CHAPTER 6
EXISTING ENVIRONMENT

6.1 PRELIMINARY

This chapter describes the existing environment in the vicinity of the proposed project SCaRF site, within the 5 km zone of impact (ZOI) as shown in Figure 6.1(1). The description is based on primary data collected by the consultants during the study period and complemented by data from various studies carried out in the vicinity of the proposed project site and as well as published sources. The existing environment of the proposed Project site shall be described according to three sub-chapters which are:

a) Physical Environment, comprising:

1) Topography;
2) Geology and soil condition;
3) Land use;
4) Hydrology;
5) Surface water quality;
6) Climate and air quality;
7) Noise level;

b) Biological Environment, comprising:

1) Flora
2) Fauna
3) Fish life

c) Human Environment, comprising:

1) Socioeconomic status
2) Public health
3) Traffic
4) Waste management

The site location and the surrounding areas as shown by the stipulated 5km Zone of Impacts (ZOI) is as given in Figure 6.1(1) and 6.1(2). The proposed plant is located next to the well known LYNAS plant, with the Kuantan Port about 6km to the south-east of it and the East Coast highway to the west of it; thus it is in a very accessible location.

Location in Semenanjung and in Pahang

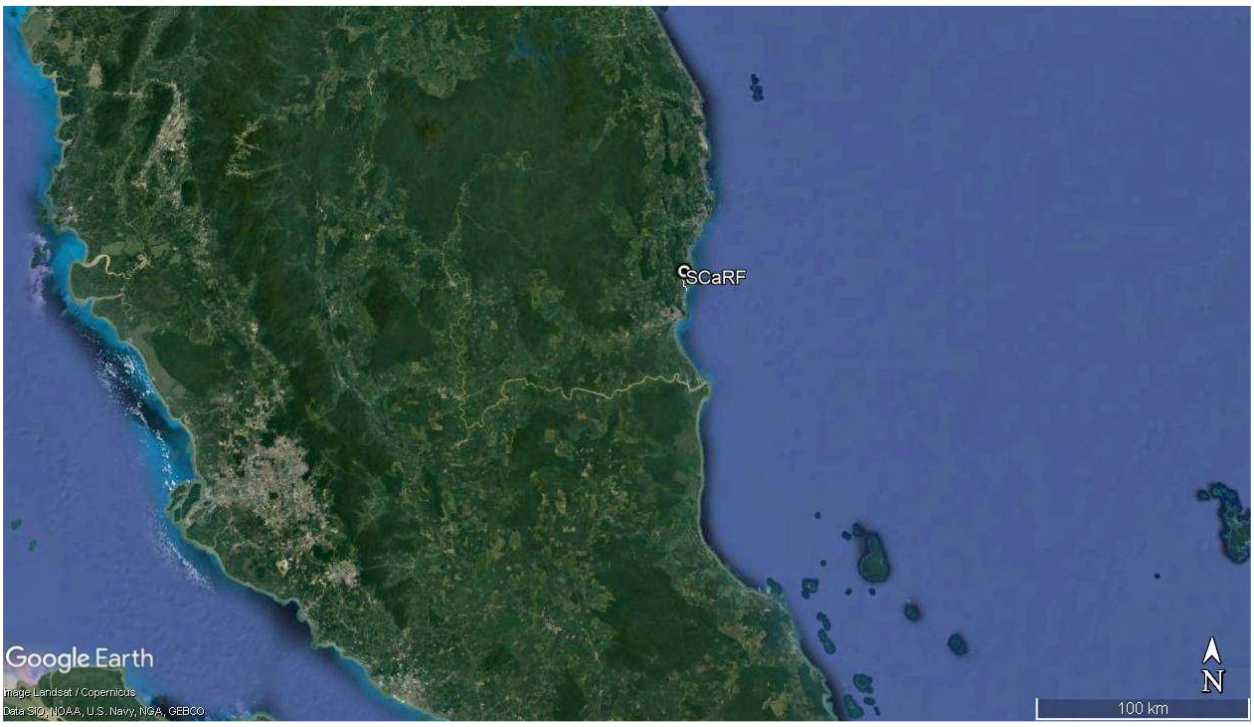


Figure 6.1(1): Location of Gebeng Industrial Estate (GIE)

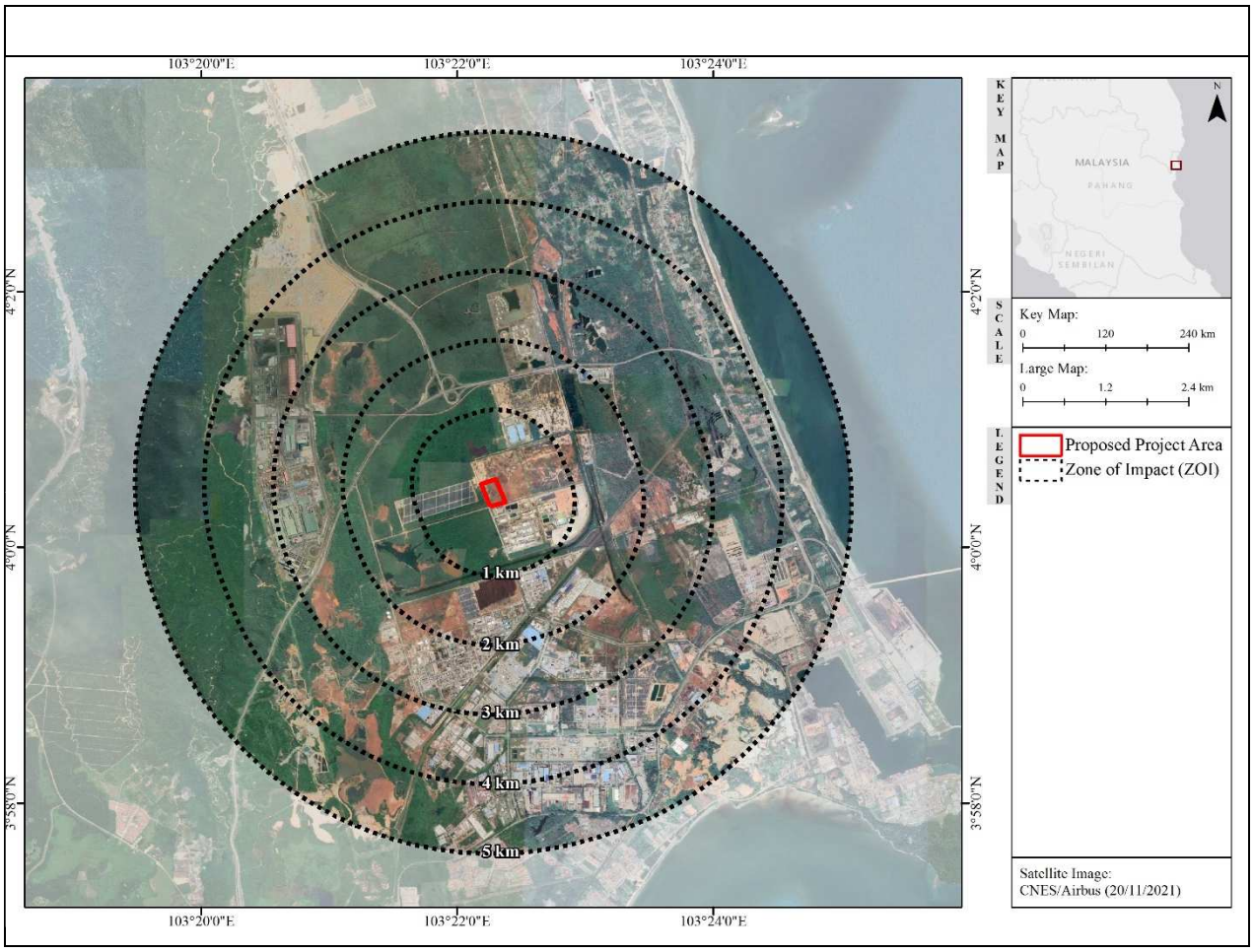


Figure 6.1(2) Location of proposed SCaRF in Gebeng Industrial Estate (GIE) and its 5km ZOI

6.2 TOPOGRAPHY AND LANDUSE

6.2.1 Topography

Topography of an area is closely related to, if not determines, its landuse. The easier to build areas, which are the flat areas, tend to be occupied first, notably for human habitation. The Baluk and Cherating coasts next to Gebeng started as fishermen's villages that stretch along the peninsular east coast strip from southern Thailand to Mersing in Johore, with the people speaking similar dialect. Just inland from the coast is the Gebeng area, which is a generally flat area, as it is geologically an alluvial plain, being of the Simpang and Beruas formations (see Section 6.3). Most of Kuantan District (75.19% of its land size) is categorised as "lowland" (elevation of less than 150 m). It covers a lowland area in the east that extends as far as the coast of the South China Sea. This area includes beaches at the north beginning from

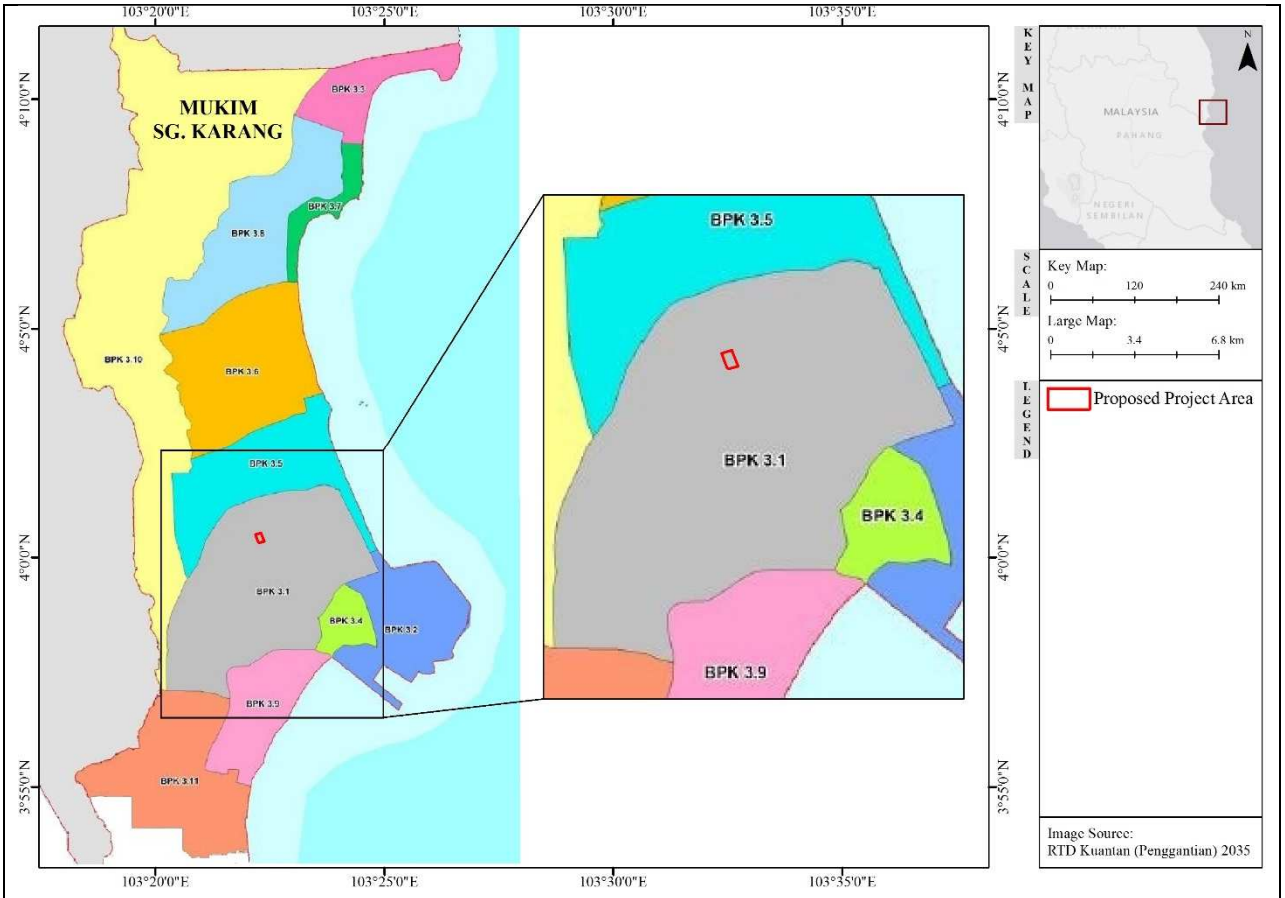
the border with the state of Terengganu, and comprises Cherating, Sungai Karang, Beserah, Kuala Kuantan and onwards to Penur. Meanwhile, the "highland" category area with an elevation exceeding 300 m covers only 13.16 % of its land area (*Rancangan Tempatan Daerah Kuantan 2035 (Penggantian)*). The Gebeng industrial estate (GIE) is located within the low-lying and predominantly swampy Sg. Baluk catchment area. It was filled to construct the platform for the GIE with an average land elevation of 7m above mean sea level (MSL). The highest peak within 5 km of the Project site is located southeast of the Project site with the elevation of 197 m, namely Bukit Pengorak.

6.2.2 Landuse

The administration of this area falls under the jurisdiction of Kuantan City Council (MBK). The main land use pattern within 5 km from the study area comprises of Vacant Land, Forest and Industries.The planning for land use within the study area is covered under the *Rancangan Tempatan Daerah Kuantan 2035 (Penggantian)* and *Rancangan Struktur Negeri Pahang 2050*. Areas in these Local Plans have been divided into planning control areas known as "Planning Blocks" (BP). Further subdivisions of the Planning Blocks are named as "Sub-Planning Blocks" or *Blok Perancangan Kecil* (BPK). The proposed Project area is located in BPK 3.1 Gebeng of BP3-Sungai Karang, which has 11 sub-planning blocks. The BPKs and thus the surrounding landuse, are shown in Table 6.2(1), with their locations shown in Figure 6.3(1).

Table 6.2(1) Sub-planning blocks or BPKs in BP 3: Sungai Karang

BPK 3.1	Gebeng		BPK 3.7	Cerating—Pantai Kg. Kubang Ikan
BPK 3.2	Pelabuhan Kuantan		BPK 3.8	Kg. Air Hitam – Kg. Padang Lalang
BPK 3.3	Cendur		BPK 3.9	Baluk—Cengal Lempung
BPK 3.4	Kampung Selamat		BPK 3.10	Hutan Simpan Kekal Baluk
BPK 3.5	Sungai Ular		BPK3.11	Aspa Cottage—Kg. Sg. Karang Darat
BPK 3.6	Baging			
Source: *Rancangan Tempatan Daerah Kuantan 2035 (Penggantian)*				



Source: *Rancangan Tempatan Daerah Kuantan 2035 (Penggantian)*

Figure 6.2(1) Sub-Planning Blocks (BPK) and BPK 3.1 Gebeng of the BP 3: Sungai Karang

The lot for the proposed SCaRF plant is within the Gebeng Industrial Estate (GIE), one of the five main industrial areas gazetted in the Kuantan district. Other areas that have been gazetted as industrial areas are Tanjung Gelang Industrial area and Kuantan Port, Semambu Industrial area, Indera Mahkota Industrial area and Prima Kota Industrial area in Kuantan City. The trend of industrial development for heavy industries is more concentrated in the GIE where the proposed SCaRF plant is to be built. Landuse within the study area is as shown in Figure 6.2(2), showing the main land use type is Vacant Land, of which most are located at the west, north and east of the study area.

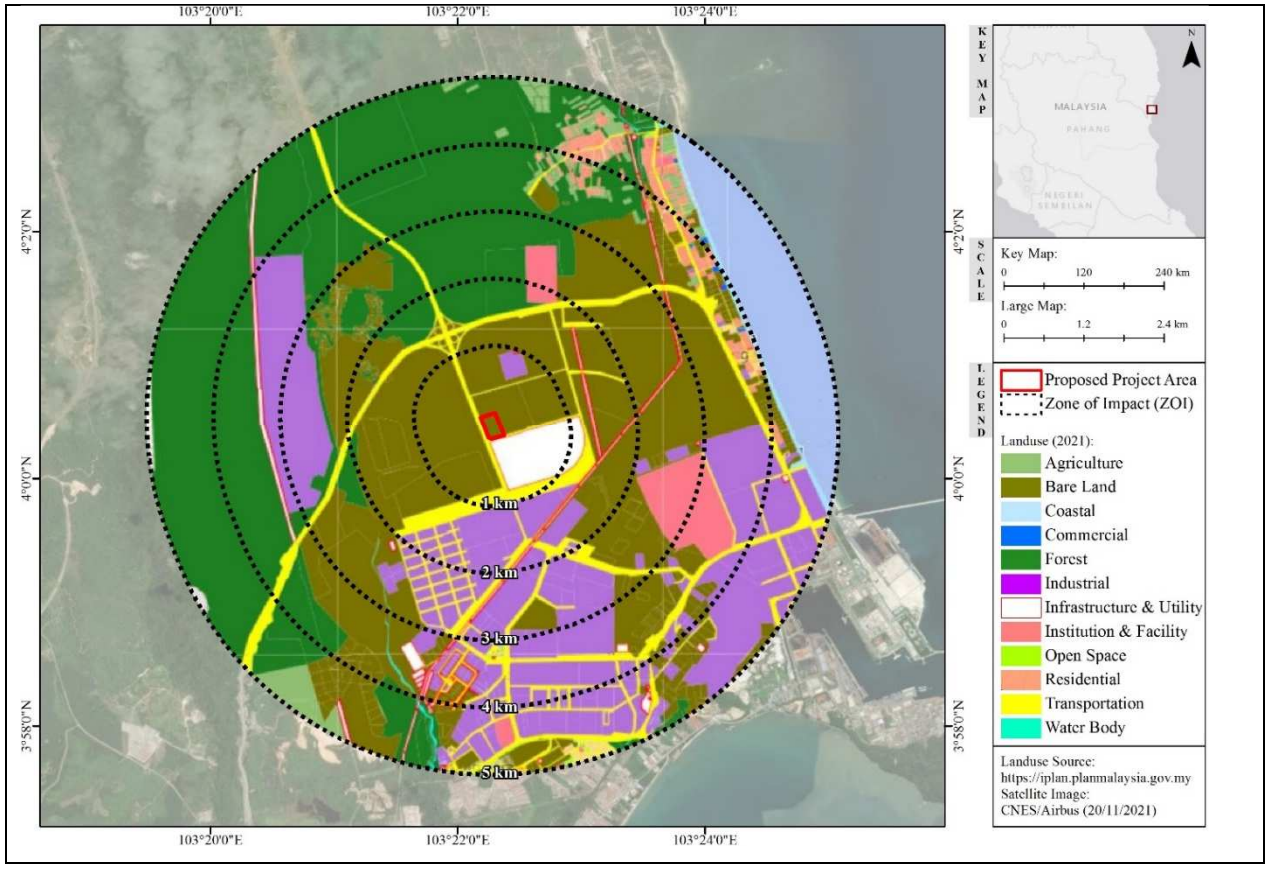


Figure 6.2(2) Landuse within the study area

As can be seen in Figure 6.3(2) there is still substantial area of bare land (khaki colour) north of the existing industrial areas (purple colour); most of the vacant lands are intended as industrial activities for future development. These will add on to the list of industries already present in GIE as listed in Table 6.2(2), showing 32 major plants.

Table 6.2(2) List of major industries already present in GIE

	LOCATION	LATITUDE	LONGITUDE
1.	Lynas Malaysia Sdn. Bhd	4° 00' 14"	103° 22' 19"
2.	ICP Kuantan Factory	4° 01' 22"	103° 22' 59"
3.	Hap Seng Clay Products Sdn. Bhd.	4° 00' 08"	103° 23' 30"
4.	Petrosystems Sdn. Bhd.	3° 59' 25"	103° 22' 59"
5.	CSWIND Malaysia Sdn. Bhd.	3° 59' 27"	103° 22' 45"
6.	PETRONAS Emergency Response Centre (ERC)	3° 59' 30"	103° 22' 31"
7.	PETRONAS Gas Berhad Utilities Gebeng	3° 59' 23"	103° 22' 22"
8.	RE Gebeng Sdn. Bhd.	4° 00' 10"	103° 21' 35"
9.	Polyplastics Sdn. Bhd.	3° 59' 52"	103° 22' 38"
10.	Wasco Coatings Malaysia Sdn. Bhd.	3° 59' 43"	103° 24' 26"
11.	VEGA Precision Technology (Malaysia) Sdn. Bhd.	3° 59' 18"	103° 23' 44"
12.	Nice Rika Biotechnologies Sdn. Bhd.	3° 59' 16"	103° 23' 29"
13.	Tiong Nam Warehouse	3° 59' 11"	103° 23' 50"
14.	Kanon Loading Equipment (M) Sdn. Bhd.	3° 59' 9"	103° 23' 44"
15.	Eastman Chemical (Malaysia) Sdn. Bhd.	3° 58' 59"	103° 22' 59"
16.	D'Camel Warehouse	3° 59' 14"	103° 22' 41"
17.	Kaneka EPERAN Sdn. Bhd.	3° 58' 57"	103° 22' 25"
18.	BUCIDA Engineering & Consultancy Sdn. Bhd.	3° 59' 24"	103° 21' 30"
19.	Wilmar Kuantan Edible Oils Sdn. Bhd.	3° 58' 32"	103° 23' 30"
20.	South Pacific Chemical Industries Sdn. Bhd.	3° 58' 32"	103° 23' 20"
21.	RP Chemicals Malaysia Sdn. Bhd.	3° 58' 35"	103° 23' 11"
22.	PETRONAS Chemicals MTBE Sdn. Bhd.	3° 58' 31"	103° 22' 57"
23.	W R Grace Specialty Chemicals (Msia) Sdn. Bhd.	3° 58' 36"	103° 22' 33"
24.	UPC Chemicals (M) Sdn. Bhd.	3° 58' 45"	103° 21' 52"
25.	BASF PETRONAS Chemicals Sdn. Bhd.	3° 58' 53"	103° 21' 45"
26.	Malaysia-China Kuantan Industrial Park (MCKIP)	3° 59' 50"	103° 20' 53"
27.	Alliance Steel (M) Sdn. Bhd.	4° 00' 01"	103° 20' 58"
28.	Asturi Metal Builders (M) Sdn. Bhd.	3° 58' 14"	103° 23' 27"
29.	Mieco Manufacturing Sdn. Bhd.	3° 58' 09"	103° 23' 19"
30.	Institut Latihan Perindustrian Kuantan	3° 57' 56"	103° 22' 26"
31.	Urban Environment Industries Sdn. Bhd.	3° 57' 57"	103° 22' 12"
32.	East Coast Manufacturing Sdn. Bhd.	3° 57' 47"	103° 21' 55"

The zoning of future land use was gazetted through the *Rancangan Tempatan Daerah Kuantan 2035 (Penggantian).* The zoning has planned most of the now vacant areas in **Figure 6.2(2)** for industries, as shown in **Figure 6.2(3).** Thus, the areas to the north of the proposed project site will be for future industries. This means that effluent discharges from these industries, if going to Sg. Baluk, will be downstream of the discharge from the proposed SCaRF site; i.e. enlargement of the river flow as well as potential impacts to it would be more downstream towards the river mouth, where the flow is much larger and the river is thus more resilient to any change.

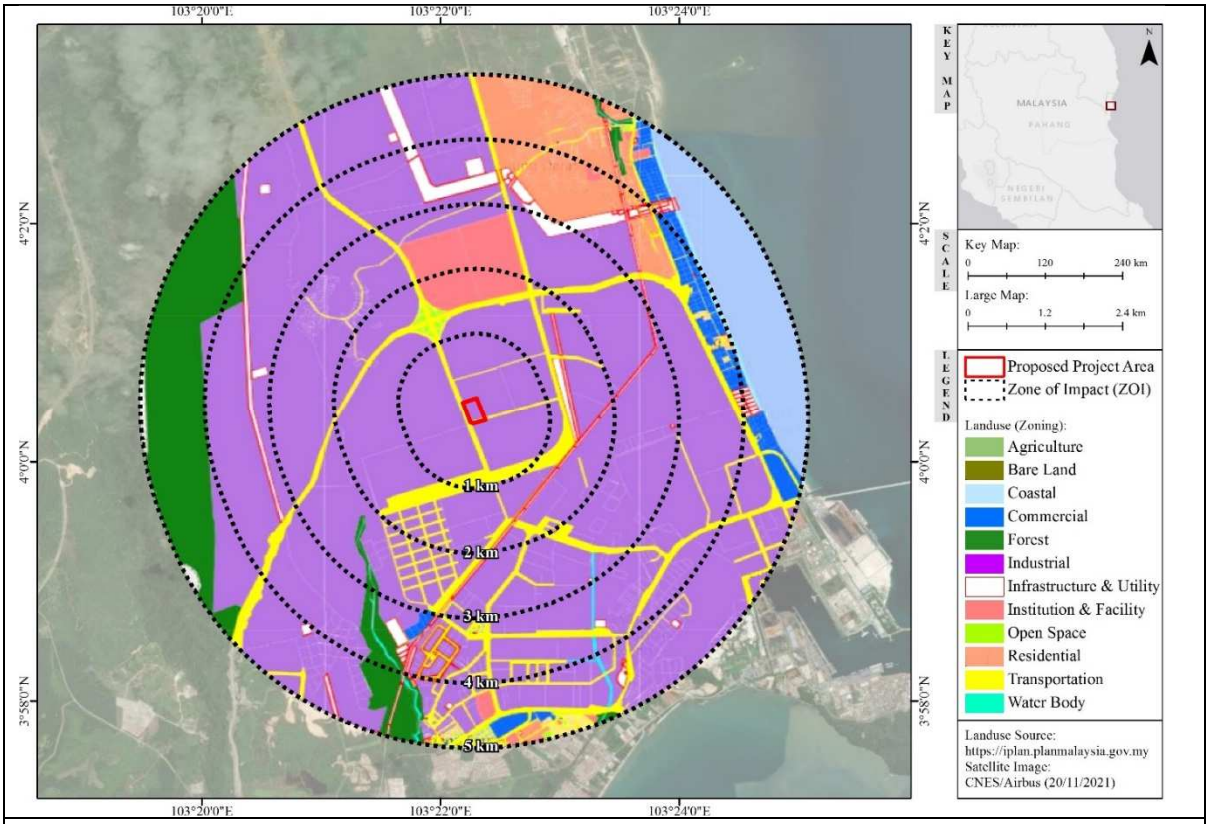


Figure 6.2(3) Zoning plan for Landuse in GIE
Source: Rancangan Tempatan Daerah Kuantan 2035 (Penggantian)

With presence of workers for the industries, there arises need for public and commercial facilities, such as housing, police station, mosque, clinic, schools, shops, hotels, and service businesses, such as car service shops, laundries, clinics, etc. Growth of the GIE has similarly led to growth of several townships, such as Baluk Makmur,

Baluk Baru, Baluk Perdana, etc. Among the major facilities serving the GIE are listed in **Table 6.2(3)**. The oldest township is the Baluk Makmur, with the facilities as shown below in **Figure 6.2(4).**

The landuse in Gebeng is expected to be quite dynamic, especially with the expected rapid developments in Gebeng. Two of them, slated to start operation in 2026 are the Kuantan International Airport (KIA) and its metropolis in Gebeng and the ECRL station at Kuantan Port (**Figure 6.2(5)**) with the connection of the two expected to greatly enhance throughput via the Kuantan Port.

Table 6.2(3) List of major facilities already present in GIE

LOCATION	LATITUDE	LONGITUDE
Akademi Maritim Sultan Ahmad Shah (AMSAS)	4° 01' 34"	103° 22' 32"
Surau Kampung Gebeng	4° 00' 45"	103° 24' 24"
Sekolah Kebangsaan Sungai Ular	4° 02' 32"	103° 23' 42"
Masjid Sungai Ular	4° 02' 38"	103° 23' 38"
Pondok Polis Kawasan Perindustrian Gebeng	3° 58' 36"	103° 22' 19"
Masjid Balok Makmur	3° 57' 48"	103° 23' 01"
Institut Latihan Perindustrian Kuantan	3° 57' 56"	103° 22' 26"
Dewan Orang Ramai Kampung Sungai Ular	4° 02' 32"	103° 23' 37"
Klinik Desa Sungai Ular	4° 02' 42"	103° 23' 37"

 Housing in Baluk Makmur	 Housing in Baluk Makmur	 Rooms in Baluk Makmur
 Sekolah Kebangsaan Balok Makmur	 Masjid Kg Baluk Makmur	 Kids Nursery, Baluk Makmur
 Petrol Station in Baluk Makmur	 Eating shop in Baluk Makmur	 Clinic in Baluk Makmur

Figure 6.2(4) Facilities in GIE at Baluk Makmur

KIA and its metropolis

ECRL station at Kuantan Port

Figure 6.2(5) Among near future developments in Gebeng

6.2.3 Conclusion on Topography and Landuse

The Gebeng Industrial Estate (GIE) and thus the proposed SCaRF plot lies on a flat alluvial plain, the level of which has been raised to prevent flood and make the land suitable for industrial activities. In the GIE is located the heavy industries of Pahang. The growth of the GIE has led to demands for housing and services, with almost all typical township services now available in townships such as Baluk Makmur. For the establishment of SCaRF, there should be sufficient housing and facilities in the surrounding townships to cater to workers during construction and operation. The zoning plan for the Gebeng area will see more industries coming to the area, most of it to the west, north and east of the proposed SCaRF site, especially with the coming into operation in 2026 of the Kuantan International Airport and the Kuantan Port ECRL station.

6.3 GEOLOGY AND SOIL

6.3.1 Geology at SCaRF Proposed Site

The proposed project site and its surroundings are in areas underlain by Quaternary geological formation with alluvial layer, consisting of peat, humic clay and silts of the Beruas and Simpang Formations (Geological Map of Peninsular Malaysia, 8th Edition 1985, Geological Survey Department of Malaysia (publisher)) as shown in **Figure 6.3(1)**. The geological formations are listed below; showing that both are alluvial deposits.

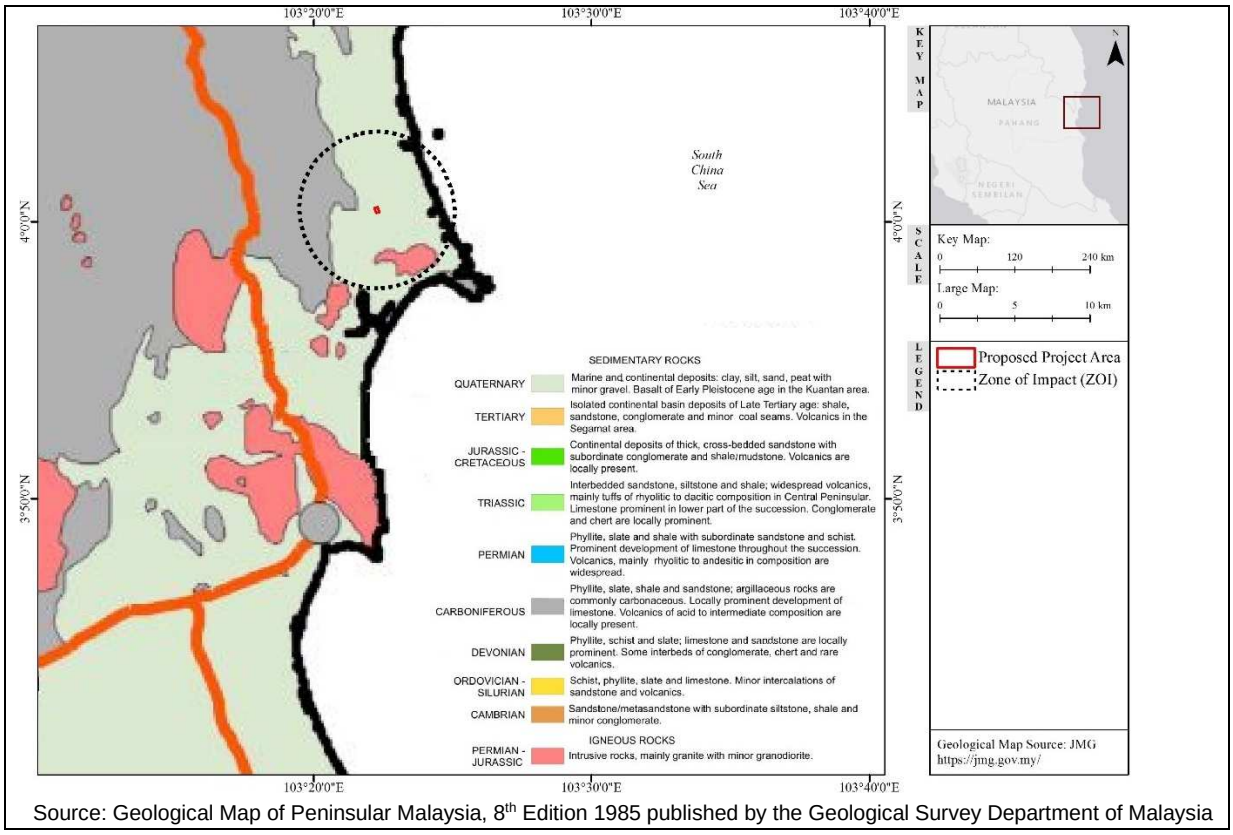
Simpang Formation

The Simpang Formation is the main formation consists mainly of quaternary alluviums with a mixture of weathered rocks. The lithology of the Simpang Formation is made up of gravel, sand, clay, silt and peat.

Beruas Formation

The Beruas Formation constitutes sand, gravel, clay, silt and occasionally peat accumulated or deposited in terrestrial environment by fluvial processes during the Holocene period.

Both being alluvial deposits, hard rocks hindering constructions are not expected.



Source: Geological Map of Peninsular Malaysia, 8th Edition 1985 published by the Geological Survey Department of Malaysia

Figure 6.3(1) Regional geological map and geology at proposed site

The geology of the Project area would not change with the implementation of earthworks and construction works for the proposed project, and as the construction would not involve trenching or topping, it would not alter the existing flat terrain of the area. The hydrogeology of the area would only probably change if groundwater is abstracted in large quantities, which might lead to ground subsidence. No groundwater abstraction is expected, as there are many primary water sources around the site and potential secondary water source linked to the proposed project.

6.3.2 Soil at SCaRF Proposed Site

a) Preliminary

This section assesses the existing soil at the proposed site and estimate the erosion soil loss from the site. The conditions of the site are summarized below:

Topography The project site is a barren flat land scarcely covered with secondary vegetation i.e., trees, bushes, and scrubs.

Elevation The land surface within the project is flat and there is no slope. The elevation of this project site varies between 7.1m to 8.8m from M.S.L .

Soil Based on the Soil Reconnaissance Map of peninsular Malaysia, 2002, published by Jabatan Pertanian Malaysia, the soil series within the project site was previously peat. However, the project site has been graded to platform level with earth material (sandy loam).

Hydrology The surface run-off of the project site shall flow into the existing earth drain within the Gebeng Industrial Estate (GIE) before eventually flowing into Sg. Baluk.

b) Estimation of the Soil Erosion Potential for Existing Conditions

The purpose of the soil loss equation is to predict soil loss due to soil erosion processes and to provide a guide in conservation planning on a farm basis. The equation enables the planner to predict the average rate of soil erosion for each of the various combinations of crop system, management techniques and conservation practices on any area. The Universal Soil Loss Equation (USLE) was developed from erosion plot and rainfall simulator experiments. The USLE is composed of six factors to predict the long-term average annual soil loss (A). The equation takes the simple product form:

$$A = R \times K \times LS \times C \times P$$

Where;

A = average annual soil loss in the project area

R = rainfall erosivity index

K = soil erodibility factor

LS = topographic factor, L for slope length and S for slope steepness

C = a cropping-management factor

P = conservation practice factor

Therefore, USLE equation which follows the Urban Storm Water Management (MSMA) and Department of Agriculture Malaysia (DOA) guidelines is used to estimate the value of an average annual soil loss of the project area. The unit of the average annual soil loss (A) is in ton/hectare/year. The Department of Agriculture Malaysia classified the soil loss into 5 categories as follows **(Table 6.3(1)):**

Table 6.3(1): Classification of Soil Loss

Soil Loss (ton/ha/yr)	Classification
<10	Low
10 - 50	Moderate
50 -100	Moderate High
100 - 150	High
>150	Very High

Source: Erosion Risk Map Peninsular Malaysia, Department of Agriculture

For this study, the catchment area is:

Table 6.1(2): Demarcation of Catchment Areas		
Catchment	**Area (ha)**	**Description**
C1	8.1	Catchment Area 1
Total	8.1	

Potential soil loss was calculated using the USLE method. **Table 6.3(3)** shows the estimation of the soil erosion potential for existing condition. The USLE calculation sheet can be referred in **Appendix 3.** The project site is a disturbed area where it was graded to platform level. The overgrown secondary vegetation at site contributed to reducing the erosion of the barren soil. The existing erosion risk at site is categorized as moderate (**Table 6.3(3)**).

Table 6.3(3): Estimation of Soil Loss during Existing Condition (Before Development)

EXISTING CONDITION		
Catchment	**A (t/ha/year)**	**Risk Category**
C1	38.89	Moderate

Source: Consultant's Calculation

6.3.3 Conclusion on Geology and Soil

The proposed project site is geologically stable, comprising of the Simpang and Beruas formations. Only groundwater extraction could jeopardise the underlying rock stability; however, such extraction is not expected here as the surrounding areas have many water bodies and the site has a potential secondary water source. The soil is originally peat, but has since, in 2011, been topped with loamy soil; and soil loss for existing condition has been calculated to be in "moderate" category.

6.4 DRAINAGE AND FLOOD

6.4.1 Drainage Catchment

The proposed project site faces an earth drain that joins Sg. Baluk, thus is situated within the Sg. Baluk catchment. This catchment has two main rivers flowing through, namely Sg. Baluk and Sg. Tunggak, that joins Sg. Baluk almost at the coastal area, as shown in **Figure 6.4(1)**. Sg. Baluk serves the western part of Sg. Baluk catchment area, and is approximately 10 km long and several metres wide at its middle section widening to about 10m downstream; thus it is a short but moderately large downstream. This river flows about 2.5 km west of the Project site, where the drain from the site **Figure 6.4(2)(i)** joins the river just downstream of the section shown in **Figure 6.4(2)(ii).** Sg. Baluk originates as Sg. Bukit Panjang from the hilly areas northwest of the GIE and flows in the southerly direction to confluence with the tributary, Sg. Tunggak in the south. Sungai Baluk flows in a southerly direction and eventually discharges into the South China Sea. There is no impoundment or river water intake point (WIP) for potable water supply within the catchments of Sungai Baluk; thus, any discharge from any industrial plant within this catchment has to, at the minimum, comply to the Standard B of the Environmental Quality (Industrial Effluent) Regulation 2009 or the EQ(IE)R2009.

Being a short river that discharges to the South China Sea, any large flow due to heavy rain can be expected to rapidly flow out to the sea if the drainage in the occupied areas are well designed; this has been proven true as no major flood has occurred in the GIE since the platform was lifted and drainage improved in 2011 (see Section 6.4.2 below).

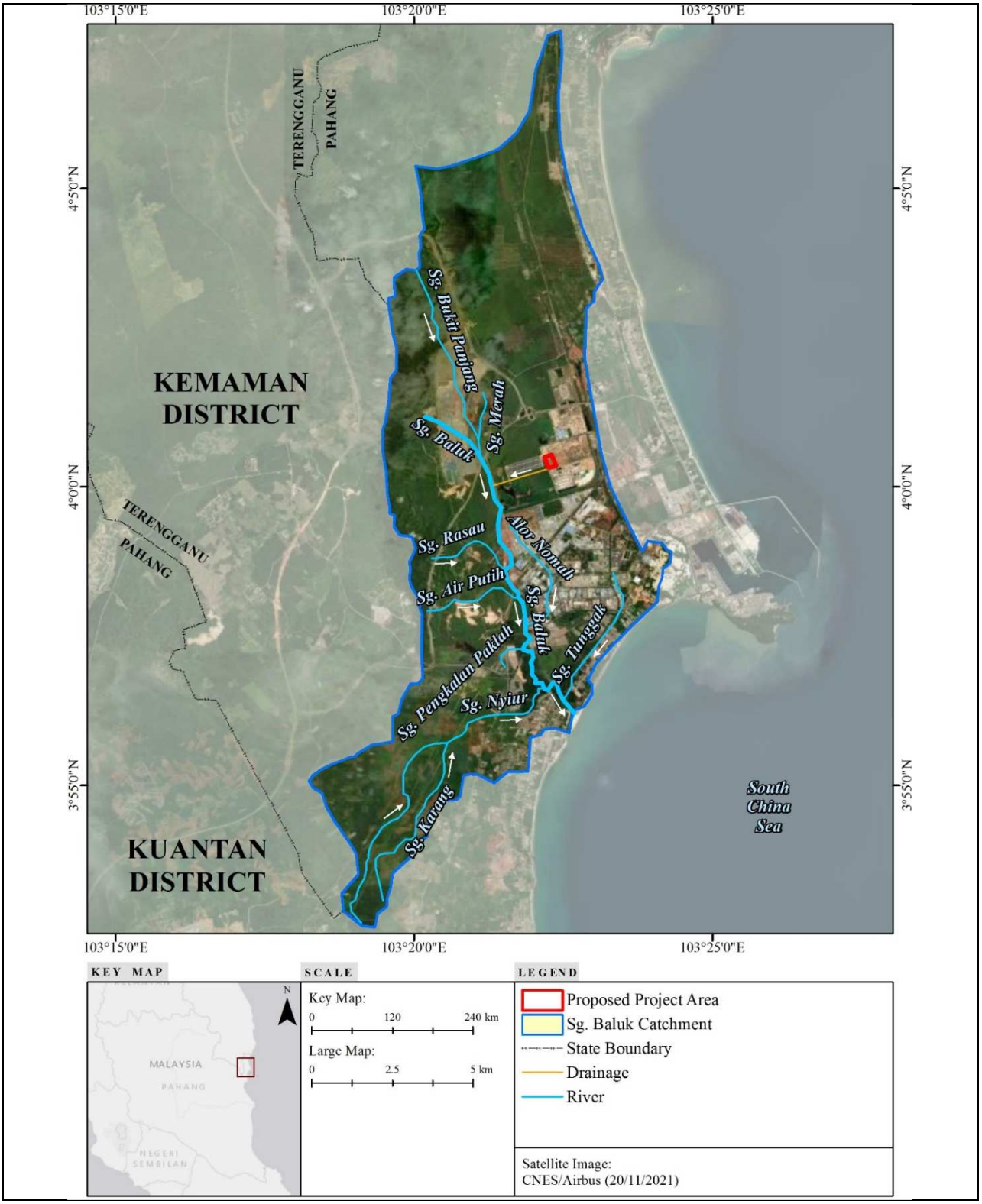


Figure 6.4(1) shows the Sg. Baluk catchment area

i) Drain in front of proposed site draining into Sg. Baluk

ii) Sg. Baluk upper river

iii) Sg. Baluk upper middle river

iv) Sg. Baluk lower middle river

Figure 6.4(2) Pictures of Sungai Baluk

6.4.2 Flood events and potential

Although the Sg. Baluk catchment is small and it drains to the South China Sea, it is low lying and in the past (before the industrial areas were filled to lift the platform and drainage improved) had experienced flood, when there was extremely heavy rainfall. Among the reported flood events over the past two decades are:

1) Floods during the monsoon period, on 6 December and 30 December 2010; it was reported by an online newspaper *MStar* as due to a severe monsoon event in Sungai Karang Darat. Nevertheles, the Lynas site (LAMP) located next to this proposed

Project site was not affected by those events. The DID report on "Updating of Condition of Flooding and Flood Damage Assessment in Malaysia (UCFFDA)" (DID, 2012) mentioned this as the worst flood event within the Sg. Baluk catchment, based on the 10-year historical records by DID, and that the 2010 flood, which had affected Sungai Karang Darat, was a 100 year ARI return period event. The flood depth recorded was around 0.5 to 1.1 m.

2) On 14 July 2021, however, *Sinar Harian* reported that a flash flood event had occurred at Jalan Gebeng – Bypass of Sungai Ular locality northeast of the proposed Project site near to MCKIP, and this had temporarily disrupted local traffic. This event was reported to be probably due to poor drainage, when subjected to sudden heavy convectional rain (as it was not during monsoon season).

Flash floods had also occasionally occurred due to poor drainage, but not where the platforms had been raised for industrial lots and according to the DID Annual Flood Report, there was no flooding near or around the proposed Project site, where the land in this area had been converted to industrial lots, where the platform had been raised in 2011 to about 8.4m above MSL and straight earth drains draining to Sg. Balok (as is at the proposed site) had been constructed. As the 2010 flood was a 100 year ARI return period event and the flood depth was 0.5 to 1.1m., it may be concluded that flooding at the proposed site is highly unlikely.

6.4.3 Conclusion on Drainage and Flood

Sg. Baluk is about 10km long and without any potable water intake point (WIP) on it. Being a short river that discharges to the South China Sea, any large flow due to heavy rain can be expected to rapidly flow out to the sea if the drainage in the occupied areas is well designed. The platform for the industrial lots of Gebeng has been raised in 2011 since the monsoon flood experienced in 2010. Ever since then no flood had occurred on the raised industrial lots. Thus, it may be concluded that flooding at the proposed site is highly unlikely since the platform was raised and drainage improved in 2011, and will remain so provided the drainage is well maintained.

6.5 WATER QUALITY

6.5.1 Preliminary

Sg. Baluk flows about 2.5km to the west of the proposed project site (the site), and an earth drain flows from the site to Sg. Baluk as shown in **Figure 6.4(2)(i)**. The river is about 10km long, meandering through the almost flat basin and widens near the estuary where its estuary becomes a fairly popular angling spot. At the estuary the banks are covered by nipah palms. Some pictures of the river are shown in **Figure 6.4(2) above**; it is a typical lowland river with grassy banks, that widens as it nears the estuary. Sg. Baluk is the main river draining the Gebeng Industrial Estate (GIE). With rapid developments of GIE, as well as planned future developments, such as spill-overs from the proposed Kuantan International Airport in Gebeng, this river is expected to grow into a substantial water body; nevertheless, with careful protection of its water quality and river reserves, it may be an ecological asset that would ecologically balance the industrial and commercial growths in Gebeng.

6.5.2 Water Quality (WQ) Assessment

1) WQ Assessment Overall

Assessment of the river existing river water quality and potential impacts to it was carried out as below:

a) On-site surveys were carried out to assess water quality based on assessment of water appearance and sources of pollution.
b) Sampling and analysis, including in-situ analysis were carried by an accredited laboratory.
c) Parameters analysed are: Temperature, Turbidity, pH, Dissolved Oxygen (DO), SS, BOD, COD, Ammonia and others as per list in Environmental Quality (Industrial Effluent) Regulation 2009 or EQ(IE)R2009, as shown in **Table 6.5(1)** below.
d) Sampling were carried out at 8 points at a single depth of about one (1) meter below the water surface, where possible, at predetermined coordinates, at appropriate points.
e) Secondary data was also used as reference to describe existing water quality.

f) All analysis were carried out by an Accredited laboratory, as per Standard Methods (APHA) or USEPA Approved Methods for the whole 30 parameters in EQ(IE)R2009,

g) Calculation of WQI will be based on 6 parameters (Chemical Oxygen Demand, Biochemical Oxygen Demand, Dissolved Oxygen, Suspended Solids, pH and Ammoniacal Nitrogen)

h) Impact analysis via Water Quality Modelling was carried out (in Chapter 7) with the existing water quality obtained as baseline, for normal and worst case scenarios. Modelling will use the QUAL2K model developed by the United State Environmental Protection Agency (USEPA) which is suitable for small rivers such as Sg. Baluk where the waters can be assumed to be completely mixed as it travels.

2) Sampling locations

Water quality of Sg. Baluk was assessed in this study at eight points sampled during this study (Points WQ1 to WQ8) whose locations are shown in **Figure 6.5(3)** with respect to the ZOI and in in **Table 6.5(1)** with locations and river appearances**.** The analytical methods employed are listed in **Table 6.5(2).**

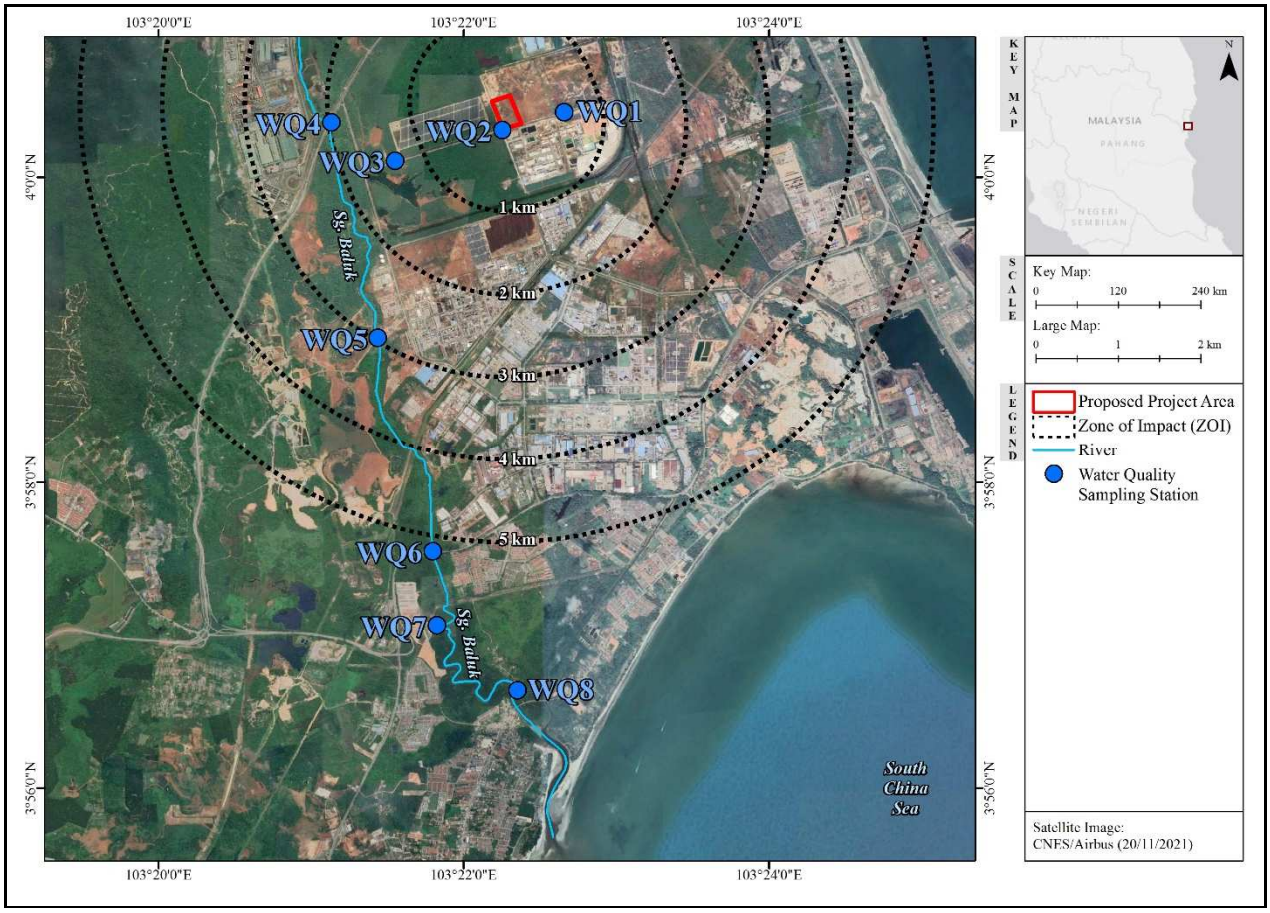


Figure 6.5(1) Sampling Locations for Water Quality and ZOI

Table 6.5(1): Sampling Locations for Water Quality and River Appearances

WQ1
4° 0'25.61"N
103°22'39.49"E
Drain before any discharge from SCaRF

WQ2
4° 0'18.56"N
103°22'15.15"E
Drain immediately after SCaRF

WQ1

WQ2

Table 6.5(1): Sampling Locations for Water Quality and River Appearances

WQ3 4° 0'6.56"N 103°21'32.96"E On earth drain after RE Gebeng, before joining Sg. Baluk	
WQ4 4° 0'21.56"N 103°21'7.91"E On Sg. Baluk before the junction of drain with Sg. Baluk. 	
 **WQ3**	 **WQ4**

Table 6.5(1): Sampling Locations for Water Quality and River Appearances

WQ5 3°58'56.98"N 103°21'26.11"E Downstream of confluence of earth drain with Sg. Baluk.	
WQ6 3°57'32.87"N 103°21'47.75"E Downstream, along Sg. Baluk. Road crossing at WQ6	 

Table 6.5(1): Sampling Locations for Water Quality and River Appearances

<table>
<tr>
<td colspan="2"> 

WQ5</td>
<td colspan="2"> 

WQ6</td>
</tr>
<tr>
<td>WQ7
3°57'3.75"N
103°21'49.46"E
Downstream, along Sg. Baluk.</td>
<td colspan="3"> 
</td>
</tr>
<tr>
<td>WQ8
3°56'38.29"N4
103°22'21.13"E
Downstream, along Sg. Baluk.</td>
<td colspan="3"> 
</td>
</tr>
</table>

Table 6.5(1): Sampling Locations for Water Quality and River Appearances

 **WQ7**	 **WQ8**

3) Sample analysis

Sample analysis was carried out by an accredited laboratory (Analysis certificates given in Appendix B); with analytical methods employed as listed in **Table 6.5(2)** below.

Table 6.5(2): Analytical methods used

Sampling Date	:	5/7/2022
Date Sample Received	:	6/7/2022
Sample Description	:	River Water

Parameter	Unit	Date of Analysis	Test Method
pH (*in-situ*)	-	05/07/2022	APHA 4500H$^+$- B
Dissolved Oxygen (*in-situ*)	mg/L	05/07/2022	APHA 4500 O-G
Temperature (*in-situ*)	°C	05/07/2022	APHA 2550 B
Turbidity (*in-situ*)	NTU	05/07/2022	APHA 2130 B
*Total Suspended Solids	mg/L	06/07/2022	APHA 2540 D
*Biochemical Oxygen Demand (5d,20°C)	mg/L	06-11/07/2022	APHA 5210 B
*Chemical Oxygen Demand	mg/L	06/07/2022	APHA 5220 C
*Ammoniacal Nitrogen	mg/L	06/07/2022	APHA 4500 NH3-N (B&F)
Oil and Grease	mg/L	06/07/2022	APHA 5520 D
*Mercury as Hg	mg/L	06/07/2022	APHA 3112 B (2005)

Parameter	Unit	Date of Analysis	Test Method
*Cadmium as Cd	mg/L	06/07/2022	APHA 3111 B, APHA 3030 F (2005)
*Chromium Hexavalent	mg/L	06/07/2022	APHA 3500 Cr B (2005)
*Arsenic as As	mg/L	06/07/2022	APHA 3114 B, APHA 3030 F (2005)
*Cyanide as CN^-	mg/L	06/07/2022	APHA 4500 CN C, D (2005)
*Lead as Pb	mg/L	06/07/2022	APHA 3111 B, APHA 3030 F (2005)
*Chromium Trivalent	mg/L	06/07/2022	APHA 3500 Cr B (2005)

4) Water Quality Index (WQI) Calculations

Evaluation of water quality of a water body parameter by parameter, may lead to misleading perception, e.g. for a water low in BOD but high in ammonia. The Water Quality Index (WQI) groups several parameters of greatest influence (although they relate more to sewage) and combines them into a single number, by use of weightages or sub-indices. The WQI value of the water samples was calculated using the method developed by the DOE Malaysia in 1981. Six parameters were used for evaluation of WQI, i.e., Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Suspended Solids (SS), pH and Ammoniacal Nitrogen (NH_3-N). The sub-indices for the chosen parameters are named SICOD, SIBOD, SIDO, SISS, SIpH and SIAN, and the formula used in the calculation WQI is:

WQI= 0.16 * SICOD + 0.19 * SIBOD + 0.22 * SIDO + 0.16 * SISS + 0.12 * SIpH + 0.15 * SIAN

where, SI is the sub-index for each parameter. The sub-index for each parameter is derived from a system of best-fit equations; they are as shown in **Table 6.5(3)**. The indices obtained are then fitted to water quality usages and requirements, as given in **Table 6.5(4).**

Table 6.5(3): Best-Fit Equations for the Estimation of the Sub-Indexes Values

Parameter	Sub-Index Formula	Condition
DO	SIDO = 0	For x £ 8
	SIDO = $-0.395 + 0.030x^2 - 0.00020x^3$	For 8 < x < 92
	SIDO = 100	For x ³ 92
BOD	SIBOD = 100.4 – 4.23x	For x £ 5
	SIBOD = $108 * e^{-0.055x} - 0.1x$	For x > 5
COD	SICOD = -1.33x + 99.1	For x £ 20
	SICOD = $103e^{-0.0157x} - 0.04x$	For x > 20
$N\text{-}NH_3$	SIAN = 100.5 – 105x	For x £ 0.3
	SIAN = $94 * e^{-0.573x} - 5 * x - 2$	For 0.3 < x < 4
	SIAN = 0	For x ³ 4
SS	SISS = $97.5 * e^{-0.00676x} + 0.05x$	For x £ 100
	SISS = $71 * e^{-0.0016x} - 0.015x$	For 100 < x < 1000
	SISS = 0	For x ³ 1000
pH	SI pH = $17.2 - 17.2x + 5.02x^2$	For x < 5.5
	SI pH = $-242 + 95.5x - 6.67x^2$	For 5.5 £< 7
	SI pH = $-181 + 82.4x - 6.05x^2$	For 7 £ x < 8.75
	SI pH = $536 - 77.0x + 2.76x^2$	For x ³ 8.75

NOTE: x - concentration in mg/l for all parameters except for pH and DO (% used)

* - Multiply by

Table 6.5(4): Water Quality Classification Based on Water Quality Index

Range	Class		Usage Suitability
> 92.7	Class I	**81-100** Clean	Water supply: almost No Treatment required For very sensitive aquatic species
92.7 76.5 –	Class II		Water supply: conventional treatment sufficient For sensitive aquatic species Suitable for recreational activities
76.5 51.9 –	Class III	**60-80** Slightly Polluted	Water supply: Advanced treatment required For common and tolerant aquatic species For livestock drinking
51.9 31.0 –	Class IV	**0-59** Polluted	For irrigation
< 31	Class V		Not for above usage

Source: National Water Quality Standard (NWQS)

6.5.3 Water Quality Results

The water quality results obtained from this study is shown in **Table 6.5(5)**, with the analysis certificates from the accredited laboratory given in Appendix B. The results are compared to the Class IIB limits of the National Water Quality Standard for Malaysia (NWQS) and are discussed below:

Water pH and Temperature

The pH ranges from 6.35 to 8.37 (within the NWQS Class IIB limits) at all points, except at WQ3 (4.01), WQ4(5.45) and WQ5(5.91) which are slightly acidic. Slightly acidic values are expected for river water in peat areas, where biological fermentations of organic debris in the peat soil releases organic acids. As river flows downstream, the water pH is corrected to those normal for river waters, i.e., slightly below pH 7. Temperatures ranged between 26.1 to 29.5^{0}C, i.e., normal temperatures indicating no hot discharges from industries.

Turbidity and Total Suspended Solids (SS)

Waters are slightly turbid at WQ1 and WQ2, with corresponding elevations of SS values to about 100 mg/l; the water colours observed during sampling indicate that turbidities are due to erosion and the moderate values indicate generalised erosion of banks, etc.

Dissolved Oxygen (DO)

The values of DO at all points, i.e., range from 5.0 mg/l to 6.3 mg/l, all within the NWQS Class IIB range of 5 to 7 mg/l, indicating a well aerated river, despite being in peat soil area.

Oil and Grease

Oil and grease were at non-detectable level (<1 mg/L) at all points, indicating insignificant pollution effects from sources such as kitchens, workshops, etc.

BOD, COD and Ammoniacal Nitrogen (AN)

BOD values are low to moderate, ranging from 3 to 13 mg/l, while COD values range from 20 to 98 mg/l, indicating possible emission from biodegradations in peaty soils which would release organic acids. BOD: COD ratios were ≤ 0.2 except at WQ8, which are typical of water with humic acids from peaty soils or foresty areas. At WQ8, the most downstream point, the water is low in COD and higher in BOD and ammonia-N, with ratios indicative of organic contamination, most likely by sewage. Nevertheless, the water quality modelling as given in **Section 7.6** indicates that due to the very small flowrate from the proposed SCaRF project as compared to the river flowrate, the proposed SCaRF discharge is well dissipated before at WQ3 and has insignificant contribution to the water quality of Sg. Baluk, thus no effect on the BOD and COD of the river. Ammoniacal-N (AN) were moderate at all points, at 0.88 to 3.872 mg/l. The higher level at WQ4 is associated with flows from upstream of proposed site, which is the foresty areas, while the higher level at WQ8 is probably associated with organics discharge as discussed above.

Metals

Heavy metals remain largely non-detectable or around the NWQS Class llB limits at all points, indicating no significant heavy metal contamination in the river. The slight elevations in Cu and Ni at WQ3 and Mn are most likely soil related, as can be seen by the association of Cu and Ni; the slightly acidic pH values would enhance metals leaching out from the soils.

6.5.4 Conclusion on Water Quality

Overall, the water quality is moderate with respect to organics and nutrients, mostly due to peaty soils in the area; with respect to industrial contribution in terms of pH, temperature and heavy metals, it is still not visible. Due to moderate values of DO, BOD and ammonia-N, the water quality index in **Table 6.5(6)** shows the river as slightly polluted at all points and polluted at WQ4, which is upstream of the SCaRF location. The water quality modelling as given in **Section 7.6** indicates that due to the very small flowrate from the proposed SCaRF project as compared to the Sg. Baluk river flowrate, the proposed SCaRF discharge is well dissipated upon reaching Sg. Baluk and has insignificant contribution to the water quality of Sg. Baluk.

Table 6.5(5): Water Quality Results for Sg. Baluk

Parameter	Unit	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	NWQS Class IIB	WQ in brief
pH (*in-situ*)	-	8.37	6.68	4.01	5.45	5.91	6.35	6.48	6.77	6-9	
Dissolved Oxygen (*in-situ*)	mg/L	6.3	5.5	5.3	5.6	5.0	5.8	5.1	5.3	5-7	Fairly high DO, all aerobic
Temperature (*in-situ*)	°C	26.8	26.1	27.1	27.3	28.2	28.5	28.7	29.5	Norm ±2C	Normal temperatures, no hot discharges
Turbidity (*in-situ*)	NTU	93	101	101	65	43	24	27	18		Moderately clear waters, except at WQ1, WQ2 and WQ3.
*Total Suspended Solids	mg/L	88	96	18	24	50	56	14	38	50	Low SS, except at WQ1 and WQ2.
*Biochemical Oxygen Demand (5d, 20°C)	mg/L	6	5	3	13	5	12	8	13	3	Low BOD except further downstream at WQ4, WQ6 and WQ13
*Chemical Oxygen Demand	mg/L	42	56	28	61	98	61	42	20	25	Low COD except moderate at WQ5
*Ammoniacal Nitrogen	mg/L	1.526	1.063	0.880	3.872	1.388	0.981	1.910	3.465	0.3	Low NH3-N, except at WQ4 and WQ8
Oil and Grease	mg/L	ND(<1)	ND(<1)	ND(<1)	ND(<1)	ND(<1)	ND(<1)	ND(<1)	ND(<1)	ND	Non-detectable at all points
*Mercury as Hg	mg/L	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)		Non-detectable at all points
*Cadmium as Cd	mg/L	ND(<0.002)	ND(<0.002)	ND(<0.002)	ND(<0.002)	0.002	ND(<0.002)	0.002	0.004	0.01	Very low at all points
*Chromium Hexavalent	mg/L	ND(<0.003)	ND(<0.003)	ND(<0.003)	ND(<0.003)	ND(<0.003)	ND(<0.003)	ND(<0.003)	ND(<0.003)	0.05	Non-detectable at all points
*Arsenic as As	mg/L	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	0.05	Non-detectable at all points
*Cyanide as CN^-	mg/L	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.02	Non-detectable at all points

Table 6.5(5): Water Quality Results for Sg. Baluk

Parameter	Unit	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	NWQS Class IIB	WQ in brief
*Lead as Pb	mg/L	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.05	Non-detectable at all points
*Chromium Trivalent	mg/L	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	-	Non-detectable at all points
*Copper as Cu	mg/L	ND(<0.01)	ND(<0.01)	0.16	0.02	0.01	0.02	0.02	0.01	0.02	All low; below NWQS Class IIB limits except at WQ3.
*Manganese as Mn	mg/L	0.17	0.18	0.19	0.32	0.15	0.12	0.14	0.16	0.1	All low and slightly above NWQS Class IIB limits.
*Nickel as Ni	mg/L	ND(<0.01)	0.02	0.37	0.01	0.07	0.04	0.08	0.11	0.05	All low and around NWQS Class IIB limits, except at WQ3.
*Tin as Sn	mg/L	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	-	Non-detectable at all points
*Zinc as Zn	mg/L	0.03	ND(<0.01)	0.03	0.13	0.08	0.05	0.06	0.01	5	All well below NWQS Class IIB limits.
*Boron as B	mg/L	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	1	Non-detectable at all points
*Iron ad Fe	mg/L	0.56	0.71	0.83	1.04	2.10	0.77	0.55	0.36	1	All below or slightly above NWQS Class IIB limits.
*Phenol	mg/L	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	ND(<0.001)	0.01	Non-detectable at all points
*Free Chlorine	mg/L	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	ND(<0.1)	-	Non-detectable at all points
*Sulphide as S^{2-}	mg/L	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)	ND(<0.10)		Non-detectable at all points

Table 6.5(5): Water Quality Results for Sg. Baluk

Parameter	Unit	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	NWQS Class IIB	WQ in brief
*Chromium Total	mg/L	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)	ND(<0.02)		Non-detectable at all points
*Silver as Ag	mg/L	ND(<0.01)	0.25	0.07	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.09	0.05	0.05	All below or slightly above NWQS Class IIB limits.
*Aluminium as Al	mg/L	0.036	0.027	0.738	0.174	0.041	0.028	0.077	0.075	-	All low; no limit in NWQS Class IIB.
*Selenium	mg/L	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)	0.01	
*Barium	mg/L	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	1	
*Fluoride as F	mg/L	ND(<0.01)	ND(<0.01)	0.01	0.86	0.66	0.54	0.63	0.78		
*Formaldehyde	mg/L	0.029	0.034	0.045	0.19	0.008	0.003	0.022	0.020		
*Colour	ADMI	157	163	107	135	45	63	70	42		

Table 6.5(6): Water Quality Index (WQI) and Class for Sg. Baluk

WQ Point	WQI VALUE	WQ CATEGORY	WQ CLASS
WQ1	66.99	Slightly Polluted	Class III
WQ2	66.48	Slightly Polluted	Class III
WQ3	69.02	Slightly Polluted	Class III
WQ4	55.29	Polluted	Class III
WQ5	61.04	Slightly Polluted	Class III
WQ6	64.58	Slightly Polluted	Class III
WQ7	66.40	Slightly Polluted	Class III
WQ8	61.95	Slightly Polluted	Class III

6.6 CLIMATE AND AIR QUALITY

6.6.1 Climate

The climate of the proposed project area is of typical tropical monsoon which may be summarised as:

a) uniform in temperature throughout the year, with ambient temperatures of 30± 2^{0}C,

b) high humidity of about 85% with monthly average relative humidity of 82 to 87% (Source: weather-and-climate.com).

c) there are four seasons, namely the Southwest Monsoon from June to September, Northeast Monsoon from November to March and two shorter inter-monsoon transition periods, as shown in **Figure 6.6(1)** below.

d) high rainfall during the monsoon season, particularly the Northeast monsoon and convectional rains during off-monsoon periods,

e) Convectional rains tend to be intense and short.

f) The driest month occurs in February which only receives an average 140 mm rainfall while the wettest month is in December with an average of 560 mm, as shown in **Figure 6.6(2).**

g) Wind speeds tend to coincide with the monsoon seasons (**Figure 6.6(3)**), with highest speed at 2m/s in December to March, that is double the speed for other months.

h) From the wind roses, the dominant wind was blowing from North (N) which is about 30% of the annual period in 2020. Windrose also shows that wind was frequently gust from South (S) at about 15% of the time, while 13.3% of the time was calm **(Figure 6.6(4)).**

MONSOON					SOUTHWEST MONSOON					NORTHEAST	
JAN	FEB	MAC	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Figure 6.6(1) Typical Monsoon seasons

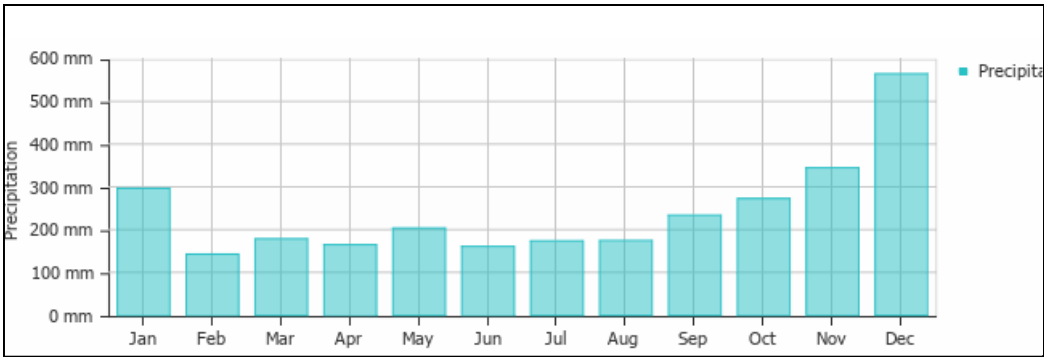


Figure 6.6(2) Average monthly rainfall
(Source: weather-and-climate.com)

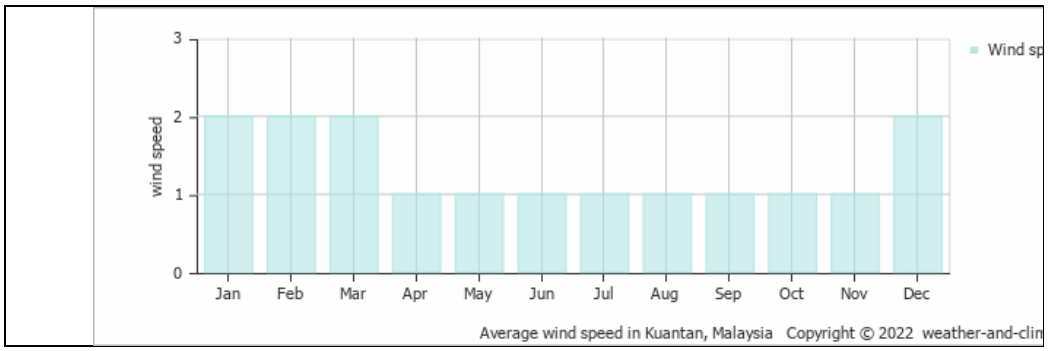


Figure 6.6(3) Average windspeed (m/s)
(Source: weather-and-climate.com)

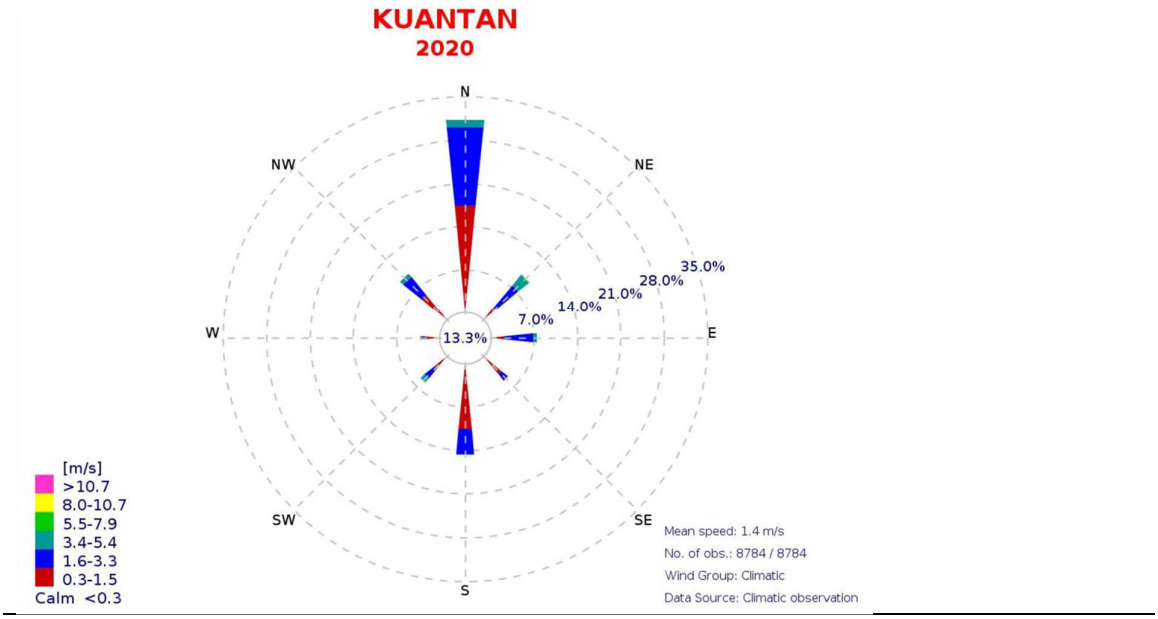


Figure 6.6(4) Annual wind rose for Kuantan MMD Station for year 2020
Source: Malaysian Meteorological Department (MMD)

6.6.2 Air Quality Assessment

1) Air Quality Sampling points

Baseline ambient air quality (AQ) is analysed in this study at the proposed project site (AQ1) and at the nearest nearest sensitive receptors in the vicinity of the Project (AQ2 to AQ6) as shown in **Figure 6.6(5),** with respect to the ZOI. Locations of the sampling points and their surroundings are shown in **Table 6.6(1)**. Air quality samples were obtained and analysed by an accredited laboratory. The data obtained from these points were compared with the limits of Malaysia Ambient Air Quality Standard (MAAQS) 2020.

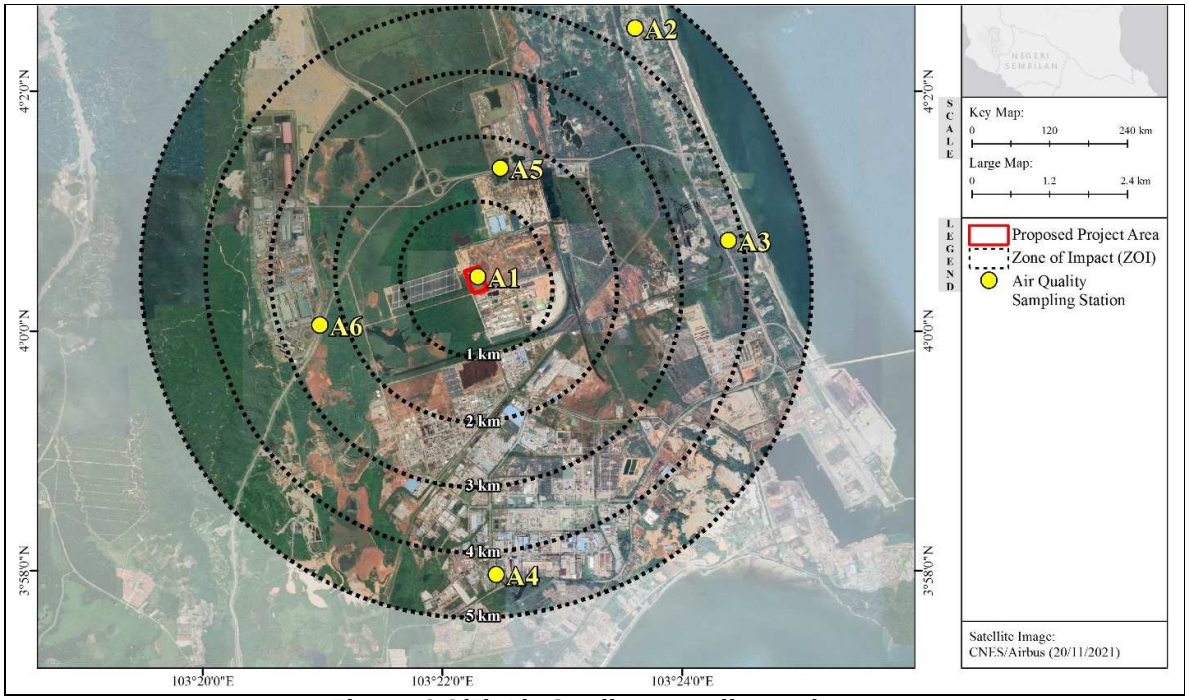
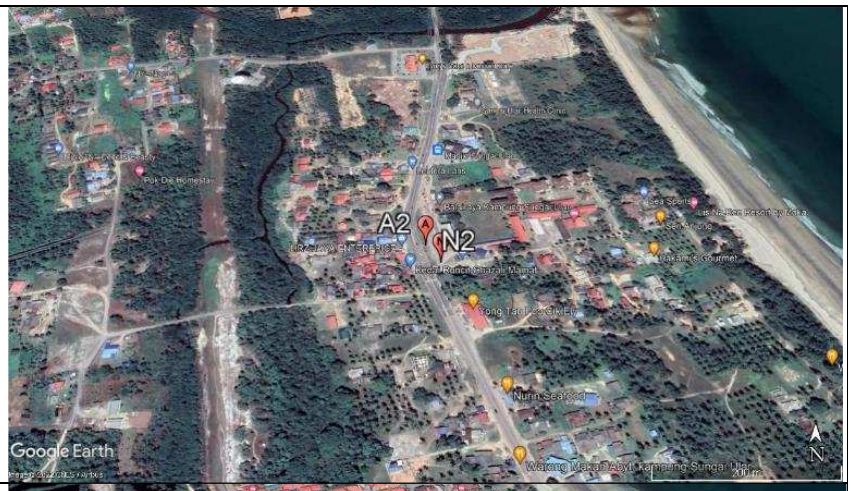


Figure 6.6(5) Air Quality sampling points

Table 6.6(1) Locations of Air Quality (A) and Noise (N) Sampling Points and Rationale

A1 & N1 4° 0'26.97"N 103°22'17.61"E At SCaRF site 	

A2 & N2 4° 2'31.56"N 103°23'36.43"E At coastal residential villages, Kg. Sg. Ular. 	
A3 & N3 4° 0'45.01"N 103°24'23.58"E At seaside residential area, east of the SCaRF site. 	
A4 3°57'58.00"N 103°22'27.03"E Next to a college, the Institut Latihan Perindustrian Kuantan (ILPK), south of the site. 	

A5 4° 1'21.48"N 103°22'28.99"E At Akademi Maritim Sultan Ahmad Shah (AMSAS), north of the SCaRF site. 	
A6 4° 0'3.03"N 103°20'58.58"E In front of Malaysia China Kuantan Industrial Park (MCKIP), west of the SCaRF site 	

2) Methodology for AQ measurements

The AQ sampling locations are tabulated in **Table 6.6(1)**. The sampling stations are selected to represent the background concentrations of air pollutants in the proposed location. The principle of methodologies used for determination of selected air pollutants are summarised in **Table 6.6(2).**

Table 6.6(2): Methodology for Air Quality Measurement

Test Parameter / Station	Test Method
TSP	USEPA 40 Part 50, Appendix B
PM10	USEPA 40 Part 50, Appendix J
SO2	ISC 704 A
NO2	ISC 408
CO	EC-IAQ-01
VOC	NIOSH 2549
H2S	NIOSH 6013
CH4	USEPA Method 3C

6.6.3 Ambient Air Quality Monitoring Results

Results of air quality monitoring carried out on 20th July 2022 Is as tabulated in **Table 6.6(3).** These levels may serve as Baseline data, for comparison during construction and operation.

Table 6.6(3) Baseline Air Quality Results

Test Parameter	Unit	A1	A2	A3	A4	A5	A6	MAAQS, 2020	Comment
TSP	µg/m^3	46	12	54	121	75	112		
PM10	µg/m^3	38	9	46	63	57	54	100 µg/m^3	Clear air, not dusty
PM2.5	µg/m^3	23	7	27	30	28	25	35 µg/m3	Fine dust still low
SO2	µg/m^3	24	18	27	34	36	38	80 µg/m^3	No noticeable acidic gas SO_2
NO2	µg/m^3	29	21	32	37	39	42	70µg/m^3	No noticeable acidic gas NO_2
CO	mg/m^3	6	2	6	10	7	9	10 mg/m^3	CO still within limit
VOC	mg/m^3	0.31	0.22	0.39	0.75	0.47	0.68	NS	As baseline data
H2S	mg/m^3	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	NS	As baseline data
CH4	mg/m^3	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	NS	As baseline data
Note: NS: Not Stated									

Table 6.6(4) Malaysian Ambient Air Quality Standard (MAAQS) 2020

Pollutants	Averaging Time	Ambient Air Quality Standard		
		IT-1 (2015) µg/m^3	IT-2 (2018) µg/m^3	Standard (2020) µg/m^3
Particulate Matter with the size of less than 10 micron (PM_{10})	1 Year	50	45	40
	24 Hour	150	120	100
Particulate Matter with the size of less than 2.5 micron ($PM_{2.5}$)	1 Year	35	25	15
	24 Hour	75	50	35
Sulfur Dioxide (SO_2)	1 Hour	350	300	250
	24 Hour	105	90	80
Nitrogen Dioxide (NO_2)	1 Hour	320	300	280
	24 Hour	75	75	70
Ground Level Ozone (O_3)	1 Hour	200	200	180
	8 Hour	120	120	100
***Carbon Monoxide (CO)**	1 Hour	35	35	30
	8 Hour	10	10	10

*mg/m^3

All ambient air quality parameters measured had recorded concentrations that were below the limits set by the MAAQS (2020). The concentrations of PM_{10} and $PM_{2.5}$ ranged between PM10 at 9 to 63 µg/m3 while PM2.5 at 7 to 30 µg/m3. These were still below the set limits for PM_{10} and $PM_{2.5}$ which are 100 and 35 µg/m^3 respectively. Meanwhile, concentrations of gases SO2, NO2 and CO are all still below the limits as set under MAAQS 2020 with SO2 at 18-38 µg/m^3 (MAAQS 2020 ≤ 80 µg/m^3); NO2 at 21-42 µg/m^3 (MAAQS 2020 ≤ 70 µg/m^3) and CO at 2-10 µg/m^3 ((MAAQS 2020 ≤ 10 µg/m^3). Overall, the baseline ambient air quality is still very good.

Air dispersion modelling was carried out (**Section 7.5**) and this has shown that with the air pollution control (APC) in place, during normal plant operation, the contribution of identified criteria air pollutants from the project to the surrounding environment is assessed to be insignificant at all identified off-site sensitive receptors.

6.6.4 Conclusion on Air Quality

All ambient air quality parameters measured at all points had recorded concentrations that were below the limits set by the MAAQS (2020), indicating that the existing air quality is still very good.

6.7 NOISE LEVEL

6.7.1 Noise Level Sampling Points

Existing Noise level measurements were conducted at the sampling points as in **Figure 6.7(1)** by an accredited laboratory to establish the existing noise levels at the nearest sensitive receptors as shown in **Table 6.7(1),** which gives locations as well as the site appearance.

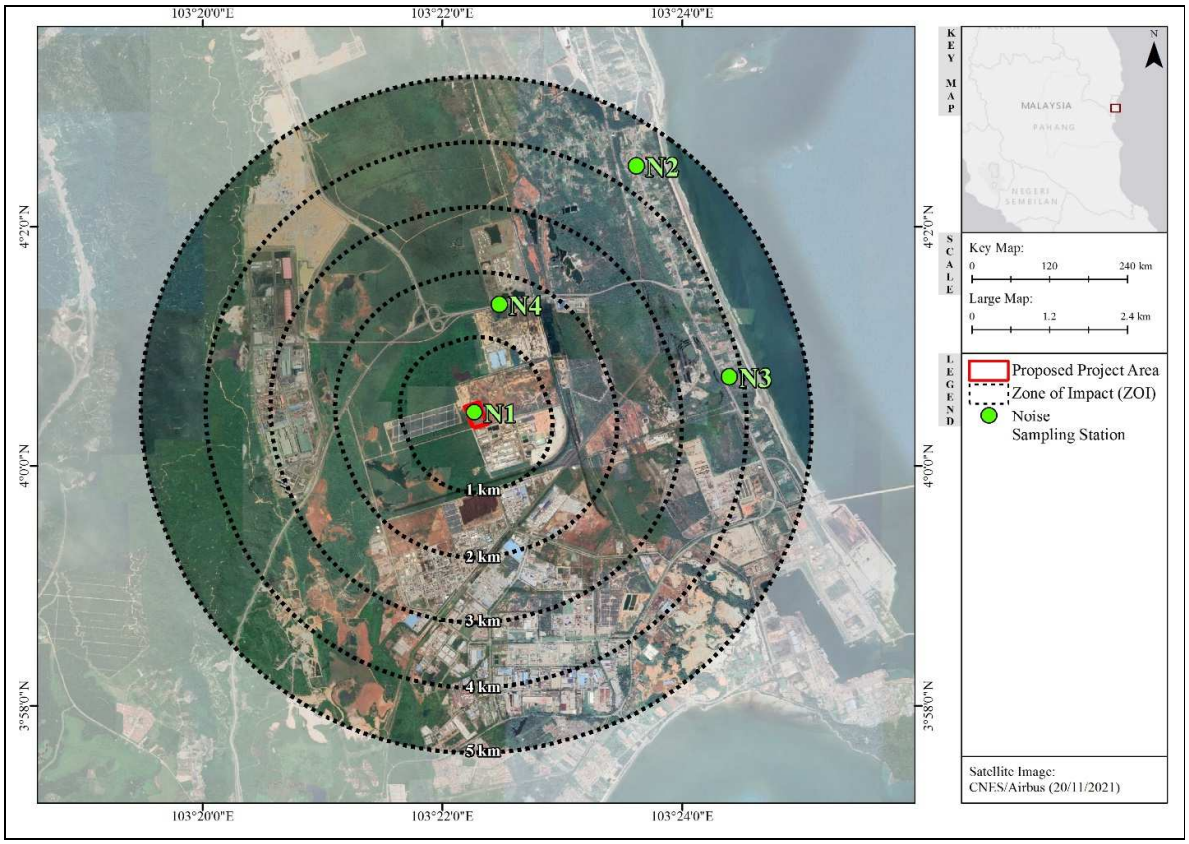
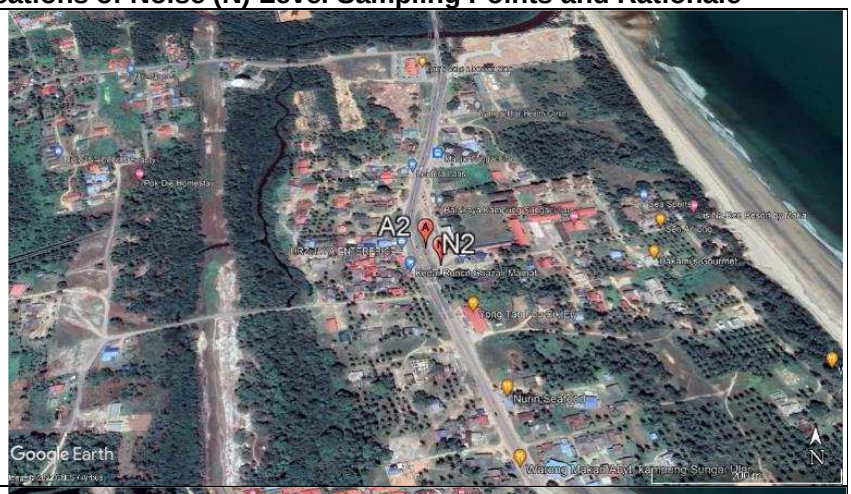


Figure 6.7(1) Noise level sampling points

Table 6.7(1) Locations of Noise (N) Level Sampling Points and Rationale

N1 4° 0'26.97"N 103°22'17.61"E At SCaRF site 	

Table 6.7(1) Locations of Noise (N) Level Sampling Points and Rationale

N2 4° 2'31.56"N 103°23'36.43"E At coastal residential villages, Kg. Sg. Ular. 	
N3 4° 0'45.01"N 103°24'23.58"E At seaside residential area, Kg. Gebeng, east of the SCaRF site. 	
N4 4° 1'21.48"N 103°22'28.99"E At Akademi Maritim Sultan Ahmad Shah (AMSAS), north of the SCaRF site. 	

6.7.2 Methodology for Noise Measurement

The methodology used for determination of noise level is shown in **Table 6.7(2).**

Table 6.7(2): Methodology for Noise measurements

Parameter	Method
L_{Aeq}, L_{10}, L_{90}, L_{min} , L_{max}	Measurements of noise levels at each station were carried out by using pre-calibrated integrating high precision sound level meter In house method (ESF/N/01) based on ISO 1996-1:2016 (E) using Sound Level Meter Type 1.
	Noise level measurements were conducted on 5th July 2020 using sound level meter continuously for: 7 am to 10 pm: >15 hours for day time noise 10 pm to 7 am: 9 hours for night time noise.

6.7.3 Baseline Noise Monitoring Results

The results of noise level are as tabulated in **Table 6.7(3)** while the certificates of analysis are in **Appendix 3c.**

Table 6.7(3) Results of noise level measurements

Station	N1		N2		N3		N4	
	Date and time							
Parameters	(05/07/2022) 0700 – 2200 hrs	(05 - 06/07/2022) 2200 – 0700 hrs	(05/07/2022) 0700 – 2200 hrs	(05 - 06/07/2022) 2200 – 0700 hrs	(05/07/2022) 0700 – 2200 hrs	(05 - 06/07/2200 – 0700 hrs	(05/07/2022) 0700 – 2200 hrs	(05 - 06/07/2022) 2200 – 0700 hrs
L_{eq} dB(A)	50.7	49.2	66.0	62.9	66.0	62.9	72.3	68.8
L_{max} dB(A)	78.2	70.8	107.5	89.9	107.5	89.9	108.8	92.2
L_{min} dB(A)	38.4	42.2	38.7	36.7	38.7	36.7	40.4	41.9
L_{10} dB(A)	52.7	50.6	66.3	61.3	66.3	61.3	76.0	72.1
L_{90} dB(A)	45.5	45.8	52.2	43.9	52.2	43.9	57.0	54.9
Reference	E		B		B		E	
dB(A)	70	65	60	55	60	55	70	65

The noise baseline results were compared with The Planning Guidelines for Environmental Noise Limits and Control, Department of Environment, Third Edition December 2019 given in **Table 6.7(4)**.

Table 6.7(4) DOE's maximum permissible sound Level (L_{eq}) by receiving land use for planning (A to E)

RECEIVING LAND USE CATEGORY	DAYTIME 7:00 AM – 10:0 PM	NIGHT-TIME 10:00 PM – 7:00 AM
A. Low density residential noise sensitive receptors, institutional (school, hospital, worship place)	55 dBA	50 dBA
B. Suburban residential (medium density) recreational	60 dBA	55 dBA
C. Urban residential (high density) areas, mixed development areas	65 dBA	60 dBA
D. Commercial business zones	65 dBA	60 dBA
E. Designated industrial zones	70 dBA	65 dBA

The results of ambient noise level at stations in the GIE (category E) during daytime and night time show that the baseline L_{Aeq} comply with the limits at N1, i.e., at the proposed site where very low values were obtained, as the site is still empty. The values at N4 however were slightly (about 3 dBA) above the limits, most probably because it is next to a major road that connects the highway to the coastal areas. The values at the two coastal residential areas are also slightly above the limits for suburban residential, most likely due to traffic, such as motor bike traffic. Nevertheless, none of the values measured at all points were of category Noisy or ≥ 80 dBA (Occupational Safety and Health (Noise Exposure) Regulations 2019.

6.7.4 Conclusion on Noise Level

Measured values gave low to moderate levels, the higher values most probably due to vehicular traffic, such as motor bikes, due to locations next to roads. Nevertheless, none of the values measured at all points were of category Noisy or ≥ 80 dBA (Occupational Safety and Health (Noise Exposure) Regulations 2019.

6.8 VIBRATION LEVEL

6.8.1 Preliminary

Vibration relates more to requirements for engineering stabilities, where technical design of any structure should incorporate possible background vibrations. The area is quiet with Day- time and Night-time noise level of about 50 dBA (see **Section 6.7** above) and free of noisy and hammering industrial activities. The processes to be installed at the proposed recovery plant deal with materials which are already of small particles or powdery, thus there will not be hammering, vibrating activities. Nevertheless, having some knowledge of the background vibration level would be useful to counter any potential finger pointing. Being thus,

the secondary data as measured in the same area during the 2021 PDF EIA is referred to here. These would not have changed due to lack of development in the area since those measurements were made, and the area is sited in a geologically stable area, as was seen in **Section 6.2**.

6.8.2 Adjacent Areas Vibration Levels

The existing condition of vibration levels applicable to SCaRF site is shown in **Table 6.8(1).** The vibration levels at the points closest to the proposed plant complied with the recommended limits as given in **Table 6.8(2)** [The Planning Guidelines for Vibration Limits and Control, 2nd Ed. (DOE, 2007)]. Measurements of vibration at adjacent areas area at locations as shown in Table 6.8(1) were taken using digital seismograph for a period of 24 hours. Peak Particle Velocity of 3 axes were reported at every 15-minute interval. (PDF, 2021). The accelerometer was placed on a hard surface to obtain good surface contact to ensure the best possible vibration signal would be captured. The peak vibration level in terms of velocity unit millimetre per second (mm/s) was selected for the measurements as recommended by The Planning Guidelines for Environmental Vibration Limits and Control 2nd Edition (DOE, 2007). The vibration baseline results obtained were compared with Annex A: Schedule of Recommended Vibration Limits; Schedule 2: Recommended Limits for Damage Risk in Buildings from Short Term Vibration (**Table 6.8(2)**).

Table 6.8(1) Vibration sampling stations close to SCaRF site

STATION	LOCATION	LATITUDE (N)	LONGITUDE (E)	TIME	TRANVERSE (y)	LONGITUDINAL	VERTICAL
					PPV, mm/s	PPV, mm/s	PPV, mm/s
V3	Kampung Gebeng about 3km to the proposed project site	4° 0' 45.03"	103° 24' 22.87"	1247 hrs to 1232 hrs	1.600 (32Hz)	0.250 (16Hz)	1.800 (21Hz)
V4	PDF site, adjacent lot to SCaRF	4° 00' 32.74"	103° 22' 45.9"	1400 hrs to 1345 hrs	0.800 (27Hz)	2.920 (17Hz)	1.150 (33Hz)
REF: Vibration velocity for Sensitive structures to be ≤ 8 mm/s							

The vibration measurements showed that vibration ranged between 0.250 to 2.920 mm/s, all well below the safe limit of 8 mm/s for Sensitive Structures as in Table 6.8 (2).

Table 6.8(2) Schedule 2: Recommended Limits for Damage Risk in Buildings from Short Term Vibration

SCHEDULE 2: RECOMMENDED LIMITS FOR DAMAGE RISK IN BUILDINGS FROM SHORT TERM VIBRATION	**VIBRATION VELOCITY v_1 (mm/s) AT PLANE FLOOR OF UPPERMOST FULL STOREY, ALL FREQUENCIES**
Industrial buildings and buildings of similar design	40
Commercial building, dwelling, and buildings of similar design and/or use	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed above; or are of great intrinsic value (e.g. residential houses, or buildings that are under preservation order) (Sensitive structures)	8
Source: The Planning Guidelines for Environmental Vibration Limits and Control 2nd Edition (DOE, 2007)	

6.8.3 Conclusion on Vibration

Vibration data for surrounding areas showed low vibration values ranging between 0.250 to 2.920 mm/s, all well below the safe limit of 8 mm/s for Sensitive Structures showing that the proposed site is safe for sensitive equipment or structures.

6.9 FLORA AND FAUNA

6.9.1 Preliminary

The proposed site, as with other surrounding industrial lots in the Gebeng Industrial Estate (GIE), has been topped with lateritic soil in about 2011 after the monsoon flood event in 2010; thereafter secondary vegetation has covered the lot, comprising mainly acacias and common grasses as shown below. Thus, the GIE area is not rich in terms of flora fauna; any that inhabits still empty industrial lots would migrate to vegetated areas in the nearby forest reserve when the industrial lot is built-up. Eventually, the remaining vegetated areas would be only the river reserves.

Figure 6.9(1) Secondary vegetation at the site

The main river draining GIE is the Sg. Baluk, which is a narrow river that broadens as it nears the estuary; as more factories open up in GIE, the river is expected to enlarge as shown in **Figure 6.9(2)**. If the river reserves are well protected, the river and its green river reserves could become an important nature site in GIE.

Upstream Downstream

Figure 6.9(2) Sg. Baluk vegetation on riverbanks

6.9.2 Flora Fauna

Site visits have shown the conditions at the proposed SCaRF site and adjacent industrial sites as appearing dry and covered with low bushes, with the flora being mainly acacia and lalangs, as expected of topped up soils and the fauna would be those associated with those vegetation. Nevertheless, along river reserves the vegetation has been quite intact, as shown in **Figure 6.9(2)** above. A recent 2021 detailed enumeration and assessment of the total flora and fauna in the Sg. Baluk catchment has shown the following results (PDF, 2021):

1) Flora species diversity:

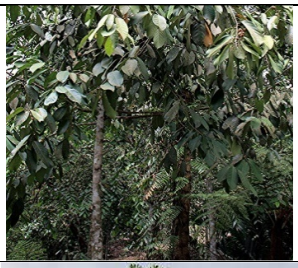
   Based on samplings carried out in the catchment, Sg. Baluk recorded the highest number of flora species identified with 91 species, followed by Upper Sg. Baluk with 59 species, Balok Forest Reserve with 58 species, Kampung Gebeng- Sungai Ular with 56 species, Sungai Ular with 45 species, Kuala Balok (KB) with 41 species and Peat Sungai Ular with 35 species. The Proposed Project Area for PDF (next to the proposed SCaRF site) recorded the least number of flora species found with only 34 species.

2) Flora conservation status:

   Of the flora species found, only two (2) species of flora were in category of Critically Endangered (CR) under the IUCN database namely *Shorea materialis* (Balau Pasir) and *Shorea platycarpa* (Meranti Paya); these are shown in **Table 6.9(1)**. Besides these, there were four (4) species of flora categorised under Vulnerable (VU) which are *Avicennia rumphiana* (Api-api Bulu), *Vatica pauciflora* (Resak Paya), *Intsia bijuga* (Merbau Ipil) and *Horsfieldia sucosa* (Penarahan). There were 2 species of flora categorised under Near Threatened (NT) namely *Phoenix paludosa* (Kedangsa) and *Shorea leprosula* (Meranti Tembaga). Meanwhile, 34 species of flora were categorised as Least Concern (LC) and the remaining 203 species of flora were Not Evaluated (NE).

Table 6.9(1) Flora Species which are Endangered or Vulnerable or Near Threatened found in Sg. Baluk catchment

Critically Endangered			
Balau Pasir *Shorea materialis*			
Meranti Paya *Shorea platycarpa*			
Vulnerable			

Api-api Bulu *Avicennia rumphiana* Fast growing Timber for building; Flowers for honey bees.			
Resak Paya *Vatica pauciflora*			
Merbau Ipil *Intsia bijuga* Hardwood			
Penarahan *Horsfieldia sucosa* For timber; edible fruits			
Near Threatened			
Kedangsa *Phoenix paludosa* Mangrove date			
Meranti Tembaga *Shorea leprosula*			

The above species signal the importance of maintaining the river reserves along Sg. Baluk, as these will be about the only sites available to sustain these trees, once the GIE and Gebeng area are fully developed. These trees are not only by

themselves useful species, but they promote the faunal biodiversity, as well as serve as barriers against flash floods and erosion (see Chapter 7)

3) Fauna:

The Sg. Baluk catchment area is surrounded by industrial lots, road network, highways and electric cable network causing the vegetated areas to be divided into small fragments. Wildlife had to move to new, safer areas to avoid exposure to predators and the risk of food shortages. This has affected the fauna diversity; only species that can adapt to these extreme changes can remain living in this sort of areas, or birds which are mobile by flying.

4) Fauna conservation

A recent 2021 detailed enumeration and assessment of the total flora and fauna in the Sg. Baluk catchment (PDF, 2021) has given an indication of the present fauna in the area. For conservation status of the fauna recorded, the International Union for Conservation of Nature (IUCN) and Malaysia Wildlife Conservation Act 2010 (WCA) were referred to. The study had recorded a substantial number of species of birds (avifauna); with 54 species of avifauna recorded. This is rather expected as avifauna remains mobile by flying and presence of nearby forest reserve and the river provides good neighbourhoods for them. It was shown that according the IUCN database, 2 species of Avifauna are categorised as Near Threatened (NT) namely Green Iora (*Aegithina viridissima*) and Black-bellied Malkoha (*Phaenicophaeus diardi*), and 1 species, Javan Myna (*Acridotheres javanicus*), is listed as Vulnerable (VU) (**Table 6.9(3)**).

For mammals the study (PDF, 2021) had sighted several large mammals due to proximity to the Balok Forest Reserve; these were one sighting of Malayan tiger (IUCN Critically Endangered), one sighting of Sun bear (IUCN Vulnerable) and eight sightings of Long-tailed Macaque (IUCN Vulnerable). These are expected to keep to the forest reserve, for as long as the forest are not disturbed.

Table 6.9(2) Near threatened and Vulnerable birds in the area

Near threatened species		Vulnerable species
Green Iora (*Aegithina viridissima*)	Black-bellied Malkoha (*Phaenicophaeus diardi*)	Javan Myna (*Acridotheres javanicus*)
		

6.9.3 Aquatic life

Aquatic life diversity and abundance in a river are dependent on several correlated factors the most prominent of which are:

- water quality which determines aquatic life survival and abundance of planktons;
- Plankton density, as zooplanktons feed on phytoplanktons and are hindered by fine particles in water; on the other hand phytoplankton requires sunlight to grow and are hindered by turbidities;
- Shelters such as wetland plants for juveniles.

a) Planktons of Sg. Baluk

Planktons comprise phytoplankton and zooplanktons. The base of the foodchain is the phytoplankton, which is also a primary producer. Being plant in nature it photosynthesises carbon dioxide to oxygen; thus, phytoplankton generates oxygen in water (measured as D.O.) essential for aquatic life (Sambolich, 2014), as well as serves as the base of the food chain that is the start of aquatic life food webs. Zooplanktons, fish fries, and some larger species of fish and whales consume phytoplankton as their main food source. These fishes then become prey for larger fishes and marine mammals on up the chain. Thus, plankton concentrations determine the fishlife in a river. Studies on plankton diversities and concentrations in Sg. Baluk (PDF, 2021) showed:

- Phytoplankton Chlorophyta or green algae was the most dominant in terms of cell abundance comprising 86.6% of the total phytoplankton counts. Chlorophyta or

green algae is characterised by having chlorophyll-a and b as the major photosynthetic pigments. Its abundance contributes towards the chlorophyll-a content in water which indicates high productivity.

- Phytoplankton densities, however, were relatively low, ranging from about 40 cells/l to about 800 cells/l. Phytoplankton densities depend on availability and balance of nutrients in the water and sunlight for photosynthesis, where high turbidities would hinder photosynthesis.
- Zooplankton Arthropoda was the most dominant (PDF, 2021) at 96.6% of the total zooplankton counts.
- The abundance or densities of zooplanktons ranged from about 130 to about 1200 ind/m^3 showing that the zooplankton populations were in good condition, all along Sg. Baluk.

The reasonable population of zooplankton along Sg. Baluk would translate into good fish population.

b) River reserves of Sg. Baluk

River reserves play crucial role in protection of river water quality, thus the river aquatic life, by:

- filtering sediments from reaching the river by leaf litter and undergrowth vegetation, thus decreasing the river water suspended solids (SS);
- protecting river banks against erosion by the plants' roots, thus decreasing SS in water;
- slowing runoffs by leaf litter and undergrowths, thus decreasing erosion and SS in water;
- filtering of pollutants by leaf litter and undergrowths, thus protecting river water from pollutants.

Zooplanktons are sensitive to SS as they are filter feeders, and their abundance determines the fish life richness in a river as they are primary food sources for fishes, particularly juvenile fishes; from here it can be seen that a well protected river reserve contributes to richness of fish life in the river. At present the river banks of Sg. Baluk are still fairly richly covered by vegetation as can be seen in **Figure 6.9(2).**

c) Fishlife in Sg. Baluk

Being a river near Kuantan town and within the GIE, Sg. Baluk is a popular angling site, notably near its estuary. Extensive fish life assessment was carried out in 2021 (PDF, 2021); the study has recorded about 26 fish species, which include freshwater and brackish water fishes. At a station west of the proposed site, at about location of WQ4, the fishes caught were as listed in **Table 6.9(4)**; these may be used as the baseline of fishes in the river, for future monitoring. That seven species found at this spot indicates reasonably high fish diversity, eventhough the water class at this point is classed as polluted; this is due to peaty nature of the soil, giving rise to slightly acidic conditions with moderate levels of ammonia, although the water is fairly clear with reasonable DO, as shown below:

Parameter	Unit	WQ4
pH (*in-situ*)	-	5.45
Dissolved Oxygen (*in-situ*)	mg/L	5.6
Temperature (*in-situ*)	°C	27.3
Turbidity (*in-situ*)	NTU	65
Total Suspended Solids	mg/L	24
Biochemical Oxygen Demand (5d, 20°C)	mg/L	13
Chemical Oxygen Demand	mg/L	61
Ammoniacal Nitrogen	mg/L	3.872
Oil and Grease	mg/L	ND(<1)

The species are common river species and categorised as of Least Concern under IUCN; nevertheless the varieties indicate a still healthy environment, and holds promise for Sg. Baluk to be an anglers' spot.

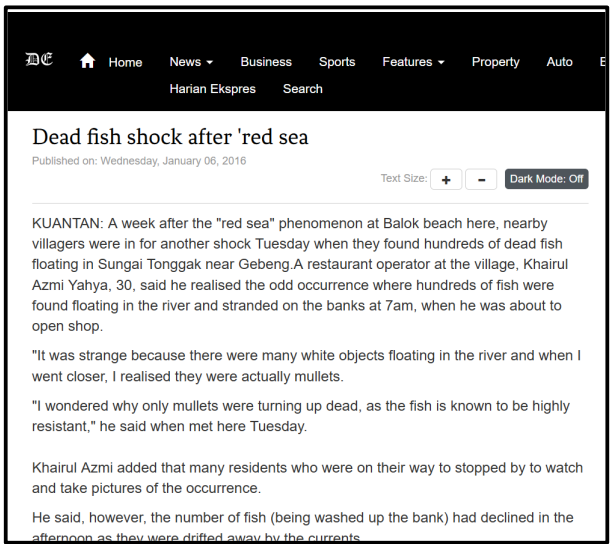
Table 6.9(3) Fishes caught in Sg. Baluk west of project site (at about location of WQ4)

Fish Group	Fish	IUCN Category
*Barbonymus gonionitus**		Least Concern
Lampan jawa		
*Barbodes banki**		Least Concern
Tebal sisik		

Table 6.9(3) Fishes caught in Sg. Baluk west of project site (at about location of WQ4)

*Rasbora sumatrana** Seluang bada		Least Concern
*Rasbora vulgaris** Seluang		Least Concern
Cyclocheilichthys apogon Temperas		Least Concern
Barbonymus schwanefeldii Lampam sungai		Least Concern
*Osteochilus vittatus** Terbul		Least Concern

Although Sg. Baluk is still reasonably healthy in terms of phytoplankton, zooplankton and fish varieties, it being the major drainage water body for the GIE places it at risk of pollution. Indeed, there was fish death reported in 2016, which was never solved why yet.



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Dead fish shock after 'red sea

Published on: Wednesday, January 06, 2016

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KUANTAN: A week after the "red sea" phenomenon at Balok beach here, nearby villagers were in for another shock Tuesday when they found hundreds of dead fish floating in Sungai Tonggak near Gebeng.A restaurant operator at the village, Khairul Azmi Yahya, 30, said he realised the odd occurrence where hundreds of fish were found floating in the river and stranded on the banks at 7am, when he was about to open shop.

"It was strange because there were many white objects floating in the river and when I went closer, I realised they were actually mullets.

"I wondered why only mullets were turning up dead, as the fish is known to be highly resistant," he said when met here Tuesday.

Khairul Azmi added that many residents who were on their way to stopped by to watch and take pictures of the occurrence.

He said, however, the number of fish (being washed up the bank) had declined in the afternoon as they were drifted away by the currents.

6.9.4 Conclusion on Flora and Fauna

The proposed site being in an industrial area, with the lot being of filled to raise the platform to prevent flood, the flora and fauna at the site is not notable. Nevertheless, the area is close to the Baluk forest area and the river reserve is still largely intact; thus, there are present several notable flora species (such as balau and meranti) and bird species as these can fly. Conservation of these, notably of those in the still largely intact river reserves, will be environmentally beneficial for habitat protection as well as river water quality protection. The Sg. Baluk is still healthy in terms of phytoplankton, zooplankton and fish life, with reasonable varieties of fishes. Although the species are common river species categorised as of Least Concern under IUCN; the varieties indicate a still healthy environment, and holds promise for Sg. Baluk to be an anglers' spot. However, being the major drainage river in Gebeng, the probability of pollution remains; thus, the importance of protecting the river reserve as a protection barrier against pollution and as nesting sites for fish juveniles.

6.10 SOCIOECONOMY AND PUBLIC HEALTH OF PROPOSED PROJECT'S ZOI

6.10.1 Introduction

The Project Site lies in the Mukim Sungai Karang, Daerah Kuantan, Pahang. The information developed includes the demographic characteristics and other relevant socio-economic data pertinent to the EIA study. This assessment also gathers the respondent's perceptions and views on the proposed project.

6.10.2 DEMOGRAPHY

The Department of Statistics Malaysia has not yet published the Population and Housing Census of Malaysia based on the Distribution by Local Authority Areas and Mukims 2020. Therefore, the latest reference for this study is the Key Findings Population and Housing of Malaysia 2020: Administrative District Kuantan. **Table 6.6(1)** shows the population distribution in 2020, the total population of District Kuantan is 548,014 people, and Mukim Sungai Karang is 68,238. In terms of households, Mukim Sungai Karang has 16,501 families with an average household size of 4.0. Mukim Sungai Karang has 16,501 houses, while District Kuantan has 154,355 houses. The gender distribution of the population in Kuantan District and Mukim Sungai Karang shows the male population were slightly larger than the females.

Table 6.10(1) Population Distribution 2020

Population Characteristic	District Kuantan	Mukim Sungai Karang
Population	548,014	68,238
Households	145,270	16,501
Average Household Size	3.8	4.0
Living Quarters	154,355	17,857
Male	285,191	37,273
Female	262,823	30,965

Source: Key Findings Population and Housing of Malaysia 2020: Administrative District Kuantan, Department of Statistic Malaysia, 2022

6.10.3 METHODOLOGY

The baseline study aims to build a socio-economic profile of the area within 5 km of the proposed Project area. However, few settlements outside of a 5-km radius have been considered to be surveyed. The profile includes demographic characteristics, occupation, livelihood, and settlements. This information has been sought from two (2) primary sources, namely secondary data, e.g., published and unpublished reports on the human environment in the study area (Key Findings Population and Housing Census 2020, Department of Statistic Malaysia, 2022) and from primary data generated through social surveys.

The socio-economic survey involved a questionnaire survey of the communities in the study area using a purposive sampling technique. Sample surveys were conducted to collect the primary data directly from those individuals and inhabitants living in the areas perceived to be affected by the implementation of the proposed project, typically those living within the 5 km Zone-of-Influence (ZOI). The survey was conducted over four days, from 13 to 16 August

2022. Altogether 120 respondents were sampled within a 5-km radius from the project boundary.

6.10.4 RESPONDENTS SOCIO-ECONOMY PROFILE

There are 120 respondents drawn randomly from the proposed project site's nearest settlements using a purposive sampling technique with questionnaires. The respondents were interviewed in Table 6.6(2), and socio-survey pictures are shown in Table 6.6(3). The closest settlement area is Kampung Darat Sungai Ular, located within a 3-kilometre to a 4-kilometre radius from the proposed project site.

Table 6.10(2): Sample Distribution in the Study Area

No.	Radius from Project Area (km)	Town and Residential Area	Number of Respondents
1.	3 – 4	Kampung Darat Sungai Ular	30
2.	3 – 4	Kampung Gebeng	20
3.	4 – 5	Kampung Sungai Ular	30
4.	5 – 6	Kampung Selamat	10
5.	5 – 6	Taman Balok Makmur	20
6.	6	Jeti Seberang Sungai Ular	5
7.	8	Jeti Sungai Balok	5
TOTAL			**120**

Source: Socio Survey, August 2022

Table 6.10(3): Pictures During Socioeconomics Survey Within Study Area

	
Kampung Gebeng	Kampung Gebeng
	
Kampung Sungai Ular	Kampung Sungai Ular
	
Kampung Darat Sungai Ular	Kampung Darat Sungai Ular
	
Kampung Selamat	Kampung Selamat
	
Jeti Sungai Balok	Jeti Sungai Balok

6.10.4.1 Respondent Age Group

The respondent age group was subdivided into a ten-year-old cohort. Most of the respondents come from 40-49 years old, comprising 28.3%. In comparison, the respondents from 30-39 years old comprised 23.3%. The respondents come from the range of 20-29 years old, consisting of 15.8%. The respondents' least range comes from 50 – 59 years old, with 12.5%. The above 60 years old comprise 20% of the total respondents **(Table 6.10(4)).**

Table 6.10(4): Age Structure of the Respondents in the Study Area

Age Group	Percentage (%)
20 – 29	15.8
30 – 39	23.3
40 – 49	28.3
50 – 59	12.5
Above 60	20.0

Source: Socio Survey, August 2022

6.10.4.2 Educational Level

Table 6.6(5) shows that most of the respondents came from secondary education backgrounds, represented by 74.2%. Besides, the primary level of education was represented by respondents at 14.2%, and the least was tertiary educational level, represented by 10.9% of the overall percentage. Some respondents have no formal education; about 0.8% are senior citizens.

Table 6.10(5): Educational Level of the Respondents in the Study Area

Educational Level	Percentage (%)
No formal education	0.8
Primary school	14.2
Secondary School	74.2
STPM/Matriculation	9.2
University/College	1.7

Source: Socio Survey, August 2022

6.10.4.3 Family Size

The majority family size in the study area ranged between two or three persons in a family, represented by 60 respondents (50.0%). Another 17.5% of respondents had a family member with four to six persons, and 4.1% had more than seven families in one house (**Table 6.6(6)**). The single member is 28.3%; they are a senior citizen living alone or single workers living in rental houses.

Table 6.10(6): Family Size of the Respondents in the Study Area

Family Size	Percentage (%)
1	28.3
2 – 3	50.0
4 – 6	17.5
7 – 9	3.3
>10	0.8

Source: Social Survey, August 2022

6.10.4.4 Employment

Table 6.6(7) represents respondents' employment status within the study areas. Most of them were working in the private sector, represented by a percentage value of 36.6%. About 35.0% are fishermen, and 17.5% of respondents work in the government sector. Other than that, about 9.2% are unemployed, including pensioners and housewives.

Table 6.10(7): Employment Status of the Respondents in the Study Area

Employment	Percentage (%)
Pensioner/Housewife/Unemployed	9.2
Fishermen	35.0
Government Servant	17.5
Private Sector	38.3

Source: Social Survey, August 2022

6.10.4.5 Household Income

Table 6.10(8) shows the monthly household income of the respondents in the study area. The respondents with household income below RM500 in the study area comprised 1.7%. Those who earned between RM501 and RM1000 comprised 1.7% too. Respondents with household income between RM1001 and RM2000 made up 26.7%, while the income

group between RM3001 and RM5,000 comprised 20.0%. The majority group income comprised 49.2%, ranging between RM2,001 and RM3,000.

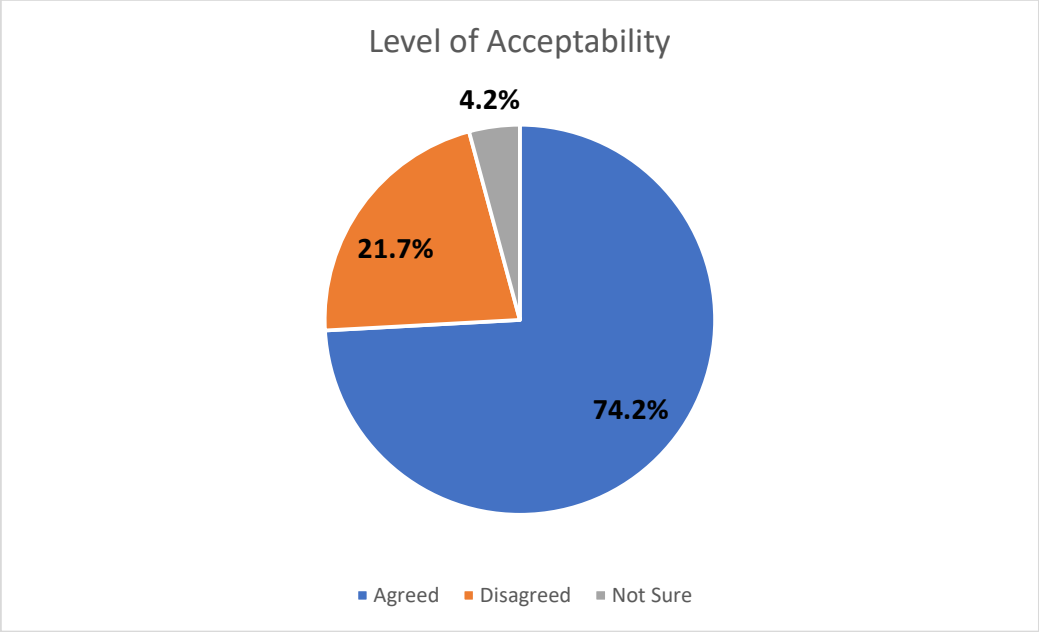
Table 6.10(8): Household Income of the Respondents in the Study Area

Household Income (RM)	Percentage (%)
<500	1.7
501 – 1000	1.7
1001 – 2000	26.7
2001 – 3000	49.2
3001 – 5000	20.0
>5000	0.8

Source: Social Survey, August 2022

6.10.5 AWARENESS AND PERCEPTION

A social survey has been carried out to get local people's opinions and perceptions of the project. The consensus was that the local people's aspiration to get new jobs and infrastructural improvement was a central viewpoint. They were concerned about the potential benefits they may gain from the project as it would generate employment opportunities for the local people.



Source: Socio Survey, August 2022

Figure 6.10(1) Perceived Acceptability Level of the Project

Figure 6.10(1) provides the perceived acceptability level of the project. Total respondents, 74.2% of respondents agreed with the project, and 4.2% did not know about their acceptance of the project since the proposed project is located in the industrial zone area. Therefore, there

is no issue with the site to be developed. Simultaneously, the respondents agreed to the proposed project because this project can help grow the local economy and give job opportunities to local people. During these few years, many residents lost their jobs, or fresh graduates could not get employed; therefore, they encouraged new job opportunities in their area.

Another 21.7% of respondents did not agree with the project because they thought it would negatively impact the existing environmental conditions. The respondent within the study area is faced with environmental issues such as river pollution, air pollution and the risk of road accident, which makes them worried if this area will become worse with this new development.

Figure 6.10(2) shows the opinion section on the positive impact of the proposed project. Most respondents disagreed that factory development would give business opportunities to locals, encourage development and growth, and increase facilities and infrastructures. Meanwhile, the majority agree the proposed project would provide employment opportunities to the locals (96.7%).

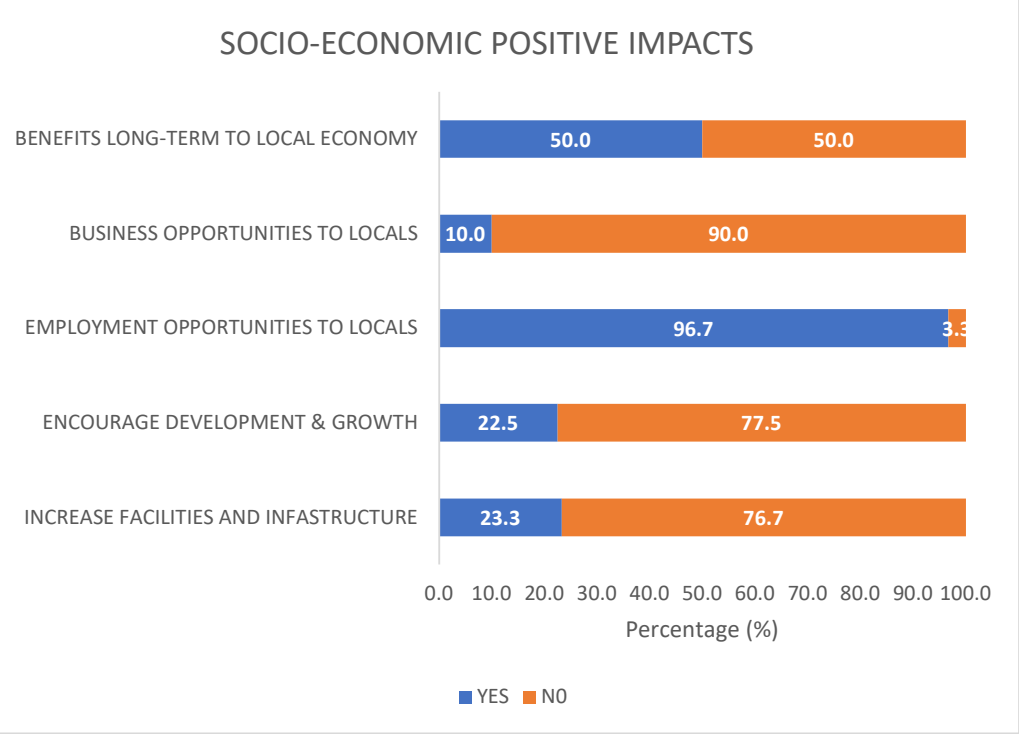


Figure 6.10(2): Positive Impact

Figure 6.10(3) shows the negative impact of the proposed project. All respondents agreed that this development would cause traffic congestion from heavy vehicle ingress and egress

from the project site (88.3%), affect the aesthetic value of the environment (73.3%), road damage (61.7%), road accidents risk (52.5%) and increase of foreign workers (52.5%).

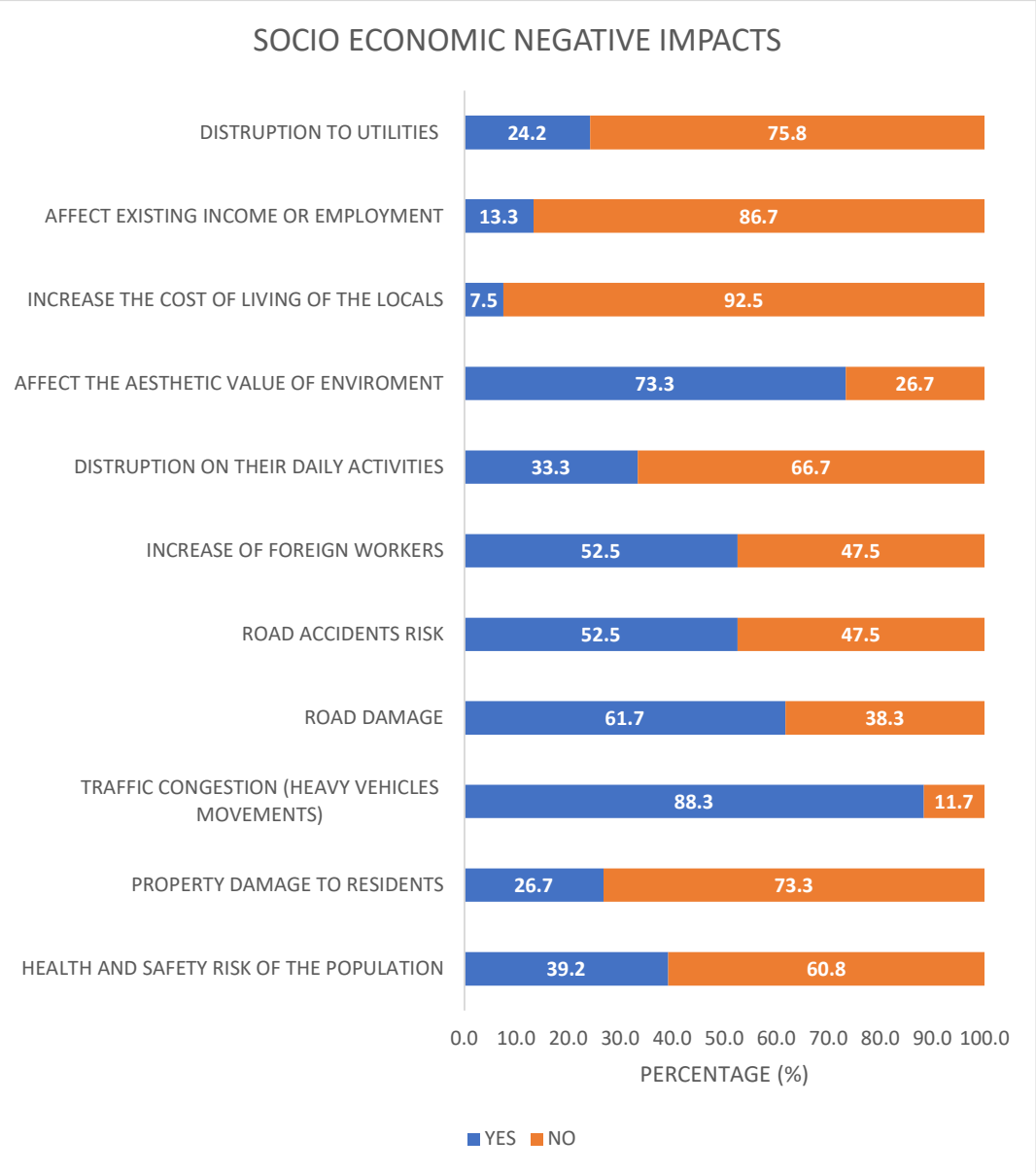
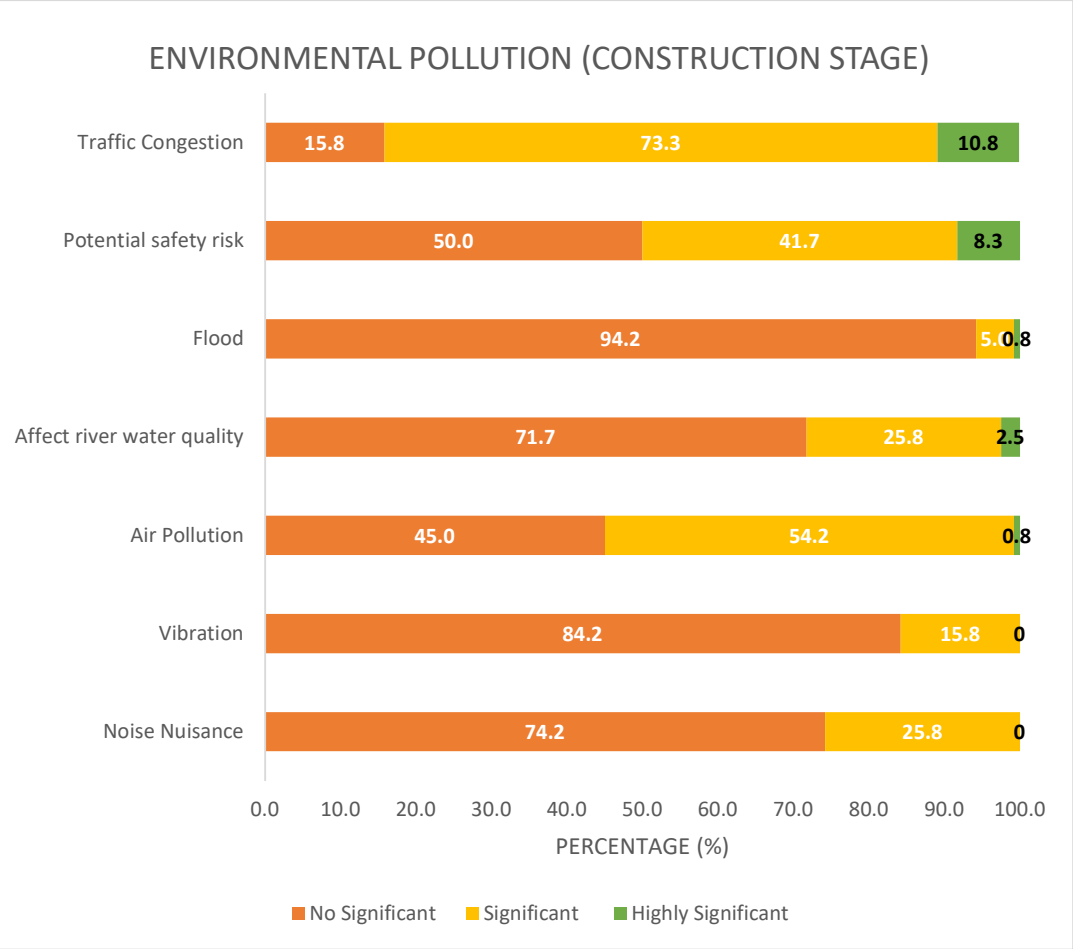


Figure 6.10(3): Negative Impact

Figure 6.10(4) represents the perception of environmental pollution for the project development during the construction stage. All the respondents agreed that the project would cause traffic congestion during construction (73.3% significant and 10.8% highly significant). Other environmental concerns the air pollution from heavy vehicle movement and project activities (54.2% significant and 0.8 highly significant). Due to the location of the proposed

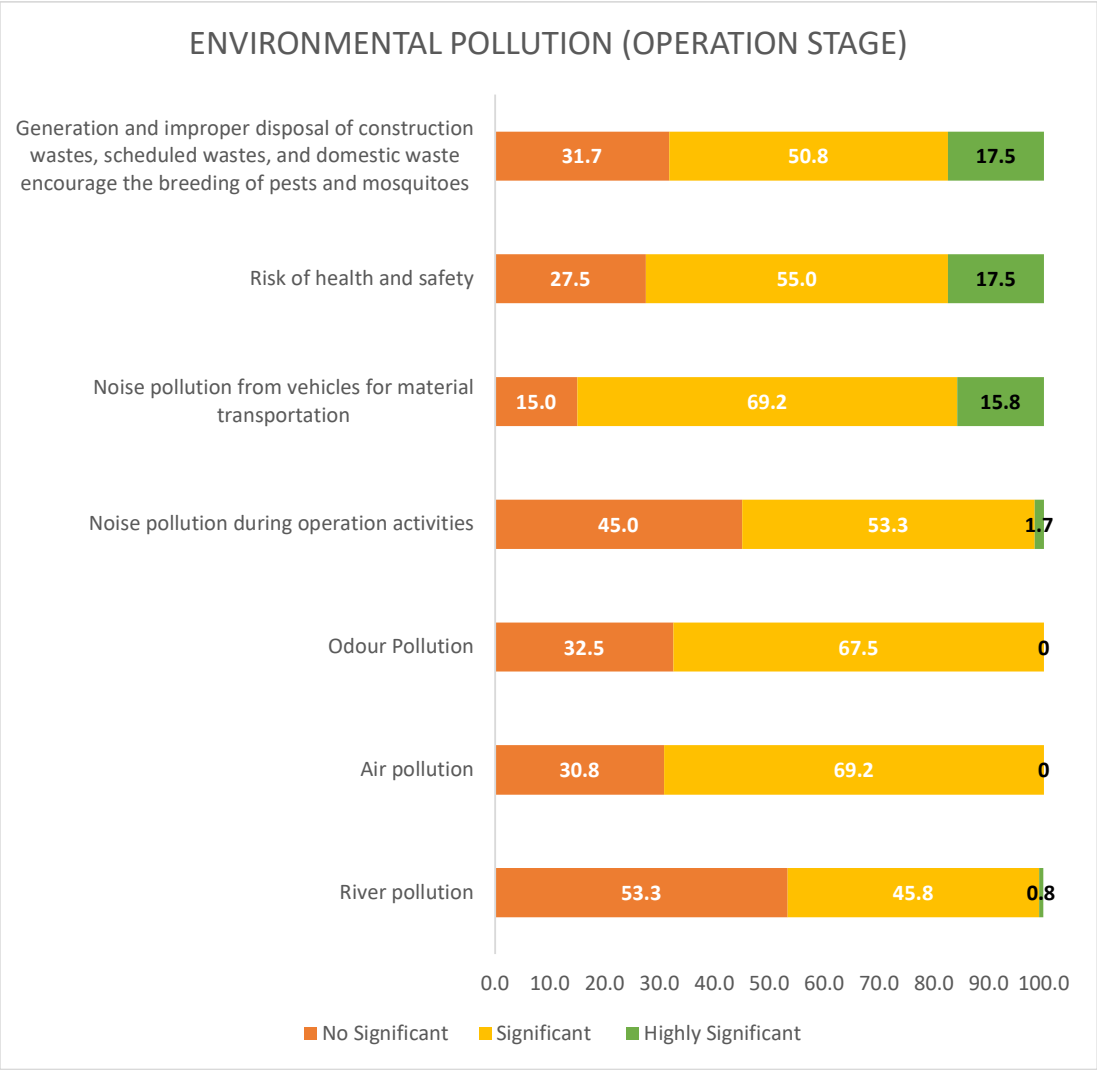
project site being far from most of the residential area, therefore, most respondents believe that potential environmental impacts such as flood (94.2%), vibration (84.2%), noise nuisance (74.2%), and river pollution (71.7%) are not significant.



Source: Socio Survey, August 2022

Figure 6.10(4): Perception of Environmental Pollution (Construction Stage)

Figure 6.10(5) represents the perception of environmental pollution for the project development during the operation stage. The majority felt all potential environmental pollution could happen during the operation stage. Most respondents agreed that the project would cause noise pollution from vehicles for material transportation during operation (69.2% significant and 15.8% highly significant). Other pollution concerns to be expected are odour pollution (67.5% significant), air pollution (69.2%), and risk of health and safety (55.0% significant and 17.5% highly significant).



Source: Socio Survey, August 2022

Figure 6.10(5): Perception of Environmental Pollution (Operation Phase)

6.10.6 HEALTH EXISTING CONDITION

6.10.6.1 Toilet Facilities

The survey results show that 55.8% of the respondents use pump flush toilets connected to a communal sewerage system or use individual septic tanks (**Table 6.10(9)**). The rest of the respondents use the pour-flush toilets. It was noted that the pour flush toilet system is used mainly in the old/heritage villages located within a 5 km radius from the proposed project site.

Table 6.10(9) Types of Toilets Used

Toilet	Percentage (%)
Pump Flush Toilet	55.8
Pour Flush Toilet	44.2
Total	100.0

Source: Socio survey, August 2022

6.10.6.2 Types of Water Supply

Most of respondents (77.5%) have secured safe drinking water from Pengurusan Air Pahang Berhad (PAIP) direct into their houses. About 22.5% use tube well water as their water supply daily, they are respondents from Kampung Sungai Ular, Kampung Gebeng and Kampung Darat Sungai Ular.

Table 6.10(10):Types of Water Supply

Water Supply	Percentage (%)
Tube Well	22.5
Piped water in the house	77.5
Total	100.0

Source: Socio survey, August 2022

6.10.6.3 Method of Domestic Waste Disposal By Respondents

Most of the respondents (80.8%) practices open burning as a method of disposal for their domestic waste. This method will affect sensitive and vulnerable people such as senior citizens, babies, and asthmatic people. Only 17.5% of respondents claimed that the Municipal authority came and collected their household waste. Others throw it onto an open space (1.7%).

Table 6.10(11): Method of Disposal

Toilet	Percentage (%)
Throw on an open space	1.7
Open Burning	80.8
Collect by Municipal authority	17.5
Total	100.0

Source: Socio survey, August 2022

6.10.6.4 The Prevalence of Illnesses in the Past Six Months

Of 120 respondents, about 35 have family members who experienced some kind of illness in the past six months. The majority had URTI (Upper Respiratory Tract Infection), about 27 complaints; seven were for coughing up phlegm, and only one was for diarrhoea, as shown in **Table 6.6(11)**.

Table 6.10(11): Illness in the Past Six Months Within Family Members

Illness	Frequency
Diarrhoea	1
URTI	27
Cough Up Phlegm	7
Total	35

Source: Socio survey, August 2022

6.10.6.5 Illness Confirmed by A Doctor in the Past Six Months

About 39 respondents said they went to seek medical attention within six months of their illness. A total of 20 family members were diagnosed with hypertension, 11 diagnosed with diabetes, four with asthma, two with skin disease and only one with heart attack and dermatitis, as shown in **Table 6.10(12)**.

Table 6.10(12): Illness Confirmed by A Doctor in the Past Six Months

Illness	Frequency
Asthma	4
Hypertension	20
Heart Attack	1
Skin Disease	2
Dermatitis	1
Diabetic	11
Total	39

Source: Socio survey, August 2022

6.10.6.6 Admission to Hospital and Illness Confirmed by Hospital Doctors

Only two respondents said that some household member was hospitalised within the last six months. Of those who went to the hospital, about 36 family members have been

diagnosed with illness by hospital doctors. Twenty-one people have hypertension, nine for diabetes, four for asthma, one for heart attack and one for skin disease.

Table 6.6(13): Illness Confirmed by Hospital Doctors in the Past Six Months

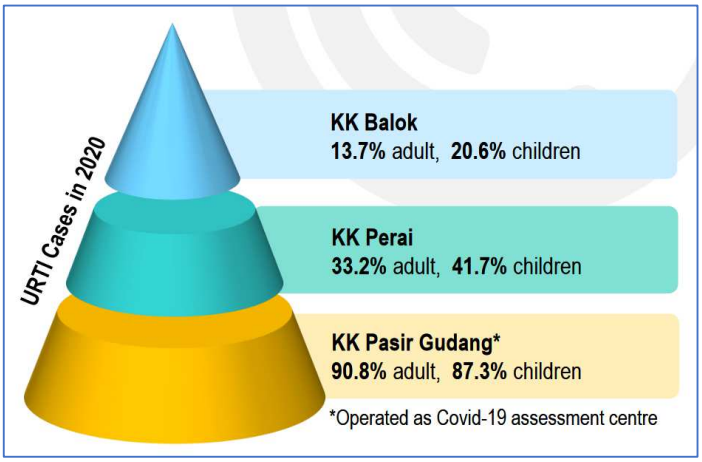
Illness	Frequency
Asthma	4
Hypertension	21
Heart Attack	1
Skin Disease	1
Diabetic	9
Total	36

Source: Socio survey, August 2022

6.10.6.7 Health Existing Condition from Other Studies

A very recent study on air quality effects on health in industrial areas, by looking at Upper Respiratory Tract Infections (URTI) has concluded that, relative to other industrial areas in Malaysia (areas studied were Pasir Gudang, Gebeng, Kertih-Paka, Klang and Prai) Gebeng presents the lowest % of URTI among those reporting at the local government Health Clinic, as shown in Figure 6.10(6) (KABPU, 2022), indicating the air as still clean and not significantly affecting the health of the locals.

Upper Respiratory Tract Infections (URTI)



Source: KABPU (2022) Kajian Analisis Beban Udara di Kawasan Industri Berisiko di Malaysia (KABPU), DOE Putrajaya, 2022.

Figure 6.10(6) Public Health due to Air Quality – Incidences of URTI

6.10.7 Conclusion on Socioeconomy and Health

The largest age groups are 30 – 39 years at 23.3% and 40 – 49 years at 28.3% that is the employable age groups, thus in-line with the proposed project's aim to employ locals, and for them to recide in the local areas. Most have a certain degree of formal education, with most up to secondary school (74.2%) and tertiary education at 1.7%. Family size is mostly small with 2-3/family at 50%, indicating that a family house may still accommodate additional members and housing is not critically short. Employmentwise, a large % is working as fishermen, which is an informal work category (35%) opening them to employment at work sites, etc, in-line with the proposed project's aim of employing locals and not importing foreign workers. Accounting for the small household, level of education and large work group being fishermen, the majority of households (49.2%) has household income of RM2,001 and RM3,000, which is regarded as moderately low; this low-income condition may be seen from the pictures during survey as shown in Table 6.10(3). There was high acceptability of the proposed project, at 74.2%, while the Respondents hold onto high expectations of new jobs and infrastructural improvement. A potential improvement as proposed here is developing a river reserve cum nature park along Sg. Baluk, that would serve the locals, as well as attract eco enterprises in angling, boating, etc. This initiative may be taken up by GIE Park Management; with participations from the industries in the area as part of their Corporate Social Responsibility (CSR).

Healthwise the existing living conditions are relatively poor with high % of non-flush toilets and garbage burning as indicators. Nevertheless, health conditions are normal without prevalence of serious or strange illnesses and studies by KABPU (2022) on air quality in 5 biggest industrial areas in Malaysia has shown Gebeng as having lowest URTI compared to others.

6.11 LAND TRAFFIC

6.11.1 Introduction

The proposed project (The Construction and Completion of a Metals from Spent Catalyst Recovery Facility (SCaRF) in Gebeng Industrial Area, Kuantan, Pahang) is to cater for used catalyst from Petrochemical plants in Pengerang, Johor, as well as (in future) other petrochemical plants to recover valuable metals. The location of the proposed Project Site is equipped with good infrastructure and systematic traffic flow which is beneficial for local and foreign investors, as well as advantageous during construction and operation phase.

Accessibility to project site can be categorised into 3 modes of transportation which is by land, water and air. The project site can be accessed directly via road or indirectly by flight, ship and future connectivity by train, via the East Coast Rail Link (ECRL), specifically via the ECRL Station 10 at Kuantan Port. **Table 6.11(1)** below explains details of the project site accessibility.

Table 6.11(2): Accessibility to Project Site

Via	Accessibility
Road	From the East Coast Expressway (E8), the site is accessible by: • Travelling straight toward Kuala Terengganu after the Jabor Toll Plaza, take the exit 836 onto Gebeng Bypass (101) towards Gebeng. From Jalan Johor Bharu – Rantau Panjang (FR3), the site is accessible by: • Travelling North from Kuantan Town, head north towards Gebeng and take exit to Gebeng Bypass (101) towards Kuala Lumpur.
Flight	Accessible indirectly by flight via the Sultan Ahmad Shah Airport in Kuantan which is located about 37km south of site.
Ship	Kuantan port is a multipurpose port in Kuantan located about 12km southeast of site. However, the port serves mainly for logistic cargo handling. Hence it is not a good choice of access point to site from the Mainland.
Train	Future connectivity, ongoing construction of the East Coast Rail Link (ECRL) connecting Kuantan Port from east to west coasts of Peninsular Malaysia, expected completion in 2026.

During operation, it is anticipated that the logistics of used catalyst transport from Petrochemical plants in Pengerang, Johor, to the location of the proposed Project Site would be during active weeks only, i.e., after spent catalyst is generated. The most frequent active weeks is for ARDS catalyst (**Table 5.3(1)**) at about 4 active (transporting) weeks in 3 months, with about 8 trucks/day during the active weeks. The recommended route for this transfer minimises passage through townships, with the most stretch through highways, as given in **Appendix 5** (Please refer to Appendix 5: Proposed logistic route from Pengerang to SCaRF, Gebeng). The roads likely to have direct influence on traffic to/from the Project site are Jalan Gebeng 2/7, Jalan Gebeng 1/11 (Jalan Qinzhou) and Jalan 101 (Gebeng Bypass). Jalan Gebeng 2/7 and Jalan Gebeng 1/11 (Jalan Qinzhou) are 2-lane single carriageway of width 3.3 metres in each direction and with speed limit of 60 kilometres per hour with partial access control. Jalan Gebeng 2/7 stretch of road will be most affected during construction and

operational phase of the project as it will become egress and ingress points into the Project site. Jalan 101 (Gebeng Bypass) is a 4-lane single carriageway of 3.5 metres width in each direction and with speed limit of 90 kilometres per hour, that merges with the East Coast Expressway (E8) in the West, meanwhile joining with Federal Route 3 (Jalan Johor Bharu – Rantau Panjang) in the East, to serve as an alternative route passing through Gebeng town. Existing road junctions near project site is shown in **Figure 6.11(1)**.

This traffic study is based on secondary data information which was extracted from the Road Traffic Volume (2020) published by the Public Works Department (JKR). The traffic flow along the road is taken from the traffic volume count by the State Public Works Department, coordinated by the Highway Planning Division, Ministry of Works Malaysia (2020). There are four census stations located at the surrounding area of the proposed site. **Figure 6.11(2)** and **Table 6.11(2)** show the details of the census station.

Table 6.11(2): Existing Information of the Census Stations

Census Station Number	Survey Type	Route Number	Description of Location	Type of Carriageway
CR410	2	FR3	Kuantan -Kemaman (Sg. Ular)	T1-1
CR409	0	FR2	Kuantan - Kemaman	K2-2
CR407	0	231	Kuantan – Sg Lembing	T1-1
CR405	3	FR3	Kuantan Bypass	T2-2

Source: Road Traffic Volume Malaysia 2020, Ministry of Works Malaysia

Note: T1-1: 2-Lane Single Carriageway, K2-2: 4-Lane 1-Way Single Carriageway,
T2-2: 4-Lane Single Carriageway

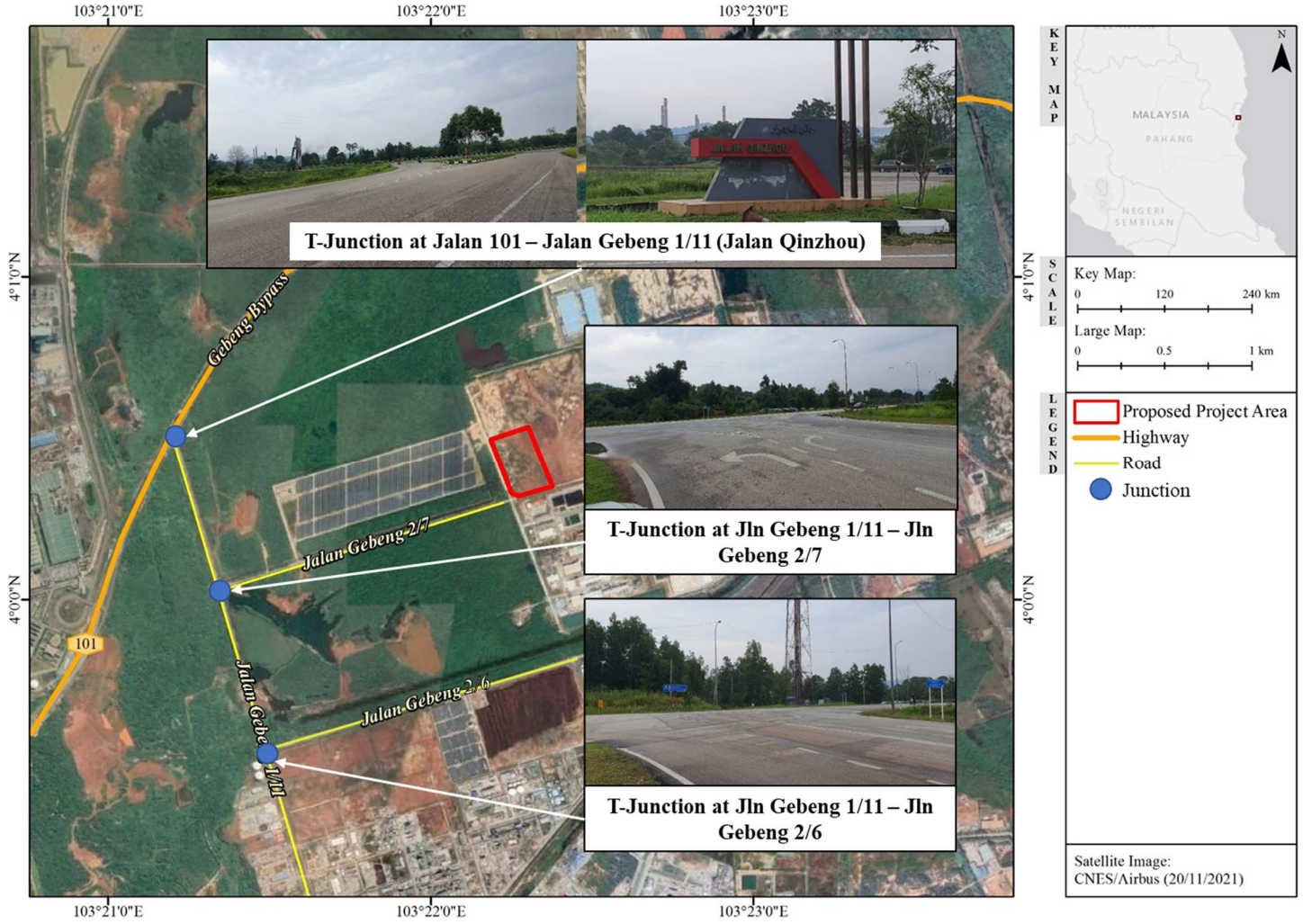


Figure 6.11(1): Existing Road Junctions near Project Site

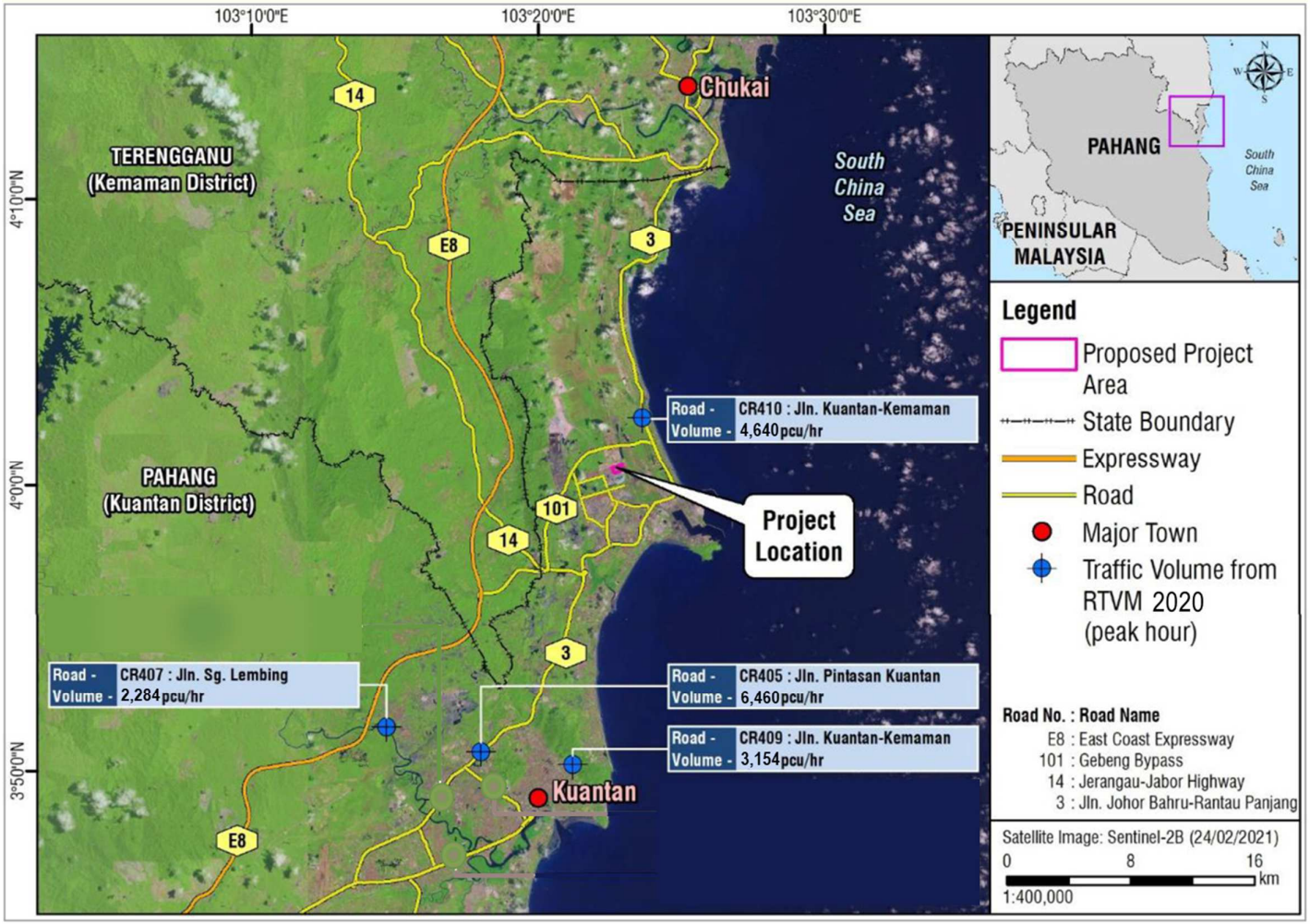


Figure 6.11(2): Project Location and Traffic Volume Census Station

6.11.2 Existing Traffic Condition

Census Data

Referring to the published Road Traffic Volume (2019), the average 16 hours traffic volumes by vehicle type at census station CR410, CR409, CR407 and CR405 were about 30,615, 30,640, 22,088 and 57,753 respectively whereas the traffic volume for peak hour is 4,640, 3,154, 2,284 and 6,460. The vehicle classification can be divided into six classes as shown in **Table 6.11(3)**. The numbers of cars and taxis were the highest with 65.2% for CR410, 75.6% for CR409, 67.6% for CR407, and 69.9% for CR405. Other percentage of vehicle's composition is shown in **Table 6.11(4)**.

Table 6.11(3): Vehicles Classification

Class	Vehicle Type
Class 1	Motorcars, Taxis and Small MPV's
Class 2	Small Vans, Big MPV's and Utilities (Light 2-axles)
Class 3	Lorries and Large Vans (Heavy 2-axles)
Class 4	Lorries with 3-axles (Heavy 3-axles and above)
Class 5	Buses
Class 6	Motorcycles & Scooters (include 3-wheel motorcycles)

Source: Road Traffic Volume Malaysia 2020, Ministry of Works Malaysia

Table 6.11(4): Average 16-Hour Traffic Volume and Composition by Vehicles Types 2020

Route	16-Hour Traffic	Peak Hour	Percentage Vehicles Composition (%)						LOS
			Cars & Taxis	Van & Utilities	Medium Lorries	Heavy Lorries	Buses	Motorcycles	
CR410	30,615	3,613	65.2	12.2	5.0	3.7	0.6	13.3	F
CR409	30,640	2,876	75.6	5.2	2.1	0.5	0.2	16.5	A
CR407	22,088	1,890	67.6	10.4	3.9	1.7	0.6	15.8	F
CR405	57,753	5,073	69.9	12.0	4.5	4.1	0.2	9.3	E

Source: Road Traffic Volume Malaysia 2020, Ministry of Works Malaysia

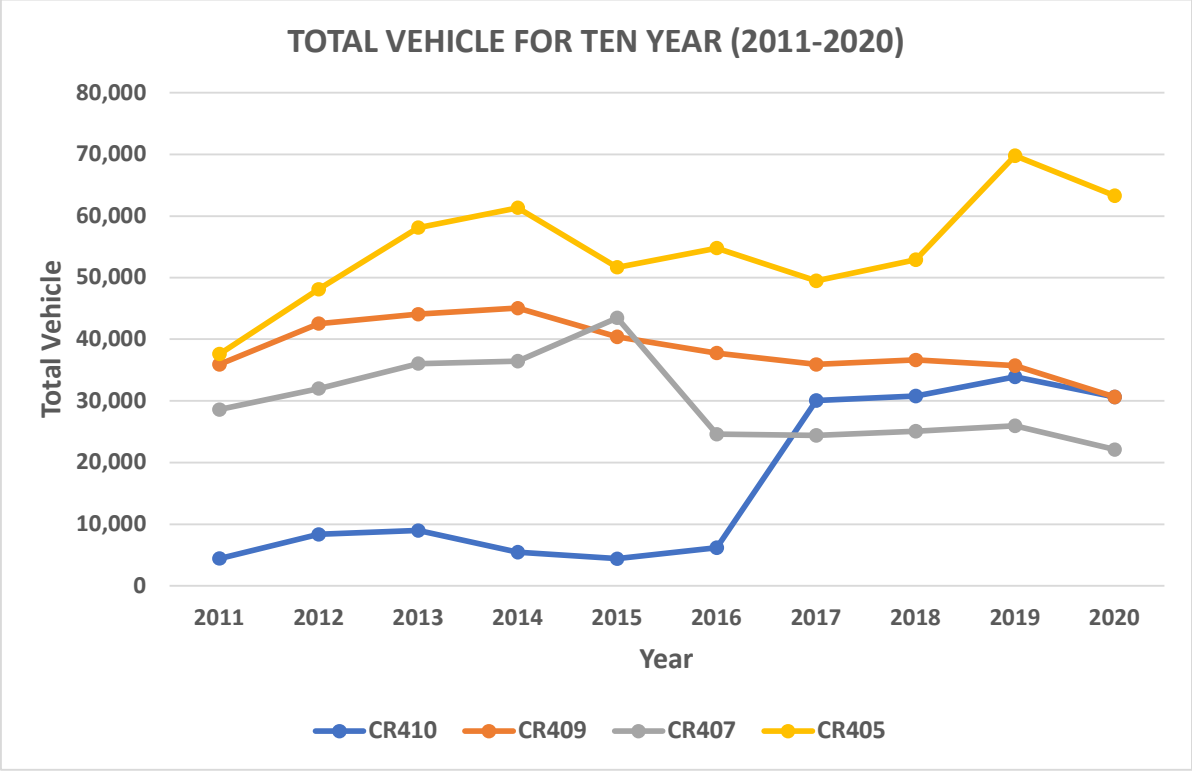
The annual traffic growth rate for year 2010 to 2019 is 4.82% for CR410, -2.60% for CR409, -4.50% for CR407 and 3.78% for CR405 station; details of values for total vehicles in ten years and annual traffic growth rate is tabulated in **Table 6.11(5)**. The graph in **Figure 6.11(3)** shows

the total number of vehicles for ten years (2011-2020). The graph illustrates the fluctuation in the number of vehicles for ten years for the four stations.

Table 6.11(5): Total Vehicles for 10 Years (2011-2020) and Annual Traffic Growth Rate Year 2020

Census Station number	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Normal Growth (%/yr)
CR410	23,278	22,911	21,601	22,995	20,827	24,850	30,052	30,768	33,911	30,615	4.82
CR409	35,911	42,538	44,054	45,060	40,395	37,748	35,897	36,636	35,717	30,640	-2.60
CR407	28,580	31,994	36,043	36,464	43,477	24,585	24,362	25,084	25,967	22,088	-4.50
CR405	37,595	48,105	58,126	61,322	51,699	54,823	49,476	52,890	69,806	63,322	3.78

Source: Road Traffic Volume Malaysia 2020, Ministry of Works Malaysia



Source: Road Traffic Volume Malaysia 2020, Ministry of Works Malaysia

Figure 6.11(3): Total Vehicles for Ten Years (2011-2020)

Traffic Count Survey

The existing traffic scenario in the study area was ascertained through visual survey to provide quantitative and qualitative measure of the existing site conditions as well as better understanding of the current travel patterns and route choice. The survey undertaken include the junction volumetric counts at critical junction and vehicle classification counts. This traffic counts will provide the composition of traffic at the road network, current demand on existing junction near the Project site and performance of the existing road network.

The traffic count survey was conducted at Jalan 101/Jalan Gebeng 1/11 Junction, Jalan Gebeng 1/11/Jalan Gebeng 2/7 and Jalan Gebeng 1/11/Jalan Gebeng 2/6 with three counting station setups at influence areas as shown in **Figure 6.11(4).** The traffic count survey was recorded on 9th August 2022 and 10th August 2022 during morning and evening peak hours, with peak hour periods of 0730 to 0830hrs, 1230 to 1330 hrs and 1730 to 1830 hrs respectively.

Traffic counts involved vehicle classification counts where vehicles entering and leaving each station were recorded, subsequently, these classified counts were converted to equivalent passenger car unit or more commonly abbreviated as *pcu*. Five classes of vehicles passenger car unit equivalent factor criteria are shown in **Table 6.11(7).**

Table 6.11(6): Passenger Car Unit (*pcu)* Equivalent Factor

Vehicle Classes	Passenger Car Unit Equivalent Factor
Motorcycles	0.75
Passenger Cars	1.00
Light Vans	2.00
Medium Lorries	2.50
Heavy Lorries	3.00
Buses	3.00

Source: A Guide on Geometric Design of Roads, REAM-GL 2/2002

The data from the traffic count survey were processed and summarised, and the existing traffic volume during morning and afternoon peak hours is presented in **Figure 6.11(4).**

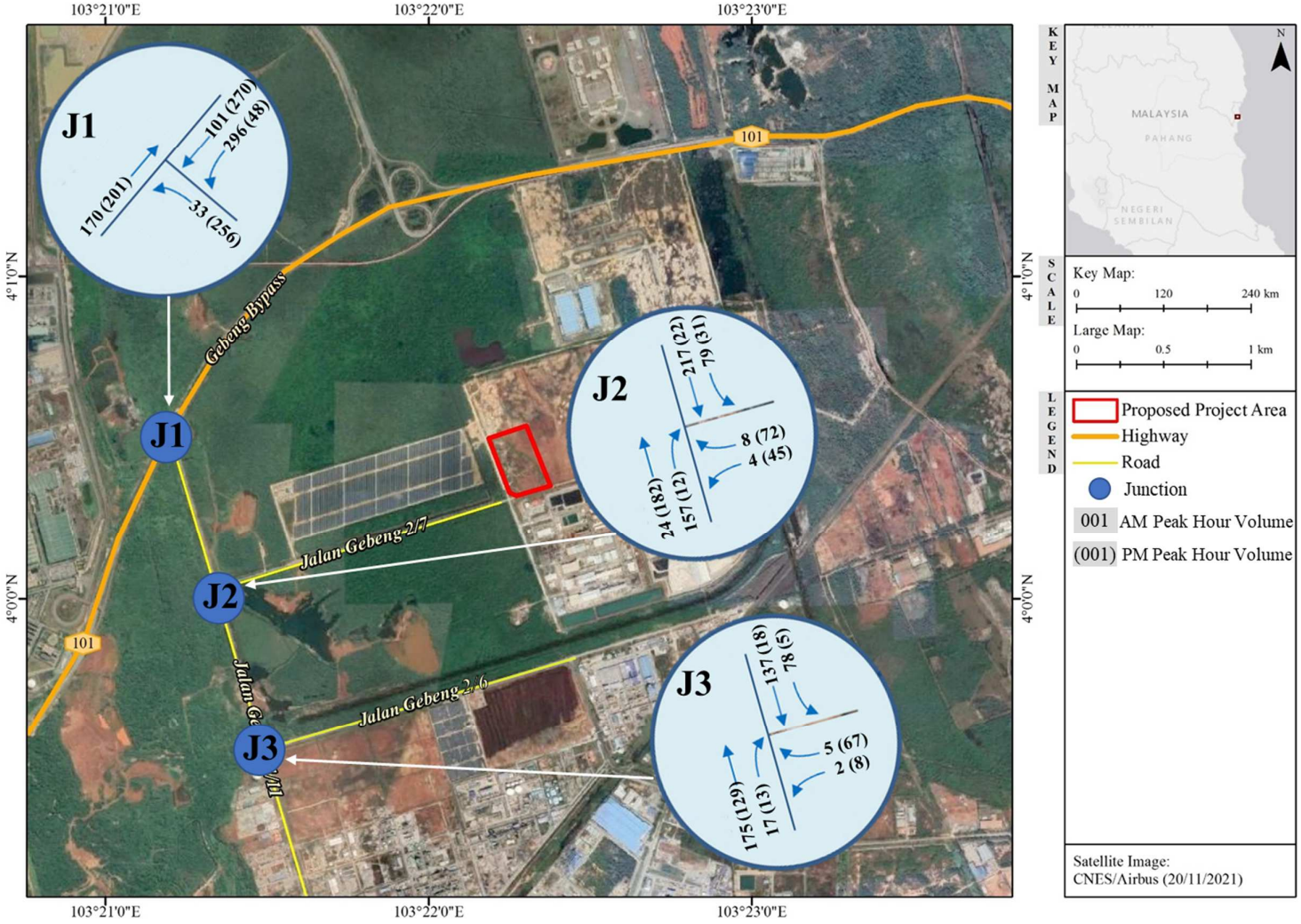


Figure 6.11(4): Locations for Traffic Counting Sampling and Existing Traffic Volume

6.11.3 Evaluation of Roadway and Junction Performance

The operational performance of the road in the immediate vicinity of the project site is measured by comparing the current traffic volumes and carrying capacity of the road section. Capacity of the road section is maximum amount of traffic that can be accommodated by certain sections of the carriageway. The performance is measured based on the maximum traffic volume/capacity ratio, which represents the 'worst case' scenario. It is related to Level of Service (LOS) concept by giving letter designations from A to F as shown in **Table 6.11(8).**

Table 6.11(7): Level of Service Definition

LOS	Volume/ Capacity	Flow Condition	Definition
A	< 0.60		Free flow with volume densities and high speeds. Drivers can maintain their speeds with little or no delay. Merging and diverging vehicles have little effect on other freeway flows.
B	0.60-0.69		Stable flow. Operating speeds beginning to be restricted somewhat by traffic conditions. Some slight delay. Merging vehicles have to adjust their speed slightly.
C	0.70-0.79		Stable flow. Speed and maneuverability are more closely controlled by higher volume. Acceptable delay.
D	0.80-0.89		Approaching unstable flow. Tolerable operating speeds, which are considerably affected by operating conditions. Tolerable delay.
E	0.90-0.99		Unstable flow. Yet lower operating speeds and perhaps stoppages of momentary duration. Volumes are at or near capacity. Congestion and intolerable delay.
F	> 1.00		Forced flow. Speeds and volume can drop to zero. Stoppages can occur for long periods. Queues of vehicles baking up from a restriction downstream.

Existing Environment

The major roads in the surrounding area are Jalan Gebeng 2/7, Jalan Gebeng 1/11 (Jalan Qinzhou) and Jalan 101 (Gebeng Bypass). The road type, capacity, and level of service (LOS) are shown in **Table 6.11(9)** and as presented in **Figure 6.11(5)**. From the analysis, it can be observed that all the major roads surrounding the proposed Project site are performing at LOS A, which indicates that the surrounding road network is currently performing at a very good LOS, where drivers can maintain their speeds with little or no delay, furthermore, merging and diverging vehicles have little effect on other freeway flows.

Table 6.11(8): Level of Service Roadway

Route Name	Type of Carriageway	Maximum Hourly Capacity (pcu/hr/lane)	Volume (pcu/hr)		V/C Ratio (LOS)	
			AM	PM	AM	PM
Jalan 101 (Gebeng Bypass)	4-lane single carriageway	2000 (per lane)	397	526	0.20 (LOS A)	0.26 (LOS A)
Jln Gebeng 1/11 (Jln Qinzhou)	2-lane single carriageway	2800 (bothways)	402	307	0.14 (LOS A)	0.10 (LOS A)
Jln Gebeng 2/7	2-lane single carriageway	2800 (bothways)	244	160	0.09 (LOS A)	0.06 (LOS A)

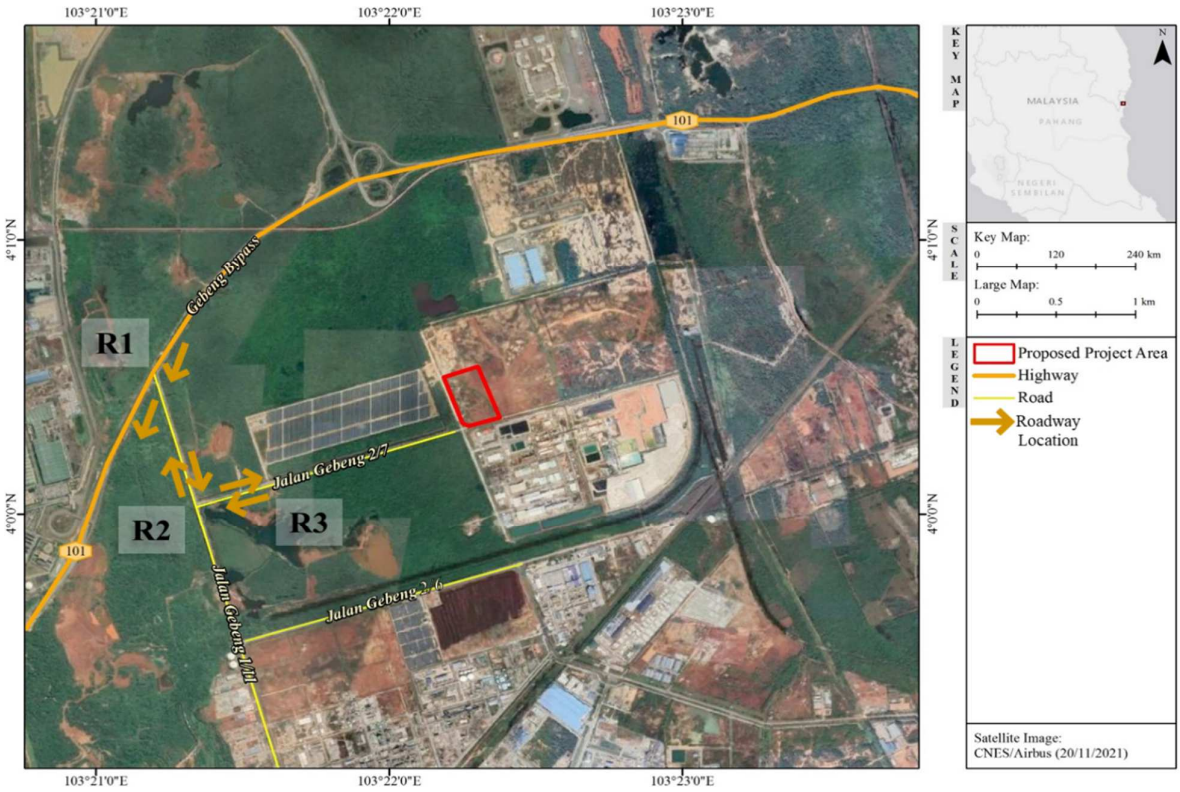


Figure 6.11(5): Roadway Location

Junction performance is usually measured based upon the volume over capacity ratio (v/c). The delay and queue are related to the level of service concept, whereby the LOS A and F represent the best and worst operating conditions of the roads respectively. Generally, LOS D or better is regarded as an acceptable level of service for an urban road system. To achieve this acceptable level of service, the road should have a volume over capacity ratio of 0.89 or less, depending on the design free flow speed of the multilane road. Most urban roads operate between LOS D to LOS F due to the acute congestion problems. For this study, it is deemed necessary to attempt to achieve LOS D. However, LOS E will be the lowest acceptable for the design criteria.

Simulated Current Traffic Scenario at the at Jalan Gebeng 1/11/Jalan Gebeng 2/7 and Jalan Gebeng 1/11/Jalan Gebeng 2/6 during peak hour period is presented in **Table 6.11(10).** From the analysis, all the of the junctions are operating in acceptable conditions during peak hours; at LOS A. Hence it means the junctions operate in free flow with low volume, densities and high speeds, drivers can maintain their desired speeds with little or no delay.

Table 6.11(9): Junction Performance

Junction	Type of Junction	Level of Service	
		AM	PM
J2 (Jln Gebeng 1/11 - Jln Gebeng 2/7)	3-legged, priority junction	LOS A	LOS A
J3 (Jln Gebeng 1/11 - Jln Gebeng 2/6)	3-legged, priority junction	LOS A	LOS A

6.11.4 Conclusion on Existing Traffic

A review of present road facility and its ability to cater for current traffic demand was carried out to determine if any improvement need to be introduced. Traffic study has been carried out on Jalan Gebeng 2/7, Jalan Gebeng 1/11 (Jalan Qinzhou) and Jalan 101 (Gebeng Bypass) as these are the roads likely to have direct influence on traffic to/from the proposed Project site. From the roadway midblock performance and junction performance results, it is clear that the surrounding road network is currently performing at a very good LOS for both weekday and weekend. Generally, the traffic at these roads is operated in free flow. In addition, traffic would be affected only during the construction period, whereas during the operation, the heavy vehicle would be for dry spent catalyst transportation, with the most frequent for ARDS catalyst at only about 4 active (transporting) weeks in 3 months, with about 8 trucks/day during the active weeks. Hence, the overall traffic in the Project Site is not sufficiently constrained to be of concern.