1.0 INTRODUCTION

This Preliminary Traffic Impact Assessment (TIA) Study has been conducted for the "The Proposed 120 Acres of Coastal Reclamation and 50 Acres of Water Chalets (Without Reclamation) At Pekan Klebang Section III, Mukim Klebang Besar, Daerah Melaka Tengah, Melaka".

1.1 Objective

Despite TIA study is not required by JKR for the proposed Project, a preliminary TIA is carried out by consultant for DEIA purposes. The objective of the study is to forecast the traffic generated by the Project especialy during reclamation stage and assess its impact on the present surrounding road network.

In pursuance of this objective, the study will include the following:

(a) Determine the existing surrounding road network, traffic volumes of potentially affected roads and their capacities;
(b) Determine and project the traffic volume generated by the Project;
(c) Assess the impact of increased traffic on the traffic hinterland; and
(d) Identify mitigation measures to overcome any serious traffic impacts due to the Project.

1.2 Scope of Work

The scope of work consists of the following tasks:

(a) Analyse traffic data obtained from traffic count surveys;
(b) Determine peak hour traffic volumes for roads, ingress and egress in the traffic influence area;
(c) Appraise the volume-capacity of existing roads and the future road network taking into consideration improvements and/or additions to facilitate and accommodate the anticipated increase in traffic;
(d) Forecast the traffic volumes and characteristics, with and without the Project; and
(e) Recommend mitigation measures to alleviate anticipated traffic problems.

1.3 Data Sources

Primary and secondary data on existing traffic, land-use, socio-economic condition and impending development within the traffic influence area has been obtained from various sources. These include:

(a) Primary data on traffic volume obtained from traffic counts in the traffic influence area in year 2014; and,
(b) Secondary information obtained from Population and Household Census, 2010, and from published reports by various State Government Departments.

1.4 Study Approach

The traffic characteristics in the influence area had been determined from the data collected by the Traffic Counts Survey in year 2014. Forecasts of future traffic volumes will be based on these data and those generated by the Project.

Seven-year time frame (2014 – 2021) of traffic volumes for proposed intersection is forecasted. The forecasting model (SIDRA) allows the forecasted traffic volumes be assigned to the road ingresses and egresses based on road capacities and also determine when the intersections will reach maximum capacity.

2.0 EXISTING TRAFFIC PATTERNS IN THE STUDY AREA

2.1 Location

The proposed Project will be located in Mukim Klebang Besar, Daerah Melaka Tengah, Melaka. Its latitude is N 2°12'41.49" - 2°13'9.47" and longitude is E 102°10'34.11" - 102°11'7.82". It is located about 0.2 km away from Seri Bayan Condominium and 0.35 km from Taman Nirwana **(Figure 2.1)**.

2.2 Road Network

The site is easily accessible from North South Expressway via Simpang Ampat Exit to join to Leburaya Alor Gajah-Melaka Tengah-Jasin (AMJ) or FR19 and then Jalan Pandan (M3). At the end of the road, turn right will join to Jalan Limbongan and then Jalan Klebang Besar. Drive strainght will pass by Everly Resort Hotel Malacca and eventually reach a junction off Jalan Klebang Besar at coordinates N 2°13'16.97" and E 102°10'54.60" which will lead to the proposed site.

2.3 Road Characteristic

For the purpose of this Study, the road likely to be affected by the Project has been identified. Federal Route 5 or Jalan Klebang Besar is a bi-directional road with single lane for each direction and without a divider to separate the traffic from each direction. The speed limit for the road is 80 km/hr. Traffic surveys were conducted along this road.

3.0 TRAFFIC SURVEY & ANALYSIS

3.1 Traffic Survey

The traffic survey includes traffic counts carried out at Road FR5 or Jalan Klebang Besar to assess the traffic condition. The traffic to and fro the Project site will be determined and used as basis to forecast traffic volume for the future, in conjunction with trips generated by the Project.

3.2 Traffic Count

The 'classified traffic count' based on 5 classes of observed vehicles shown in **Table 3.1** was adopted and used. The objectives of the traffic count are:

(a) To capture the existing traffic situation, particularly during morning, afternoon and evening peaks at the affected roads; and
(b) To obtain a base year traffic data for forecasting traffic growth up to the year 2021 when the Project will be fully operational.

Two traffic count stations were established at FR5 adjacent to the potential ingess and exgress of Project site

Manual counts were made on 20 September 2014 between 0700 hours to 1800 hours for 15 minute intervals to determine the morning, afternoon and evening peaks and to rationalize the hourly counts. The counting stations and road are described in **Table 3.2** and shown in **Figure 3.1**.

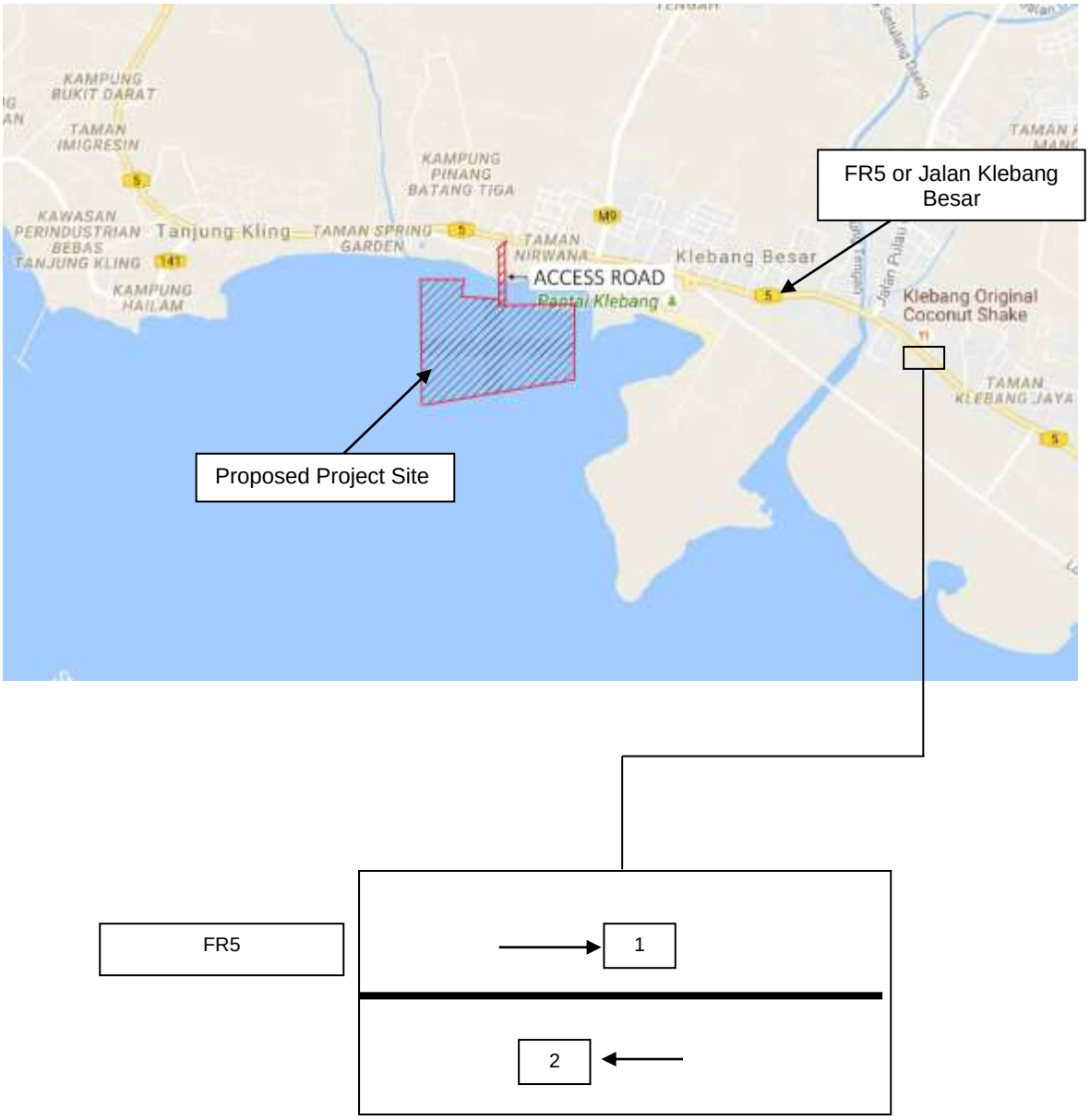
Table 3.1: Vehicle Types and Passenger Car Unit Equivalent (PCU) Criteria

Vehicle Types	Passenger Car Unit Equivalent (PCU)
Car/ Taxi	1.00
Van/ Pajero	1.00
Bus/ Lorry/ Tanker	2.00
Small Lorry/ Goods Van	1.30
Motorcycle	0.33

Table 3.2: Description of the Road at the Counting Stations

Station Number	Name of Road	Description
1	Road FR5 (Eastbound)	Captures the through traffic from Pantai Klebang or Tanjung Kling or Masjid Tanah or Project site to Pokok Mangga or Kg Limbongan or Bandaraya Melaka
2	Road FR5 (Westbound)	Captures the through traffic from Pokok Mangga or Kg Limbongan or Bandaraya Melaka to Project Site or Pantai Klebang or Tanjung Kling or Masjid Tanah

Figure 3.1: Location of the Traffic Counting Stations Adjacent to Project Site



3.3 Traffic Analysis (Year: 2014)

(a) Peak Traffic Flow

The data from the traffic counts are summarized in **Table 3.3** and **Figures 3.2 – 3.4**. The traffic pattern and characteristics of the surveyed road are:

(i) Heavy Vehicle Composition

- Road FR5 5.7%

(ii) Peak Hour Periods

- Morning Peak - 0730 to 0830 hours
- Afternoon Peak - 1200 to 1300 hours
- Evening Peak - 1700 to 1800 hours

(b) Traffic Composition

The traffic composition at the Project site is presented in **Table 3.4**. The mode of transport at Road FR5 surveyed, in decreasing order of magnitude, are cars, followed by motorcycles, vans/small lorries, lorries/tankers and finally buses.

The destinations for all categories were to places of work, commercial area, resort and home.

Table 3.3: Surveyed Traffic Volume

Station Number	Name of Road	Movement	Type	Morning Peak	Afternoon Peak	Evening Peak
1	Road FR5	Through	LV	620	578	596
			HV	38	29	36
2	Road FR5	Through	LV	545	521	587
			HV	27	30	37

Note: LV: Light vehicles, HV: Heavy vehicles.

Table 3.4: Traffic Composition at Roads Surveyed

Station	Name of Road	Vehicle Type (%)				
		Cars	Motorcycles	Vans/ Small Lorries	Buses	Lorries/ Tankers
1	Road FR5	70.0	18.5	5.7	2.0	3.8
2	Road FR5	68.2	18.0	8.2	1.8	3.8

Note: LV: Light vehicles, HV: Heavy vehicles.

Figure 3.2: Traffic Movement for Morning Peak Adjacent to Project Site (Year 2014)

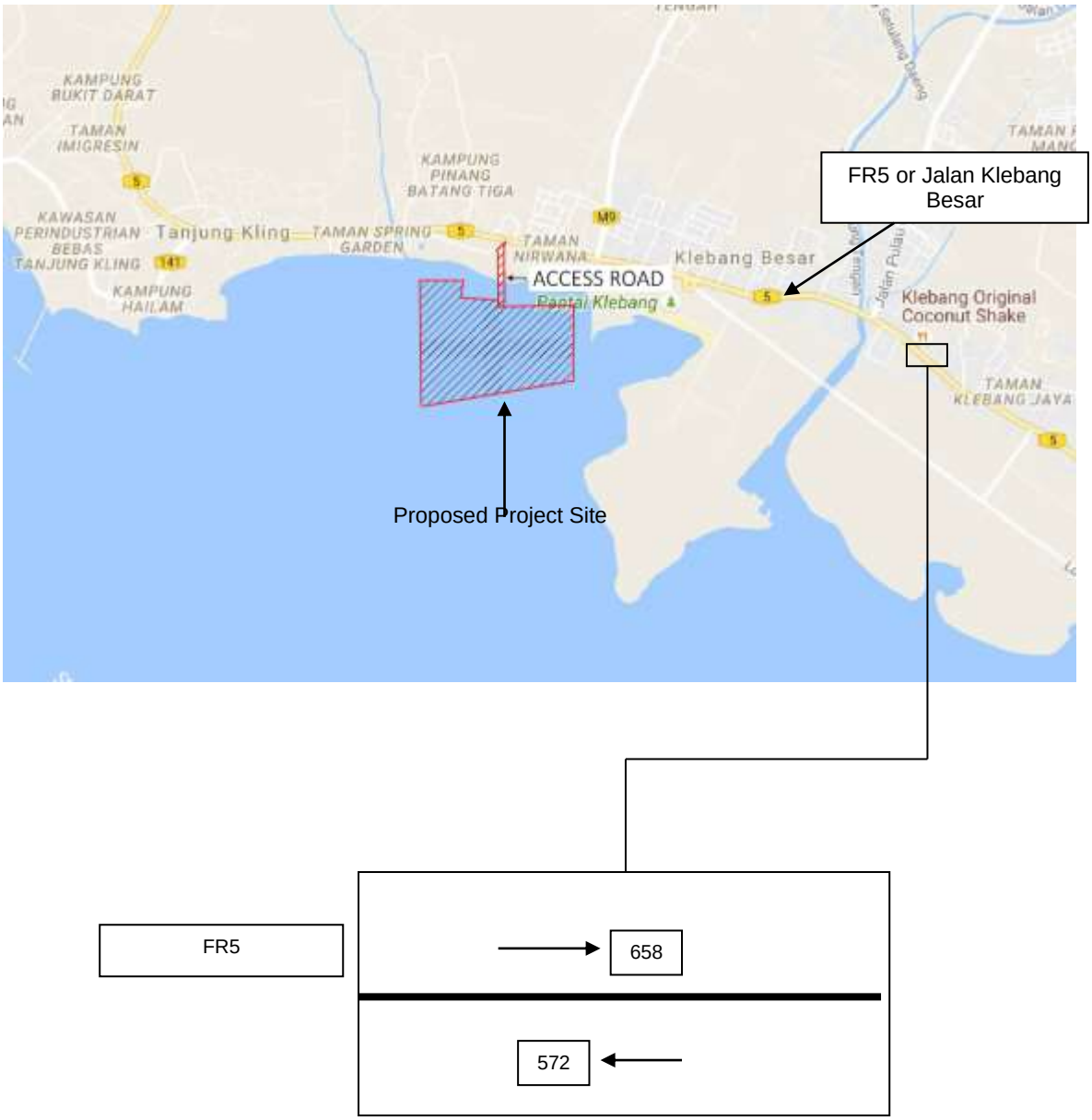


Figure 3.3: Traffic Movement for Afternoon Peak Adjacent to Project Site (Year 2014)

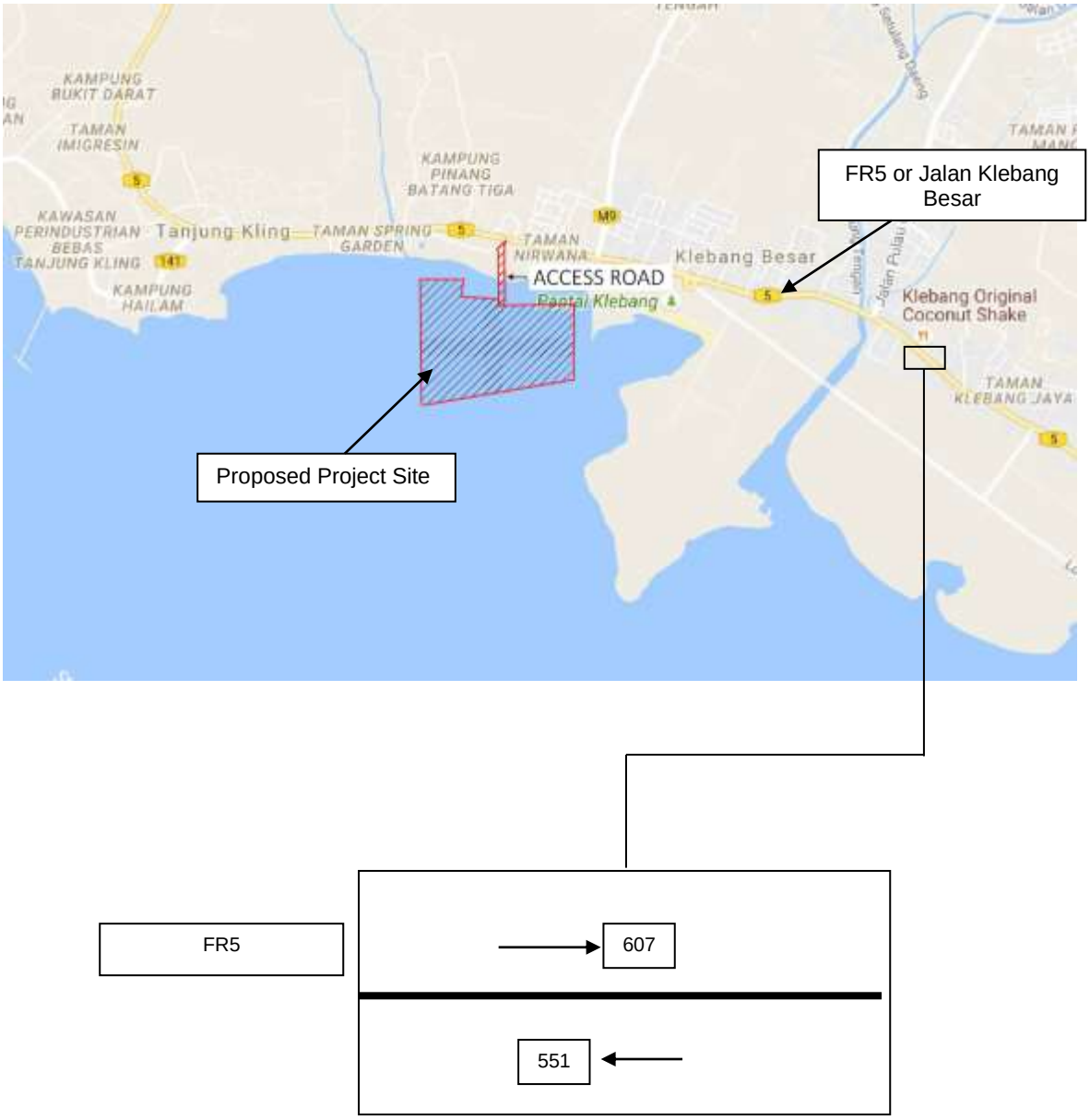
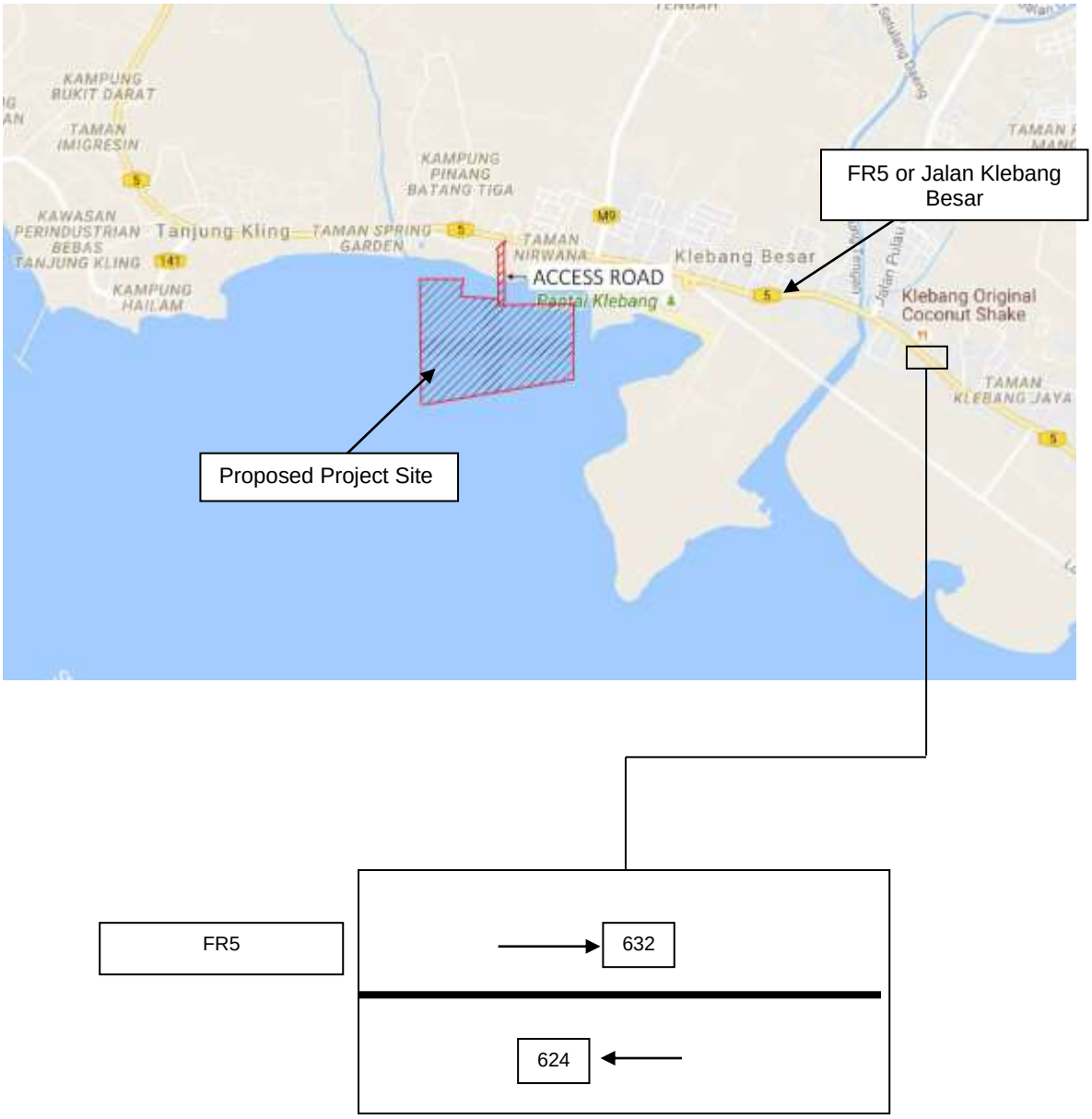


Figure 3.4: Traffic Movement for Evening Peak Adjacent to Project Site (Year 2014)



4.0 TRAFFIC IMPACT

The traffic situation in the vicinity of the Project site has been described in the previous Section. The traffic impact due to the Project development will be assessed and evaluated using forecasts of traffic volumes in the impact area from collected traffic data and projected vehicle trips generated by the Project and other developments in the region.

4.1 Traffic Simulation

The Signalised Intersection Design Research Aid (SIDRA) model is used to determine degree of road capacity saturation, average time delay and level of service (LOS) of the road facilities. Reference is made to the Highway Capacity Manual (HCM) (1985) and JKR Arahan Teknik (1987).

The inputs to the SIDRA model are:

(a) Total vehicle volume;
(b) Volume of heavy vehicle;
(c) Uninterrupted speed;
(d) Lane width;
(e) Lane discipline;
(f) Number of approach lanes;
(g) Number of adjacent exit lanes;
(h) Median width;
(i) Movement description and turn designation; and
(j) Minor (opposed) and priority (unopposed) movements.

The outputs from the model are:

(i) Degree of saturation (v/c);
(ii) Average delay (v/s); and
(iii) Level of Service (LOS).

LOS is a parameter that describes the operational condition of a traffic stream. It incorporates useful traffic indicators such as speed and travel time, freedom of maneuver, traffic interruptions, comfort, convenience and safety. Six levels of service, A to F, have been defined, with LOS A representing the best operating condition and LOS F the worst. The six LOS are described in **Table 4.1**.

The degree of saturation (v/c) is an important parameter for traffic capacity analysis. Being a ratio of traffic volume to road capacity, it is therefore dependent on several factors such as the number of lanes, width and adjacent interruption of traffic flow. The principal objective of capacity analysis is to estimate the maximum traffic carrying capacity for various sections of the road network.

The average delay (v/s) is a parameter that indicates the travel condition of a vehicle in the traffic stream. The longer the average delay time, the less comfortable is the ride.

Tables 4.2 to 4.4 provide information on the traffic condition in the vicinity of the Project site. The following information can be drawn:-

Table 4.1: Definition of Various Level of Service (LOS)

Level of Service	Description
A	This represents free flow operation. Individual users are virtually unaffected by the presence of others in the traffic stream. The freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorists, passenger or pedestrian is excellent.
B	In the range of stable flow. The freedom to select desired speed is relatively unaffected but there is a slight decline in the freedom to manoeuvre within the traffic stream from LOS A.
C	Still in the zone of stable flow but speed and manoeuvrability are more closely controlled by the higher traffic flow.
D	High density but stable flow. Speed and freedom to manoeuvre are severely restricted. Small increases in the traffic flow will generally cause operational problems at this level.
E	Operating conditions at or near the capacity. All speeds are reduced to a low but relatively uniform value. The freedom to manoeuvre within the stream is extremely difficult. Operations at these levels are usually unstable because small increases in traffic flow or minor perturbations within the traffic will cause long queues.
F	Forced or breakdown flow. This condition occurs whenever the volume of traffic approaching a point exceeds the volume, which can transverse it. Queues form behind such points. Operations within the queue are characterized by stop-and-go waves and are extremely unstable. LOS F is used to describe the operating conditions within the queue as well as the points of the breakdown.

Source: Highway Capacity Manual, 1985.

(a) The level of service (LOS) from Pantai Klebang or Tanjung Kling or Masjid Tanah or Project site to Pokok Mangga or Kg Limbongan or Bandaraya Melaka or has average LOS of 'B' during the morning and evening peak hour indicating the traffic is In the range of stable flow. The freedom to select desired speed is relatively unaffected but there is a slight decline in the freedom to manoeuvre within the traffic stream from LOS A during afternoon peak. The destination of the traffic is to town or commercial area or resort during morning session and to homes after working hours.

(b) Traffic at the opposite lane, i.e. from Pokok Mangga or Kg Limbongan or Bandaraya Melaka to Project site or Pantai Klebang or Tanjung Kling or Masjid Tanah is found to exhibit LOS of 'A' during all the three peak hours. This indicated smooth traffic flow without time delay. Individual users are virtually unaffected by the presence of others in the traffic stream. The freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high. The results also showed that the capacity of the Road FR5 is able to cater to the existing volume of vehicles travelling on the road.

Table 4.2: Traffic Performance in the Project's Impact Area
Time: Morning Peak (0730 – 0830)
Year: 2014

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.047	3.4	B
2	Road FR5 (Westbound)	0.022	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.3: Traffic Performance in the Project's Impact Area
Time: Afternoon Peak (1200 – 1300)
Year: 2014

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.036	0.0	A
2	Road FR5 (Westbound)	0.020	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.4: Traffic Performance in the Project's Impact Area
Time: Evening Peak (1700 – 1800)
Year: 2014

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.044	3.0	B
2	Road FR5 (Westbound)	0.032	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

4.2 Forecasted Traffic in Year 2021 without Project

The forecasted traffic in year 2021 is obtained on the assumption that the traffic volume will grow at the rate of 4% per annum. No other committed development is found in the vicinity of the Project site other than the proposed Project that will be completed in year 2021. **Figures 4.1 to 4.3** show the traffic volumes for morning, afternoon and evening peaks on roads in the Project's impact area in year 2021.

The forecasted traffic data are input into the SIDRA model to provide indication of the traffic condition in year 2021. The degree of saturation, average time delay and level of service are presented in **Tables 4.5 – 4.7** for morning, afternoon and evening peaks respectively.

The results from the SIDRA analyses for year 2021 indicate the following:

- By the year 2021, there will be a substantial increase in traffic based on the non-site forecast of traffic volumes. The degree of saturation is shown in **Tables 2.5 – 2.7** for the morning, afternoon and evening peaks respectively.

- The results showed that the capacities for FR5 still accommodate the traffic volumes for both directions as indicated by the moderate v/c ratios. LOS of FR5 will have LOS of 'A' to 'C' level during all the three peak hours by the year 2021. Congestion will be rarely even though there are no improvements in traffic circulation and traffic facilities.

Figure 4.1: Non-site Traffic Movements (in volume) for Morning Peak (0730-0830) adjacent to Project Site, Year 2021

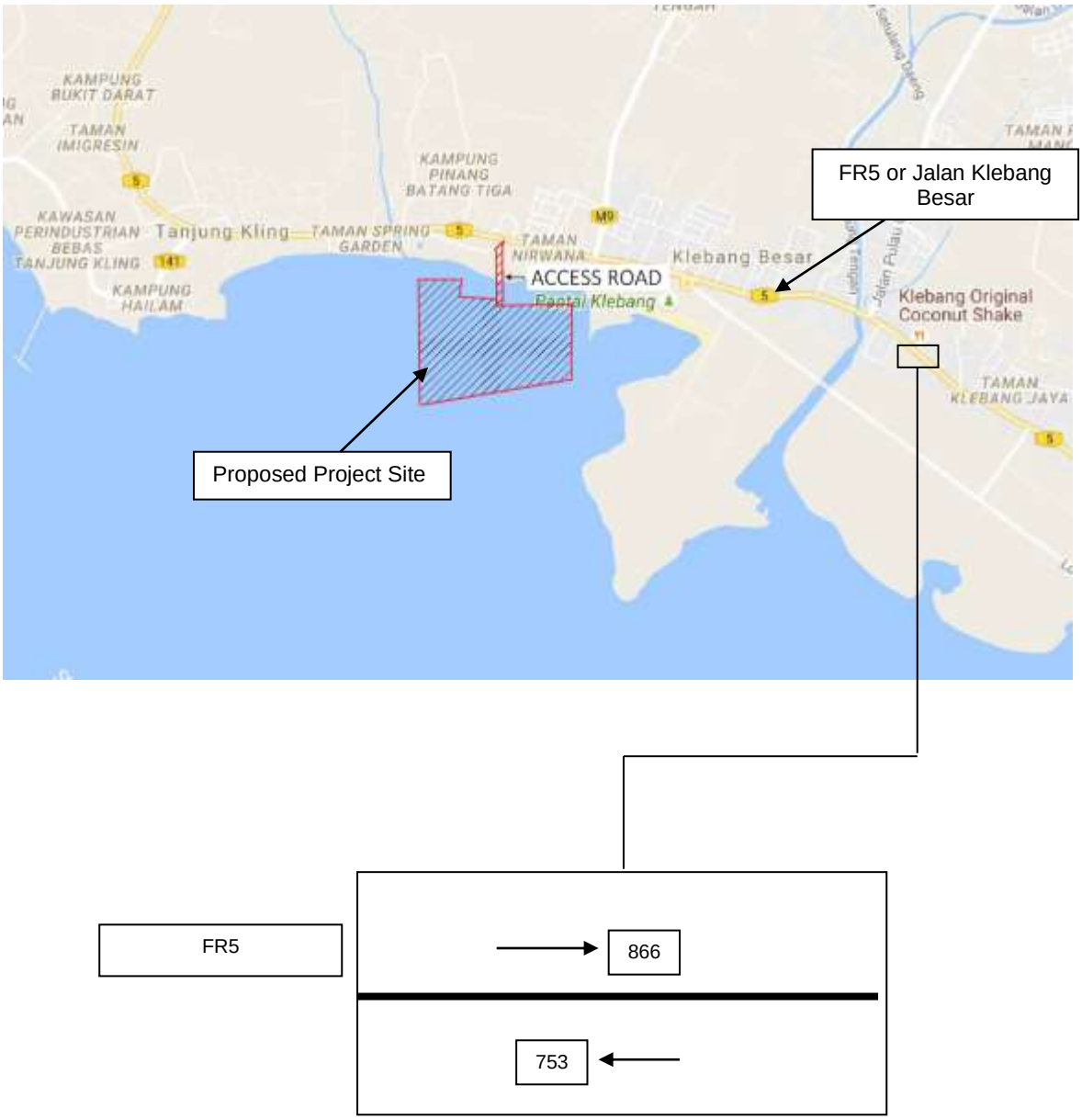


Figure 4.2: Non-site Traffic Movements (in volume) for Afternoon Peak (1200-1300) adjacent to Project Site, Year 2021

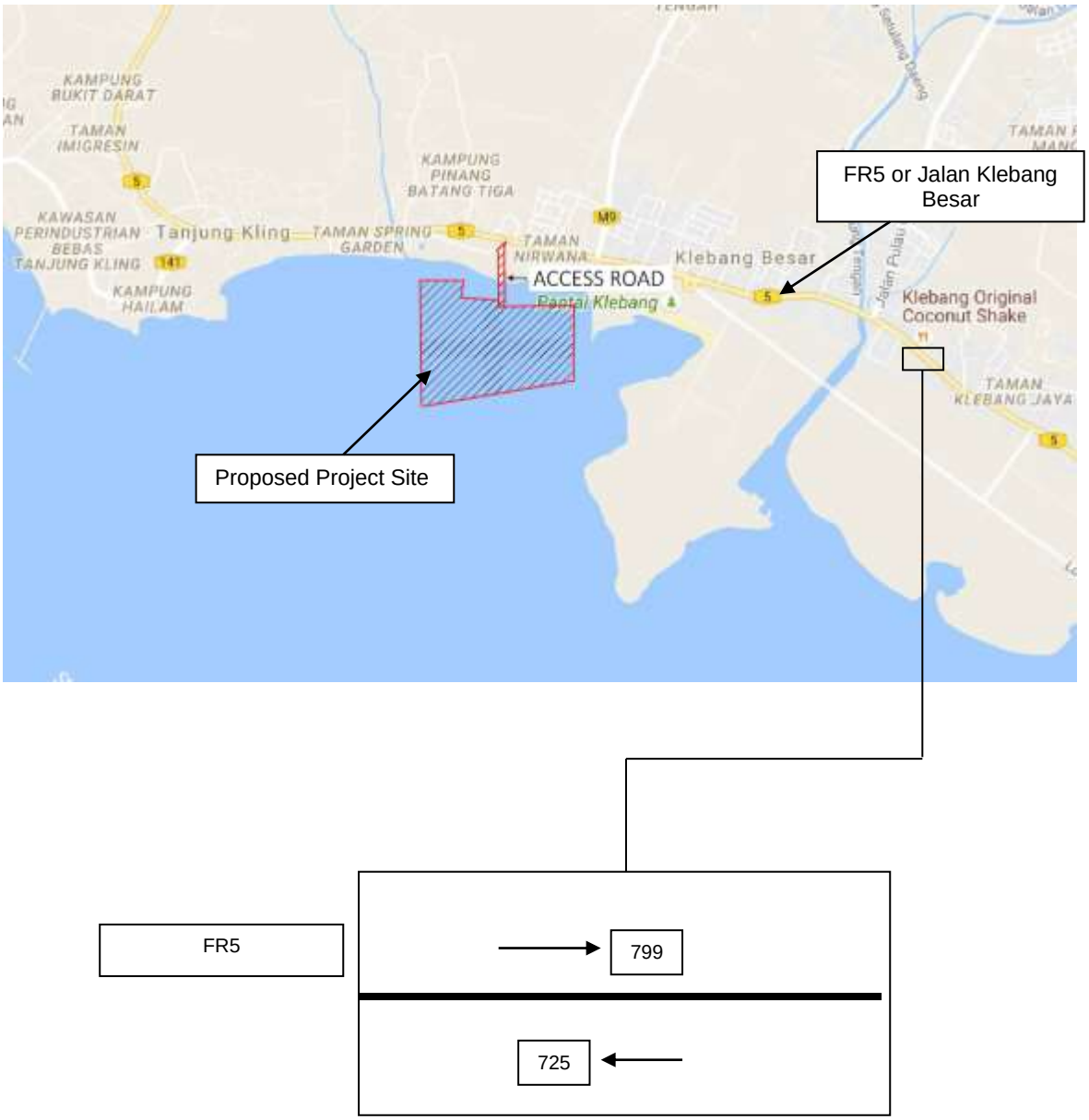


Figure 4.3: Non-site Traffic Movements (in volume) for Evening Peak (1700-1800) adjacent to Project Site, Year 2021

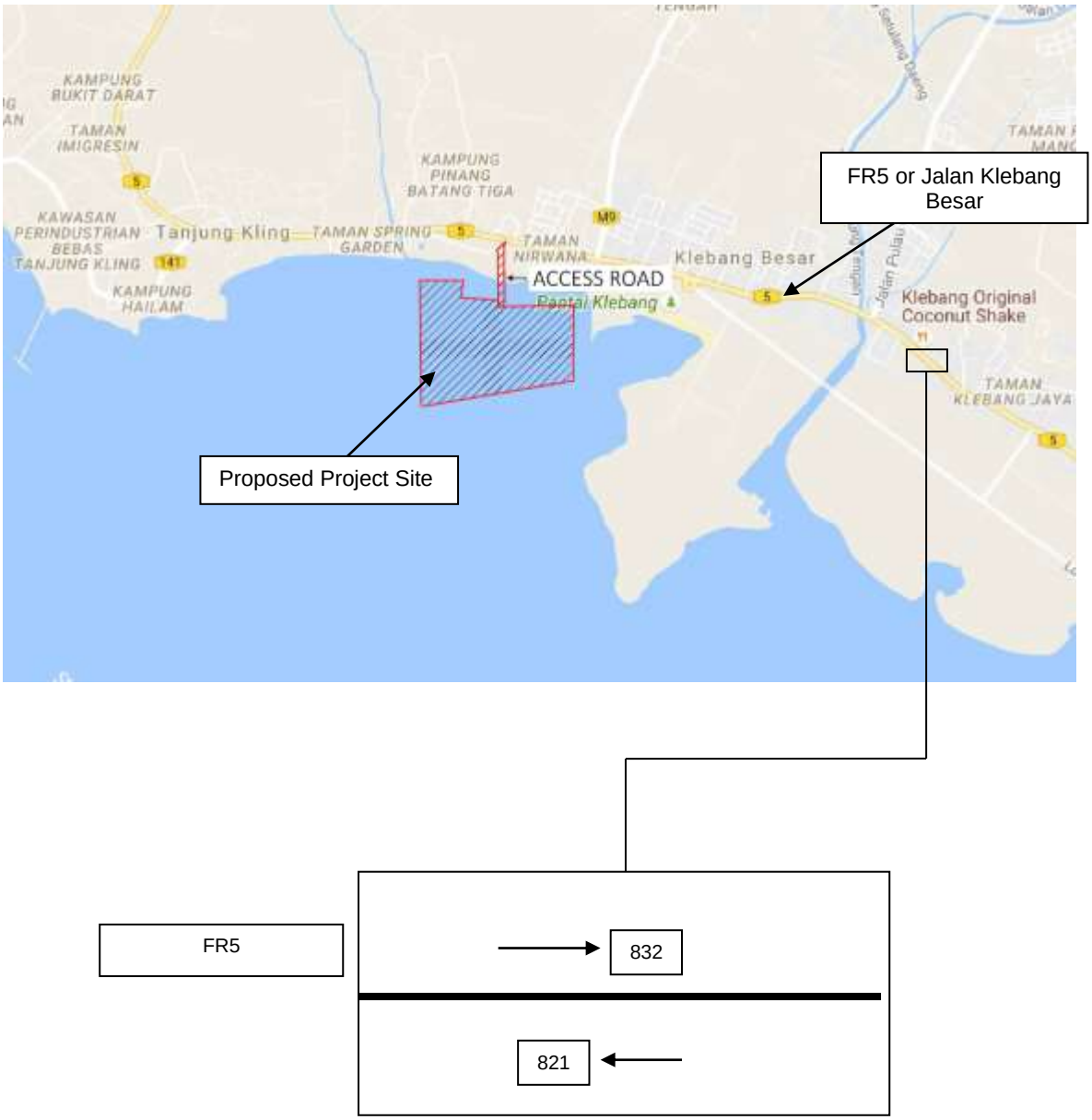


Table 4.5: Traffic Performance around the Project Site (Without the Project)
Time: Morning Peak (0730 – 0830)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.084	10.2	C
2	Road FR5 (Westbound)	0.040	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.6: Traffic Performance around the Project Site (Without the Project)
Time: Afternoon Peak (1200 – 1300)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.065	5.5	B
2	Road FR5 (Westbound)	0.030	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.7: Traffic Performance around the Project Site (Without the Project)
Time: Evening Peak (1700 – 1800)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5 (Eastbound)	0.076	7.6	B
2	Road FR5 (Westbound)	0.051	0.0	A

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

4.3 Forecasted Traffic in Year 2021 with Project

The development of 155 unit of water chalet (85 unit of Floating Villa (Type A) & 70 unit of The Wharf Villa (Type B)) will generate additional traffic onto the road network. The trip generation rates adopted for this study are derived from traffic survey and the Trip Generation Rates Manual by Highway Planning Unit (HPU) and shown in **Table 4.8**.

The forecasted additional traffic volume plying on the influence roads when the project is estimated to be completed in year 2021 is shown in **Table 4.9.**

Table 4.8: Trip Generation Rates

Development Component	Morning Peak	Afternoon Peak	Evening Peak
Hotel / Chalet			
Villa	1.25 vehicle trip / unit	0.65 vehicle trip / unit	1.26 vehicle trip / unit

Table 4.9: Additional Traffic Volume after Project Implementation

Road	Additional Traffic Volume During Peak hour		
	Morning	Afternoon	Evening
Road FR5	100	65	125

The SIDRA analyses, using this information, identify the traffic conditions during the three peaks hours in year 2021 and the results are presented in **Tables 4.10 – 4.12**.

The road is found to exhibit the LOS in the range of 'B' – 'C' during morning, afternoon and evening peak hours, indicating traffic is still in the zone of stable flow but speed and manoeuvrability are more closely controlled by the higher traffic flow. The LOS level are still maintained the same even though with higher degree of saturation and average delay.

Overall, the forecasted traffic condition at the surveyed road is considered stable for the traffic plying along the road. The anticipated increase in traffic volume due to the Project will have minor traffic impact during the morning, afternoon and evening peak hours.

Table 4.10: Traffic Performance After the Project Development
Time: Morning Peak (0730 – 0830)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5	0.131	15.3	C
2	Road FR5	0.077	5.6	B

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.11: Traffic Performance After the Project Development
Time: Afternoon Peak (1200 – 1300)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5	0.114	10.4	C
2	Road FR5	0.068	4.7	B

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

Table 4.12: Traffic Performance After the Project Development
Time: Evening Peak (1700 – 1800)
Year: 2021

Stn	Name of Road /Junction	Degree of Saturation (v/c)	Average Delay (secs)	LOS
1	Road FR5	0.119	11.8	C
2	Road FR5	0.089	6.8	B

Notes: v: Observed amount of vehicles
c: Capacity or maximum amount of vehicles the road can accommodate

4.4 Traffic Impact during the Construction Phase

On commencement and at completion of the construction phase, especially the reclamation stage, heavy vehicle such as truck, excavators and compactors needed to go in and out of the site. Other smaller vehicles and equipment will find their own way to and from the site. These vehicle, especially heavy vehicle, however, are within the site and will not impact the road network traffic. Transport of sand materials to the site may not be an issue to territorial traffic because sea transport such as barge will be used to transport the sand to the site.

Other potential impacts attributable to vehicle traffic and their movements during the reclamation phase are:

(i) Occasional traffic congestion at the approach to the site, most likely at the junction to enter the Project site;
(ii) Traffic accident due to increased volume of traffic traveling along the roads;
(iii) Potential damage to the public roads;
(iv) Noise and vibration caused by the movement of heavy vehicles; and
(v) Air pollution due to movement of and exhaust emission by heavy vehicles along the road.

4.5 Traffic Impact during the Operation Phase

During this phase, traffic to and from the site is mainly light vehicles or van or buses driven by tourist or local residents. These vehicles do indeed increase the traffic volume onto the existing road network and contribute traffic impact to the effected road especially at the ingress / exgress point of Project site

5.0 MITIGATION MEASURE

(a) During Construction

The traffic impact on the road network that may justify mitigation consideration is when heavy vehicles go to and from the site at the commencement and completion of reclamation activity respectively. Owing to the size and length of the transports, their travel speed will be slow and turning circle wide. Their presence will slow down other traffic and cause annoying congestion. It is therefore considerate to plan, schedule and control their trips, especially during the peak hours, so as to minimize the adverse traffic impact.

Working vehicle movements within the site do not contribute to traffic impact on the road network. However, to avoid unnecessary accident, it is desirable to plan, schedule and control the deployment and operation of working vehicles for smooth and unhindered traffic movements within the site.

For the sake of environmental control, it is necessary to direct all vehicles entering or exiting from the site to pass through a wash trough to clean their tires and to receive a water jet spray to remove dust particles on them.

(b) During Operation

By year 2021, when the Proposed Project is in operation, the traffic forecasts indicate the existing road facilities in the traffic influence area is still able to cater for the increase traffic. However, the following are recommendations to be considered:

(i) The proposed T-junction connecting the main road to Project site shall be designed properly as it might have impact to accommodate the traffic flow in or out of Project site as indicated by the higher v/c ratios and average delay due to increase traffic.

(ii) Traffic management system to be implemented at the ingress / egress point of Project site in order to manage the traffic accordingly.

6.0 CONCLUSION

This traffic impact study leads to the following conclusions:

(a) The Project's traffic generation will contribute moderate level of traffic volume in the road network within the impact area.

(b) The proposed Project will not have serious impact to the through traffic along Road FR5.

PLATES

Plate 1. A view of Road FR5

Reference

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