.3**. Tapak cadangan projek hanya boleh diakses melalui feri dari Lumut ke Pulau Pangkor dan melalui udara. Terdapat dua jenis perkhidmatan feri yang disediakan iaitu seperti berikut:

- a) Jeti Lumut: melalui Sg Pinang Kechil ke jeti Pulau Pangkor. Mengambil masa selama 30 minit untuk laluan sehalu. Tambang feri bagi dua hala ialah RM10 bagi dewasa dan RM6 bagi kanak-kanak. Perkhidmatan feri ini bermula dari jam 6.30 pagi dengan kekerapan perkhidmatan setengah jam sekali.
- b) Jeti Marina Island: Mengambil masa perjalanan selama 10 minit untuk laluan sehalu dengan caj bayaran ialah RM10 untuk dewasa dan RM6 untuk kana-kanak bagi tambang dua hala. Perkhidmatan feri ini bermula daripada 6.45 pagi sehingga 8.00 malam.

RE.5.2 Konsep Projek

Cadangan pembangunan TDCR ini akan menggalakkan aktiviti pelancongan dengan menjadikan keindahan alam sekitar di Teluk Dalam sebagai daya tarikan yang utama. Pembangunan projek TDCR ini merangkumi pembinaan villa, resort, hotel, utiliti dan landskap.

RE.5.3 PELAN CADANGAN DAN KOMPONEN GUNA TANAH

Komponen Guna Tanah seperti yang telah dicadangkan didalam projek TDCR adalah seperti didalam **Jadual RE. 1** dan ekstrak bagi pelan susunatur ditunjukkan dalam **Figure ES.4**.

Jadual RE.1: Komponen Guna Tanah

Jenis Pembangunan	Unit	Luas (ac)	Peratus (%)
a) Komersil			
Bangunan Utama	1	1.49	3.55
Bangunan Spa	1	0.36	0.86

Jenis Pembangunan	Unit	Luas (ac)	Peratus (%)
Dewan Banquet	1	1.03	2.46
Beach Villa	32	1.60	3.81
Jungle Villa	24	1.44	3.43
Hotel	148	1.79	4.27
Beach Club	1	1.10	2.62
Nursery, Buggy Office	1	0.12	0.29
b) Lanskap			
Kolam Renang	1	0.77	1.84
Pejalan Kaki & ruang terbuka	-	7.06	16.83
Kawasan Lapang	-	16.15	38.51
Gelanggang Tennis	-	0.34	0.81
c) Utiliti			
Tangki Air	1	0.01	0.02
Bilik Penyaman Udara (Chiller)	3	0.02	0.05
Kolam Osidasi (STP)	-	0.34	0.80
Rezab Jalan (Persendirian)	-	5.37	12.80
Rezab Jalan Awam	-	2.95	7.03
Jumlah Keseluruhan		41.94	100.00

RE.5.4 AKTIVITI PROJEK

Fasa Pra-Pembinaan

Aktiviti yang dijalankan ketika fasa pra-pembinaan adalah seperti yang berikut:

- Kajian Topografi;
- Kajian Geoteknikal
- Perkara lain yang berkaitan penyiasatan tapak

Fasa Pembinaan

Aktiviti utama ketika fasa pembinaan merangkumi:

- Kerja tanah dan pembersihan tapak bina;

- Membina loji binaan dan kawasan peralatan;
- Mendirikan pejabat tapak dan sempadan tapak bina;
- Pembangunan infrastruktur dan sistem utiliti;
- Pembinaan bangunan dan struktur;
- Kerja-kerja lanskap

Fasa Operasi

Aktiviti ketika fasa operasi merangkumi proses mendiami dan penggunaan kawasan kediaman, komersial, rekreasi, pelancongan dan fasiliti infrastruktur. Implikasi terhadap alam sekitar bagi projek ini adalah seperti berikut:

- Penghasilan air sisa (mendakan, kumbahan);
- Penghasilan sisa pepejal (sisa domestik)
- Peningkatan puncak air larian permukaan disebabkan ketidaktelusan permukaan tanah dan,
- Peningkatan trafik

RE.5.5 JANGKAMASA PEMBANGUNAN PROJEK

Projek cadangan TDCR dibahagikan kepada dua peringkat iaitu peringkat tender dan peringkat pembinaan. Peringkat tender dijangkakan akan bermula pada March sehingga April 2016. Berikut adalah yang terlibat semasa peringkat tender:

- i) Lukisan arkitek
- ii) Lukisan struktur
- iii) Lukisan M&E
- iv) Dokumen Tender (Tender dibuka &ditutup)

Bagi cadangan pembangunan TDCR, pembinaan akan dijalankan dalam tempoh masa 24 bulan yang dijangkakan akan bermula pada bulan Mei 2016 sehingga bulan Mei 2018.

RE.6 ALAM SEKITAR SEDIA ADA

RE.6.1 GEOLOGI DAN TANAH

Geologi bagi tapak cadangan TDCR projek dikaji berdasarkan Map Geologi Semenanjung Malaysia yang diterbitkan oleh Jabatan Geologi Malaysia 1985. Projek cadangan TDCR ini dan kawasan sekitarnya dilapais oleh batu yang terbentuk semasa waktu Quarternary Deposit.

Merujuk kepada Reconnaissance Soil Map untuk Semenanjung Malaysia yang diterbitkan oleh Kementerian Pertanian, Malaysia (2020) siri tanah untuk tapak projek TDCR adalah Tanah Tinggi dan Kawasan Curam.

RE.6.2 TOPOGRAFI

Pada masa ini, kawasan cadangan TDCR merangkumi bangunan resort sediaada dan fasiliti yang terutamanya terletak di bahagian barat dan tengah tapak projek. Tapak projek juga dikelilingi oleh landskap sedia ada seperti pokok kelapa, pokok pinang, pokok bunga dan rumput/lalang. Di bahagian timur dan selatan tapak projek terdiri daripada hutan dan tumbuhan sekunder.

Kontour bagi kawasan yang telah didirikan resort adalah diantara 0m sehingga 14m. Walaubagaimanapun, di kawasan timur dan selatan tapak cadangan contour adalah di antara 28 m sehingga 60m.

Berdasarkan eta ketinggian, tapak cadangan TDCR adalah terletak di tanah rendah dengan ketinggian adalah di antara 0m sehingga 14m dari aras laut untuk bahagian barat dan utara projek. Di arah tenggara projek dan sebahagian timur laut ketinggian tapak adalah diantara 42m sehingga 56m dari aras laut.

Analisis Risiko Cerun

Kawasan projek adalah didominasi struktur tanah rata pada hampir keseluruhan tapak projek (68%) meliputi cerun dengan kecuraman 0°-15° (Cerun Kelas I). Kebanyakan

kawasan di tapak projek tergolong dalam kategori 16°-25° (17.38 %). Peratusan kecil 14.62% tergolong didalam kategori Kelas III dan Kelas IV.

Hakisan Tanah

Berdasarkan analisis hakisan cerun, dapat dilihat hampir kesemua kawasan (88.30 %) terdedah kepada hakisan pada kadar ~10 T/ha.yr pada keadaan persekitaran asal. Jumlah purata keseluruhan kadar hakisan tanah adalah dianggarkan sebanyak 7.50 T/ha.yr dan jumlah kehilangan tanah akibat hakisan adalah dianggarkan sebanyak 127.27 T/yr.

RE.6.3 HIDROLOGI

Satu saluran air mengalir dari arah selatan (Hutan Bukit Pangkor) ke arah utara (tapak cadangan TDCR). Untuk tapak projek TDCR terdapat dua aliran air keluar terus ke arah pantai Teluk Dalam yang mana satu aliran keluar terletak di bahagian barat dan satu lagi terletak di bahagian timur tapak projek. Sistem perpartitan sedia ada bagi tapak cadangan akan disambungkan melalui longkang-longkang kecil yang setrusnya akan bersambung dengan saluran air keluar yang terletak di bahagian timur dan barat tapak projek.

RE.6.4 METEOROLOGI DAN PERUBAHAN CUACA

Data meteorologi diperolehi daripada Stesen Sitiawan daripada tahun 2005 hingga 2014. Data yang diperolehi adalah merangkumi bilangan hari hujan, suhu, kelembapan, arah angin, penyejukan dan wind rose.

Keadaan pada bulan October menunjukkan purata hujan yang tertinggi iaitu 278 mm, manakala pada bulan Jun menunjukkan purata hujan yang paling terendah iaitu 82.2mm. Bilangan hari hujan yang tertinggi adalah dicatatkan pada bulan November (22 hari), manakal bulan Februari menunjukkan hari hujan yang paling sedikit iaitu 8 hari sahaja. Tiada musim kemarau yang dicatatkan.

Purata kadar suhu adalah di dalam lingkungan 26.6 °C sehingga 28.0 °C. Purata suhu minimum adalah dicatatkan pada bulan Januari (25.5 °C) manakala purata suhu maximum direkodkan pada bulan Mei dan Jun (32.8 °C). Purata kelembapan relatif paling rendah dicatatkan pada bulan Februari (80.7%) manakala bulan November mencatatkan bacaan

tertinggi iaitu 85.9%. Purata penyejatan bulanan tertinggi adalah pada bulan Februari sehingga April dengan bacaan 4.1mm dan bacaan terendah dicatatkan pada bulan Disember (3.2mm).

Berdasarkan Annual Wind Rose untuk stesen Sitiawan, kadar laju angin adalah di antara 0.3 m/s sehingga 1.5m/s adalah sebanyak 46.2%, diikuti dengan kadar laju angin diantara 1.6m/s sehingga 3.3m/s sebanyak 24.7%. Kadar laju angin 0.3m/s sehingga 1.5m/s bergerak dari arah timur (13.9%) dan diikuti dari arah timur laut, 11%.

RE.6.5 KUALITI ALAM SEKITAR SEMASA

Pemantauan semasa dan analisis alam sekitar telah dilakukan untuk menilai kualiti alam sekeliling bagi air sungai, air laut, udara dan tahap kebisingan berdekatan dengan kawasan projek TDCR. Stesen pemantauan ditunjukkan didalam **Figure ES.5**.

Pengujian kualiti air sungai menunjukkan keadaan sungai berada ditahap yang bersih, dimana Indeks Kualiti Air (WQI) berada di dalam kelas II bagi semua sampel yang dijalankan pada waktu pagi dan juga petang. Sample RW1, terletak di aliran air keluar menunjukkan indeks kualiti air berada pada kelas II dengan bacaan purata ialah 87.05. Sample RW2, terletak di bahagian hulu saluran air yang akan bersambung dengan lokasi sample RW3, dengan bacaan purata indeks kualiti air ialah 89.92 (Kelas II). Sample RW3 yang terletak di aliran air keluar di bahagian timur projek juga menunjukkan indeks kualiti air kelas II dengan bacaan purata 91.37. Berdasarkan hasil analisis, kualiti air yang disalurkan terus ke dalam laut adalah pada keadaan bersih.

Untuk kualiti air laut, hasil dari kajian makmal menunjukkan semua parameter bagi pont MW1 dan MW2 untuk air pasang dan air surut berada pada bawah tahap Kelas 2 daripada *Marine Water Quality Criterion Standard (MWQCS)*.

Keadaan analisis kualiti udara menunjukkan kualiti udara di kawasan persekitaran tapak TDCR adalah dalam keadaan memuaskan dan masih berada had yang ditetapkan, dimana Jumlah Pepejal Terapung (TSP) berada dibawah kelas dibawah $260 \mu\text{g}/\text{m}^3$, nilai PM_{10} adalah dibawah $150 \mu\text{g}/\text{m}^3$, nilai $\text{PM}_{2.5}$ adalah dibawah $75 \mu\text{g}/\text{m}^3$ manakala tiada nilai NO_2 , SO_2 , Co dan O_3 dicatatkan.

Tahap bunyi bising pada waktu siang berada diatas had piawaian sebanyak 55 dB(A), bagi semua lokasi pemantauan yang mana N1 (63.4 dB(A)), N2 (64.7 dB(A) dan N3 (63.7 dB(A)). Bacaan yang tinggi pada waktu siang dipengaruhi oleh bunyi fauna yang berada di sekitar tapak projek. Di selatan dan timur tapak projek adalah dikelilingi oleh hutan.

Tahap bunyi bising pada waktu malam berada diatas had piawaian sebanyak 45 dB(A) di semua stesen pemantauan. Hal ini mungkin di sebabkan oleh persekitaran tapak projek yang terletak berhampiran hutan yang mana punca bising adalah disebabkan oleh fauna di hutan yang berhampiran.

RE.6.6 FLORA DAN FAUNA

Pada masa ini, kawasan tapak projek di sebahagian timur dan barat tapak dipenuhi dengan tumbuhan lanskap seperti pokok kelapa, pokok pinang, bunga kertas, bungan siantan dan bunga kemboja. Di selatann dan di sebahagian timur tapak projek dikelilingi oleh tumbuhan sekunder dan hutan.

Taburan sepsis fauna di tapak TDCR projek boleh dibahagikan kepada dua iatitu di bahagian tengah dan selatan tapak projek. Di bahagian tengah tidak sesuai untuk spesis haiwan liar. Fauna yang terdapat di kawasan projek adalah mamalia, reptilia, burung dan juga haiwan dua alam. Walau bagaimanapun di bahagian selatan dan sebahagian timur tapak projek mungkin terdapat spesis haiwan liar kerana kawasan tersebut berhampiran dengan Hutan Simpan Sg Pinang (selatan) dan Bukit Batu Puteh (timur). Mungkin terdapat haiwan-haiwan liar yang telah menjadikan kawasan ini sebagai habitatnya.

Tiada pembangunan yang akan dijalankan di bahagian selatan tapak projek TDCR dan di sebahagian timur tapak projek. Kawasan ini akan dikekalkan seperti sedia ada. Oleh itu, tiada kehilangan spesis flora dan fauna yang dilindungi disekitar kawasan tapak projek TDCR.

RE.6.7 GUNA TANAH

Pembangunan projek ini terletak di daerah Manjung yang terletak di Pantai Barat Semenanjung Malaysia. Pembangunan TDCR termasuk dibawah Blok Perancangan 8:

Pangkor, sebahagian daripada Rancangan Tempatan Daerah Manjung (Penggubahan) 2020 dan di bawah sub-blok BPK:8.1.1 Teluk Dalam.

Guna Tanah Persekitaran di dalam lingkungan 5 km Radius

Cadangan pembangunan projek TDCR secara umumnya telah dikelilingi oleh Lapangan terbang Pulau Pangkor, Kg Teluk Dalam, Pangsapuri Damai, jeti Pangkor Island Beach Resort, Hutan Simpan Kekal Sungai Pinang dan Selat Melaka. (Rujuk **Figure ES.6**).

RE.6.8 SOSIO EKONOMI

Projek pembangunan TDCR berada di mukim Lumut, daerah Manjung dan di bawah penguatkuasaan Majlis Daerah Manjung (MDM). Data demografi bagi Pangkor, Pasir Bogak dan Sg Pinang Kechil telah digunakan sebagai rujukan untuk socio ekonomi bagi cadangan pembangunan TDCR.

Jumlah populasi keseluruhan ialah 2,745 orang yang mana warganegara adalah seramai 2,692 (98.1%) manakala selebihnya adalah bukan warganegara, 53 (1.91 %). Berdasarkan penduduk warganegara, komposisi etnik menunjukkan Cina adalah majoriti populasi iaitu 1,553 (57.69%), diikuti oleh Bumiputera 1,011 (37.56%) dan India 115 (4.27 %). Peratusan jantina bagi lelaki dan perempuan adalah 51.4 % (1,410) dan 48.6 % (1,335).

RE.6.9 TRAFIK DAN PENGANGKUTAN

Kini, jalan utama untuk ke tapak projek adalah melalui Jalan Persekutuan A270 dan Jalan Persekutuan A205. Jalan Persekutuan A207 terletak di bahagian arah tapak projek yang mana ia akan melalui kawasan Teluk Nipah. Jalan ini adalah jalan satu lorong dua hala dengan limit kelajuan 35 km/j. Jalan utama ke tapak projek TDCR ditunjukkan dalam **Figure ES.7**.

Untuk ke lokasi tapak projek TDCR ia hanya boleh diakses melalui kenderaan air atau udara. Untuk masa kini, lapangan terbang Pulau Pangkor ditutup untuk sementara waktu. Hanya

perkhidmatan feri yang sedia ada. Daripada jeti Pulau Pangkor, pengunjung boleh menyewa atau menaiki teksi, motorsikal dan basikal.

Berdasarkan kajian trafik bagi jalan sedia ada, *level of service (LOS) A*.

RE.7 IMPAK ALAM SEKITAR DAN LANGKAH KAWALAN

Impak alam sekitar yang mungkin akan berlaku daripada projek TDCR dikelaskan kepada impak fasa pembinaan dan fasa pengoperasian. (Bab 5 dan Bab 6). Impak ini di rumuskan bersama langkah kawalan di **Table ES.3** dan seperti yang dilampirkan.

RE.7.1 FASA PEMBINAAN

RE.7.1.1 Hakisan tanah dan pemendapan

Impak

- Penyediaan tanah dan kerja-kerja tanah akan mengganggu strata tanah serta hakisan semasa musim hujan.
- Pemendapan tanah berlaku di perparitan sepanjang kawasan tapak.
- Tanah yang terdedah akan menyebabkan habuk dan debu, dimana hal ini boleh menyebabkan masalah kepada penduduk berhampiran, masalah kesihatan dan keselamatan terhadap alam sekitar.
- Peningkatan kepekatan pepejal terampai akan mengurangkan sinaran matahari dan menyebabkan pengurangan proses fotosintesis dan pertumbuhan fauna akuatik.
- Pertumbuhan fauna akuatik akan berkurangan disebabkan faktor kepekatan dan sistem pernafasan tersumbat.

Langkah Tebatan

Impak dari hakisan dan mendakan tanah hasil dari aktiviti tanah boleh dikawal dengan secara efektif melalui pengaplikasian struktur Pengurusan yang terbaik iaitu BMP. Pengurusan ini dilengkapi didalam Langkah Kawalan Hakisan dan Mendakan Tanah (ESCP) seperti berikut:

- (a) Meminimumkan hakisan tanah
 - Pembangunan projek TDCR boleh dilakukan secara berperingkat dan melalui fasa.

- Aktiviti tanah seperti kerja pembersihan tanah, penambakan, dan penanaman rumput sementara untuk setiap fasa pembangunan memendekkan jangkamasa pembangunan.
 - Pengurusan aktiviti pembangunan perlu diambil kira dari segi aspek hidrologi dan musim.
 - Tumbuhan sedia ada perlu dikekalkan sebagai penapis dan penstrukturkan kontur untuk mengurangkan aliran huajan dan meningkatkan kualiti air.
 - Kawasan kawalan pengairan perlu dikekalkan mengikut garis panduan Jabatan Pengairan dan Saliran.
 - Pokok yang telah ditebang perlu dikekalkan didalam kawasan tapak sebagai penutup bumi, sebagai pelindung sementara untuk tanah dari terhakis.
 - Tanah yang telah digali perlu diletakkan dan disimpan, sebagai kegunaan penanaman kelak.
 - Penahan tanah sementara perlu disediakan
- (b) Menjaga permukaan atas tanah
- Semua tanah yang telah digali hendaklah dijadikan sebagai simpanan dan digunakan untuk proses penanaman semula.
 - Penstabilan sementara hendaklah dilakukan untuk kawasan yang terdedah.
- (c) Laluan masuk utama
- Setiap laluan keluar masuk kedalam kawasan tapak perlu ditunjukkan didalam ESCP.
 - Jalan dan perparitan utama perlu dibina seawall yang mungkin untuk mengawal aliran air semasa pembinaan. Perparitan sementara itu, perlu disambungkan ke kolam tadahan.
 - Bahu jalan perlu dijaga secara kaedah mekanikal dan ditanam tumbuhan untuk mengelakkan hakisan.
 - Kawasan yang terdedah dengan tanpa penutup bumi perlu dibasahi air untuk mengurangkan debu dan habuk apabila musim panas.
 - Semua laluan masuk ke dalam tapak projek perlu diturap sekurang-kurangnya 10m daripada jalan utama.
 - Kemudahan membasuh tayar prlu disediakan di setiap laluan keluar kenderaan dan jentera tapak.

- (d) Pengawasan perparitan di kawasan tapak pembinaan
- Aliran air perlu selari bagi mengelakkan mamasuki laluan yang tidak stabil.
 - Membina perparitan dan alur air dengan cara yang betul supaya tidak berlaku masalah mendakan tanah.
 - Membuang bahan mendakan tanah semasa musim kering untuk mengelakkan mendakan di hilir sungai.
 - Pembahagi sementara antara benteng dan sistem penapis pada setiap alur masuk perlu dibina bagi menyalurkan arus air secara terus kedalam kolam tahanan.
 - Tiada badan air utama yang boleh terlibat sehingga mendapat kelulusan dari Jabatan Pengairan dan Saliran.
 - Parit yang tidak diselenggara dengan baik perlu diselenggara dan dibaiki.
- (e) Kerja Tanah dan Kawalan Hakisan
- Pemetongan dan penambakan adalah seperti berikut:
 - i) Pemetongan : 36,752 m³
 - ii) Penambakan : 35,497 m³
 - iii) Baki : 1,255 m³
 - Import dan eksport hanya meibatkan debris dan bahan yang tidak diperlukan. Semua bahan ini hendaklah diletakkan di kawasan tanah rata atau lapang.
 - Kawasan yang terdedah hendaklah disediakan perlindungan seperti penanaman rumput atau penutup plastik.
 - Kawasan yang lebih kecil memerlukan masa yang berlainan untuk kerja penstabilan tanah.
 - Kerja tanah yang melebihi had ketinggian sehingga 1.5m dan dalam tidak boleh dipotong dan di bersihkan sehingga kawasan pembinaan tersebut mendapat kelulusan tapak.
 - Kawasan yang dibersihkan perlu ditanam semula dengan tumbuhan dalam masa 3 bulan selepas kerja tanah semasa musim kering dan sebulan selepas musim hujan.

(f) Kawalan Mendakan

- Satu kolam perangkap mendap telah dicadangkan untuk dibina. Dimensi kolam perangkap mendap itu ialah 31.0m x 63.0 m. Saliran perparitan yang dilengkapi dengan check dam akan disalurkan ke kolam perangkap mendap ini sebelum dilepaskan ke dalam laut.
- Perangkap kelodak dan langkah kawalan mitigasi yang lain perlu dihapuskan apabila tanaman penutup bumi dan langkah kawalan telah stabil sepenuhnya.
- Model hakisan tanah disediakan semasa fasa pembinaan dengan mengambil kira kawalan mitigasi dan ditunjukkan seperti dalam **Jadual RE.2**.

Jadual RE.2: Model Risiko Hakisan dengan langkah mitigasi

<i>Kategori Risiko Hakisan</i>	<i>Kadar Hakisan (T/ha.yr)</i>	<i>Luas (ekar)</i>	<i>Peratusan (%)</i>	<i>Jumlah keseluruhan</i>
Risiko Rendah	< 10	40.88	97.47	Kehilangan tanah akibat hakisan 93.87 T/yr
Sederhana	10 - 50	1.05	2.50	
Sederhana Tinggi	50 . 100	0.01	0.02	
Risiko Tinggi	100 . 150	0.00	0.01	Purata Kadar hakisan 5.53 T/ha.yr
Kritikal	>150	0.00	0.00	
TOTAL		41.94	100.00	

Berdasarkan model risiko yang telah disediakan, kadar hakisan bagi projek TDCR adalah berada pada risiko yang rendah (97.47%) , dengan purata kadar hakisan ialah 5.53 T/Ha.yr. Kadar hakisan ini adalah lebih rendah berbanding dengan keadaan sediaada. Setelah langkah-langkah mitigasi diambil kira semasa fasa pembinaan, kehilangan tanah adalah dianggarkan sebanyak 93.87 T/tahun.

Maka, jika cadangan BMP seperti yang dinyatakan dalam ESCP dilaksanakan, maka ia dapat membantu kadar hakisan di projek TDCR.

RE.7.1.2 Kestabilan Cerun

Impak

Perkara berikut adalah hasil yang diperolehi daripada analisis peta kecerunan (**Figure ES.8**):

- Majoriti tapak projek TDCR adalah dikategorikan dalam kecerunan 0 . 15° iaitu sebanyak 68 % dan diikuti oleh kecerunan 16-25° iaitu 17.4%.Selebihnya 9.74% adalah kawasan bercerun 26- 35° dan untuk kecerunan lebih daripada 35° ialah sebanyak 4.9 %.
- Kawasan tanah tinggi bagi tapak projek TDCR adalah terletak di bahagian timur dan selatan tapak.

Langkah Kawalan

- Pemotongan dan penambakan cerun hendaklah sentiasa dipantau dan dibaja bagi mempercepatkan pertumbuhan rumput dan tumbuhan.
- Dinding cerun perlu dilitupi dengan tanaman, penstabilan kimia dan tembok penahan yang kukuh.
- Kaedah kawalan di setiap teres cerun perlu diaplikasikan.
- Pembangunan yang bersesuaian hendaklah mengikut garis panduan kajian yang terperinci tentang geologi, geoteknik dan aspek kejuruteraan didalam kawasan projek.
- Jika berlakunya kegagalan batuan, analisis geologi secara kinematik perlu dilakukan untuk mendapatkan pelan, rekabentuk dan profil batuan bagi kaedah penstabilan cerun yang sesuai.
- Penahan sementara hendaklah dikekalkan untuk mamimumkan hakisan
- Elakkan dari mengganggu atau berada berdekatan dengan aliran air.
- Pemantauan terhadap penstabilan cerun dilakukan secara berkala untuk mengelakkan tanah runtuh.
- Sistem perparitan dikawasan cerun hendaklah dibina seperti yang dispesifikasikan.

RE.7.1.3 Air Larian dan Risiko Banjir

Impak

Air larian permukaan dan mendakan di dalam sistem perparitan dan sungai boleh menyebabkan peningkatan lapisan mendakan semasa musim hujan dan banjir.

Langkah Kawalan

Air Larian dan risiko banjir boleh dikawal menerusi program pengurusan kawalan banjir dengan strategi berikut:

- Menghalang . Menghalang kerosakan daripada gangguan tanah mendakan yang boleh mengakibatkan pergerakan sedimen.
- Mengawal . Kolam Perangkap kelodak perlu dibina pada setiap aliran air dan haruslah sentiasa diselenggara dengan baik. Tanaman penutup bumi perlu ditanam bagi mengawal hakisan dan mengurangkan aliran air.
- Persediaan . Membuat pengumuman dan memberitahu kepada semua pekerja mengenai risiko banjir serta pelan tindakan banjir.
- Tindakan Pantas - Menyediakan Pelan Tindakan Kecemasan jika berlakunya banjir.

RE.7.1.4 Kualiti Air

Impak

Punca terhadap impak kualiti air adalah:

- Hakisan tanah hasil daripada aktiviti kerja-kerja tanah akan menyebabkan peningkatan TSS dan nilai kekeruhan yang lebih rendah berbanding keadaan sedia ada.
- Peralatan dan minyak enjin yang terhasil daripada pengoperasian kenderaan dan jentera ditapak.
- Tiada pengawalan dan rawatan dilakukan sebelum aliran masuk sungai atau kolam, pencemaran seperti E.coli boleh mendatangkan kesan kesihatan kepada komuniti.
- Sampah sarap seperti bekas penyimpanan dan bahan terpakai daripada pembinaan dibiarkan bersepah semasa kerja pembinaan.
- Toksik daripada pembinaan dan sisa pembinaan boleh memberi impak kepada kehidupan akuatik di dalam laut.

Langkah Kawalan

Dalam menguruskan kualiti air daripada tercemar semasa jangkamasa pembinaan, berikut disenaraikan langkah yang boleh diambil:

- Tempat penyimpanan diesel dan minyak diletakkan diatas permukaan tanah yang rata dan mempunyai perimeter berbenteng. Ketumpatan benteng tersebut harulah berkapasiti 110% terhadap tangki.

- Minyak terpakai mestilah disimpan dan diletakkan dengan tersusun dan perlu dilupuskan.
- Tempat penyimpanan sisa terjadual perlu dilabelkan, diletakkan diatas permukaan yang telap dan berbumbung.
- Pengurusan sisa pepejal perlu mempunyai aktiviti pemungutan yang terjadual.
- Pelan keselamatan hendaklah diedarkan bagi mengawal tumpahan dan sisa kimia minyak.
- Penyelenggaraan berkala perlu dilakukan keatas sistem rawatan air.
- Sisa kumbahan perlu dirawat sebelum disalir keluar ke sungai berhampiran.
- Semua efluen kumbahan daripada loji individu perlu mengikut piawaian Standard A Kualiti Alam Sekeliling (Kumbahan) 2009.
- Kuarters dan rumah pekerja tidak boleh dibina berdekatan dengan sungai dan perlu diletakkan sebuah tandas sementara yang telah di spesifikasikan oleh Kementerian Kesihatan atau Pihak Berkuasa Tempatan dan kemudahan tersebut perlu diselenggara setiap hari.

RE.7.1.5 Pengurusan Sisa Kumbahan

Impak

Punca yang menyebabkan masalah system sanitari:

- Air kumbahan dan air basuhan dari pejabat tapak yang tidak dirawat
- Penyelenggaraan tandas mudah alih yang tidak sempurna
- Air kumbahan dan air basuhan dari tapak penempatan pekerja yang tidak dirawat.

Langkah Kawalan

- Memastikan air kumbahan dan air basuhan dirawat sebelum disalurkan ke badan air yang berhampiran.
- Air kumbahan dari penempatan pekerja ditapak projek hendaklah disalurkan ke individual septik tank.
- Semua sia kumbahan hendaklah mematuhi piawaian Standard A Kualiti Alam Sekeliling (Sisa Kumbahan) 2009. Penempatan pekerja hendaklah disediakan dengan tandas sementara dan penempatan tersebut tidak boleh berada dekat dengan badan air.

RE.7.1.6 Kualiti Udara

Penghasilan debu, terutamanya semasa musim kering dan kemarau hasil daripada aktiviti oleh jentera pembinaan dan kenderaan ditapak merupakan penyumbang utama kepada pencemaran udara. Punca penghasilan debu ini adalah daripada:

- Aktiviti kerja tanah dan pembersihan tapak
- Operasi pemecahan batuan
- Pergerakan jentera dan kenderaan ditapak
- Pengangkutan bahan binaan
- Tanah yang diangkut keluar oleh jentera tapak dan melalui laluan keluar dari tapak

Impak

Impak yang akan terjadi daripada penghasilan debu adalah:

- Mengurangkan kualiti udara dan penglihatan
- Nilai PM₁₀ semasa musim kering boleh menyebabkan jerebu.

Langkah Kawalan

- Tanah yang terjatuh dari kenderaan semasa kerja memindahkan tanah perlu segera dibersihkan.
- Melakukan pembasahan tanah dengahkerap sepanjang laluan utama, jalan masuk dan setiap laluan keluar masuk ke tapak.
- Kemudahan pembersihan tayar perlu disediakan di setiap laluan keluar ke jalan utama.
- Bahan yang berdebu perlu dibasahkan.
- Pembakaran secara terbuka adalah dilarang.
- Pemantauan kualiti udara disyorkan semasa fasa pembinaan.
- Kenderaan yang membawa pasir, batuan dan bahan terpakai perlu ditutup dengan kain terpal.
- Penyelenggaraan berkala bagi kenderaan pembinaan untuk mengawal perlepasan asap hitam.

RE.7.1.7 Kualiti Tahap Kebisingan

Impak

- Bunyi bising biasanya terhasil daripada pergerakan kenderaan berat dan jentera di tapak. Kerja-kerja menanam cerucuk, peletupan batuan dan aktiviti kuari juga menghasilkan bunyi bising.
- Penerima bunyi ini adalah penduduk dikawasan berdekatan iaitu di penduduk Kampung Teluk Dalam, Pangsapuri Damai, pekerja di tapak pembinaan dan pengunjung pantai.

Langkah Kawalan

- Kaedah kejuruteraan seperti jentera yang tidak menghasilkan bunyi yang kuat boleh digunakan dan meletakkan peralatan penghalang bunyi.
- Had waktu bekerja adalah jam 0700 hingga 1900.
- Mesin dan peralatan yang boleh mengganggu perlu di setkan kepada had yang minimum.
- Meletakkan papan penghalang disepanjang tapak pembinaan bagi mengurangkan bunyi.

RE.7.1.8 Pengurusan Sisa Pepejal

Sisa pepejal terkumpul daripada aktiviti pembinaan terdiri daripada sisa pembersihan, bahan terpakai, sisa domestic dan sampah dari pejabat serta bengkel pekerja. Sisa Terjadual pula terdiri daripada bekas penapis, bateri terpakai, minyak dan gris serta cat terpakai.

Impak

Semasa aktiviti pembinaan, sisa pepejal boleh dibahagikan kepada:

- Biomass
- Bahan pembinaan
- Sisa domestic

Langkah Kawalan

- Melakukan aktiviti kitar semula
- Membuat pengumpulan secara berkala dan sisa pepejal tersebut perlu diangkut oleh pihak kontraktor yang telah berdaftar.
- Mengamalkan dengan berhemah Piawaian Kualiti Alam Sekeliling (Sisa Pepejal) 2005.
- Pembakaran sampah adalah tidak dibenarkan.
- Melakukan penguraian di tapak pembinaan
- Melakukan kerja pembersihan di dalam tapak.

RE.7.1.9 Impak Ekologi

Impak

Impak terhadap flora dan fauna adalah kurang kerana kawasan tapak projek sedia ada hanyalah kawasan resort sedia ada yang mempunyai tanaman landskap dan sebahagian daripada tapak projek di litupi oleh tumbuhan sekunder.

Langkah Kawalan

Tiada langkah kawalan yang khusus perlu dilakukan, namun pemantauan berikut perlu dilakukan:

- Penebangan pokok hendaklah dalam kuantiti yang sedikit
- Semasa kerja pembinaan, pekerja dilarang merosakkan tanaman sedia ada jika perlu.
- Kawasan yang terdedah hendaklah ditanam dengan tumbuhan.
- Pemantauan setiap bulan harus dilakukan terhadap aktiviti di kolam perangkap mendakan.

RE.7.1.10 Sosio Ekonomi

Impak

- Menambah peluang pekerjaan khususnya kepada pekerja buruh.

- Pengambilan pekerja asing boleh memberi impak kepada kesihatan persekitaran seperti malaria dan cholera.
- Pendapatan secara tetap memberi peluang kepada masyarakat setempat.
- Ekonomi untuk pendapatan sampingan meningkat terutamanya kepada bekalan makanan, barang keperluan harian dan bekalan bahan binaan.
- Pengambilan pekerja asing memberi kesan baik dan buruk terhadap masyarakat setempat.
- Impak positif adalah memberi pendapatan sampingan, manakala negative impak adalah konflik sosial dan budaya masyarakat yang berbeza.
- Bahaya dan risiko kesihatan terhadap penyakit demam terutamanya terdapat kawasan yang mudah untuk nyamuk membiak.
- Bahaya terhadap bunyi bising dan pencemaran udara.
- Risiko kemalangan kesan daripada kehadiran jentera pengangkutan ditapak.

Langkah Kawalan

- Pengurusan tapak pembinaan yang betul perlu dilakukan.
- Sebagai tambahan, setiap aduan perlu direkodkan dan tindakan yang serius hendaklah diambil.
- Laluan utama ke tapak projek hendaklah bersih daripada lumpur dan debu. Laluan yang rosak hendaklah diselenggara dengan baik.
- Lori yang membawa tanah hendaklah ditutup dengan kain terpal.
- Kontraktor hendaklah bertanggungjawab terhadap kebajikan pekerja.

RE.7.1.11 Trafik dan Pengangkutan

Impak

- Penambahan trafik di laluan jalanraya
- Kesan kualiti udara
- Impak bunyi bising kepada penduduk yang berdekatan.
- Gangguan terhadap kenderaan yang membawa bahan keluar dari kuari.

Langkah Kawalan

- Mengurangkan gangguan perjalanan di lauan utama semasa waktu puncak (7.00 pagi hingga 9.00 pagi dan 5.00 ptg dan 7.00ptg).
- Kontraktor perlu memastikan kenderaan yang digunakan diselenggarakan dengan baik dan pemandu kenderaan tersebut perlu peka dengan perjalanan trafik dikawasan tersebut.
- Kelajuan jentera dan kenderaan ditapak hendaklah dikawal. .
- Bahan yang dibawa oleh lori pengangkut perlu ditutup dengan kain terpal.
- Laluan hendaklah sentiasa dipantau agar tiada kesan lumpur dan tanah yang tertinggal.
- Menyediakan kemudahan basuhan tayar, dan memastikan kenderaan yang keluar dari tapak perlu membersihkan tayar kenderaan mereka.

RE.7.1.12 Keselamatan dan Kesihatan

Impak

Masalah kesihatan adalah dari penyebaran virus yang tidak sihat dari penempatan pekerja dan mungkin akan menyebabkan penyakit denggi. Keselamatan pekerja perlu diambil kira, termasuklah jatuhan objek, penahan yang tidak stabil dan kawasan yang mempunyai permukaan yang licin. Keselamatan pengguna jalanraya juga akan timbul kerana pertambahan kenderaan di jalanraya.

Langkah Kawalan

Selain penyelenggaraan dan membersihkan kawasan tapak secara teratur, langkah-langkah lain adalah :

- Elakkan orang awam dari memasuki kawasan tapak pembinaan.
- Kontraktor perlu mengawal pergerakan jentera binaan untuk memastikan keselamatan pekerja.
- Semua pekerja perlu mengikuti kursus keselamatan di tapak binaan.
- Menggunakan peralatan keselamatan.

RE.7.2 FASA OPERASI

RE.7.2.1 Hakisan Tanah dan Mendapan

Impak

- Kawasan tanah yang terdedah akan menyebabkan pemendapan terhadap badan air yang berdekatan.

Langkah Kawalan

- Pada peringkat awal selepas pembinaan selesai, pengelodakan dan pemendapan dijangka berterusan untuk beberapa waktu sehingga tanah mendap dan stabil apabila kawasan yang terdedah ditumbuhi dengan tumbuh-tumbuhan.
- Berdasarkan keputusan analisis kadar hakisan tanah, untuk keadaan selepas pembinaan selesai, kehilangan tanah adalah dianggarkan sebanyak 86.01 T/Setahun. Purata kadar hakisan ialah 5.07 T/ha/setahun.
- Kawasan yang terdedah hendaklah ditutupi dengan rumput untuk mengelakkan ia terdedah dari hujan dan angin.

RE.7.2.2 Air Larian Permukaan

Impak

- Pembuangan sisa pepejal terutamanya sisa domestik ke sistem perparitan atau sungai akan menyebabkan saluran tersumbat dan penurunan kualiti air dan meningkatkan bilangan tikus.

Langkah Kawalan

- Pemeriksaan pada lur masuk, keluar dan sistem rawatan kolam tadahan perlu sentiasa dipantau.
- Sampah yang ada di dalam kolam perlu dibersihkan dari kolam tadahan. Gunakan mesin dan jentera yang bersesuaian bagi mengumpul dan melupuskan sampah di tempat yang betul.
- Kerosakan perlu dibaiki dengan segera, sebagai contoh pada struktur asas.
- Memantau aktiviti penyelenggaraan, termasuklah pembersihan dan mengambil kira faktor musim, ciri kawasan sekitar dan jenis pokok yang ada

RE.7.2.3 Kualiti Air

Impak

- Pelupusan sisa pepejal yang terdiri daripada sisa domestik disalurkan secara terus ke system perparitan atau sungai dan ini akan menyebabkan saluran tersumbat, pengurangan kualiti air dan menambah bilangan tikus
- Kegagalan STP daripada merawat sisa kumbahan ke dalam pantai Teluk Dalam akan meningkatkan kandungan BOD, TSS, Ammoniacal Nitrogen dan E-coli.
- Penggunaan racun perosak bagi penyelenggaraan tanaman landskap akan menambah kandungan bahan kimia ke dalam system perparitan dan kolam.
- Apabila musim hujan, kandungan nutrient dan kimia hasil dari bahan baja akan memasuki kawasan kolam perangkap mendapan.

Langkah Kawalan

- Memantau operasi STP untuk memastikan ia mematuhi piawaian yang ditetapkan.
- Menyediakan jadual berkala untuk peralatan STP seperti pump dan screen untuk memastikan ia berfungsi sepenuhnya.
- Pemantauan kualiti air di alur keluar STP terutamanya; BOD₅, COD, TSS, Ammoniacal Nitrogen, Oil & Grease dan E.coli perlu dilakukan untuk memantau kualiti air bagi Sg. Sekiahi.
- Mempraktikkan pengurangan penggunaan racun dan baja bagi mengurangkan kandungan nutrient pada badan air.
- Bahan baja organik dan racun organik boleh digunakan untuk mengelakkan kandungan kimia memasuki badan air

RE.7.2.4 Kualiti Udara

Impak

Selepas pembinaan siap dan fasa pengoperasian bermula, pencemaran udara adalah sedikit. Punca utama yang akan ada adalah dari trafik penduduk setempat.

Langkah Kawalan

Pencemaran dapat dikurangkan dengan:

- Persimpangan direkabentuk dengan sempurna.

- Zon penampungan dijalanraya hendaklah ditanam dengan tumbuhan sebagai penapis udara
- Program penyelenggaraan rangkaian jalan hendaklah dilakukan.

RE.7.2.5 Kualiti Bunyi

Impak

Selepas pembinaan siap dan fasa pengoperasian bermula, pencemaran bunyi bising adalah minimal.

Langkah Kawalan

Tiada langkah kawalan untuk peringkat fasa operasi.

RE.7.2.6 Pengurusan Sisa Pepejal

Semasa fasa pengoperasian, sisa pepejal yang terhasil adalah dari sampah domestik dan tanaman.

Impak

Program pemungutan sampah yang tidak sempurna akan menyebabkan :

- Pembakaran terbuka mudah berlaku apabila musim panas.
- Sistem perparitan akan tersumbat.
- Mendatangkan masalah kesihatan kepada masyarakat setempat.
- Pembuangan sampah mungkin akan berlaku di kaki lima, sungai dan tapak pelupusan yang tidak berdaftar.

Langkah Kawalan

- Pemungutan sampah yang berjadual dari pihak berkuasa sekurang-kurangnya 3 kali di dalam tempoh seminggu.
- Menggalakkan amalan kitar semula

- Bahan buangan bejadual hendakla dilupuskan seperti yang telah ditetakan dalam peratura Bahan Buangan Berjadual, 2005, Jabatan Alam Sekitar.

RE.7.2.7 Impak Ekologi

Impak

Pengurusan landskap akan memperkenalkan jenis tanaman baru dan sepsis pokok yang oleh menarik minta burung dan bintang lain. Ini akan memberi impak positif kepada sistem ekologi di TDCR .

Langkah Kawalan

Dalam proses pemilihan pokok, faktor berikut perlu diambil kira :

- Spesis dari luar perlu dielakkan. Spesis tempatan perlu diberi perhatian khusus untuk menaikkan imej semulajadi landskap tanahair.
- Spesis Canopy dan pokok berbunga serta herba disyorkan di kawasan rekreasi dan laluan berjogging.
- Penanaman rumput di setiap cerun amat dicadangkan.

RE.7.2.8 Sosio Ekonomi

Impak

Impak positif dapat memberi kelebihan terhadap implikasi di TDCR .

- Perumahan dan kemudahan yang disediakan meningkatkan populasi penduduk di kawasan Pulau Pangkor.
- Kemudahan alternative daipada komuniti perniagaan akan menaikkan taraf sosio ekonomi.
- Peluang pekerjaan akan bertambah dan sector pekerjaan akan menarik minat penduduk untuk tinggal di kawasan Pulau Pangkor.

Langkah Kawalan

Tiada langkah kawalan dicadangkan kerana situasi ekonomi yang bakal berlaku adalah bertambah baik.

RE.7.2.9 Trafik dan Pengangkutan

Impak

- Untuk cadangan pembinaan 204 unit bilik hotel akan menghasilkan sejumlah 1,415 PCU/trip/24 jam sehari atau 138 PCU/jam dan 155 PCU/jam untuk waktu puncak pagi dan waktu puncak petang.
- Semua kenderaan keluar masuk ke tapak projek akan melalui jalan persekutuan A205.
- Apabila resort ini beroperasi sepenuhnya, akan terdapat peningkatan untuk penggunaan jalan iaitu daripada 174 kepada 236 PCU/jam.

Langkah Kawalan

Untuk memastikan pergerakan trafik yang lancar ke tapak projek TDCR, beberapa langkah telah dicadangkan dan diuraikan seperti berikut:

- a) Jalan sedia ada yang menghubungkan ke seluruh Jalan Persekutuan A205 ke timur dan barat akan dimansuhkan dan menjadi sebahagian daripada komponen pembangunan resort.
- b) Jalan sedia ada di arah selatan tapak projek TDCR akan digunakan untuk menggantikan item (a) di atas dengan beberapa sambungan jalan raya di bahagian timur.
- c) Laluan keluar dan masuk untuk ke tapak pembangunan TDCR dari arah barat daya akan disediakan. Ia dijangka beroperasi sebagai penyambung untuk simpang dari semua arah.
- d) Laluan masuk / keluar ke tapak projek TDCR akan dibina yang baru kira-kira 170 meter panjang yang direka dengan rizab lebar 16 meter dan dengan pembahagi jalan pusat.
- e) Item (d) diteruskan dengan jalan lebar 11 meter yang direka dengan sistem gelung satu hala pada akhir timur utara. Akhirnya, kedua-dua perkara (d) dan (e) akan menyediakan akses kenderaan antara jalan masuk / jalan keluar, kawasan tempat letak kereta dan bangunan pusat 2 tingkat.

RE.8 PEMANTAUAN DAN PENGURUSAN ALAM SEKITAR

Seksyen ini memfokuskan kepada keperluan pengurusan alam sekitar untuk fasa pembinaan dan operasi bagi cadangan projek. Kualiti air sungai, udara dan tahap kebisingan semasa fasa pembinaan dan operasi harus dipantau berdasarkan keadaan semasa yang telah diambil.

Semasa fasa pembinaan, mendakan yang memasuki kawasan air sedia ada merupakan isu utama, maka keberkesanan struktur kolam tahanan akan dipantau oleh pihak kontraktor dengan mengukur tahap pepejal terampai bagi memastikan jumlah sedimen tidak memasuki badan air yang utama. Sampel air sungai perlu dikumpul dan di analisis setiap bulan sepanjang kerja-kerja tanah dijalankan dan setiap 3 bulan sekali sehingga kerja-kerja tersebut siap. Parameter ukuran yang diambil adalah pH, Total Suspended Solid (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), Ammoniacal Nitrogen, E-coli dan Oil and Grease.

Semasa fasa pembinaan, pemantauan kualiti udara dijalankan pada setiap sisi kawasan perumahan penduduk. Parameter yang dianalisis termasuk TSP dan PM₁₀. Pemantauan hendaklah dilakukan bagi setiap bulan atau suku kitaran bulan bergantung kepada kelulusan laporan EIA yang diperolehi daripada JAS. Tahap bunyi bising semasa fasa pembinaan hendaklah dipantau, bagi memastikan para kontraktor menggunakan cara yang terbaik untuk mengurangkan bunyi bising. Pemantauan bunyi bising hendaklah dilakukan pada waktu siang dan malam setiap bulan atau 3 bulan sekali.

Audit alam sekitar dicadangkan bagi mematuhi piawaian EMP dengan melakukan pemeriksaan langkah kerja pengincian dan dicadangkan agar langkah kawalan dan pemantauan dilaksanakan dengan sepenuhnya. Semasa fasa pembinaan, aktiviti kontraktor hendaklah diaudit setiap 3 bulan sekali bagi memastikan keberkesanan EMP.

RE.9 KESIMPULAN

Penilaian Kesan Impak Alam Sekitar untuk Projek TDCR menyimpulkan bahawa cadangan langkah kawalan dan disepadukan dengan pengurusan alam sekitar terhadap pembangunan akan mengatasi impak alam sekitar dari fasa pembinaan dan operasi.

Pelan Pengurusan Alam Sekitar (EMP) dan Kajian terperinci untuk Pelan Kawalan Hakis dan Mendakan (ESCP) harus disediakan untuk keberkesanan kerja pembinaan (terutamanya penyediaan tapak)

Mukasurat ini dibiarkan kosong.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This Environmental Impact Assessment (EIA) is prepared in support of the:

“Cadangan Meroboh dan Membina Semula Pusat Peranginan Pesisiran Pantai yang Mengandungi 56 Unit Villa, 148 unit Bilik Hotel, Kemudahan-Kemudahan Lain Seperti Kolam Renang, Dewan, Restoran, Kelab Rekreasi dan Sukan, Pencawang Elektrik Beserta Sebuah Loji Rawatan Kumbahan di atas Lot 10991-11054, 12318-12329, 12331-12332, 12334-12347, PT13222, PT13223 dan Sebahagian Rezab Jalan di Teluk Dalam, Pulau Pangkor, Mukim Lumut Daerah Manjung, Perak Darul Ridzuan” for Messrs. Casuarina Pangkor Sdn.Bhd.

In this document, the project is referred to as the Teluk Dalam Coastal Resort project or abbreviated to TDCR project.

The TDCR project site is graphically located at latitude 4°14'49.59" North and longitude 100°33'29.42" East. It is located at the northern of Pulau Pangkor and surrounded by Short Take Off and Landing (STOL) Pangkor Airport and Kg Teluk Dalam at the western side and Bukit Batu Puteh at the eastern side. It takes about 10 minutes to reach the TDCR project site from Pangkor Island Jetty. From the jetty, the TDCR can be accessed via Jalan Pasir Bogak (western of TDCR project site) or Jalan Besar at the eastern side of TDCR project site).

The Key Plan and Location Plan of the TDCR project site is shown in **Figure ES.1**.

ES.2 PROJECT PROPONENT AND CONSULTANTS

The Project Proponent of the TDCR Project is:

Casuarina Pangkor Sdn.Bhd.

No 1-A, Blok A, Menara PKNP,

Jalan Meru Casuarina,

Bandar Meru Raya,

30020 Ipoh,

Perak Darul Ridzuan.

Tel: 05-501 9888

Fax: 05-501 9999

Contact Person: Dato' Aminuddin Md Desa
Chief Executive Officer (CEO)

The project town planner is Messrs Urban Scale Sdn.Bhd., Architects is Messrs S&A Architects Sdn.Bhd, C&S Engineering is Messrs NMI & Associates Sdn Bhd; M&E Engineering Consultant is Messrs Jurutera Perunding JBI (M&E) Sdn Bhd.

The survey for the TDCR Project Site was conducted by Messrs Jurutera Perunding Services (Ipoh) Sdn Bhd. The Traffic Impact Assessment (TIA) was done by traffic consultant, Messrs MAG Technical & Development and this Environmental Impact Assessment (EIA) was prepared by the Environmental Consultant, Messrs Erinco Sdn. Bhd.

ES.3 LEGAL REQUIREMENT

This EIA report is prepared in compliance with the requirements of Section 34A of the Environmental Quality Act 1974 together with the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 1987.

The project is deemed as ~~Prescribed Activity~~ under 17 (a), as follows:

Activity 17: Resort and Recreational Development

(a) *Construction of coastal resort facilities or hotels with more 80 rooms*

The Preliminary Site Assessment (PAT) was approved vide letter reference number AS(B)A91/110/621/017 Jld 34 (4) dated 30 September 2015.

ES.4 STATEMENT OF NEED AND OPTIONS

ES.4.1 STATEMENT OF NEED

The proposed development project site is situated within Mukim Lumut, Daerah Manjung. In the *Rancangan Tempatan Daerah Manjung (Penggubahan) 2020*, the proposed TDCR is under planning block 8: Pulau Pangkor and sub-planning block 8.1.1: Teluk Dalam.

The local plan has outline some development strategies to achieve the goals and objectives by taking account the national vision and Perak State development vision. The development strategy is divided into certain sector which comprise of socio, economic, township, rural, physical and environment, Pangkor socio economic and infrastructure, utility and public accommodation. There are few strategy that related for Pangkor Island development, as following:

- i) To develop Pangkor Island as international tourism destination
- ii) To protect the sensitive tourism area and environment sensitive area within Pangkor Island.
- iii) To gazette as National Treasure

Based on the strategies developed by the local and state government to promote tourism activity in Pulau Pangkor, this project will provide the following:

- The proposed development will be a positive feature in contributing towards further transformation of Pulau Pangkor town.
- It will promote opportunities for the further development of the Pangkor Island and Manjung district as an area of commercial, eco-tourism, and services.
- Help to create spin-off economic activities and new employment opportunities which are essential to the economic development of the region and state.
- The development property will bring in new sources of revenue from property and business tax.
- The beautiful scenery of the natural environment and the coastline of Teluk Dalam will benefit to the visitor to enjoy the natural beauty.
- Promote socio-economic growth of the local government and the region.
- Encourage tourism activity within Pangkor Island.

ES.4.2 OPTIONS

BUILD OUT OPTION

The positive factors that affect the implementation of the proposed TDCR development are summarised as follows:

- Creation of employment and business opportunities during the construction and operational phases of the project.
- The proposed development will encourage eco-tourism activity in the region during operational phases of the project.
- The development in the proposed site will give benefit to the land owner, project developer, local authority and state government in term of socio economic.
- The proposed development will give new attraction in Pangkor Island by providing accommodation with high class and comfortable.
- The proposed TDCR is bounded by Teluk Dalam beach to the north of the project site. This will be the main attraction to the guest to stay at the resort, where they can enjoy beach activities and enjoy the seaside view.

NO-BUILD OPTION

The ~~No~~ Build+ option as opposed to the ~~Build~~ Out+ option, if adopted would result in the project site remaining status quo. The existing structure for the previous resort would become abandoned area. This will decrease tourism activities in Pangkor Island.

The adoption of a ~~No~~ Build+ option has several socio-economic implications; primarily in that it will deprive the local populace from benefiting from tourism and beach activities and through the creation of employment opportunities during the construction and operational phases of the project. The project proponent as well as local authority will not gain profit from the project development.

ES.4.3 RECOMMENDATIONS

It is recommended that the ~~Build~~ Out+ option be adopted. This option would achieve the goals and recommendations set forth in the Rancangan Tempatan Daerah Manjung and fulfil the critical need for more mixed development in the region. Furthermore, the proposed TDCR project site is in line with the landuse as stipulated in the Rancangan Tempatan Daerah Manjung for sub-planning block 8.1.1: Teluk Dalam.

ES.5 PROJECT DESCRIPTION

ES.5.1 PROJECT LOCATION

The proposed Telok Dalam Coastal Resort (TDCR) development is located within 4 km radius from Pangkor Island Jetty. It is located on the northern tip of Pangkor Island, West Coast of Peninsular Malaysia. TDCR is adjacent to the Short Take-Off and Landing (STOL) Pangkor Airport in the western side and Bukit Batu Puteh in the eastern side. It is bounded with Straits of Malacca in the northern boundary of TDCR project site. The total area for the proposed TDCR is 41.94 acre (16.97 hectares). The TDCR project site is geographically located as follows:

- Latitude: between 4°14'49.75"N and 4°14'49.50"N
- Longitude: between 100°33'23.59"E and 100°33'33.88"E

The aerial view of the project site is shown in **Figure ES.2**. The TDCR project site can be accessed from the North-South Expressway, NSE (E1) at both north and south direction to reach the jetty terminal at Lumut:

- North : Exit Changkat Jering (Exit 146) onto state road Route 60, turn left into state road Jalan Kuala Trong A101) and continue to Jalan Changkat Jering-Sri Manjung-Kampung Roh (Route 60).
(Travelling distance of about 116 km from the Changkat Jering toll exit (Exit 146) from NSE. Alternatively, it also can be access by exit at Jelapang toll (Exit 140) with travelling distance is about 90 km)
- South : Exit Bidor (Exit 130) onto Federal Route 58 (Jalan Changkat Jong) pass Teluk Intan, turn right onto Federal Route 5, turn left onto Federal Route 60 (Jalan Changkat Jering . Sri Manjung . Kg.Koh) pass Seri Manjung and finally turn to left onto Federal Route 18 (Jalan Iskandar Shah) to Lumut Jetty Terminal.
(Travelling distance of about 111 km from the Bidor toll exit (Exit 130) from NSE. Alternatively, it also can be access through Gopeng toll exit (Exit 135) with travelling distance is approximately 86 km)

The access road to the project site from North-South Highway is shown in **Figure ES.3**. The project site is located in Pangkor Island which can be accessed by water-based or ferry

services to or from Lumut. Currently, there are two ferry services provider available which as below;

- **Lumut Jetty:** The route of the ferry is Sungai Pinang Kechil Jetty-Pangkor Jetty, which takes about 30 minutes for one way journey. The two way fare is RM10 and RM6 per passenger for adult and children respectively. The services starts from 6.30 a.m at Pangkor Jetty and 7.00 a.m from Lumut Jetty with half-an-hour frequency.
- **Marina Island Jetty:** The routing takes about 10 minute for one way journey with two-way fare of RM10 per passenger for adult and RM6 for children. The services at Pangkor Jetty starts at 6.45 a.m until 7.30 p.m while the services from Marina Island, Lumut start at 7.15 a.m and ends at 8.00 p.m.

ES.5.2 PROJECT CONCEPT

The proposed TDCR is will promote the tourism industry and taking advantage of the natural resources of the Teluk Dalam such as sandy beaches, seaside and jungle adjacent to the project site. The proposed development will comprises villa, hotels, utility and landscaping.

ES.5.3 PROPOSED LAYOUT AND LAND USE COMPONENTS

The extract of layout plan is shown in **Figure ES.4**. The overall land use schedule is summarized in **Table ES.1**.

Table ES.1: TDCR Land Use Components

Development Component	Unit	Acre (ac)	Percentage (%)
a) Commercial			
Main Building	1	1.49	3.55
Spa Building	1	0.36	0.86
Banquet Hall	1	1.03	2.46
Beach Villa	32	1.60	3.81
Jungle Villa	24	1.44	3.43
Hotel	148	1.79	4.27
Beach Club	1	1.10	2.62
Nursery, Buggy Office	1	0.12	0.29
b) Landscape			

Development Component	Unit	Acre (ac)	Percentage (%)
Swimming Pool	1	0.77	1.84
Pedestrian & Open space	-	7.06	16.83
Green Area	-	16.15	38.51
Tennis Court	-	0.34	0.81
c) Utility			
Water Tank	1	0.01	0.02
Chiller	3	0.02	0.05
Sewage Treatment Plant	-	0.34	0.80
Private Road Reserve	-	5.37	12.80
Public Road Reserve	-	2.95	7.03
Total		41.94	100.00

ES.5.4 PROJECT ACTIVITIES

Pre-Construction Phase

Activities undertaken during the pre-construction phase including the following:

- topographical surveys;
- geotechnical study
- other relevant field investigations

Construction Phase

The principal construction activities are:

- Site clearance and earthworks;
- Mobilization of construction plant and equipment;
- Establishment of site offices and construction yards;
- Development of infrastructure and utility systems;
- Construction of buildings and structures;
- Landscaping

Operational Phase

Operational phase activities are from the occupancy and use of the residential, commercial, recreational, tourist and infrastructure facilities. Environmental implications from such activities include the following:

- Generation of wastewater (sullage, sewage);

- Generation of solid wastes (municipal waste)
- Increased peak surface runoff due to increased impermeability of ground surface, and
- Traffic generation

ES.5.5 PROJECT DEVELOPMENT TIMELINE

The proposed TDCR development is divided into tender stage and construction stage. The tender stage is expected to begin in early March up to end of April 2016. During the tender stage it will involve the followings:

- i) Architectural Coordination Drawings
- ii) Structural Coordination Drawings
- iii) M & E Coordination Drawings
- iv) Final Tender Documentation (Tender Call & Tender Close)

The overall development of TDCR is expected to be completed in 24 month of construction period which begin on early May 2016 up to early of May 2018.

ES.6 EXISTING ENVIRONMENT

ES.6.1 GEOLOGY AND SOIL

The geology of the project site is study based on the Geological Map of Peninsular Malaysia, published by Geological Survey Department of Malaysia (1985). The geological formation for the Project Site and its surrounding area consists of rock formation originates from Quaternary Deposits. Quaternary Period is represented by extensive deposits of unconsolidated to semi-consolidated boulders, gravel, sand, silt and clay that underlie the coastal and inland plains as well as infilled valleys. Such sediments also form river terraces and beach ridges, locally known as *permatang*. All the sediments have traditionally been known as *alluvium* though some are definitely of a colluvial, littoral or marine origin. Ongoing research indicates that some of them may be much older, possibly Middle to Late Tertiary.

Based on the Reconnaissance Soil Map of Peninsular Malaysia published by Ministry of Agriculture, Malaysia (2002), the soil category for the Project Site is under on Hills and Mountains, Steep land.

ES.6.2 TOPOGRAPHY

At present, the TDCR project site comprise of existing resort and facilities structures mainly at the central and western of the project site. Landscape surrounding the resort also comprise of coconut tree, casuarina tree, flowering plant and shrubs. The eastern and southern side of TDCR comprise of secondary vegetation.

The resort presently located at the project site, comprises buildings located in the western and northern portion of the site, with ground elevation ranging from 0m to 14m above mean sea level. However, in the eastern and southern portions of project site, where the ground elevation ranges from 28m to 60m above mean sea level, the resort units are built on stilts along the existing contours.

Slope Risk Analysis

The project area is predominantly flat with most of the project site (68%) is within Class I slope with slope gradient is in the range of 0 to 15 degree. It is about 7.28 acre (17.38%) of the proposed area is located within Class II in which the slope gradient is within 16 to 25 degree. The Class III and Class IV slopes cover an area of 6.13 acre which is 14.62 % of the total proposed area. Class I is classified as suitable for any proposed development based on Local Plan, whilst Class II is suitable for conditional development with minimal slope cutting and earthwork. Class III is sensitive area and the proposed development is limited. For Class IV, the development is limited to infrastructure, utility, recreational facility and maintenance work for hilly area.

Soil Erosion

The erosion risk model analysis was conducted using IDRISI 32 (version 32.01) GIS Software by applying the RUSLE. Most of the area (88.30%) experiences low risk erosion rate of less than 10 T/ha.yr under existing conditions whilst 11.42% of the area is under moderate risk erosion rate within the range of 10 to 50 T/ha.yr. The average overall erosion rate for the project site is computed as 7.50 T/h.yr, and annual soil loss from erosion is estimated to be 127.27 T/yr

ES.6.3 HYDROLOGY

A stream is flowing from the southern to the northern direction within the project site. The water is flowing from Hutan Bukit Pangkor toward Teluk Dalam beach. Basically, there are two discharge outlets flowing from the TDCR project site to the Teluk Dalam beach. On the eastern side of the TDCR project site, the existing drainage and irrigation system within the

TDCR project site has been connected to the existing stream .On the western side of the TDCR, the existing drainage system directly discharges to the Teluk Dalam beach. The drainage and irrigation system at the proposed project site is equipped with open drainage type with the perimeter width is 1 foot. For the drainage and irrigation system in the main access road, the open and close monsoon drain with perimeter width is 3 foot is provided to cater the runoff.

ES.6.4 CLIMATE AND METEOROLOGY

The meteorological data for this EIA report was obtained from the nearest Meteorological Station, Sitiawan Station. The data collected covers rainfall and number of raindays, temperature, relative humidity, surface wind, evaporation and wind rose for the year 2005 to 2014.

The months of October experience high average rainfall amount of 278mm, whilst lowest average rainfall amount were observed in the months of June, with readings of 82.2mm. The month of November experienced high number of raindays; which is 22 days, whilst low number of raindays occurred in February with number of raindays of 8. Conclusively, there was no presence of a distinct dry season.

The average mean monthly temperature is uniform and generally high; ranges from 26.6°C to 28.0°C. The mean minimum temperature was at the lowest in the months of January at 23.5°C, whilst the mean maximum temperature was at highest at 32.8°C in the month of May and June. The average relative humidity is lowest in the month of February (80.7%), whilst the highest is in the month of November (85.9%). The mean monthly evaporation reaches a maximum in the months of February to April at 4.1mm respectively, and declines to minimum in the month of December at 3.2mm.

Based on the Annual Wind rose Summary of Sitiawan, the wind speed for within 0.3m/s to 1.5 m/s with a total of 46.2% of the time, followed by wind speed within 1.6m/s to 3.3 m/s with total of 24.7% of time. The wind within speed range 0.3m/s to 1.5m/s flows predominantly from easterly direction (13.9% of time), followed by north-easterly direction (11%).

On the whole, wind from easterly and north-easterly region tends to predominate, with easterly wind flows at 16.1% of time, whilst north-easterly wind flows at 12.1% of time.

ES.6.5 BASELINE ENVIRONMENTAL QUALITY

Baseline environmental monitoring and analysis was done to evaluate the existing quality of river water, marine water air and noise level near the TDCR project site. The environmental monitoring stations are shown in **Figure ES.5**.

The water quality index (WQI) for all the monitoring samples were in Class II for morning and evening. The samples at RW1 shows that the water quality discharge to the sea is within Class II for morning and evening with average WQI value 87.05. For RW2, located upstream of the stream flowing towards RW3, the average WQI value is 89.82, which is classified in Class II. The water quality at RW3, located at discharge outlet at the eastern boundary of TDCR project site also observed in Class II for sampling during morning and evening with average WQI value is 91.37. It is indicated that the water quality discharge into the sea is in good water quality.

The marine water quality for all tested parameters for MW1 and MW2 were within the reference limit of Class2 Marine Water Quality Criteria Standard (MWQCS).

Analysis results for air monitoring quality indicated that the total suspended particulate (TSP), Particulate Matter (PM₁₀) and Particulate Matter (PM_{2.5}) for all monitoring point are below the recommended limit of 260 µg/m³ for TSP, 150 µg/m³ for PM₁₀ and 75 µg/m³ for PM_{2.5}. SO₂, NO₂, CO and O₃ were not detectable for all monitoring point.

Based on the analysis results, the noise level for day time were above the reference limit of 55 dB (A) for all monitoring location, 63.4 dB (A) for N1, at 64.7 dB (A) for N2 and at 63.7 dB (A) for N3. High noise level generated within the TDCR project site might contribute by fauna living in the jungle. The project site is surrounded by existing nature on the eastern and southern side of the TDCR project site.

The result for night time showed that the noise limit for N1 (54.7 dB (A)), N2 (53.9 dB(A)) and N3 (53.4 dB (A)) are slightly higher from the reference limit of 45 dB (A) for Suburban Residential (Medium Density) Areas, Public Spaces, Parks, Recreational Areas. High noise level at all the sampling location during night time might be influence by the sound generated from surrounding fauna. The monitoring location is surrounded with variety of trees and jungle.

ES.6.6 TERRESTRIAL FLORA AND FAUNA

At present, within the TDCR project site area is landscaped as per the existing resort. On the western and northern side of the project site, the landscape flora include plants such as coconut tree, casuarina tree, archontophoenix alexandrae (*king palm*), bougainvillea, plumeria (*kemboja*) and ixora cocinea (*siantan*). On the eastern and southern side of TDCR,

the existing vegetation comprises secondary vegetation and bushes, as it has been left as belukar area for the proposed project development.

Due to the existing developments in the central portion of the TDCR project site, this area is found to be unsuitable for wildlife fauna. Thus, only common small mammals, reptiles, birds and amphibians are found within the central and northern portion of the project site.

In the eastern and southern side of the project site, there is likelihood of encountering larger animals such as monkeys and snakes. This is because the southern boundary of the TDCR is adjacent to Hutan Simpan Sg Pinang, whilst the eastern side is adjacent to Bukit Batu Puteh. However, the southern portion of the TDCR will be maintained as natural green area. Thus, the impact of loss of endangered species is insignificant for the proposed development.

ES.6.7 LAND USE

The project areas lie in the district of Manjung, located in the west coast of Peninsular Malaysia in an island off Perak. The proposed project site Teluk Dalam Coastal Resort (TDCR) is under the jurisdiction of Majlis Daerah Manjung. Referring to the local plan, Rancangan Tempatan Daerah Manjung (Pengubahan) 2020, the project site is under Planning Block (BP:8) Pangkor and sub-planning block, (BPK:8.1.1) Teluk Dalam.

Surrounding Land Use within 5 km radius

Land use mapping for the project site was done for areas beyond project site boundary but within 5 km radius from the project site. Based on the study, the immediate surrounding is STOL Pangkor Airport, Teluk Dalam settlement, Pangsapuri Damai, Pangkor Island Beach Resort Jetty (private jetty) and Hutan Simpan Kekal Sungai Pinang (refer **Figure ES.6**).

ES.6.8 SOCIO-ECONOMIC

The TDCR project is located in sub-district of Lumut, district of Manjung under the administration of Majlis Daerah Manjung (MDM). The demographic data for Pangkor, Pasir Bogak and Sg Pinang Kecil was used to represent the socio-economic for the proposed TDCR project development.

The total population for the study areas based on data obtained from census in 2010 is 2,745 which is dominated by Malaysian Citizen, 2,692 (98.1 %) whilst the non-Malaysian citizen is 53 (1.9%). Based on the total Malaysian citizen of 2,692 within the study area of Pangkor, Pasir Bogak and Sg Pinang Kecil, Chinese was 1,553 (57.69 %), followed by Bumiputera at 1,011 (37.56%) and Indian at 115 (4.27%). The minority group of other races was at 10

(0.37%) and others was at 3 (0.11%). The gender ratio of male to female for the year 2010 is 51.4 % (1,410) to 48.6% (1,335).

ES.6.9 TRANSPORTATION AND TRAFFIC

At present, Pangkor Island is served by a loop road network formed by State Road A270 and State Road A205. State Road A207 is serving the western section of the island that covers Teluk Nipah area. The road A207 is designed as single carriageway with typical speed limit is 35 kph. State Road A205 commences from the north western section of the island and forming a T-junction with State Road A207 about 300 meters to the west of the project site. The road A205 is single carriageway running along the northern coastal line along Teluk Dalam beach before crossing the southern section of the site and heading southeast via Sungai Pinang areas. The existing road network is shown in **Figure ES.7**.

The external movement to/from Pulau Pangkor is dependent on the water based or ferry services to/from Lumut. Pangkor Island has Short Take Off and Landing (STOL) airport. However, the service was temporarily closed. From the jetty, there is inland transportation services. The services include mini buses, motorcycles and bicycles. The rental rate for the motorbikes is about RM35 per day whilst for bicycle the rental rate is about RM15 per day.

Based on the analysis done on existing road network system, the performance of the existing road operates at satisfactory level of service (LOS) A.

ES.7 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The potential environmental impacts expected to arise from the implementation of the TDCR project can be classified into construction phase impacts and operational phase impacts. (Chapter 5 and Chapter 6 of the EIA respectively). These impacts and the associated mitigation measures are summarized in Table ES.3 attached and in the following paragraphs.

ES.7.1 CONSTRUCTION PHASE

ES.7.1.1 Soil Erosion and Sedimentation

Impacts

- Soil clearing and earthworks disturb soil strata and expose the soil to different rates of erosion and silt runoff due to rainfall.
- Demolition of existing structure within TDCR project site.
- Sedimentation of the drainage channels within and surrounding the site.
- Exposed soil contributes to excessive dust generation, which will be a serious problem for the surrounding area residents, aesthetic encumbrances and other health and safety issues pertinent to mismanagement of environment.
- Increased concentration of suspended solids will impede sunlight penetration, thereby reducing photosynthesis and growth rates of aquatic fauna.
- Increase aquatic fauna mortality due to clogging and smothering of gills and filters.

Mitigation Measures

The erosion and sedimentation impacts arising from the land activities can be contained and effectively mitigated through application of structural and non-structural Best Management Practices (BMPs). The proposed BMPs are defined in the Erosion and Sediment Control Plan (ESCP), as follows:

(a) Minimizing soil erosion

- Land clearing shall be conducted by phases
- Earthworks activities, such as cover clearing, filling, grading and temporary turfing for each development phases will be completed in short timeframe as possible
- Planning of development activities shall take into consideration hydrological and climatic conditions
- Existing vegetation shall be maintained as filters along contours to reduce velocity and improve water quality
- Stream buffers shall be maintained in accordance with Department of Drainage and Irrigation (DID) regulations
- Any felled trees will be left to mulch on the ground as temporary measures to provide soil cover for the exposed land.
- Any exposed land shall be turfed or vegetated if not disturb within two weeks.

(b) Preserving the topsoil

- All excavated topsoil shall be stockpiled and later used for revegetation
- Temporary stabilization is required for exposed topsoil

(c) Access Routes

- All right-of-ways or access routes shall be shown in the ESCP.
- Roads and permanent storm drains shall be installed as early as possible to control runoff during construction. The drains shall be temporarily connected to sediment basins until stabilization.
- Road shoulders shall be protected mechanically or vegetatively against erosion.
- Unsurfaced areas and roads shall be sprayed with water to reduce dust dispersion during dry periods.
- All access roads to the site shall be paved for a distance at least 10m from where these access roads join the existing paved roads.
- Wheel washing facilities shall be provided at the exit points of construction vehicles.

(d) Drainage control at construction site

- Direct runoff water so that it does not run across disturbed and unstable areas.
- Construct drainage routes and channels in such way that the beds do not self-degrade and contribute to sedimentation problems.
- Remove the sediment load accumulated in channels during dry season to avoid downstream sedimentation.
- Temporary interceptor ditches and berms with filters at inlets shall be constructed to direct runoff from development area into sediment basin.
- No watercourse or the reserves along the watercourse shall be disturbed until approval obtained from DID.
- Drains that are not mechanically stabilized shall be grassed and maintained.

(e) Earthworks and Erosion Control

- The cut and fill volume is designed to balance out to minimize earth material transportation to and from the project site.
 - The cut and fill volume is as below:
 - Cut volume : 36,752 m³
 - Fill volume : 35,497 m³
 - Surcharge volume : 1,255 m³
 - Import and export material only for debris and unsuitable material. All surplus material should be placed where uneven area or flatten the area till finished.
 - Provide protection covers such as vegetation and plastic sheets on exposed areas.
 - Small areas shall be exposed and graded at a time. The size of the area depends on erodibility of soil and time required for area stabilization after grading is completed.
 - All earthworks exceeding 1.5m in height and depth shall not be cut or cleared until the site is ready to be worked.
 - The cleared ground shall be re-vegetated within three months after commencement of earthworks during the dry season and within one month after commencement of earthworks during wet season.
- (f) Sediment Prevention and Control
- One sediment trap is proposed to be constructed to trap and store sediments from erodible area and released the filtered runoff before being discharge to the sea.
 - The dimension of the proposed sediment trap is 31.0m x 63.0 m. All the site drainage with check dams will flowing to the proposed sediment trap.
 - The proposed sediment trap should be adequately sized and constructed prior to commencement of earthworks.
 - Silt traps and other temporary control measure should only be removed and dismantled when the permanent vegetative cover and control measures are satisfactorily established.
 - Soil erosion risk model was developed for construction phase with mitigation measures implemented and presented in **Table ES.2**.

Table ES.2: Erosion Risk Analysis after Implementation of Mitigation Measures

Erosion Risk Category	Erosion Rate (T/ha.yr)	Area (acres)	Percentage of area (%)	For Overall Project Site
Low Risk	< 10	40.88	97.47%	Soil Loss from Erosion 93.87 T/yr
Moderate Risk	10 - 50	1.05	2.50%	
Moderately High Risk	50 . 100	0.01	0.02%	
High Risk	100 . 150	0.00	0.01%	Average Overall Erosion Rate 5.53 T/ha.yr
Critical Risk	>150	0.00	0.00%	
TOTAL		41.94	100.00%	

Based on the soil erosion model done, the erosion rate for overall TDCR project is expected to be low risk (97.47 %), with average overall erosion rate of 5.53 T/ha.yr. This erosion rate is slightly lower than the erosion rate under existing conditions. Once all the mitigation measures are implemented for the construction phase, the soil loss due to erosion is expected to be 93.87 T/y.

The improvement of post mitigation measure model as compared with existing condition is mainly because at current stage, there are some areas being cultivated for horticultural nurseries, thus some areas have been cleared and may not be properly covered. Thus, implementation of the proposed BMPs as per the ESCP will improve the current condition of the project site.

Good site management such as the implementation of proper site BMPs to control and treat run-off prior to discharge will ensure that the construction works will not affect the quality of the receiving waters or have a significant impact upon the receiving waters. Monitoring of surface water quality will also be carried out to check that these measures are effective and adequate.

ES.7.1.2 Slope Stability

Impacts

The slope analysis map (**Figure ES.8**) shows the slope gradient in degrees and divided into four (4) groups based on the slopes and terrain classes as outlined by the *Garis panduan*

Pembangunan Kawasan Tanah Tinggi, Kementerian Sumber Asli dan Alam Sekitar. The summary of the slope analysis study is as below:

- Majority of the project area is located within 0 to 15 degree gradient slope (68 %) and 16 to 25 degree is about 17.4%. For slope gradient 26 to 35 the percentage area is 9.74% whilst for more than 35 gradient the percentage area is 4.9%.
- The high slope within the project site is located on the eastern and southern site of the project.

Mitigations

- Cut and fill slopes shall be regularly irrigated and fertilized to encourage faster growth.
- Walls of cuts shall be protected with vegetation, chemical stabilizers and approved retention structures.
- Whenever necessary, temporary retention structures need to be maintained to minimize erosion and rock fall.
- There shall be no obstruction and interference with the natural waterways. If the road to be cut across a river or stream, bridges and culverts as approved by the enforcement authority shall be constructed and maintained according to specification by JKR or local authority.
- All plans and engineering designs for civil and infrastructural works have to be approved by relevant authorities prior to earthworks. However, prior to submission to the relevant authorities, the required engineering and environmental mitigation measures need to be addressed and incorporated into the final design.
- Work must not begin until risk has or can be reduced for geology factors (i.e. surface and subsurface soil conditions) and natural disaster (i.e. vibration)

ES.7.1.3 Runoff and Flood Risk

Impacts

Surface runoff and sedimentation in drainage system and rivers may lead to the rising of bed levels resulting in flash floods during heavy rainstorm.

Mitigation Measures

Runoff and flood risk could be mitigated via flood management programs with respect to the following strategies:

- Prevention . Preventing damage caused by soil disturbance that could cause sediment movement
- Protection . Silt/sediment traps shall be installed at all entrance points, regularly cleaned and maintained. Cover crops to be planted at all the exposed areas to reduce water flow and soil erosion
- Preparedness . informing workers about flood risk and action plan in the event of flood
- Emergency Response - developing Emergency Response Plan (ERP) in case of flood.

ES.7.1.4 Water Quality

Impacts

The potential sources of impact on water quality degradation are as follows:

- Soil erosion caused by earthworks activities might increase TSS and turbidity level compared to existing values.
- Machineries and engine lubricating oil generated from the operation of the construction vehicles
- Untreated or improperly treated leakage discharge into the lake or stream contains organic contaminants; E.coli that could affect health of community via various waterborne diseases.
- Debris and rubbish, such as packaging and used construction materials and floating refuse carelessly discarded on site during construction works.
- Toxic elements from construction waste might impose impact to aquatic fauna in water streams and ponds.

Mitigation Measures

In maintaining water quality from deterioration during construction period, below measures shall be taken:

- Proper storage of diesel and fuel in skid tank on hardstanding ground surface with bunded perimeter. The bunded volume shall have capacity 110% of the tank.
- Spent oil and grease must be properly stored and disposed off.
- Proper storage of scheduled waste in labelled drums, on hardstanding ground surface in covered shed.
- Proper solid waste management and regular collection.
- A contingency plan should be established to cater the chemical spillage.
- Regular maintenance on the water treatment system.
- Sewage must be treated prior to being discharge out to the nearby receiving stream.
- All sewage and effluent from the individual package plant must be adhering to Standard A of the Environmental Quality (Sewage) Regulation 2009.
- All the workers quarters should not be constructed near the river and should be provided with portable toilet that meets the specification set by Health Ministry and/or local government and should be service daily

ES.7.1.5 Sanitation

Impacts

The potential source of impacts arising from sanitation system are:

- Untreated sewage and sewerage effluent from sanitation facilities provided for site office
- Not well maintaining of portable treatment system for portable toilet.
- Untreated sewage and sewerage effluent from workers camp

Mitigation Measures

- Sewerage will be treated before subsequent discharge.
- Sewage generated from workers camp will be directed to individual antiseptic tank.
- All sewage and effluent from the individual package plant must be adhering to Standard A of the Environmental Quality (Sewage) Regulation 2009.

ES.7.1.5 Air Quality

Emission of fugitive dust, especially during dry weather and exhaust emission from vehicles and machines are the main concern of air quality. The potential sources of fugitive dust include:

- Land clearing and earthwork activities (filling, grading, leveling, compaction, etc.)
- Movement of heavy construction vehicles and machinery within the site and during haul operations;
- Demolition of existing building structures
- Materials handling (delivery, unloading and use of construction materials such as aggregate, cement, bricks, steel, wood, etc); and
- Material/soil tracked out of the site and deposited on local public roads.
- Vehicle/plant engine exhaust emissions will include NO_x, SO_x, CO, Volatile Organic Compounds (VOCs), particulates and smoke.

Impacts

The potential impacts arising from fugitive dust emission:

- Reduced air quality and visibility
- High level of suspended PM₁₀ particulates during the drier monsoonal month may cause haze

Mitigation Measures

- Spilled earth or soil on the road shall be removed immediately.
- Frequent spraying of water over the existing road, tracks, access roads, ingress and egress point of the TDCR project site. The frequency of watering shall increase as construction activity increases or when visible emission extends beyond the project.
- Tire washing facilities (wash trough) shall be installed at the exit point to public roads from project site to wash the wheels of the construction vehicles. The location shall be finalized before the earthwork commences.
- All dusty materials shall be sprayed with water to keep dusty materials wet.
- Open burning of construction wastes is totally prohibited.
- Air quality monitoring is recommended during the construction phase.

- Vehicles transporting sand, aggregates, earth and other loose construction materials liable to spillage shall be covered properly with tarpaulin.
- Wetting the public road and access road to the project site by using water browser. During dry season the wetting of the public road and access road should be more frequent.
- Periodic maintenance and service of construction vehicles to control black smoke emission.
- Construction vehicles which carry stockpile/construction material should be covered with tarpaulin.

ES.7.1.6 Noise Quality

Impacts

- Noise mainly generated from operation of the heavy machineries, movement of vehicles within the construction area, piling works, construction buildings.
- The main noise sensitive receptors are the construction workers within the site, the residents of neighbouring areas of Kampung Teluk Dalam, Pangsapuri Damai and visitors to the beach

Mitigation Measures

- Engineering methods could be the installation of quiet machines, insulating the machines or providing screens and noise barriers.
- Limit work hours 0700 to 1900 hours
- On-site plant should be well maintained by regular service
- Machines and equipment that may be in intermittent use shall be throttled down to minimum.
- Erect site hoarding at work areas to help contain noise generated.

ES.7.1.7 Solid Waste Management

Municipal waste generated from construction activities include biomass waste from clearing, used or rejected construction materials, domestic waste from the site office, and workers

rest area. Scheduled waste may be generated from spent filter cartridges, scrap batteries, mineral oils/engine cleaning fluids, spent oil and grease, spent solvents and paints.

Impacts

During the construction phase, solid waste generated will comprise:

- Vegetative biomass in the form of tree trunks, shrubs and undergrowth;
- Construction spoil; and
- Domestic waste.

Mitigation Measures

Recycle construction spoil when /where possible.

- Regular collection and disposal of wastes by licensed solid waste disposal contractors.
- Strictly adhere to Environmental Quality (Scheduled Wastes) Regulations 2005.
- No burning of waste is allowed
- On-site reduction through decomposition.
- Good housekeeping practices are essential within the site.
- Scheduled waste should be disposed off by licensed contractors to a licensed scheduled waste treatment facility

ES.7.1.8 Ecological Impact

Impacts

Flora: At the project site, clearing activities will create gaps which will not only cause a decline and loss of many primary species, but constrains the functions and services that are normally provided by tropical forest. Some of the functions are pollination, dispersal and home and food to many species of animals, especially the birds.

Fauna: Most of the animals are commonly found in oil palm estate and secondary vegetation. Some mammals and birds may migrate to other dense forest nearby. Some trees, such as tropical that serve as nesting or roosting place for animals, may be destroyed during land clearing.

Mitigation Measures

As the Project will not encroach into the forest, no mitigation measure need to be observed, other than as below:

- Cutting trees should be minimized
- During construction, workers must be prevented from encroaching upon to damage and poach in the adjoining secondary vegetation
- With respect to terrain alteration, the project should incorporate a significant type of plant to prevent and keep the terrain in strength.
- Monthly checking or inspection of the silt traps and sediment basins to reduce silt in the river that affect the ecosystem.

ES.7.1.9 Socio Economics

Impacts

- Provide job opportunities; particularly in the form of manual and semiskilled labour will be in demand.
- Employment of foreign labour may result in the import of communicable diseases previously not endemic to the area, for example malaria, dysentery and cholera.
- Income and work opportunities by direct engagement as construction workers
- Short term economic opportunity in spin off business opportunities due to increased demand for food supply, consumables, spare parts, building materials
- In-migration of construction labour force can have both positive and negative impacts on local community.
- Positive impacts include short-term business opportunities, negative impacts include social conflict due to different cultural sensitivities.
- Health hazard from vector borne disease such as dengue fever due to potential mosquito breeding areas at the construction site
- Health hazard for noise and air pollution from construction activities.
- Accident risk from improperly secured lorries transporting construction materials to the site.
- Temporary creation of unsightly construction site will affect the aesthetic value of the resort surroundings.

- The Project Area and surrounding is not known to have any monument or artefact of historical or cultural significance.

Mitigation Measures

- For identified air, noise and health hazard, mitigation measures include proper site management and housekeeping and described in previous sections above.
- In addition, any complaints from the surrounding residents must be recorded, considered seriously during weekly Project Management or Site Meetings and appropriate action taken.
- Access junctions from the site to public road must be kept clear of mud, silt and debris. The road must be repaired if found to be damaged construction vehicles to the Project Site.
- Any lorries carrying loads to and from the site must be covered with tarpaulin and secured properly.
- The Contractor must be responsible for the good conduct of the workers

ES.7.1.10 Transportation and Traffic

Impacts

- Increased traffic within the local roads
- Impacts to air quality from construction exhaust emissions of vehicles
- Noise impact to the adjacent residential houses
- Transportation of materials to and from the site

Mitigation Measures

- Minimize disruption to the main access road by avoiding the use of construction vehicles on this road during the peak hours (7.00-9.00am and 5.00-7.00pm)
- Contractors must ensure that construction vehicles must be well maintained and the drivers observe traffic regulations and are extra careful especially around the settlements.

- Control speed on construction vehicles in residential neighbourhoods and observe all road safety measures.
- Loads should be covered with tarpaulin, secured with chains and strong ropes
- Inspect the access junction every and clean off mud and silt whenever necessary
- Provide wash trough and wheel washing facilities at the exit point to clean the wheels of construction vehicles before they leave the site
- Maintain road surface regularly including covering of potholes and wetting of dry surface during dry season.

ES.7.1.11 Safety and Health

Impacts

Health impacts are mainly caused by noise exposure, unhygienic workers' camps (construction workers) and vector-borne diseases such as dengue (construction workers and Near Sensitive Receptors). Safety concerns of the workers during the construction include slips and falls, especially on slippery surfaces or from unstable supports; falling objects, fire hazard etc. Road safety hazards may also occur due to the increase of heavy vehicles on public roads, transportation machinery and construction materials.

Mitigation Measures

Other than general site maintenance and housekeeping measures already stated in previous sections, the following measures shall be taken:

- Prohibit access of unauthorised personnel to construction work areas.
- Contractor shall take necessary precautions in the movement and operation of heavy machinery within the site for the safety of the workers and nearby residents.
- All workers shall be inducted on the safety requirements for working on-site prior to the commencement of construction works.
- Provide Personal Protective Equipment (PPE) for workers at the site.

ES.7.2 OPERATIONAL PHASE

ES.7.2.1 Soil Erosion and Sedimentation

Impacts

- Exposed land area could result in erosion of the exposed land patches and sediment runoff into the adjacent receiving water.

Mitigation Measures

- At earlier stage after construction completed, siltation and sedimentation are anticipated to persist for some time until the soil settles and stabilizes when exposed areas are vegetated or built up.
- Based on result obtained from Soil Erosion modeling, for post construction condition, soil loss from is at 86.01 T/yr. The average overall erosion rate is at 5.07 T/ha/yr.
- Any expose bare earth shall be immediately close-turfed or hydro seeded to reduce the exposure of bare earth to elements such as rain and wind.
- An effective pest control program on landscape plants begin with proper plant selection.
- The selection of proper plants that are less prone to insect problems when designing, purchasing or replacing landscape plants shall be considered.
- Avoid spraying pesticides when the soil is saturated, when heavy rains are imminent or under any other conditions where surface runoff may result.

ES.7.2.2 Stormwater Management

Impacts

- Disposal of solid waste, mainly domestic waste directly to the drainage or river system by inconsiderate residents will lead to drainage clogging, deterioration of water quality level and increase number of rodents.

Mitigation Measures

- Detention pond, inlet and treatment systems should be inspected at least annually
- Install Gross Pollutant Traps at strategic locations in the drainage system to trap debris and floatables
- Debris should be regularly removed from surface basin or stormwater treatment system. Use appropriate machinery to collect material and remove for disposal at a suitable site
- Any deterioration threatening the structural integrity of the facilities should be immediately repaired.

- Review maintenance programs, including cleaning frequency to take into consideration local factors such as type of trees in the vicinity, season and rain characteristics.
- Avoid the direct discharge of stormwater runoff from parking lots, services areas, building and roadways directly into receiving water body

ES.7.2.3 Water Quality

Impacts

- Disposal of solid waste, mainly domestic waste directly to the drainage or river system by inconsiderate residents will lead to drainage clogging, deterioration of water quality level and increase number of rodents.
- Failure of STP will cause discharge of untreated sewage into the stream which directly discharge to Teluk Dalam beach, which increases BOD, TSS, Ammoniacal Nitrogen and E-coli levels in the marine water.
- The use of fertilizers, pesticides and herbicides in the maintenance of landscape plant in TDCR development may causes discharge of nutrients and chemical properties into the drainage system and retention.
- Accumulation of nutrients in the detention pond may cause algae growth in the ponds, thus reduces the efficiency of flood detention functions.

Mitigation Measures

- Periodic checks for the STP operation to ensure compliance with regulatory requirements
- Periodic maintenance of the STP equipments; such as aerators, pumps and screens to ensure optimal performance
- Regular and continuous monitoring of water quality at the STP effluent discharge point, mainly for water quality parameters; BOD₅, COD, TSS, Ammoniacal Nitrogen, Oil & Grease and E-coli.
- Install grease traps at restaurants and food courts to minimize release of Oil & Grease into the drainage system
- Usage of slow release fertilizers should be practice in order to reduce excessive nutrients runoff into the receiving water bodies. Avoid over-fertilizing

- Organic based herbicide and pesticide shall be used for the golf course to prevent chemical contaminants from entering water bodies.

ES.7.2.4 Air Quality

Impacts

- Upon full development, air pollution is not expected to be significant. The only form of air pollution anticipated is from exhaust emissions generated from traffic movement within the proposed residential development.

Mitigation Measures

Air pollution in the form of exhaust emissions, although not significant, can be further reduced with the adoption of the following measures:

- “ Sufficiently-sized junction shall be provided for smooth traffic circulation;
- “ Buffer zones along the road sides shall be planted with trees and vegetation to trap dust and other particulate matter; and
- “ Proper maintenance program of the road network shall be implemented.

ES.7.2.5 Noise Quality

Impacts

- In the operational phase impacts arising from increased noise levels from the proposed site will be reduced significantly.

Mitigation Measures

- Noise impacts during the operational phase are anticipated to be insignificant, thus no additional mitigation measures are recommended.

ES.7.2.6 Solid Waste Management

In operational phase, solid waste generated comprises of domestic waste and garden waste.

Impacts

- Irregular collection and careless dumping of the waste within and outside the project boundary will result in:

- On-site open burning, which would create respiratory discomfort to residents within the project and settlements located downwind of the site;
- The waste dumped may become a potential fire hazard during the dry season;
- Clogging of drains which would eventually lead to localised flooding;
- The putrid nature of degradable wastes when indiscriminately accumulated will create unhygienic conditions with both odour and visual impacts. This may give rise to public health related problems and leachate originating from these dumps can impose significant organic loads to surface and groundwater resources; and
- Indiscriminate dumping of domestic waste at unapproved sites, i.e. roadsides, rivers/sea or within the development will result in unhealthy and unattractive surroundings. Such illegal dumps provide an ideal habitat for disease vectors such as mosquitoes, flies and rats. Blocked drainage channels may cause localised flooding and create odour impacts.

Mitigation Measures

- Regular disposal and collection of solid wastes by the relevant authorities; at least thrice a week for the residential units and on a daily basis for the commercial centre.
- Encourage recycling on salvageable residential-households items such as bottles, tins, paper and plastic.
- Scheduled wastes are generated from the premises for example in the form of spent grease and oil, the proper storage, transport and disposal procedures as per the existing DOE regulations (i.e. Scheduled Waste Guidelines, 2005) will be complied with.

ES.7.2.7 Ecological Impacts

Impacts

- Landscaping will introduce new plant and tree species, which might attract migratory birds and other animals, thus give positive impacts to the existing ecology system in the TDCR project site.

Mitigation Measures

In the process of selecting plants, the following measure should be taken into consideration:

- Foreign species especially those with parasitic characteristics should be avoided since they will upset the local natural ecology and habitat. Local species should be given priority to enhance the image of the local natural landscape.

- Canopy species/trees, flowering trees and herbal species are recommended at the recreational area and jogging tracks.
- Turfing the slopes with grass is recommended

ES.7.2.8 Socio-Economics

Impacts

Significant positive socio-economic benefits are expected from the implementation of the TDCR project.

- The project will provide accommodation facilities to serve the increasing tourist/visitor in Pangkor Island region, as well as upgrade the overall socio-economic status of the region
- There will be great opportunities in employment sector and greater interaction between tourist and local residents which will ultimately increase the socio economic status of residents at Pangkor Island

Mitigation Measures

- No mitigation measures are required as socio-economic situation is expected to improve.

ES.7.2.8 Traffic and Transportation

Impacts

- The proposed 204 hotel units are projected to generate a total of 1,415 PCU trip/24 hour day or 138 PCU/hour and 155 PU/hour for morning peak and evening peak respectively.
- All incoming and outgoing traffic movements of the proposed resort development are required to pass through the proposed all-directional ingress/egress point located on the proposed aligned section of State Road A205.
- With the development fully occupied, the external road will have peak hour demands of 174 to 236 PCU/hour. The main internal road, will serve another 138 to 155 PCU/hour. With the said (relatively low) traffic demands, both roads are projected to have utilisation levels of 12% to 19% or LOS of A^+ (free flow, with little or no delay)

throughout the peak periods in year 2025. In addition, at least 81% of spare road capacities will be available by then to accommodate additional future traffic demands.

- The proposed realignment of the main road and omission of the existing central road section are not anticipated to create significant negative traffic impact on both the external traffic movements and future traffic movements of the development. The extended eastern road section would provide smoother alignment and safer vehicular movements for the area.
- The proposed ingress/egress point of the development is expected to accommodate a total hourly turning movements of 271 PCU/hour during morning peak and 283 PCU/hour during evening peak. If operated as a priority or non-signalised all directional T-junction, it is expected to be able to achieve excellent LOS of %A+ during peak hours in year 2025 with highest average delay of 3.8 seconds/vehicles.

Mitigation Measures

In order to ensure good traffic movement in the proposed development, the following traffic arrangement will be proposed:

- a) The existing central road bisecting the site linking to the rest of State Road A205 to the east and west to be omitted and becomes part of the resort internal components.
- b) The southern loop road to replace item (a) above with some road extension on the eastern section.
- c) A new ingress/egress for the development to be provided at the south western section of the site. It is expected to be operated as an all-directional T-junction.
- d) The main entrance/exit of the development from the newly aligned road-about 170 meter-long- is designed with 16-metre wide reserve and with a central road divider.
- e) Item (d) is continued with a 11-metre wide road that is designed with a one-way loop system at the north eastern end. Ultimately, both items (d) and (e) will provide vehicular access between the ingress/egress point, the car parking area and the 2-storey central building.

The remaining 10-feet to 20 feet access to individual components of the resort are expected to be utilized for pedestrian and buggy movements.

ES.8 ENVIRONMENTAL MANAGEMENT AND MONITORING

This section focuses on the environmental management requirements for the construction and operational phase of the proposed TDCR Project Site. The river water, marine, air and noise quality during the construction and operational phases should be monitored against the baseline conditions.

During construction phase, sediment loading into existing waterways is the main concern; therefore, the efficiency of sediment retention structures will be monitored by the contractor by analysing suspended solids levels of the discharge to ensure large amounts of sediment do not get washed into the river. River water samples should be collected and analysed once a month throughout the earthworks phase and every three months thereafter until all construction works are completed. The parameters tested are pH, Total Suspended Solid (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), Ammoniacal Nitrogen, E-coli and Oil and Grease.

During the construction phase, air quality monitoring will be carried out at the site bordering the nearest residential areas. Parameters to be analysed include TSP, PM₁₀, PM_{2.5}, SO₂, NO₂, and O₃ monitoring should be conducted on a monthly or quarterly basis depending on DOE's Approval Conditions for the EIA Report. Noise levels during construction phase should be monitored to ensure that Contractors are using the best available options for construction noise minimisation. Monitoring of noise levels should be carried out at both daytime and night time on a monthly or quarterly basis.

Environmental auditing is recommended to ensure compliance with the EMP by checking the environmental management procedures and the recommended mitigation measures and monitoring recommendations are being fully implemented. During construction phase, the contractor's activities should be audited every three months to check for the effectiveness of the EMP.

ES.9 CONCLUSION

The Environmental Impact Assessment for the TDCR Project concludes that provided the recommended mitigation measures are incorporated and the environmental management of

the development is addressed in the ways described herein; there will be no significant environmental impacts from the construction and operational phase of the Teluk Dalam Coastal Resort (TDCR) Project as per the present proposal.

The Environmental Management Plan (EMP) and detailed Erosion and Sediment Control Plan (ESCP) must be prepared prior to the commencement of construction work (especially site preparation).

**TABLE ES.3:
SUMMARY OF POTENTIALLY SIGNIFICANT
IMPACTS AND RECOMMENDED MITIGATION
MEASURES**

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
A. CONSTRUCTION PHASE				
A.1 SOIL EROSION AND SEDIMENTATION				
<ul style="list-style-type: none"> • Felling of trees and shrubs • Site clearing and earthworks • Stockpiling of earth material • Demolition of existing structures 	<ul style="list-style-type: none"> • Loss of vegetative cover results in higher surface runoff rates. • Increased TSS levels in the watercourse reduces light penetration within the water column, thus resulting in reduced photosynthesis rates and DO levels, and aquatic fauna mortality due to clogging and smothering of gills and filters. • Excessive dust generation from exposed soil surface such as stockpile area or fill area that are not properly compacted and turfed. 	<ul style="list-style-type: none"> • Land clearing shall be conducted in phases. • Take into consideration hydrological and meteorological conditions when planning development schedule of works. • Prior to earthworks, stands of trees that are to be retained shall be identified clearly with markings and barricade tape. • Felled trees will be left to mulch on the ground as a temporary measure to provide soil cover for the exposed land. • Once started earthworks activities shall be completed in as short a time frame as possible. • The cleared ground shall be re-vegetated within three months after commencement of earthworks • Existing vegetation shall be maintained as filters along contours to reduce velocity of runoff flow over the slopes and reduce sediment runoff. • Check dams, silt traps and sediment 	Regular water quality monitoring of silt trap discharge, outlet of cascading drain and receiving river/stream quality at upstream and downstream of site.	Section 5.2

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
		<p>basins shall be installed wherever feasible, and indicated on the earthworks plan and ESCP drawing.</p> <ul style="list-style-type: none"> • The developer is required to carry out an environmental monitoring and auditing programme throughout the construction period. • Excavated topsoil shall be stockpiled and later used for re-vegetation • Topsoil should stockpiled in areas where it will not contribute to erosion and sedimentation • Provide protection covers such as vegetation and plastic sheets on exposed areas and stockpiles. • Unsurfaced areas and internal logistic routes shall be sprayed with water to reduce dust dispersion during dry weather. 		

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
A.2 RUNOFF AND FLOOD RISK				
<ul style="list-style-type: none"> • Felling of trees and shrubs • Site clearing and earthworks 	<ul style="list-style-type: none"> • Sedimentation in drainage systems lead to the rising of bed levels resulting in flash floods during heavy rainstorm. 	<ul style="list-style-type: none"> • Installation of sufficient number of silt traps • The silt/sediment trap should be cleaned regularly once it is filled to about 75% capacity and inspected after a heavy rain. • Exposed area should be planted with cover crops such as mat turfing and closed turfing to reduce the water flow 	<p>Minimal with proper mitigation measures in place.</p> <p>Regular water quality monitoring of silt trap discharge, outlet of cascading drain and receiving stream quality at upstream and downstream.</p>	<p>Section 5.3</p>
A.3 WATER QUALITY				
<ul style="list-style-type: none"> • Runoff from construction area • Leaks and spills 	<ul style="list-style-type: none"> • Apart from sediment runoff impacts (already listed previously): • Oil & grease contamination of water 	<ul style="list-style-type: none"> • Apart from measures to reduce TSS from sediment runoff: • Proper storage of diesel in skid tank on 	<p>Minimal with proper mitigation in</p>	<p>Section 5.4</p>

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
from maintenance yard (machinery and lube oils), diesel storage, chemical storage <ul style="list-style-type: none"> Debris and rubbish such as packaging and used construction materials 	way <ul style="list-style-type: none"> Chemical contamination of water way Debris and rubbish clogging up the water way. 	hardstanding surface with bunded perimeter. The bunded volume shall have capacity 110% of the tank. <ul style="list-style-type: none"> Spent oil and grease must be properly stored and disposed off. Proper storage of scheduled waste in labelled drums, on hardstanding surface in covered shed. A contingency plan should be established to cater the chemical spillage. Proper solid waste management and regular collection and disposal. Good housekeeping practices within construction site. 	place. Inspect site housekeeping and storage facilities regularly.	
A.4 SANITATION				
<ul style="list-style-type: none"> Untreated or partially treated sewage and sullage from site office and workers camp 	<ul style="list-style-type: none"> Some of the portable sanitary treatment system is not well maintained and not located at the suitable place in the construction area; nearby watercourses. Discharge of raw sewage from the temporary construction workers camp has the potential to further deteriorate 	<ul style="list-style-type: none"> Provide adequate sanitary facilities for site office and workers. Portable toilets may be considered for use at the construction site and must be maintained regularly. The workers camp shall not be located near watercourses. 	Minimal with proper mitigation in place. Inspect workers quarters, canteen and	Section 5.5

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
	<p>the existing receiving water body quality.</p> <ul style="list-style-type: none"> • Gastro-entric micro-organisms in the sewage discharge can cause outbreaks of water-borne diseases such as cholera and typhoid. • Contaminated river water due to untreated sewage will result in damaging the river life and may cause problems associated with foul smell (malodour) • High BOD and COD levels will reduce DO levels in the river, which effect the aquatic life in the river. 	<ul style="list-style-type: none"> • The sewerage need to be treated before subsequent discharge. 	<p>toilet area regularly.</p> <p>Monitor effluent discharge monthly from worker accommodation and site office toilet area.</p>	
A.5 AMBIENT AIR QUALITY				
<ul style="list-style-type: none"> • Fugitive dust emissions especially during dry weather • Dust sources include: • Clearing and earthwork activities 	<ul style="list-style-type: none"> • Dust emission is an issue especially during dry weather. • Material/soil tracked out of the site and deposited on local roads • Emissions of black smoke from diesel powered vehicles and construction equipment • Reduced air quality and visibility. 	<ul style="list-style-type: none"> • Spilled earth or soil on the road shall be removed immediately • Vehicles transporting sand, aggregate, earth and other construction materials liable to spillage shall be covered properly with tarpaulin • Frequent spraying of water over the existing road, tracks, access roads, ingress and egress point of the TDCR 	<p>Regular monitoring of air quality at site during construction.</p>	<p>Section 5.6</p>

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
<ul style="list-style-type: none"> • Stock piling • Vehicle and plant movement • Materials handling • Soil tracked out of the site and deposited on local public roads • Vehicle emissions 	<ul style="list-style-type: none"> • Formation of haze due to suspended PM₁₀ and PM_{2.5} particles. • Exposure to fine particles can cause short-term health effects such as irritation of eye, nose, throat, shortness of breath. • Exposure to fine particles can also affect lung function and worsen medical conditions such as asthma, bronchitis, heart disease, and lung cancer 	<p>project site</p> <ul style="list-style-type: none"> • Tire washing facilities (wash trough and jet wash) shall be installed at the exit point from TDCR construction site to public road . Tires of all vehicles leaving the site shall be washed before exiting to the public road. • Open burning of construction wastes is totally prohibited • Strict compliance with speed restriction (30km/hr) for construction vehicles operating within the site or on access roads to site. • Periodic maintenance and service of construction vehicles to control black smoke emission. 		

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
A.6 NOISE QUALITY				
Noise generated from: <ul style="list-style-type: none"> • Heavy machinery such as bulldozers, backhoes, compactors operating on site • Movement of vehicles within the construction area • Piling works • Construction of buildings 	Nearest Noise Sensitive Receptors (NSR) would be the residents of neighbouring areas of Kampung Teluk Dalam, Pangsapuri Damai and visitors to the Teluk Dalam beach.	<ul style="list-style-type: none"> • Limit work hours 0700 to 1900 hours. • Separation of source and receptors or through limiting the hours of operation of the noise source. • Installation of quiet machines, insulating the machines or providing screens and noise barriers • Noise at the boundary of the construction site shall be controlled so that it does not exceed 60 dB(A) during day time and 50 dB(A) during night time • Erect site hoarding at work areas to help contain noise generated. 	Regular monitoring of noise level at site during construction.	Section 5.7
A.7 SOLID WASTE MANAGEMENT				
Municipal waste generated from construction activities: <ul style="list-style-type: none"> • Vegetative waste from land clearing • Used or rejected construction 	<ul style="list-style-type: none"> • Public health hazard • Obstruction of waterways during rainy season and causes localized flooding. • Creating ideal disease vector breeding grounds such as mosquitoes, flies and rats. • Indiscriminate off-site disposal may 	<ul style="list-style-type: none"> • General construction spoil should be recycled on site as much as possible • Strict adherence to Environmental Quality (Scheduled Wastes) Regulations 2005 where applicable • Any scheduled wastes identified will need to be disposed of by a DOE licensed 	None	Section 5.8

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
material <ul style="list-style-type: none"> • Domestic waste from the site office • Municipal waste shall be disposed off to the nearest approved dumpsites 	results in water quality degradation. <ul style="list-style-type: none"> • Pose fire hazards during dry season. • Odour generation. 	transporter at a recycling facility operated by a licensed scheduled waste contractor <ul style="list-style-type: none"> • Good housekeeping practice within the site. 		
A.8 ECOLOGICAL IMPACT				
<ul style="list-style-type: none"> • Construction activities and its resulting water, air and noise impacts could effect existing ecosystems and natural biological resources in the area 	<ul style="list-style-type: none"> • Impacts on flora and fauna are minor as the region is no longer a pristine natural resource area. The species found within site is typical flora and fauna found in secondary vegetation and agriculture/horticulture areas. 	<ul style="list-style-type: none"> • Some of the areas within the project site (southern portion) will be left uncleared. The existing natural vegetation and habitat will thus be preserved. • Areas of vegetation within the site which will be retained must be demarcated clearly so that there will be no inadvertent encroaching into these areas. • Minimise introduction of non-indigenous plant species, use only local endemic species. • Erosion control and sediment control measures must be implemented to avoid damage to riverine ecology. 	None	Section 5.9

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
A.9 SOCIO-ECONOMIC ASPECTS				
<ul style="list-style-type: none"> Construction activities will affect socio-economic status of the surrounding area. In general, beneficial impacts to the local population are expected in terms of employment opportunity, land utilisation. 	<ul style="list-style-type: none"> Business and job opportunities will be generated for the local populace Short term economic opportunity in spin off business opportunities due to increased demand for food supply, consumables, spare parts, building materials Employment of foreign labour may result in the import of communicable diseases previously not endemic to the area, for example malaria, dysentery and cholera Health hazard for noise and air pollution from construction activities. 	<ul style="list-style-type: none"> When hiring foreign labours, must ensure that the said workers are legally registered with the Department of Immigration Project Proponent need to monitor the community area near to the construction area. In addition, any complaints from the surrounding residents must be recorded, considered seriously during weekly Project Management or Site Meetings and appropriate action taken. The contractor shall held responsibility towards good conduct of the workers. 	None	Section 5.10
A.10 TRANSPORTATION AND TRAFFIC				
Increased traffic within the local roads due to transportation of materials to and from the site	<ul style="list-style-type: none"> Increased traffic within the local roads Impacts to air quality from construction exhaust emissions of vehicles Noise impact to the adjacent 	<ul style="list-style-type: none"> Construction traffic should be scheduled and controlled so as to minimize congestion to road use by avoiding the use of construction vehicles during peak hours (7.00-9.00 am and 5.00-7.00pm). The speed of construction vehicles must be restricted and all road safety measures 	None	Section 5.11

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
	residential houses <ul style="list-style-type: none"> • Transportation of materials to and from the site; mud and silt from the site tracked onto the local road by the construction vehicles leaving the site, causing the road to be muddy and slippery • Deterioration of local road conditions, potholes, etc. • Obstruction to the quarry vehicle movement. 	are practices. <ul style="list-style-type: none"> • Ensure that the vehicles used are well maintained and the drivers are competent. • Safety measure with regard to loading and transporting of heavy machinery need to be observed • Loads shall be covered with tarpaulin, secured with chains and strong ropes. • Inspect every junction and clean off mud and silt whenever necessary. 		
A.11 SAFETY AND HEALTH				
Construction works	<ul style="list-style-type: none"> • Noise exposure • Unhygienic workers camps • Vector-borne diseases such as dengue (construction workers and NSRs) • Slips and falls on slippery surfaces and unstable supports • Falling object. • Road safety hazards may also occur due to the increase of heavy vehicles 	<ul style="list-style-type: none"> • Prohibit access of unauthorised personnel to construction work areas. • Contractor shall take necessary precautions in the movement and operation of heavy machinery within the site for the safety of the workers and nearby residents. • All workers shall be inducted on the safety requirements for working on-site prior to the commencement of construction works. • Provide Personal Protective Equipment 	None	Section 5.12

Table ES.3: Summary of Potential Significant Impacts and Recommended Mitigation Measures				
Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
	<ul style="list-style-type: none"> • Fire hazard due to improper storage and solid waste disposal practices. 	(PPE) for workers at the site <ul style="list-style-type: none"> • Working areas will be prohibited to unauthorized personnel • All workers shall be properly inducted on the safety requirements for working on-site 		
A.14 PROJECT ABANDONMENT				
	<ul style="list-style-type: none"> • Temporary abandonment site • Public safety issues in case of access • Poor visual aesthetics 	<ul style="list-style-type: none"> • Facilities within the proposed TDCR site should be sealed-off from being accessible to the public • Proper signage installed to inform public on the project status • Regular observation by the police and kept under a proper maintenance to avoid any environmental impacts • Hoarding or use of foliage as visual screening. 	None	Section 5.13

(continued next page)

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
B. OPERATION PHASE				
B.1 SOIL EROSION AND SEDIMENTATION				
Erosion and sediment runoff	<ul style="list-style-type: none"> Surface erosion will be less than during construction phase but will persist until the soil settles and stabilizes when exposed areas are vegetated or built up Landscaping surrounding the resort is not well maintained , this could result in erosion and sediment runoff from the exposed land patches 	<ul style="list-style-type: none"> The landscape plants should be monitored, any exposed bare earth to be immediately close-turfed or hydro-seeded Avoid spraying pesticides when soil is saturated after heavy rain or under any condition where surface runoff may result. 	None	Section 6.2
B.2 STORMWATER MANAGEMENT				
Drainage	<ul style="list-style-type: none"> Insufficient drainage capacity and platform level will result in washout and flooding issues during the operational phase of the project Drainage clogging due to litter and debris 	<ul style="list-style-type: none"> Provide a turfed and landscaped drainage reserve (use suitable shrubs and trees) Provide Gross Pollutant Traps at strategic locations of drainage system and debris shall be removed regularly Proper maintenance of the storm water treatment facilities Periodic inspection and cleaning 	Flood during heavy rain; monsoonal season.	Section 6.3

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
B.3 WATER QUALITY				
<ul style="list-style-type: none"> • Failure of STP • Maintenance of landscape. 	<ul style="list-style-type: none"> • Deterioration of water quality level • Increase number of rodents • Failure of STP will cause discharge of untreated sewage into Teluk Dalam sea, which increases organic loading. • Use of excessive fertilizers, pesticides and herbicides will cause discharge of nutrients into the drainage system and retention ponds through surface runoff 	<ul style="list-style-type: none"> • Design drainage system and detention pond in accordance with MASMA guidelines to mitigate potential excessive runoff, sediment transport and flooding problems. • Periodic water quality monitoring shall be conducted at the discharge point of STP • Usage of slow release fertilizers should be practice to reduce nutrient runoff. Avoid over-fertilizing • Organic based herbicide and pesticide shall be used • Install grease traps at restaurants and food courts to minimize release of Oil & Grease into the drainage system 	None	Section 6.4
B.4 AIR QUALITY				
Vehicular movement.	<ul style="list-style-type: none"> • Upon full development, air pollution is not expected to be significant • Fugitive dust emission from the movement of construction traffic will be substantially reduced, as the roads will be paved. 	<ul style="list-style-type: none"> • Sufficiently-sized junction shall be provided for smooth traffic circulation; • Buffer zones along the road sides shall be planted with trees and vegetation to trap dust and other particulate matter; and • Proper maintenance program of the road 		Section 6.5

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
		network shall be implemented.		
B.5 NOISE QUALITY				
Vehicular movement.	<ul style="list-style-type: none"> No adverse impacts are envisaged, although the neighboring residents may experience some increase in noise levels through the normal vehicular movements. 	<ul style="list-style-type: none"> Noise impacts during the operational phase are anticipated to be insignificant 	None	Section 6.6
B.6 SOLID WASTE MANAGEMENT				
Type of waste produced during operation phase mainly food waste, paper and packaging materials, as well as garden waste.	<ul style="list-style-type: none"> A potential fire hazard during the dry season Clogging of drains which would eventually lead to localised flooding Dumping of domestic waste at unapproved sites 	<ul style="list-style-type: none"> Appoint a registered waste disposal contractor Encourage recycling system Requires a proper storage, transport and disposal procedure Waste disposal bin shall be provided at public places and each household 	None	Section 6.7
B.7 ECOLOGICAL IMPACT				
Landscaping	<ul style="list-style-type: none"> Introduce new plant and tree species, which could upset the local ecosystem. Beautify and aesthetically to restore the beauty of the TDCR development. 	<ul style="list-style-type: none"> Foreign species especially those with parasitic characteristics should be avoided since they will upset the local natural ecology and habitat. Local species should be given priority to enhance the image of the local natural landscape. 	None	Section 6.8

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
		<ul style="list-style-type: none"> • Canopy species/trees, flowering trees and herbal species are recommended at the recreational area and jogging tracks. • Turfing the slopes with grass is recommended • Positive impacts are anticipated for fauna during operational phase of the project. 		
B.8 SOCIO ECONOMIC				
The proposed project will have indirect effect on the socio-economic status of the surrounding area	Positive socio-economic benefits are expected <ul style="list-style-type: none"> • provide housing and recreational facilities • upgrade the overall socio-economic status of the region • opportunities in employment sector and greater interaction between new residents and local residents 	<ul style="list-style-type: none"> • Mitigation measures are unnecessary as socio-economy situation is expected to improve 	None	Section 6.9
B.9 TRAFFIC AND TRANSPORTATION				
<ul style="list-style-type: none"> • Access roads and junctions • Vehicular movement. 	Positive traffic impact are: <ul style="list-style-type: none"> • With the development fully occupied, it is projected throughout the peak period of year 2025 the State Road A205 will still operate in LOS of A. 	<ul style="list-style-type: none"> • The existing central road bisecting the site linking the rest of State Road A205 to the east and west to be omitted and becomes part of the resort internal components. 	None	Section 6.10

Project Activity	Potential Environmental Impacts	Mitigation Measures	Residual Impacts	Section in EIA
	<ul style="list-style-type: none"> • Realignment of the main road and omission of the existing central road section are not anticipated to create significant negative impact on both the external traffic movement and future traffic movement. • The proposed ingress/egress is expected to achieve excellent LOS of A during peak hours in year 2025. 	<ul style="list-style-type: none"> • A new ingress/egress for the development to be provided at the south western section of the site. • The main entrance/exit of the development from the newly aligned road-about 170 meter-long-is designed with 16-meter wide reserve and with a central road divider. 		

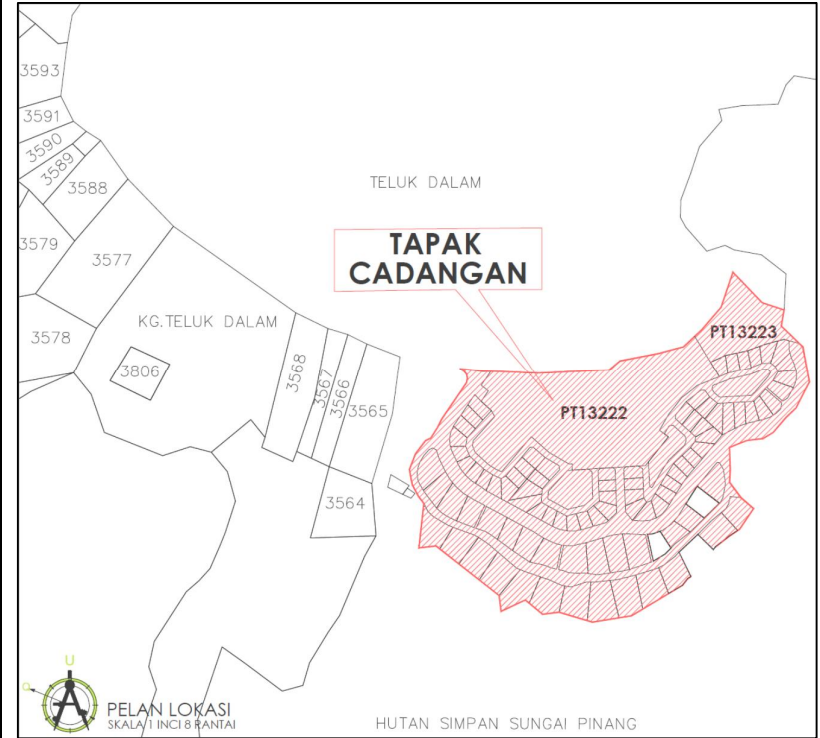
ATTACHMENT

LIST OF FIGURES:

- Figure ES.1 Key Plan and Location Plan of the TDCR
 - Figure ES.2 Aerial view of TDCR Project Site
 - Figure ES.3 Access road to TDCR Project Site
 - Figure ES.4 TDCR Layout Plan
 - Figure ES.5 Baseline Water Quality Monitoring Locations
 - Figure ES.6 Surrounding Land Use within 5 km radius
 - Figure ES.7 Existing Road Network
 - Figure ES.8 Slope Analysis Map
-



KEY PLAN



LOCATION PLAN



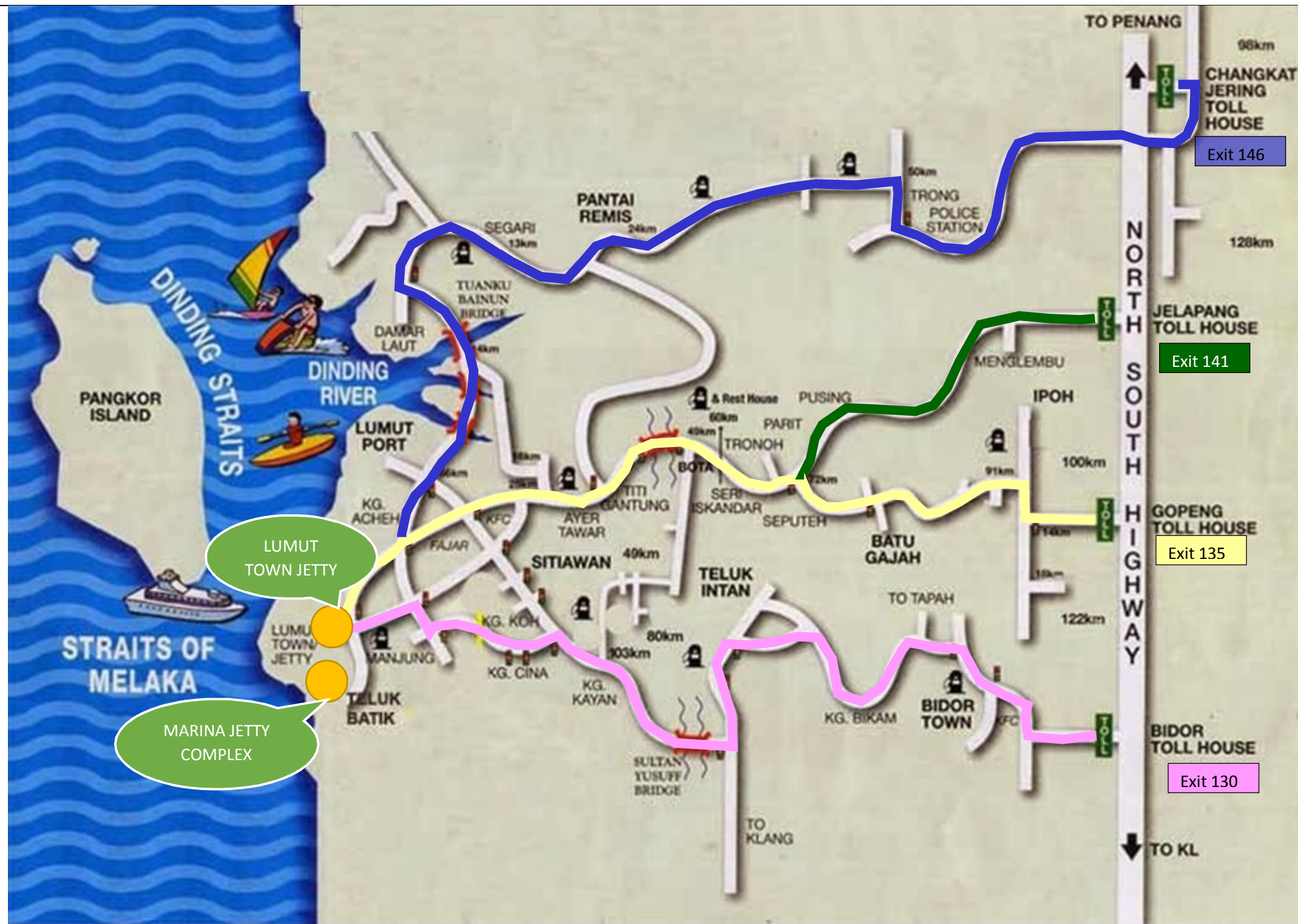
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**Figure ES.1:
 Key Plan and Location Plan**



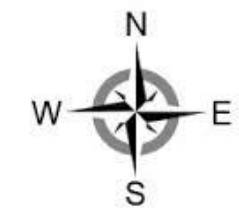
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**Figure ES.2:
 Aerial View of TDCR Project Location**



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Figure ES.3:
Access Road to TDCR Project Location

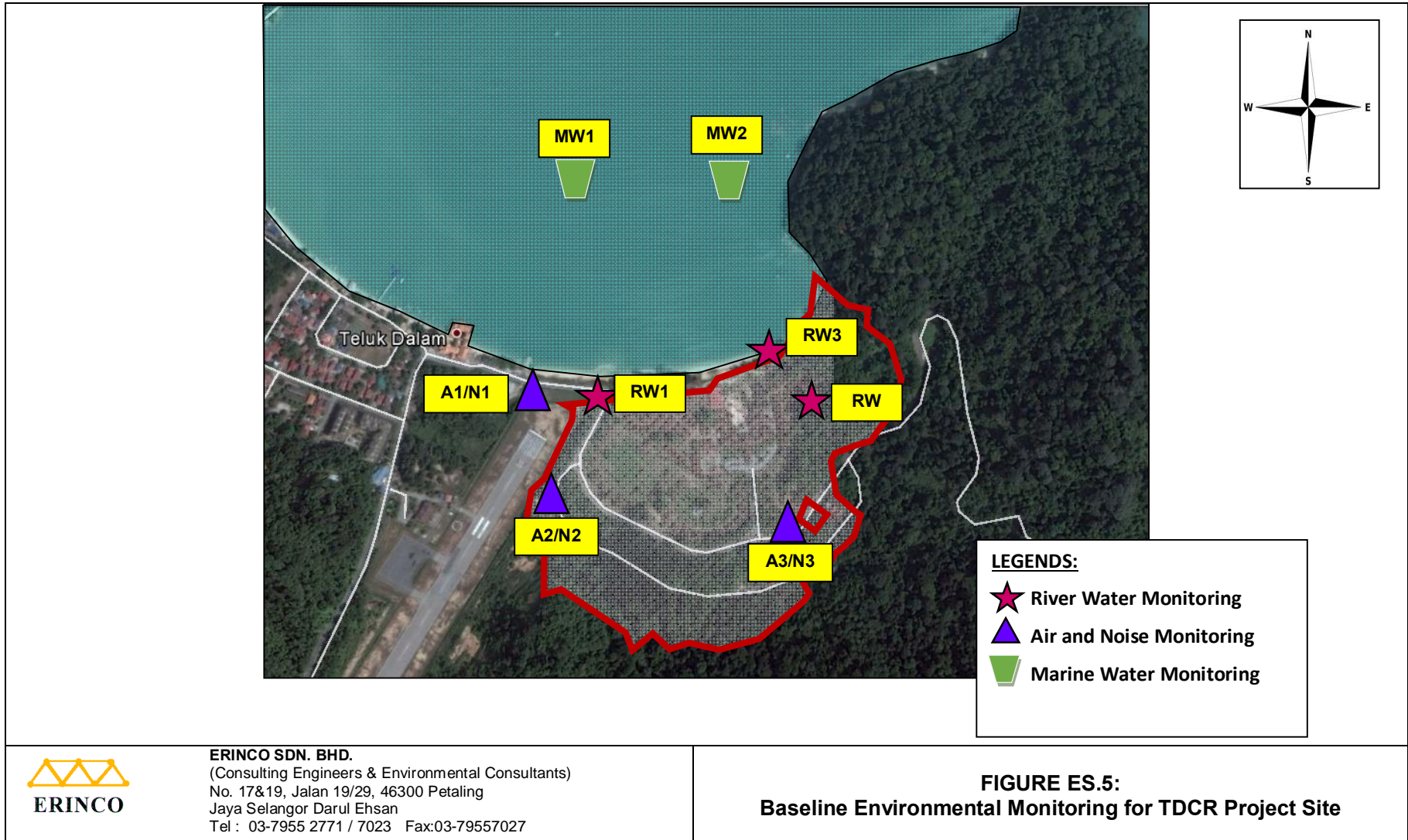


JENIS PEMBANGUNAN	UNIT	LUAS (EKAR)	PERATUS (%)
A) KOMERSIL			
BU	BANGUNAN UTAMA	1	1.49
BS	BANGUNAN SPA	1	0.36
DB	DEWAN BANQUET	1	1.03
BV	BEACH VILLA	32	1.60
JV	JUNGLE VILLA	24	1.44
BLOK	BLOK HOTEL	148	1.79
BC	BEACH CLUB	1	1.10
	NURSERI, RUANG BUGGY	1	0.12
C) LANSKAP			
KOLAM	KOLAM RENANG	-	0.77
	PEJALAN KAKI & RUANG TERBUKA	-	7.06
KL	KAWASAN LAPANG	-	16.15
	GELANGGANG TENIS	-	0.34
C) UTILITI			
TA	TANGKI AIR	1	0.01
	BILIK PENYAMAN UDARA (CHILLER)	3	0.02
STP	KOLAM OKSIDASI (STP)	-	0.34
	REZAB JALAN (PERSENDIRIAN)	-	5.37
	REZAB JALAN AWAM	-	2.95
JUMLAH KESELURUHAN		41.94	100.00



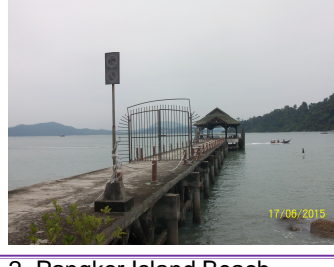
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FIGURE ES.4:
TDCR Layout Plan
 (extracted from drawing Layout Plan USS1420/TelukDalam/KM/MPM-01)





1. Hutan Lipur Pulau Pangkor



2. Pangkor Island Beach Resort Jetty



3. Pangkor Island Beach Resort



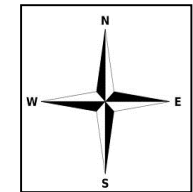
4. Kg Teluk Dalam



5. Pulau Pangkor Airport



6. Construction of Rest House



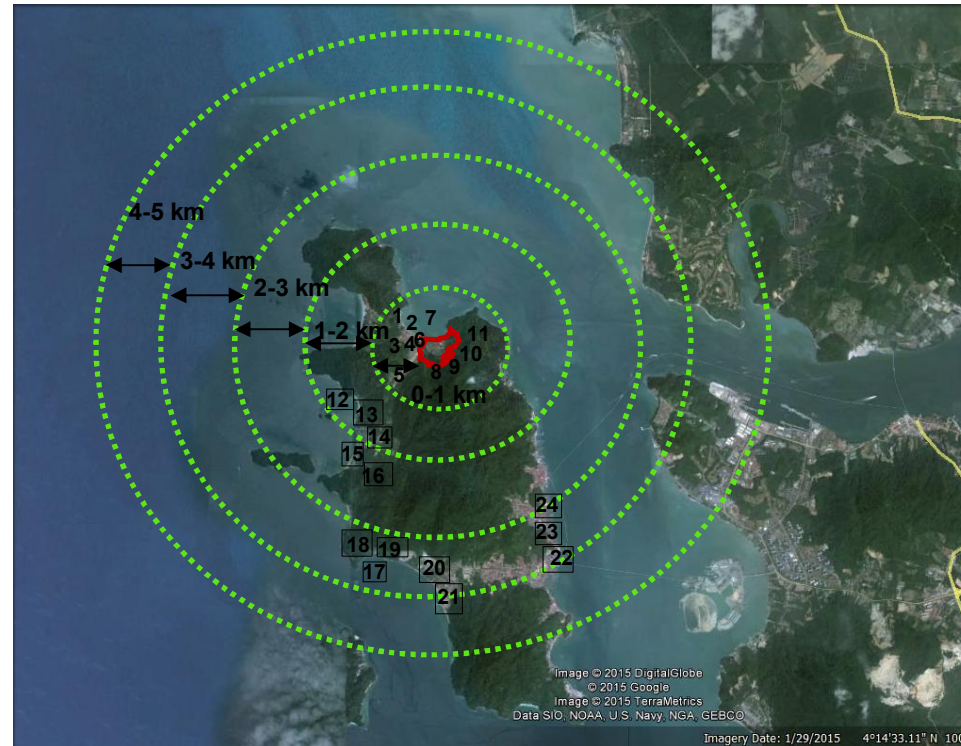
7. Pantai Teluk Dalam



17. Pantai Pasir Bogak



18. Pasir Bogak



21. Commercial Area at Pasir Bogak



22. Pulau Pangkor Jetty



8. Access Road to Mess Pegawai Kanan PDRM



19. Pangkor Village Beach Resort



20. Puteri Bayu Beach Resort



23. Taxi at Pulau Pangkor Jetty



24. Sungai Pinang Jetty



9. Mess Pegawai Kanan PDRM



16. Sg Pinang



15. JPS Daerah Manjung (Cawangang Pulau Pangkor)



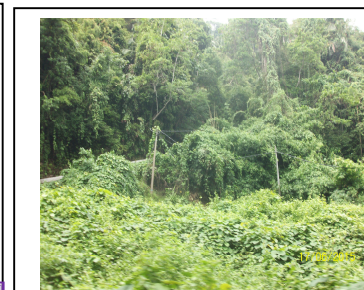
14. Beach Resort at Teluk Nipah



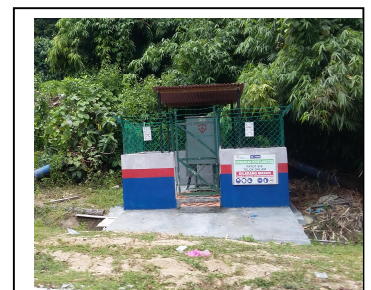
13. Commercial Area in Teluk Nipah



12. Teluk Nipah Beach



11. Bukit Batu Putih

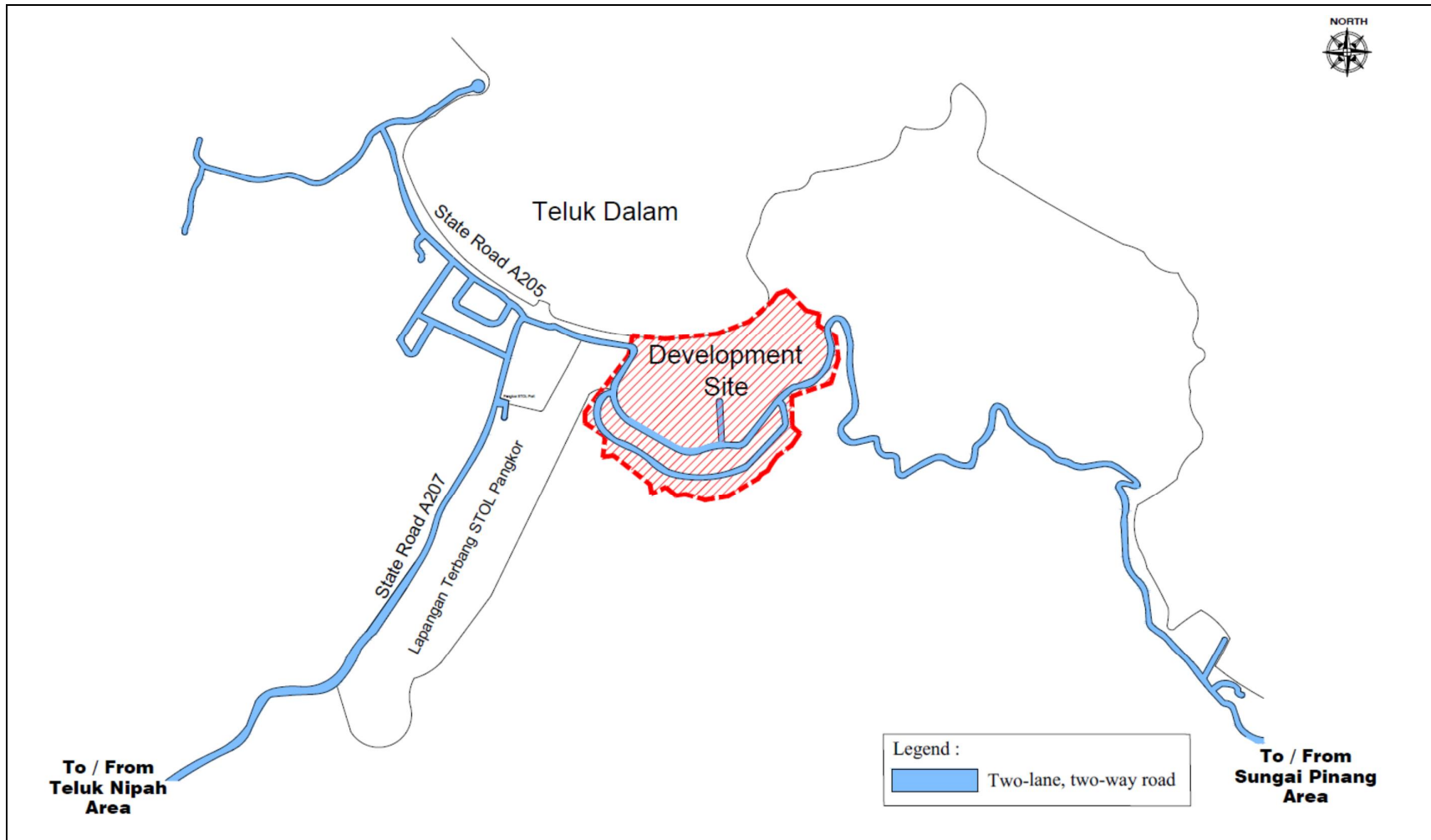


10. TNB Sub-Station



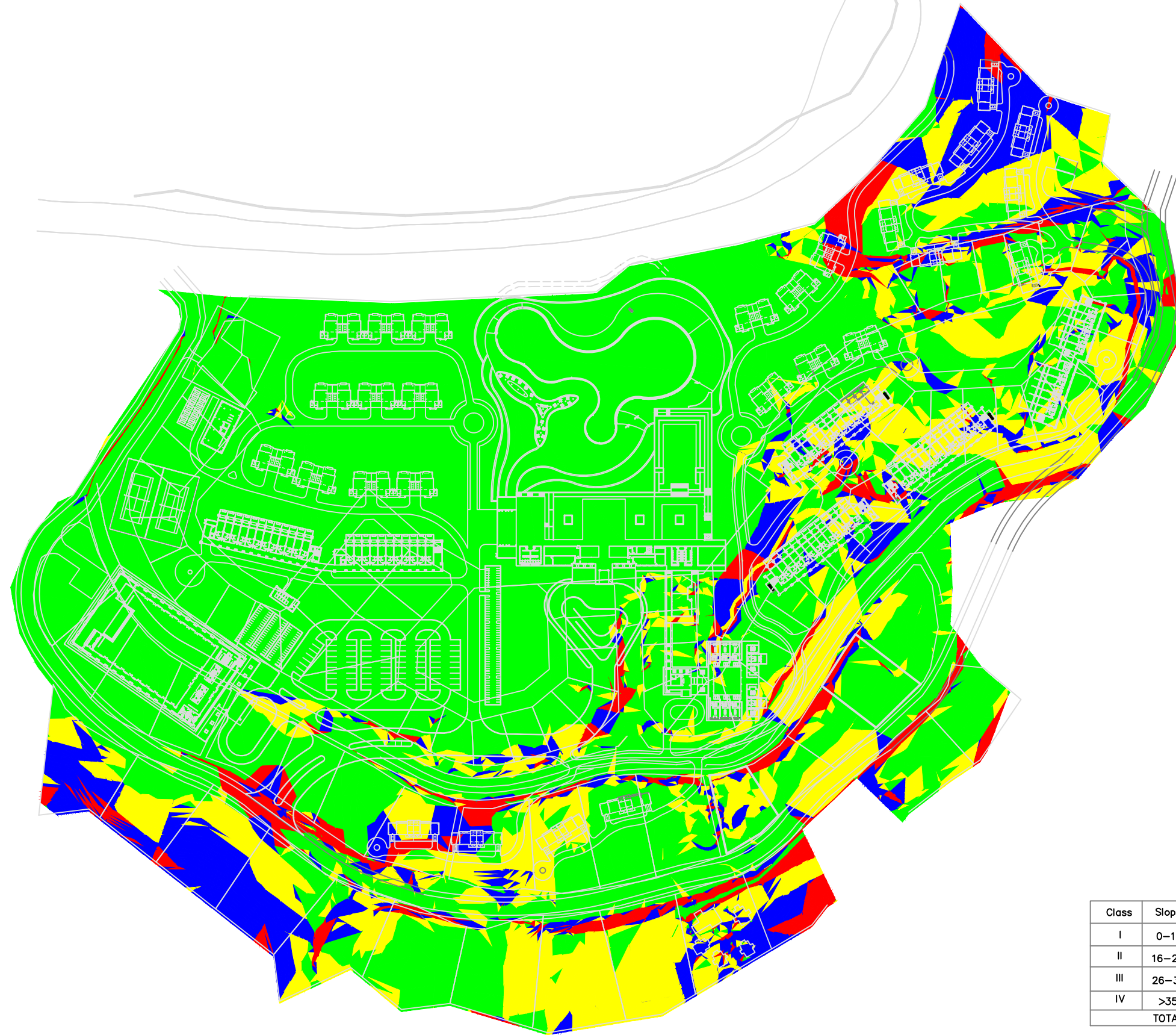
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FIGURE ES.6:
Landuse within 5km Radius of TDCR Project Site



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**Figure ES.7:
 Existing Road Network**
 (Extracted from Figure 2.1, Traffic Impact Assessment)



Class	Slope	Area (acre)	Percentage Area (%)	Color
I	0-15	28.49	68.00%	Green
II	16-25	7.28	17.38%	Yellow
III	26-35	4.08	9.74%	Blue
IV	>35	2.05	4.88%	Red
TOTAL		41.90	100.00%	

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FIGURE ES.8 :
SOIL RISK MAP FOR TDCR PROJECT SITE