CHAPTER 4.0
EXISTING ENVIRONMENT

4.1 INTRODUCTION

This chapter will present the existing environment of the proposed site and will be divided into 4 sections namely: –

i. Existing Land Use
ii. Physico-Chemical Environment
iii. Biological–Ecological Environment
iv. Socio-Economic/Human Environment

Gathering information on these environmental components is necessary before the commencement of the project. These components of the environment will represent and illustrate the existing environmental condition of the proposed project area.

4.2 EXISTING LAND USE

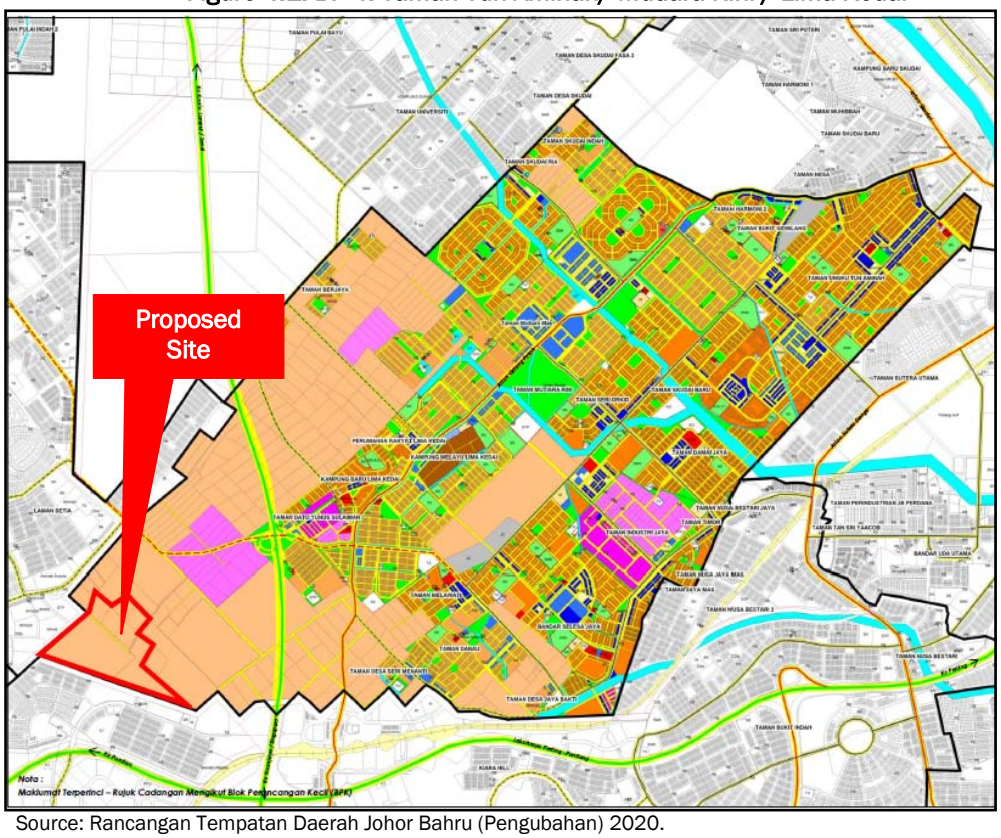
4.2.1 Existing & Surrounding Land Use

This development will cover an area **160.18 acres or 64.82 hectares** which located on Lot 663, Lot 664, Lot 804 – Lot 807, Lot 1114, Lot 917 & Lot 920, Mukim Pulai, Johor Bahru. Existing land use of proposed site consists of oil palm plantation, shrub, bushes, secondary forest and including part of Bukit Resam. Generally, this proposed site is surrounded by Setia Eco Garden (north west) and Nusa Bayu residential (south) of the proposed site. Other than that, the exisiting delopment have been identified such as industrial, commercial, housing, school, infrastructure and utilties where located at surrounding of proposed development. The coordinates for this development lies between approximately N 1° 29' 9.09" E 103°35'20.84", N 1°29' 30.55' E 103° 35' 39.32", N 1° 29' 18.30" E 103° 35' 52.33" and N 1°28' 53.45" E 103°36' 10.19. The proposed site within the jurisdiction of the Majlis Perbandaran Johor Bahru Tengah (MPJBT).

Zoning:
According to Rancangan Tempatan Daerah Johor Bahru (Pengubahan) 2020, the proposed site located in Blok Perancangan (BP) 4: Taman Tun Aminah/ Mutiara Rini / Lima Kedai and BPK 4.6: Presin Lima Kedai. **(Refer Appendix J: RTDJB Pengubahan 2020)**

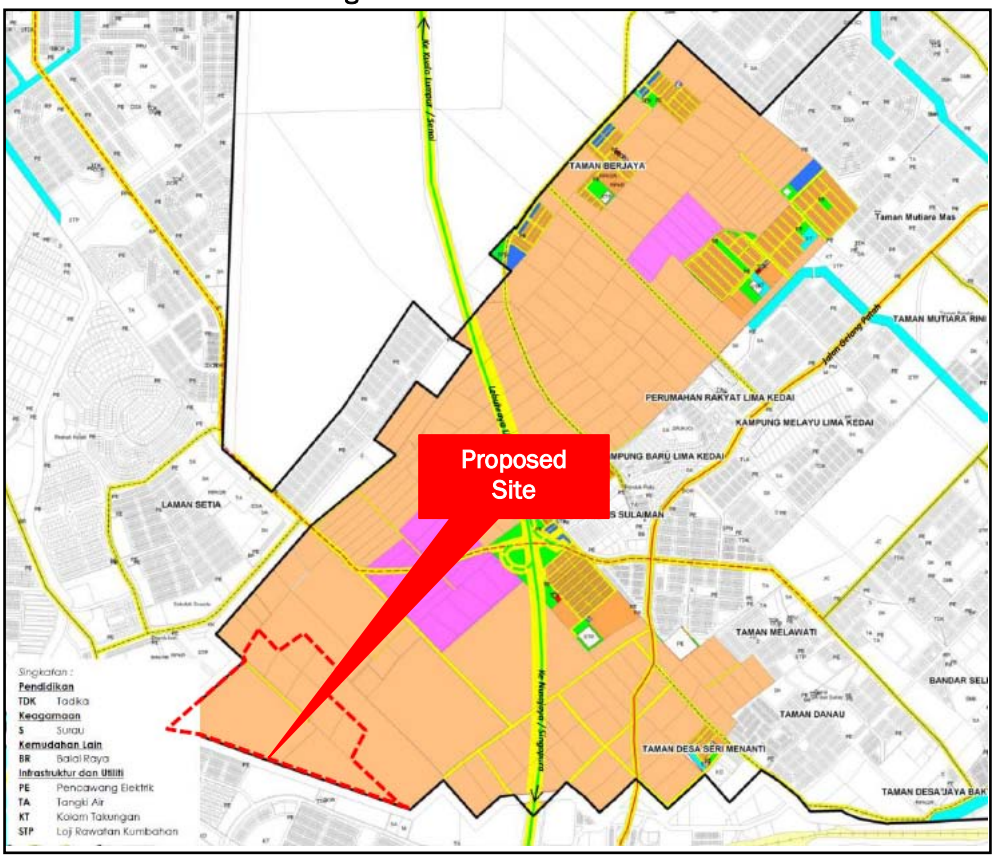
Blok Perancangan (BP)	• BP 4: Taman Tun Aminah/ Mutiara Rini / Lima Kedai
Blok Perancangan Kecil (BPK)	• BPK 4.6: Presin Lima Kedai
Zoning	• Proposed Housing, Existing & Commited Road Network

Figure 4.1: BP 4: Taman Tun Aminah/ Mutiara Rini / Lima Kedai



Source: Rancangan Tempatan Daerah Johor Bahru (Pengubahan) 2020.

Figure 4.2: BPK 4.6: Presin Lima Kedai



Source: Mega Rancang Sdn Bhd, 2013.

Existing Land Use within Proposed Site

Overall, the existing proposed site are oil palm plantation, shrub, bushes, secondary forest and part of Bukit Resam area. There is no development found at the proposed site.

Figure 4.3: Existing Land Use within Proposed Site

Bukit Resam

Oil Palm Plantation

Pylon (at boundary site)

Existing road to Bukit Resam

Source: Perunding UEP Sdn Bhd, 2013

Existing Land Use within 5km Radius

The nearest development found at surrounding of proposed site are Setia Eco Garden and Nusa Bayu area. Other existing development and iinformation regarding other development is as per described below:

	Surrounding Land Use		Distance (km)
	Land Use	Development/area	
North	Sekolah Antarabangsa Tenby, Setia Eco Garden Bukit Resam	Educational -	0.86km 1.05km
North East	Existing road to Bukit Resam	-	0.60km
East	Jelutong Water Tank	Utility	1.05km
South	Nusa Bayu	Residential	1.0km
South West	Pylon TNB	Utility	0.43km
North West	SJK (C) Pai Tze Setia Eco Garden	Educational Industrial, Commercial	0.74km 1.0km
North West	Existing STP Setia Eco Garden	Utilites	0.8km
North West	Shoplot Office Setia Eco Garden	Commercial	0.63km

Source: Perunding UEP Sdn Bhd, 2013.

Figure 4.4: Existing Surrounding Land Use within 5km

Setia Eco Garden

Sekolah Antarabangsa Tenby, Setia Eco Garden

Adjacent to proposed site

Pylon area

SJK (C) Pai Tze

Jelutong Water Tank

Nusa Bayu construction area

Existing STP

Source: Perunding UEP Sdn Bhd,2013.

Figure 4.5 :

Surrounding Land Use Plan

Sumber: Perunding UEP Sdn. Bhd, 2013

Perunding UEP Sdn. Bhd.
36A, Jalan Impian Emas 7,
Taman Impian Emas,
81300, Skudai, Johor Darul Ta'zim.
Tel : 07-557 3987 Fax : 07-557 2987
Email : peruepsb@yahoo.com

4.2.2 Existing Road Network

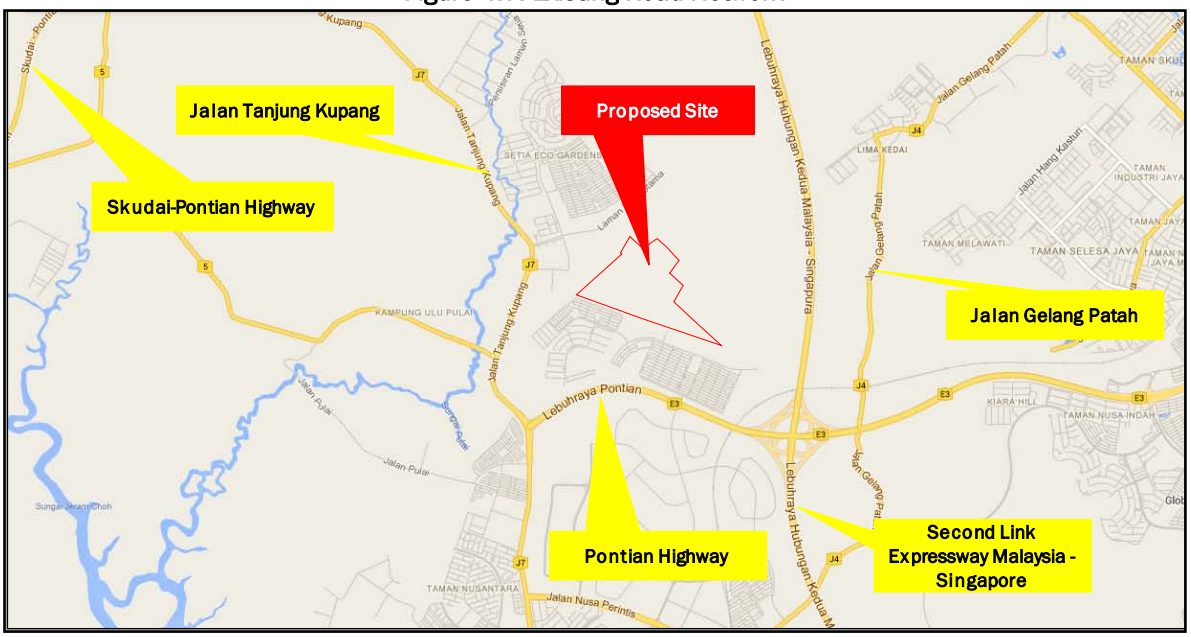
Proposed development has good accessibility because of the location can be access via Second Link Expressway (Malaysia – Singapore), Pontian Highway, Skudai – Pontian Highway, Jalan Gelang Patah and Jalan Tanjung Kupang. It is expected to offer the best value of property for resident and also facilitate the journey for those who are working around Gelang Patah, Johor Bahru City and Singapore.

Figure 4.6: Existing Road Surrounding Proposed Site

Second Link Expressway Malaysia - Singapore

Skudai – Pontian Highway

Figure 4.7: Existing Road Network



Source: Google Maps, 2013.

4.3 PHYSICO- CHEMICAL ENVIRONMENT

4.3.1 Geology

a. **Geology of Mukim Pulai**

The proposed project site is located at Mukim Pulai, Johor Bahru. In term of geological time scale, the proposed site is includes in **Triassic** and **quarternary class** while the sediment and metamorphic rocks were shale, mudstone, siltstone, phylite, slate and sandstone (interbedded) and lithology are unconsolidated deposits and for soil texture, it is composed by Clay & Silt.

b. Soil Types

Slate

Slate is a low-grade foliated metamorphic rock formed by regional metamorphism. It is similar in appearance to mudstone and shale due to the low grade of metamorphism but can be distinguished by its slaty cleavage and more dense, compact nature.

- Grade: low
- Parent Rock: clay-rich mudstone or shale
- Nature of Metamorphism: regional with directed stress
- Impt. Characteristics: planar alignment of microscopic clay grains cause the rock to break in parallel layers (slaty cleavage).

Phyllite

Phyllite is a low-grade foliated metamorphic rock that is intermediate in grade between slate and schist. Aligned near-microscopic crystals of fine-grained muscovite and chlorite give the rock a shiny surface or sheen along cleavage surfaces.

- Grade: low
- Parent Rock: clay-rich mudstone or shale
- Nature of Metamorphism: regional with directed stress
- Impt. Characteristics: intermediate in texture between slate and schist with planar alignment of near-microscopic platy minerals which give the rock a shiny reflective appearance.

Source: extracted from website: http://itc.gsw.edu/faculty/tweiland/metarx2.htm

Silt

The soil comprises of clay and silts based on geological study above. Silt is granular material of a gain size between sand and clay derived from soil and rock. Silt may occur as soil or as suspended sediment (also known as suspended load) in surface water body. It may also exist as soil deposited at the bottom of a water body.

Clay

Clay is a general term including many combinations of one or more clay minerals with traces of metal oxides and organic matter. Geologic clay deposits are mostly composed of phyllosilicate minerals containing variable amounts of water trapped in the mineral structure. Clays are distinguished from other fine-grained soils by differences in size and mineralogy. Silts, which are fine-grained soils that do not include clay minerals, tend to have larger particle sizes than clays, but there is some overlap in both particle size and other physical properties, and there are many naturally occurring deposits which include silts and also clay. The distinction between silt and clay varies by discipline. Geologists and soil scientists usually consider the separation to occur at a particle size of 2 μm (clays being finer than silts), sedimentologists often use 4-5 μm, and colloid chemists use 1 μm.

c. Soil Series

Soil series as established in order of classification system hierarchy. The actual object of classification is the so-called soil individual, or Pedon. Soil series consist of pedons that are grouped together because of their similar pedogenesis, soil chemistry, and physical properties. More specifically, each series consists of pedons having soil horizons that are similar in soil colour, soil texture, soil structure, soil pH, consistence, mineral and chemical composition, and arrangement in the soil profile.

The soil series concept was originally introduced in 1903 and intended to consist of groups of soils which were thought to be the same in origin but different in texture. Soils were thought to be alike in origin if they were derived from the same kind of rocks or if they were derived in sediments derived from the same kind of rocks and deposited at the same time.

The soil found at the proposed site is includes in **Telemong-Akob-Local Alluvium Series**, and **Pohoi Durian Tavy.**

Soil Classifications and Characteristics:

- **Telemong-Akob-Local Alluvium Series**
  Characteristics: Well drained. Coarse textures with weak structure CES=5-10 meq/100 mg soils.
- **Pohoi Series**
  - ✓ Characteristic: yellow brown (2.5Y 6/4); fine sandy clay, block structure, medium size to coarse, medium grade, friable to strong, medium depth, medium drain, wave drain to steep, caption exchange 5-10cmol (+) per kg soil, low base saturation, horizon diagnostic candic.
- **Batu Anam Series**
  - ✓ USDA Soil Taxonomy: Aquic Paleudult, clayey, mixed, isohyperthermic.
  - ✓ FAO/UNESCO Legend: Haplic Acrisol.
  - ✓ Characteristics: Light grey (10 YR 7/1, 7/2) to white (10 YR 8/1, 8/2), quiet a lot of bright yellow to brown arau (2.5Y 5/6), clay to silty clay, structured angular blocks and prisms, size medium to coarse, high grade, firm, medium depth into parent material, imperfect drainage, available in undulating terrain to choppy terrain, cation exchange capacity < 5-10 cmol (+) per kg soil, low base saturation and argilik diagnosis horizon.

Obstructions of the Soil:

- **Telemong-Akob-Local Alluvium Series**
  i. Coarse textures with weak structure.
- **Pohoi Series**
  I. Gradient:
  Medium to very serious
  II. Depth into compact layer
  Medium
  III. Nutrient imbalance
  Medium
- **Batu Anam Series**
  i. Slope: Small to moderate
  ii. Depth: Serious
  iii. Drainage: Moderate.
  iv. Nutrient Imbalance: Moderate.

Land Suitability Class and Sub-class:

- **Telemong-Akob-Local Alluvium Series**
  - ✓ Soil suitability subclasses classification by terrain limits-0-2°(2nT)
- **Pohoi Series**
  - ✓ Wavy Terrain: 2cGn(d)
  - ✓ Hilly terrain: 3G(cn)
  - ✓ Steep Terrain: 5G
- **Batu Anam Series**
  - ✓ Undulating Terrain: 3t(cdn).
  - ✓ Choppy Terrain: 3t(cdGn).

Crops Suitability:

- **Pohoi Series**
  - ✓ Oil palm, coco, rubber,coconut and fruits.
- **Batu Anam Series**
  - ✓ Palm oil, cocoa, rubber, coconut, fruits and short term crops

Management:

- Batu Anam Series & Pohoi Series
  i. Build suitable terraces and plant ground cover crops for erosion control.
  ii. Perfect fertilization.
  iii. Moisture conservation by using mulch.
  iv. Drainage especially during dry season.
  v. Usage of organic matters to increase holding capacity of nutrient and water and improve soil structure.
  Source: Panduan Mengenali Siri-siri Tanah Utama di Semenanjung Malaysia terbitan, Ogos 1993

Surface Hydrology

Surface hydrology located near to proposed site is Pakgadai River and will flows towards Sungai Pulai and ended in Strait of Johor.

Mitigation Measures

1. One of the reason soil morphology changed is there's alteration in natural hydrology. So, any activities that can cause hydrological changes must be control or avoided.
2. Use soil cover, like grass or any other ground cover crops to reduce soil erosions. For better results, replant trees to replace the ones that had been cut down earlier.
3. All the chemical wastes must be stored in a specific place or storage to avoid them from penetrating the ground water. Failure to do so will lead to surface and ground water pollution, resulting to serious water pollution when they flow into the rivers or lakes.
4. Activity like ditching must be controlled to avoid natural hydrology from changing.
5. Balance earth works, such as cutting and digging to elude erosions and ground unstable.
6. Follow the proper management to avoid soil erosion and land damage.

Figure 4.9 shows Geology Plan for Proposed Site and **Figure 4.10 shows Reconnnaissance Soil of Proposed Site**. The map is essential for evaluating the urban impact on the land and for planning the area's growth.

Figure 4.8: Existing Soil found at Proposed Site

Gravel

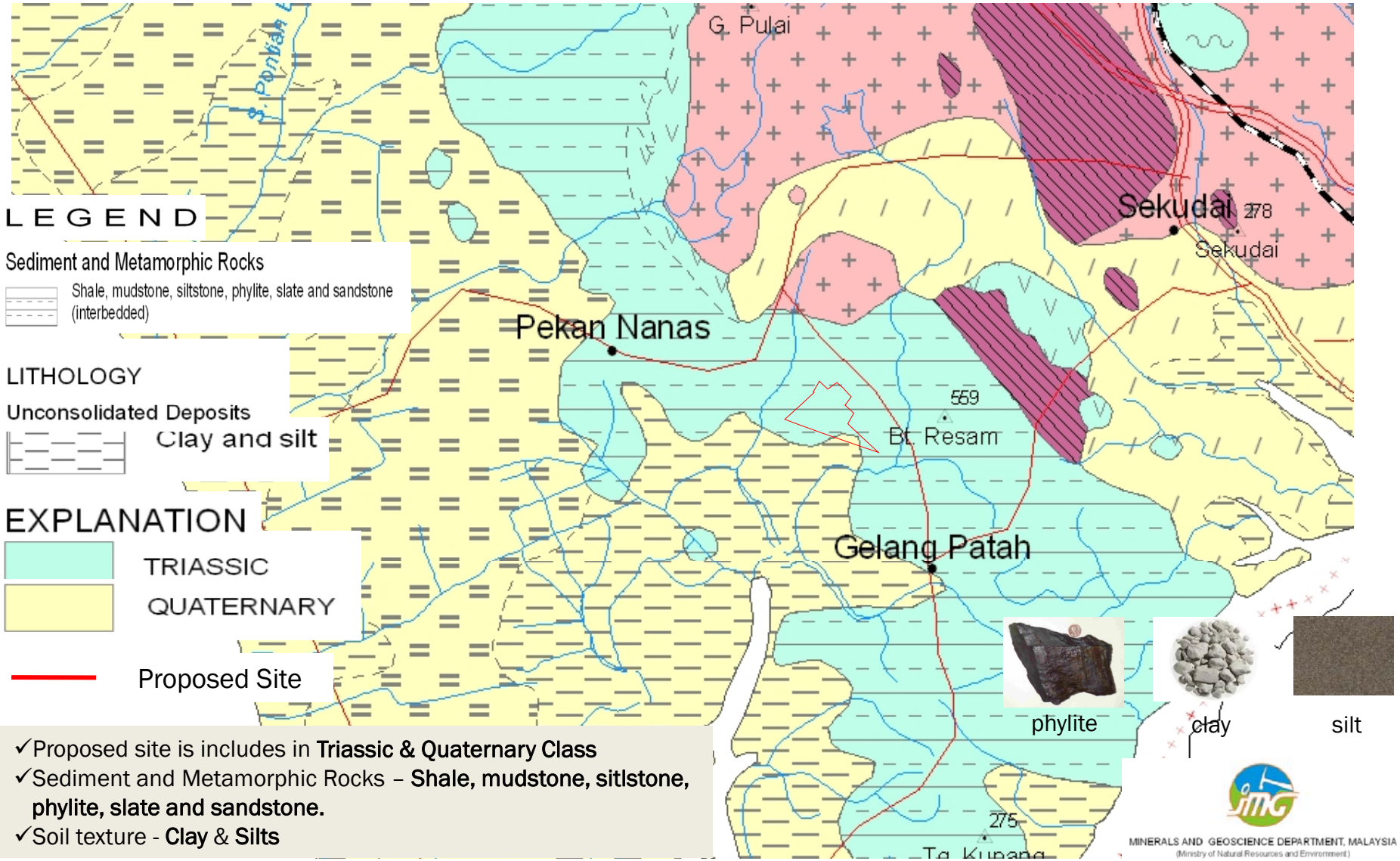


Figure 4.9:

Geological Map of Proposed Site

Legend:

Proposed Site

Source: Extract from *Peta Geologi Johor (Geological Map of Johor) Jabatan Mineral dan Geosains Malaysia*

Perunding UEP Sdn. Bhd.
36A, Jalan Impian Emas 7,
Taman Impian Emas,
81300, Skudai, Johor Darul Ta'zim.
Tel : 07-557 3987 Fax : 07-557 2987
Email : peruepsb@yahoo.com

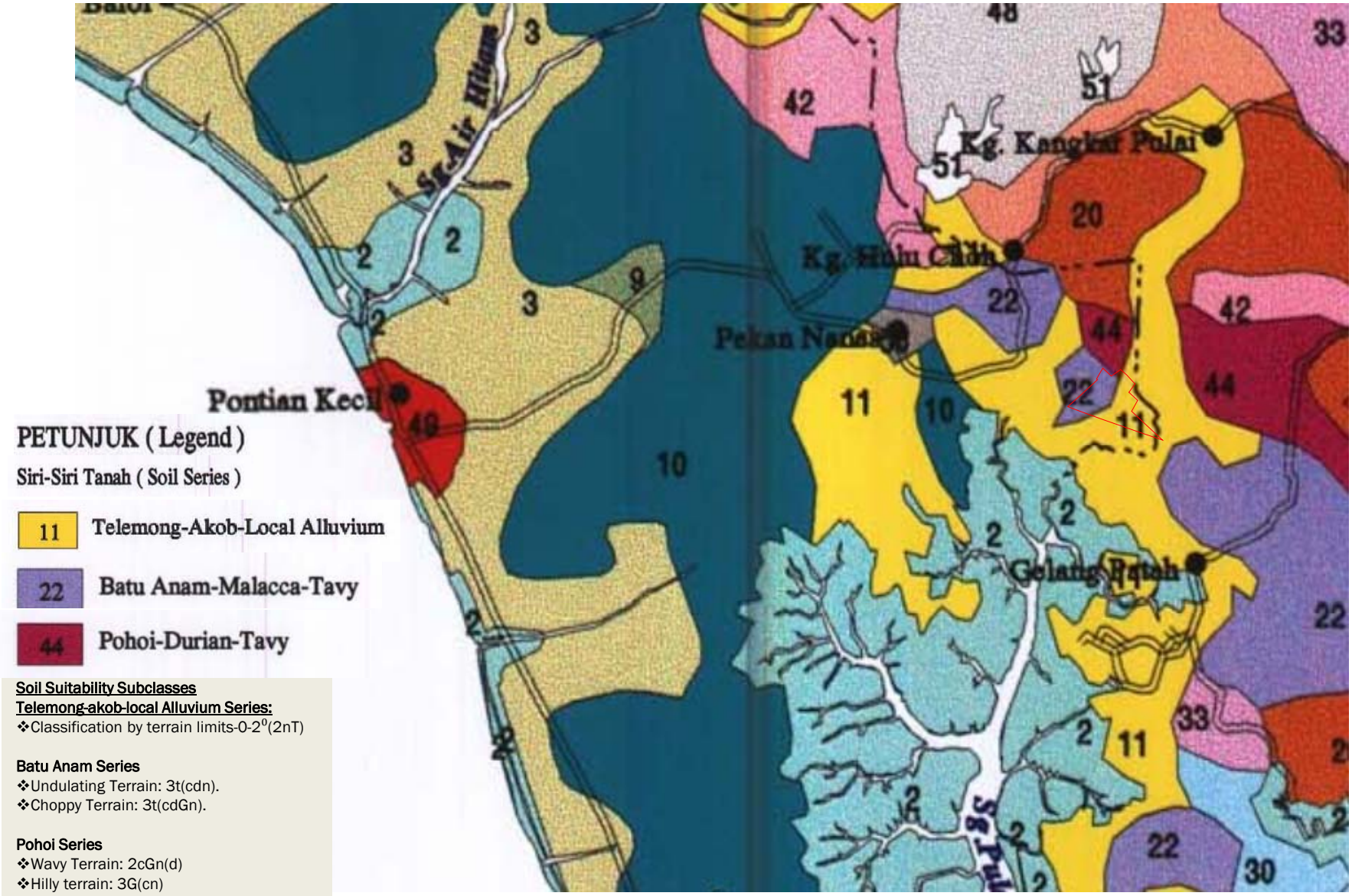


Figure 4.10:

Reconnaissance Soil Map of Proposed Site

Legend:

—— Proposed Site

Source: Extract from *Peta Tinjauan Tanih* (Reconnaissance Soil Map of Johor) Jabatan Pertanian Malaysia

Perunding UEP Sdn. Bhd.
36A, Jalan Impian Emas 7,
Taman Impian Emas,
81300, Skudai, Johor Darul Ta'zim.
Tel : 07-557 3987 Fax : 07-557 2987
Email : peruepsb@yahoo.com

4.3.2 Topography and Slope Analysis

Generally, the topography of proposed site located within hilly and some is undulating land. Slope analysis for project site basically within **class 1** (1 - <15˚) which cover an area of **143.18 acres**, **class 2** (16 ˚- 25˚) which cover an area **4.0 acres** and **Class 3 (26 º – 35 º) cover an area of 13.00 acres.** Total acreage of proposed development area is **160.18 acres.** (**Refer Figure 4.11: Slope Analysis Plan**)

Table 4.1: Slope Analysis

Class	Gradient	Physical Development	Area (Acre)	%
I	< 15º	Development project in this areas is permitted by complying fully guideline for development in Kawasan Bukit 1997(are issued by Local Government Department) And Erosion Control Guideline And Silting, 1996(are issued by Department Of Environmental).	143.18	89.4
II	16 º - 25 º	- same as class 1 -	4.00	2.5
III	26 º – 35 º	Development project in this area could be considered after taking Environment Impact Assessment result (EIA) which need is carried out in advance	13.00	8.1
IV	> 36 º	Development project in this area not allowed at all	0	0
Total			**160.18**	**100.0**

Source: Modification and extraction from Survey Plan by Jurukur Jasa Jaya Sdn Bhd, 2013

Class	Gradient	Physical Development	Area (Acre)	%
Class	<15°	Development project in this areas is permitted by complying fully guideline for development in Kawasan Bukit 1997 (are issued by Local Goverment Department) And Erosion Control Guideline And Silting, 1996 (are issued by Department Of Environmental)	143.18	89.4
Class	16°–25°	–same as class 1–	4.00	2.5
Class	26°–35°	Development project in this area could be considered after taking Environment Impact Assessment result (EIA) which need is caried out in advance	13.00	8.1
Class	>36°	Development project in this area not allowed at all	0.0	0.0
		Total	160.18	100.0

NOTE:
1) ALL HEIGHTS ARE BASED FROM BM J0838 (RL: 51.336) ALONG JALAN PONTIAN FROM ULU CHOH TO KANGKAR PULAI

LEGEND :

- BO – BUILDING
- SB – SIGNBOARD
- IL – INVERT LEVEL
- ILC – INVERT LEVEL CULVERT
- EARTH TRACK
- EARTH DRAIN
- CUTTING
- FENCE
- ZINC FENCE
- PALM BOUNDARY

Figure 4.11 :

SLOPE ANALYSIS PLAN

CLASS 1 = 0° - 15°
CLASS 2 = 16° - 25°
CLASS 3 = 26° - 35°
CLASS 4 = >35°

Environmental Consultant :
Perunding UEP SDN. BHD. 631621A
36A, Jalan Impian Emas 7,
Taman Impian Emas, 81300 Skudai,
Johor Darul Takzim
Tel : 07–5573987 Fax : 07–5572987
Email: peruepsb@yahoo.com

4.3.3 Surface Hydrology

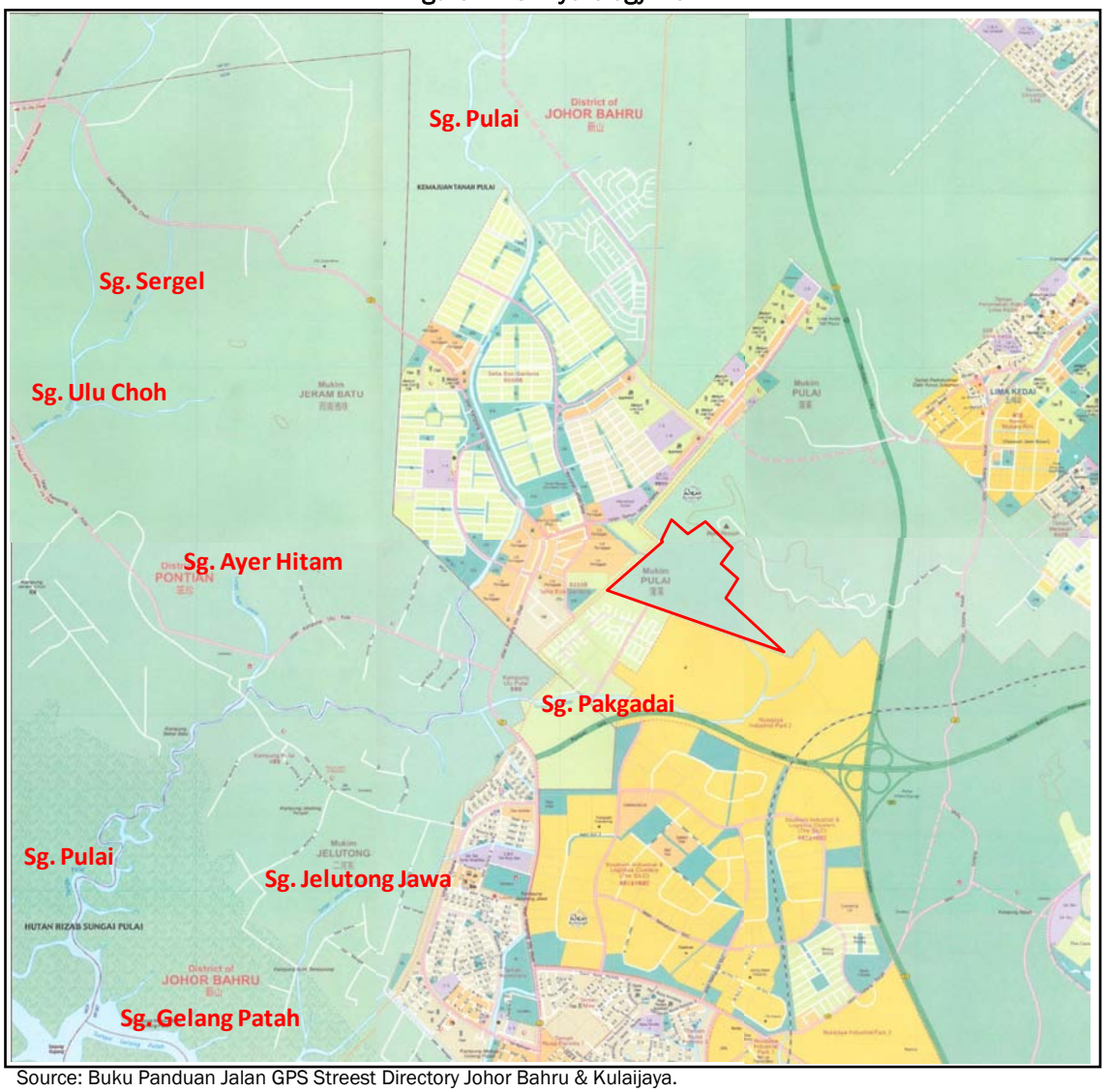
Surface hydrology located near to proposed site is Sungai Pakgadai and will flows towards Sungai Pulai and ended in Strait of Johor. (**Refer Figure 4.13: Hydrology Plan**)

Figure 4.12: Existing River

Sungai Pakgadai

Sungai Pulai

Figure 4.13: Hydrology Plan



Source: Buku Panduan Jalan GPS Streest Directory Johor Bahru & Kulaijaya.

4.3.4 Climate and Meteorology

Climate and meteorological data is obtained from the Sultan Ismail Airport Meteorological Station, Senai (Wind profile) and Hospital Johor Bahru (for rainfall data). It is the nearest meteorological station and data that are representative of the area. The existing climate and meteorology is important for engineers to consider natural effects on the design of the road or other structures. Discussion on the climate and meteorology can be further categorized into:

- Wind profile
- Rain profile
- Temperature profile and humidity

a) Wind Profile

The wind profile is important in determining the magnitude and direction of wind during the different times and seasons of the year. The information is also useful in determining crosswind characteristics and utilizes this profile in project implementation as well as for safety purpose.

The wind observations at the station are taken from pressure tube anemograph. Wind direction is analysed according to 8 compass points. The source data used in the analysis are the hourly averages of wind speed and direction.

Wind from the North dominated the wind profile with an annual frequency of 20.6%. The highest of frequency of calm winds recorded for annual frequency of 28 %. The annual dominant wind speed is 6.1 ms^{-1}.

Table 4.2: Percentage Frequency of Various Direction and Speeds (2000-2010)

SPEED M/S	PERCENTAGE FREQUENCY OF VARIOUS DIRECTIONS AND SPEEDS STATION : SENAI PERIOD : 2000 - 2010 TIME : ALL 24 HOURS ANNUAL									TOTAL			
	N	NE	E	SE	S	SW	W	NW	CALM		SPEED	Dominant Wind	Mean Speed
											m/s	TOTAL	TOTAL
< 0.3	-	-	-	-	-	-	-	-	28.0	18.4	0.2	0.0	
0.3 - 1.5	10.7	4.0	2.8	1.7	2.8	2.2	4.5	7.3	-	36.7	0.9	9.1	
1.6 - 3.3	5.9	2.8	1.6	1.9	4.8	2.2	2.7	2.9	-	31.4	2.5	14.5	
3.4 - 5.4	3.4	2.0	0.4	0.4	1.3	0.3	0.5	0.3	-	11.1	4.4	15.0	
5.5 - 7.9	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	-	0.8	6.7	4.0	
8.0 - 10.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	9.4	0.0	
> 10.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	10.7	0.0	
TOTAL	20.6	9.2	4.8	4.0	8.9	4.7	7.7	10.5	28.0	98.4		6.1	1.47

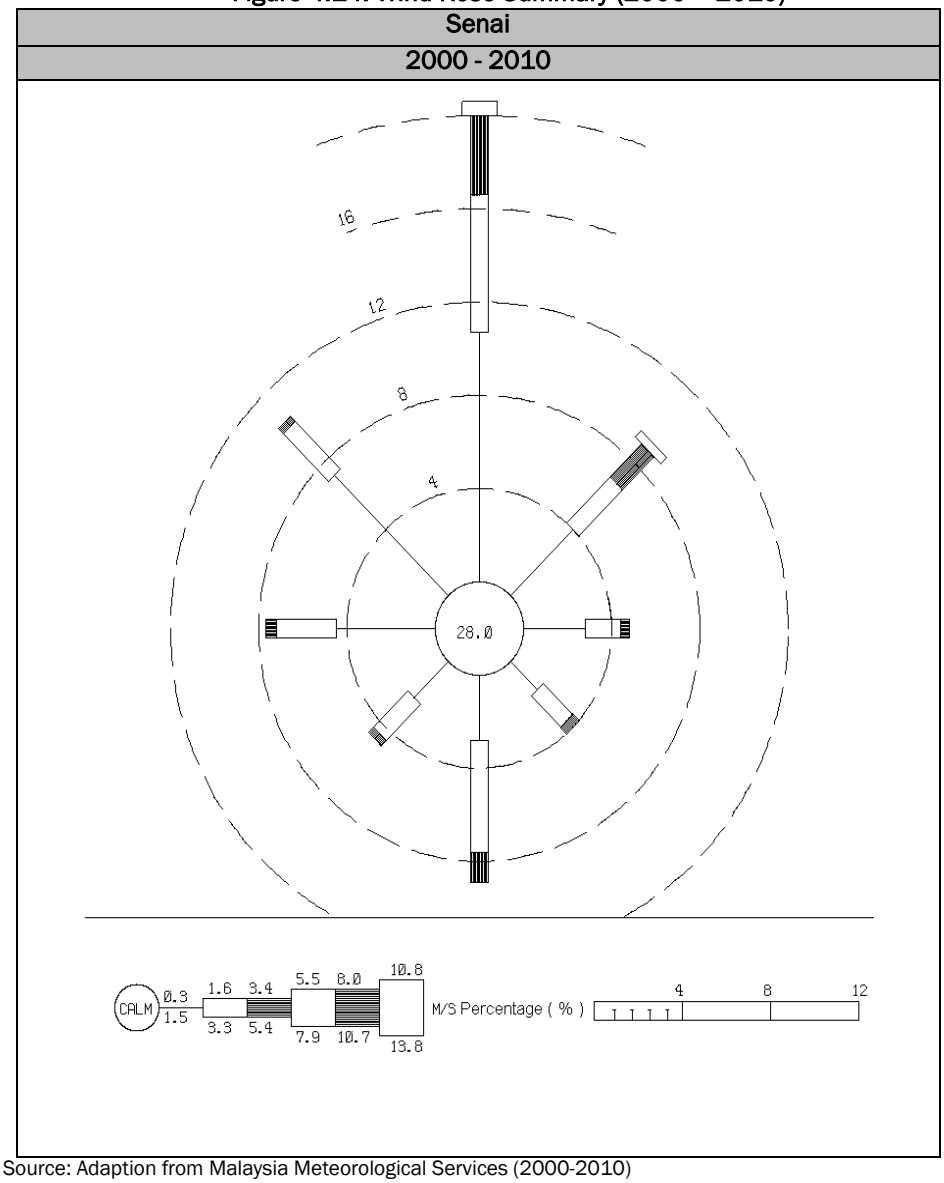
Source: Adaption from Malaysia Meteorological Services (2000-2010)
Station: Senai Airport Meteorological Station

Table 4.3: Summary of Annual and Quarterly Wind Rose (2000-2010)

Duration	Annual
Mean Speed *(ms^{-1})*	1.47
Percentage Calm Wind Frequency *(%)*	28.0
Dominant Wind Direction	North
Percentage Dominant Wind Frequency *(%)*	20.6
Dominant Wind Mean speed *(ms^{-1})*	6.1

Source: Adaption from Malaysia Meteorological Services (2000-2010)
Station: Senai Airport Meteorological Station

Figure 4.14: Wind Rose Summary (2000 – 2010)

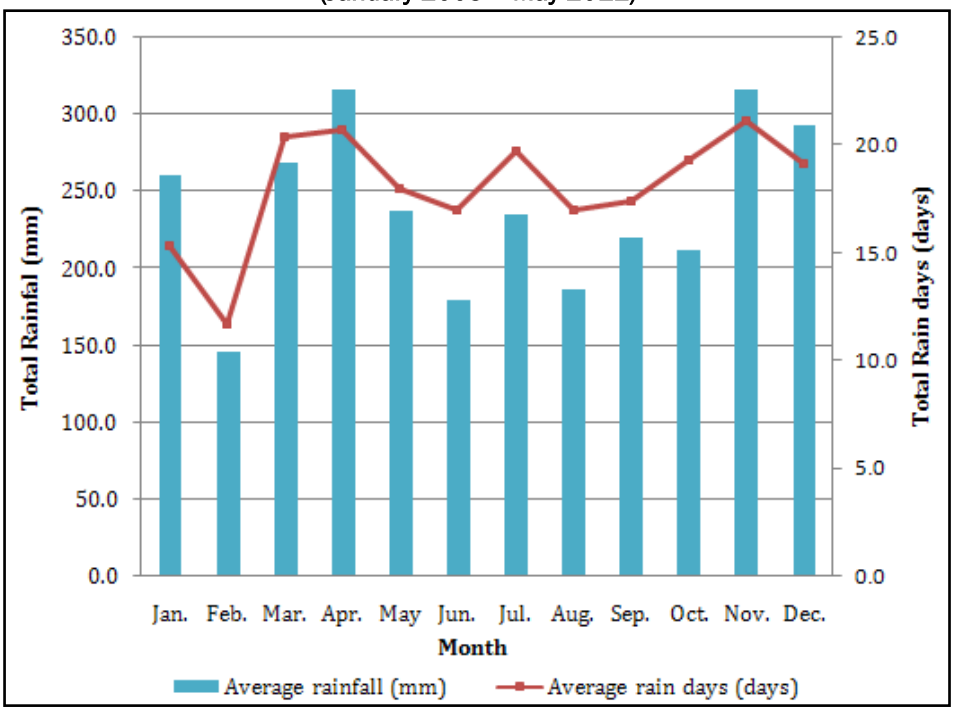


Source: Adaption from Malaysia Meteorological Services (2000-2010)
Station: Senai Airport Meteorological Station

b) Rainfall

The study area receives the lowest average total rain of **145.8 mm** in February and the highest average total rain is **316.16 mm** in November. The study area receives an average total rain from the period January 2003 – May 2011 is **2,812.8 mm**. (**Figure 4.15**)

Figure 4.15: Graph Showing Average Number of Rain Days and Average Amount of Rainfall (January 2003 – May 2011)



Source: Adaption from Malaysia Meteorological Services (2003-2011)
Station: Hospital Johor Bahru Meteorological Station

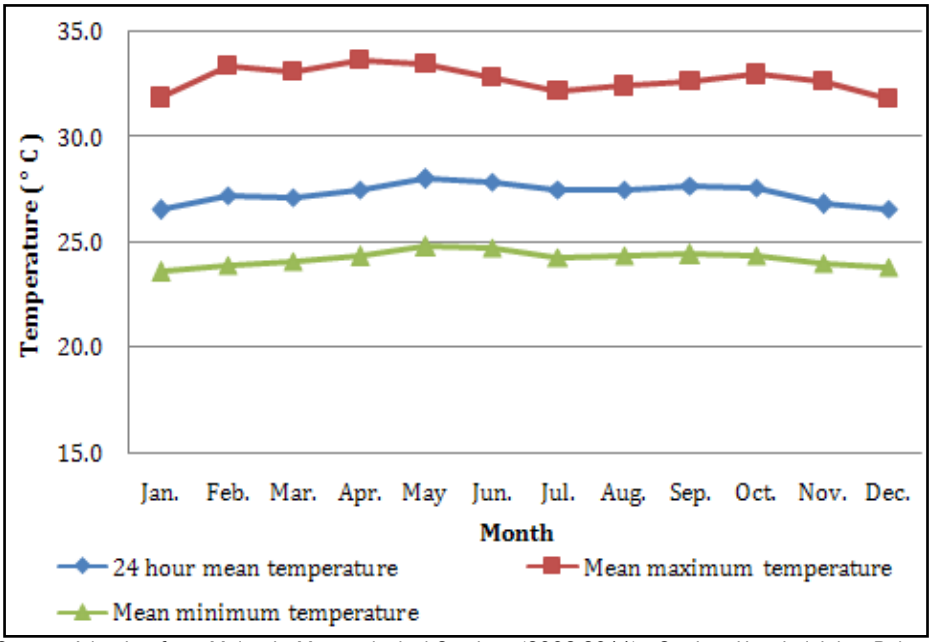
The rainfall profile is important to enable contractors phasing construction activities such as earthworks, and building construction are best phased when there is minimal amount of rain. High amount of rain will hamper construction activities and thus cause delay in the completion of the overall project. Information on rainfall is important for engineers to take into consideration while designing the drainage system for management of surface runoff during the construction and post-construction stage.

c) Temperature Profile, Humidity & Solar Radiation

For the period of January 2006 until May 2011, the highest mean temperature recorded ranging from 33.1˚C to 34.6˚C in the months of April. The minimum temperature ranges from 23.3˚C to 23.7˚C with the lowest temperature recorded in the months of January. High humidity and low temperature is favourable to construction activities as a cool and fine weather is pleasing to all workers at site. It is also good for the environment as air pollutants will attach to water particles and deposit to the ground. A dry and hot weather (low humidity and high temperature) coupled with gusts of wind causes pollutants to be easily air borne. (**Figure 4.16** to **Figure 4.18**)

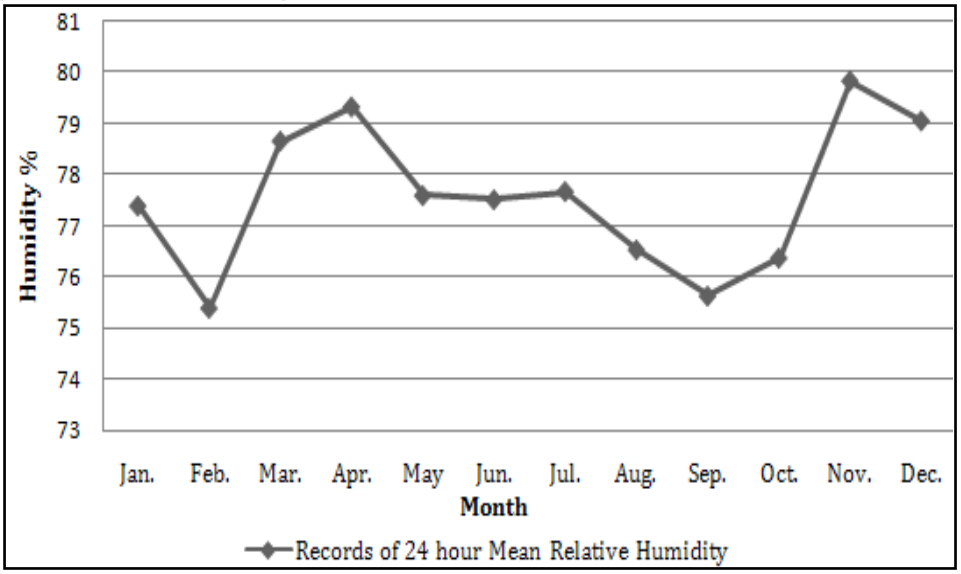
The existing temperature and humidity of the area is also important for decision makers in selecting suitable construction materials. This is because certain materials are not suitable for tropical climates like Malaysia. Construction materials selected should be able to withstand the hot and humid climate and thus meeting the designed lifespan of any structures.

Figure 4.16: Graph Showing Monthly Average Daily Temperature and Solar Radiation (January 2006 – May 2011)



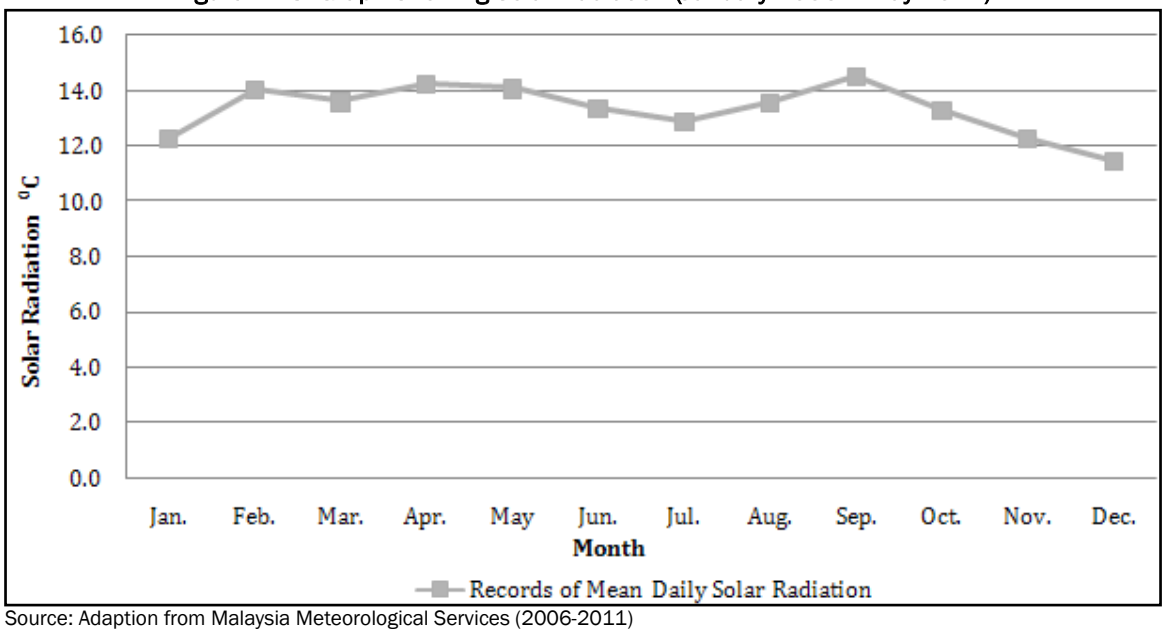
Source: Adaption from Malaysia Meteorological Services (2006-2011) , Station: Hospital Johor Bahru Meteorological Station

Figure 4.17: Graph Showing Monthly Mean Relative Humidity (January 2006 – May 2011)



Source: Adaption from Malaysia Meteorological Services (2006-2011), Station: Hospital Johor Bahru Meteorological Station

Figure 4.18: Graph Showing Solar Radiation (January 2006 – May 2011)



Source: Adaption from Malaysia Meteorological Services (2006-2011)
Station: Hospital Johor Bahru Meteorological Station

4.3.5 Existing Environmental Quality

The existing environmental quality analysis has divided into 3 categories, which include water (river/drain), air and noise quality. The summary a number of ad-hoc location station environmental quality monitoring station is shown on **Table 4.4** and **Figure 4.19**.

Table 4.4: Environmental Quality Station

Environmental Quality	No Stations	Location Description		Co-ordinate
Water (River / Drain)	4	W1	Bridge Sungai Pakgadai	N 01°28.737' E 103° 34.905'
		W2	Existing drain outside project boundary, beside Setia Eco Garden	N 01° 29.682' E 103° 35.591'
		W3	Existing drain at STP and TNB pump house	N 01° 29.546' E 103°35.358'
Air	3	A1	In front of International School Tenby, Setia Eco Garden	N 01°29.577' E 103°35.465'
		A2	Setia Eco Garden Shop Lot Office	N 01°29.531' E 103°35.301'
		A3	Nusa Bayu Housing	N 103°29.163' E 103° 35.361'
Noise	4	N1	In front of International School Tenby, Setia Eco Garden	N 01°29.577' E 103°35.465'
		N2	Existing drain outside project boundary, beside Setia Eco Garden	N 01° 29.682' E 103° 35.591'
		N3	Setia Eco Garden Shop Lot Office	N 01°29.531' E 103°35.301'
		N4	Nusa Bayu Housing	N 103°29.163' E 103° 35.361'

Source: Perunding UEP Sdn Bhd, 2013.

Figure 4.19:

Location of Environmental Quality Stations

Legend:
W – Water Quality
N – Noise Quality
A – Air Quality
Proposed Site

Sumber: Perunding UEP Sdn. Bhd, 2013

Perunding UEP Sdn. Bhd.
36A, Jalan Impian Emas 7,
Taman Impian Emas,
81300, Skudai, Johor Darul Ta'zim.
Tel : 07-557 3987 Fax : 07-557 2987
Email : peruepsb@yahoo.com

4.3.6 Water Quality

For the purpose of preparing the PEIA report, several sampling stations have been identified to determine the existing river water quality at the project site. The grab sampling method is used and all samples are preserved before being sent to an accredited laboratory for analysis. The sampling stations are shown in **Figure 4.20.**

4.3.6.1 River Water Quality

An understanding of the existing river water quality is deemed necessary to determine the background level of pollution. The existing river water quality can be used as a baseline condition for future reference against effects from construction activities. The DOE – Water Quality Index (WQI) (**Table 4.5**) is used to quantify the overall quality of the surface water based on several primary parameters. The parameters are dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), pH and ammoniacal nitrogen (NH_3-N). The sub –index of these parameters is determined before determining the overall index for the river system. **(Refer Appendix K: Environmental Quality Sampling Result)**

i. pH

Water (H_20) contains both hydrogen (H+) and hydroxyl (OH-) ions. The pH of water is a measurement of the concentration of H+ ions, using a scale that ranges from 0 to 14. A pH of 7 is considered “neutral”, since concentrations of H+ and OH- ions are equal. Liquids or substances with pH measurements below 7 are considered “acidic”, and contain more H+ ions than OH- ions. Those with pH measurements above 7 are considered “basic” or “alkaline,” and contain more OH- ions than H+ ions.

ii. Temperature

Thermal pollution may also be caused by storm water runoff from warm surfaces such as streets and parking lots. Soil erosion is another cause, since it can cause cloudy turbidity conditions in a water body. Cloudy water absorbs the sun’s rays, resulting in a rise in water temperature. Thermal pollution may even be caused by the removal of trees and vegetation which normally shade the water body.

iii. Bio-Chemical Oxygen Demand (BOD)

Biochemical Oxygen Demand, or BOD, is a measure of the quantity of oxygen consumed by micro-organisms during the decomposition of organic matter. BOD is the most commonly used parameter for determining the oxygen demand on the receiving water of a municipal or industrial discharge. BOD can also be used to evaluate the efficiency of treatment processes, and is an indirect measure of biodegradable organic compounds in water.

iv. Dissolved Oxygen (DO)

Dissolved oxygen (DO) refers to the volume of oxygen that is contained in water. Oxygen enters the water as rooted aquatic plants and algae undergo photosynthesis, and as oxygen are transferred across the air-water interface. The amount of oxygen that can be held by the water depends on the water temperature, salinity, and pressure. Gas solubility increases with decreasing temperature (colder water holds more oxygen). Gas solubility increases with decreasing salinity (freshwater holds more oxygen than does saltwater).

v. Total Suspended Solid (TSS)

Total suspended solids (TSS) include all particles suspended in water which will not pass through a filter. Suspended solids are present in sanitary wastewater and many types of industrial wastewater. There are also non point sources of suspended solids, such as soil erosion from agricultural and construction sites.

vi. Bacteria

Usually bacteria species (e.g., *Escherichia coli*) found in water body. Examples of waterborne diseases caused by bacteria are cholera, dysentery, shigellosis and typhoid fever. Faecal coli forms are the coli form bacteria that originate specifically from the intestinal tract of warm blooded animals (e.g., humans beavers, raccoons, etc.).

vii. Oil and Grease

Oil is any one or a combination of mineral, vegetable and synthetic substances and animal fats, vegetable fats that are used in a variety of processes. While grease includes the accumulation of oils, fats, cellulose, starch, proteins and wax.

viii. Ammoniacal Nitrogen (NH_3-N)

It is component of nitrogen referred as ammoniacal nitrogen, which is adopted as an indicator to determine pollution by sewage. Other component of nitrogen includes organic Nitrogen, Nitrogen, Nitrate and Nitrite. It is a natural product of decay of organic nitrogen compounds and one of the many contaminants in water supplies.

Table 4.5: Parameter Details DOE – WQI Used To Classify Rivers in Malaysia

PARAMETERS	UNIT	CLASSES				
		I	II	III	IV	V
NH_3 – N	Mg/l	≤0.1	>0.1 – 0.3	>0.3 – 0.9	>0.9 – 2.7	>2.7
BOD	Mg/l	≤1	>1 – 3	>3 – 6	>6 -12	>12
COD	Mg/l	≤10	>10 – 25	>25 – 50	>50 – 100	>100
DO	Mg/l	≥7	5<7	3<5	1<3	<1
pH	-	6.5 – 8.5	6.5 – 9.0	5.0 – 9.0	5.0 – 9.0	-
SS	Mg/l	≤25	>25 – 50	>50 – 150	>150 – 300	>300
WATER QUALITY INDEX (WQI)		≥92.7	≥76.5 <92.7	≤51.9 <76.5	≤31.0 <51.9	<31.0

	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Water Quality Index (WQI)	>80	60-80	<60
Biochemical Oxygen Demand (BOD)	>90	80-90	<80
Ammoniacal Nitrogen (NH3-N)	>90	70-90	<70
Suspended Solids (SS)	>75	70-75	<70

Source: Interim National Water Quality Standards for Malaysia (Department of Environment) 2007

Note:

Class I :	Natural Environment, suitable for all aquatic life forms, usage for domestic water supply does not require any treatment
Class II :	Conventional treatment required for domestic water supply, recreation include bathing, fishing and livestock drinking needs
Class III :	Extensive treatment required for domestic water supply, normal reaction, fishing and livestock drinking needs
Class IV :	Suitable for agricultural irrigation
Class V :	Other than the uses above

The quality of river water bodies within the proposed area was assessed using selected parameters namely:

- pH
- Biochemical oxygen demand (BOD_5),
- Chemical oxygen demand (COD),
- Dissolved oxygen (DO),
- Total suspended solid (TSS),
- Ammoniacal nitrogen (AN),
- Oil and grease (O & G),
- Escherichia Coli

Table 4.6: Description of the Water Sampling Stations (River/Drain)

Station	Location	Co-ordinate	Sampling Date
W1	Bridge Sungai Pakgadai	N 01°28.737' E 103° 34.905'	22.10.2013
W2	Existing drain outside project boundary, beside Setia Eco Garden	N 01° 29.682' E 103° 35.591'	
W3	Existing drain at STP and TNB pump house, Setia Eco Garden	N 01° 29.546' E 103°35.358'	

Source: Perunding UEP Sdn Bhd, (22nd October 2013)

Figure 4.20: Photo of Water Quality Sampling (River/Drain)

Source: Perunding UEP Sdn Bhd, (22nd October 2013)

Table 4.7: Current River Water Quality Results – River/Drain

Parameter	Sampling Station		
	W1	W2	W3
DO (mg/l)	3.9	4.0	4.2
BOD (mg/l)	1.0	2.0	2.0
COD (mg/l)	6.0	6.0	6.0
NH^3-N (mg/l)	4.77	3.77	5.59
TSS (mg/l)	18.0	22.0	22.0
pH	6.4	6.3	6.4
Oil & Grease (mg/l)	<10(3)[a]	<10(1)[a]	<10(2)[a]
E.Coli (MPN/100ml)	17.0	14.0	11.0
WQI	**69.08**	**68.53**	**57.19**
Status	**Slightly Polluted**	**Slightly Polluted**	**Polluted**
Class	**III**	**III**	**III**

Source: Spectrum Laboratories (Johor) Sdn Bhd, 2013 **(Refer Appendix K: Environmental Quality Sampling Result)**

Two (2) stations (W1 and W2) showed the WQI as slightly polluted, while the other one stations (W3) showed the WQI fell into Polluted.

For W1 station, the high concentration of AN and low concentration of DO is may be caused by surrounding activities due to the location of Sungai Pakgadai was adjacent to workshop, fishing pond, residential and commercial activities. W2 Station was located at existing drain which near to oil palm plantation may causing the result of high concentration of AN (from pesticides) and low concentration of DO. The activities which come from residential and other nearest activities could effecting the result for AN and DO for W3 station.

4.3.7 Air Quality

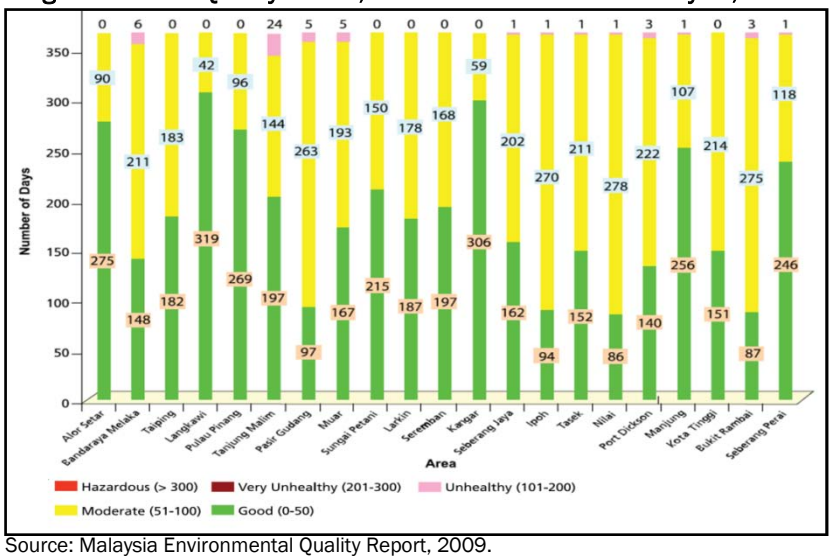
An air pollution index system normally includes the major air pollutants which could cause potential harm to human health should they reach unsafe levels. The air pollutants included in Malaysia's API are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and suspended particulate matter less than 10 microns in size (PM_{10}).

a) Air Quality Records [1]

The Department of Environment (DOE) monitors the country's ambient air quality through a network of 51 continuous monitoring stations. Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2009 was between good to moderate levels most of the time. However, there was a slight decrease in the number of good air quality days recorded in 2009 (55.6 % of the time) compared to that in 2008 (59 % of the time) while remaining 43 % at moderate level and only 1.4 % at unhealthy level. This is partly due to peatland fires and trans-boundary air pollution that occurred during hot and dry weather conditions (moderate to strong El Nino) experienced in the region during the months of June to August which resulted in short spell of haze episode.

In the southern region of the West Coast of Peninsular Malaysia (N.Sembilan, Melaka and Johor) the air quality was also between good to moderate most of the time, with the exception of few unhealthy days recorded in Port Dickson (3 days), Bukit Rambai (3 days) Bandaraya Melaka (6 days), Nilai (1 day), Muar (5 days) and Pasir Gudang (5 days). The pollutants of concerned were particulate matter (PM_{10}) and ground level ozone (O_3).

Figure 4.21: Air Quality Status, West Coast Peninsular Malaysia, 2009



Source: Malaysia Environmental Quality Report, 2009.

[1] Malaysian Environmental Quality Report, 2009

b) Current Air Quality

The ambient air sample is drawn using a High Volume Air Sampler (HVAS) The collected particles are brought back to the lab and analyzed using the gravimetric method. The sampling stations are preferably on open ground as to avoid dubious and bias readings. There is one parameter were used to represent the ambient air quality at the surrounding including Total Suspended Particulate (TSP). The descriptions of the air monitoring station and air quality result are shown in **Table 4.8** and **Figure 4.21** below;

High Volume Air Sampler (HVAS)

Table 4.8: Description of the Air Monitoring Stations

Station	Location	Co-ordinate	Sampling Date
A1	In front of International School Tenby, Setia Eco Garden	N 01°29.577' E 103°35.465'	31.10.2013 – 1.11.2013
A2	Setia Eco Garden Shop Lot Office	N 01°29.531' E 103°35.301'	
A3	Nusa Bayu Housing	N 103°29.163' E 103° 35.361'	

Source: Spectrum Laboratories (Johor) Sdn Bhd, 2013

Figure 4.21: Photo of Air Quality Monitoring

Source: Spectrum Laboratories (Johor) Sdn Bhd, 2013

Table 4.9: Recommended Malaysian Air Quality Guidelines-Ambient Standards (At 250 Celsius and 101.3 kpa)

Pollutant and Method	Averaging Time	Malaysia Guidelines	
		(ppm)	*(µg/m³)*
Ozone AS 2524	1 hour 8 hour	0.10 0.06	200 120
Carbon # Monoxide* AS 2695	1 hour 8 hour	30 9	35 10
Nitrogen Dioxide AS 2447	1 hour	0.17	320
Sulfur Dioxide AS 2523	10 minute 1 hour 24 hour	0.19 0.13 0.04	500 350 105

Pollutant and Method	Averaging Time	Malaysia Guidelines	
Particles TSP AS 2724.3	24 j hour 1 year	- -	260 90
PM 10 AS 2724.6	24 hour 1 year	- -	150 50
Lead AS 2800	3 month	-	1.5

Source: Environment Malaysia Yearbook 1996 (CETEC, ENSEARCH and AECCOM, 1996). * In mg/m³

Table 4.10: Air Quality Result

Parameter	Sampling Station			Malaysian Air Quality Guidelines
	A1	A2	A3	
TSP (µg /m³)	57	23	30	260 µg /m³

Source: Spectrum Laboratories (Johor) Sdn Bhd, 2013 (Refer Appendix K: Environmental Quality Sampling Result)

The air quality obtained is compared against the Malaysian Air Quality Guidelines. Based on the results, the ambient air quality at all stations is good (low) which ranging from **23 µg/m³ until 57 µg/m³** for all stations and within stipulated limit of Malaysian Air Quality Guidelines for 24 hours average period.

4.3.8 Noise Levels

Noise level is rather subjective because noise perceived by human ear is related to many factors including; the energy of the sound source (amplitude) the type of sound (frequency) and the level of background noise. For the purpose of this study, sampling stations has been selected. Various scales are used to measure sound levels, the most common being dB(A). The standards are normally based on land use and also the period of sampling (day or night). Please refer to **Table 4.11** on the noise standards used for comparison purposes.

Table 4.11: Ambient Noise Level Standard

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

Source: The Planning Guidelines for Environmental Noise Limits and Control, 2004 by DOE

Current Sampling Results

The noise levels were measured using a calibrated sound level meter Model: Lutron SL - 4001 (**Figure 4.22**). Several readings were recorded within an identified period at a constant interval to determine the average noise level of the surrounding area. The noise level measured indicates that urban areas produce higher noise as compare to less populated and less busy area. Please refer to **Table 4.12**.

Figure 4.22: Calibrated sound level meter Model: Lutron SL -4001

Source: Perunding UEP Sdn Bhd, 2013

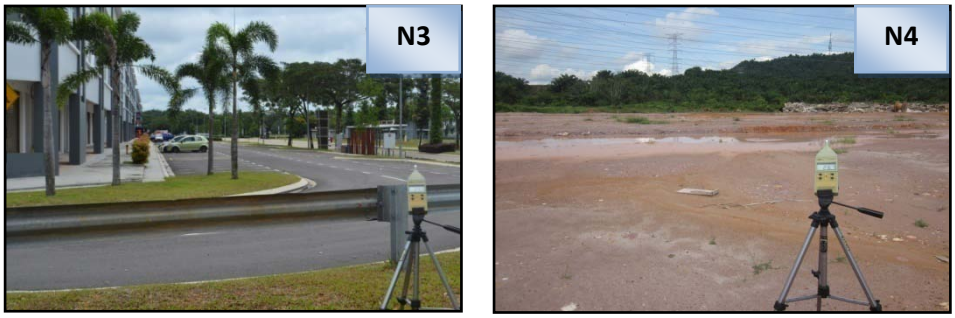
Table 4.12: Current Sampling Results

Station	Location	Coordinate (GPS)	Mean dB (A)
N1	In front of International School Tenby, Setia Eco Garden	N 01°29.577' E 103°35.465'	27.3
N2	Existing drain outside project boundary, beside Setia Eco Garden	N 01° 29.682' E 103° 35.591'	21.7
N3	Setia Eco Garden Shop Lot Office	N 01°29.531' E 103°35.301'	23.7
N4	Nusa Bayu Housing	N 103°29.163' E 103° 35.361'	35.0

Source: Perunding UEP Sdn Bhd, 2013

There are currently four (4) points scattered surrounding the proposed areas. Current noise reading is acceptable for urban area which range from **21.7 dB (A) to 35.0 dB (A)**. Overall, most station level of noise was within The Planning Guidelines for Environmental Noise Limits and Control, 2004 by DOE which below than 60dBA (daytime) and 50dBA (night time). Generally, the acoustic environment is considered good and within tolerable limit.

Figure 4.23: Photo of Noise Quality Sampling

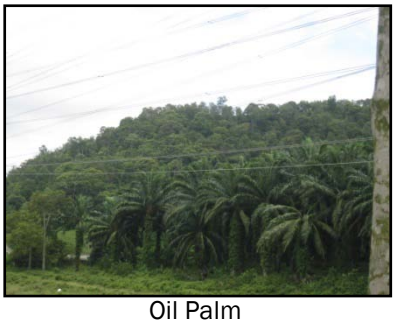


Source: Site Survey by Perunding UEP Sdn Bhd, 2013

4.4 BIOLOGICAL – ECOLOGICAL ENVIRONMENT

Existing land use of proposed site consists of oil palm plantation, shrub, bushes, secondary forest and including a part of Bukit Resam. All flora and fauna findings were recorded during site visit and environmental sampling and common for habitat in oil palm and bushes such as shrub, squirrels, insects and others.

Figure 4.24: Flora and Fauna Recorded at Proposed Site



Oil Palm

Bushes, shrub

Bukit Resam

Centipede

Squirrels

Source: Perunding UEP Sdn Bhd, 2013 and google, 2013.

4.5 SOCIO-ECONOMIC/HUMAN ENVIRONMENT

4.5.1 Demographic Profile

a) Population

Generally, there are potentially **1,334,188** population stays in Johor Bahru during 2010 based on the table below, where the majority of them located in Plentong (494,152) and the second highest is Pulai with 360,642 population. It will significantly contribute positively in creating job and business opportunities for those who live, and work near to the proposed site in future.

Figure 4.25: Total Population by Ethnic group, Mukim dan State Malaysia, 2010 – Johor Bahru (Pulai)

Daerah Pentadbiran/ Mukim *Administrative District/ Mukim*	Jumlah *Total*	Warganegara Malaysia *Malaysian citizens*							Bukan Warganegara Malaysia *Non-Malaysian citizens*
		Jumlah *Total*	Bumiputera			Cina *Chinese*	India *Indians*	Lain-lain *Others*	
			Jumlah *Total*	Melayu *Malay*	Bumiputera Lain *Other Bumiputera*				
JOHOR BAHRU	**1,334,188**	**1,218,496**	**634,153**	**603,800**	**30,353**	**456,112**	**120,683**	**7,548**	**115,692**
Bandar Johor Bahru	124,096	112,942	73,073	72,028	1,045	30,982	8,157	730	11,154
Jelutong	14,651	12,776	9,962	9,571	391	1,929	835	50	1,875
Plentong	494,152	446,285	267,040	248,270	18,770	143,234	32,727	3,284	47,867
Pulai	360,642	337,402	125,749	119,664	6,085	159,947	50,082	1,624	23,240
Sungai Tiram	13,348	11,194	10,152	9,900	252	191	408	443	2,154
Tanjung Kupang	10,972	9,629	8,850	8,434	416	666	88	25	1,343
Tebrau	316,327	288,268	139,327	135,933	3,394	119,163	28,386	1,392	28,059

Source: Jabatan Perangkaan Johor, 2010. **(Refer Appendix L)**

This development shall certainly bear many positive implications towards the betterment of the local economy, increasing their income and provide more. In summary, this project will not result only on negative impact but will offer positive long term impacts to the mixed development.

b) Economic and Employment Profile

<u>Johor</u>

In 2008, Johor's economy grew in line with Malaysia's economic development. Johor's GDP Growth was 5.2%. The manufacturing sector faced tribulations and several sectors had shown sluggish performance due to a drop in export and weak local markets related to the slow development of the construction sector. The services sector saved Johor's economy. This sector showed continuous growth at an average of 8% as a result of an increase in the transportation sector.

Table 4.13: GDP's Performance and Yearly Growth for Johor

GDP's Performance and Yearly Growth for Johor				
Sector	**2007**	**2008**	**2009**	**2010**
Agriculture, Forestry & Fishery	8.9%	8.8%	9.2%	11.1%
Rocks & Minerals	0.1%	0.1%	0.1%	0.1%
Manufacturing	37.4%	40.7%	39.5%	31.5%
Construction	2.9%	2.9%	3.1%	3.3%
Services	48.1%	47.4%	48.0%	52.1%
Annual Growth Rate	6.1%	6.7%	5.2%	7.3%

Source: Johor Economy Report, Johor State Investment Center, JSIC. **(Refer Appendix L)**

Johor Bahru

The proposed development is located within Mukim Pulai and adjacent to Setia Eco Garden and Nusa Bayu area. Overall in Johor Bahru, the total of investment in approved manufacturing project is approximately RM1, 044,235,123, including domestic and foreign from the total investment in Johor (RM5, 535,804,961). The number of employment for the approved manufacturing project in Johor Bahru is approximately 3,158.

Table 4.14: Approved Manufacturing Projects in Johor by Location, January - December 2012

APPROVED MANUFACTURING PROJECTS IN JOHOR BY LOCATION, JANUARY - DECEMBER 2012					
Location	#	Employment	Domestic Investment (RM)	Foreign Investment (RM)	Total Investment (RM)
Bandar Tenggara Ph I IE	1	5	798,142	0	798,142
Batu Pahat	8	548	83,448,409	0	83,448,409
Gelang Patah	5	345	0	329,177,276	329,177,276
Johor Bahru	15	3,158	18,214,675	1,026,020,448	1,044,235,123
Kluang	5	201	28,958,355	135,379,575	164,337,930
Kota Tinggi	2	191	4,600,000	135,000,000	139,600,000
Kulaijaya	5	809	50,459,726	47,133,328	97,593,054
Masai	2	45	0	33,800,000	33,800,000
Muar	33	3,398	141,691,508	0	141,691,508
Others	24	2,705	34,806,314	525,078,898	559,885,212
Pagoh IE	1	116	8,500,000	0	8,500,000
Pasir Gudang IE	10	335	52,992,147	502,427,437	555,419,584
Pasir Gudang II (Tanjong Langsat)	7	489	205,540,002	509,699,998	796,240,000
Pasir Gudang Tambahan	5	658	433,313,421	113,411,535	546,724,956
Plentong	2	1,275	0	19,295,000	19,295,000
Pontian	1	83	23,405,175	975,216	24,380,391
Pontian IE	2	76	86,348	8,548,428	8,634,776
Segamat	4	176	40,006,020	12,648,000	52,654,020
Skudai	1	12	486,000	324,000	810,000
Senai I IE	3	113	0	21,214,500	21,214,500
Senai II	7	1,081	39,228,587	81,510,586	120,739,173
Senai III IE	11	1,392	36,226,949	146,491,813	182,718,762
Simpang Renggam	1	29	5,121,200	778,800	5,900,000
Sri Gading IE	3	2,647	77,218,577	16,627,400	93,845,977
Tampoi	3	664	3,561,600	70,550,000	74,111,600
Tampoi IE	2	842	6,600,000	124,579,415	131,179,415
Tangkak	1	85	6,624,840	0	6,624,840
Tebrau	2	87	7,290,494	6,517,259	13,807,753
Tebrau I IE	6	1,361	14,400,000	183,784,583	198,184,583
Tebrau II Ph I IE	2	51	9,594,135	10,553,182	20,147,317
Tongkang Pechah IE	1	35	6,000,000	0	6,000,000
Ulu Tiram	8	629	33,197,403	9,942,926	43,140,329
Yong Peng	1	78	10,887,477	77,854	10,965,331
Total	**184**	**23,719**	**1,383,257,504**	**4,152,547,457**	**5,535,804,961**

Source: Johor Economy Report, Johor State Investment Centre, JSIC, 2013