

SECOND SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT FOR “CADANGAN PEMBANGUNAN SEBUAH LAPANGAN TERBANG BAHARU DI PULAU TIOMAN UNTUK OPERASI PENERBANGAN KOD 4C YANG BERKELUASAN 460.50 EKAR, TIOMAN, DAERAH ROMPIN, PAHANG DARUL MAKMUR”

EXECUTIVE SUMMARY

Project Proponent:



Tioman Infra Sdn bhd

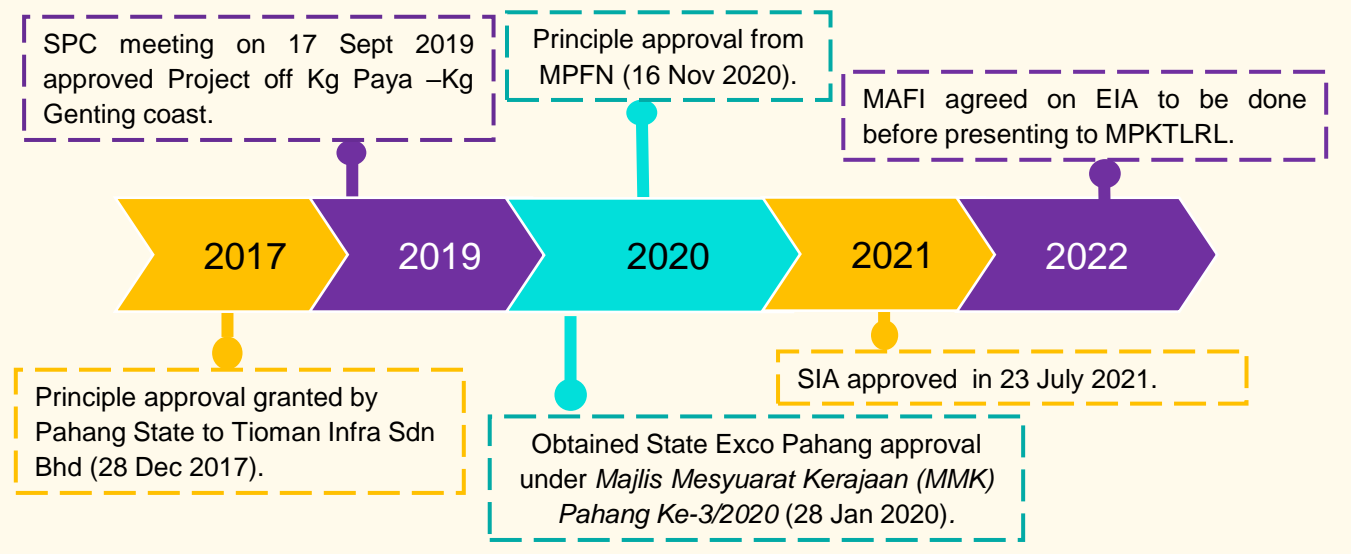
Environmental Consultant:

A S P E C

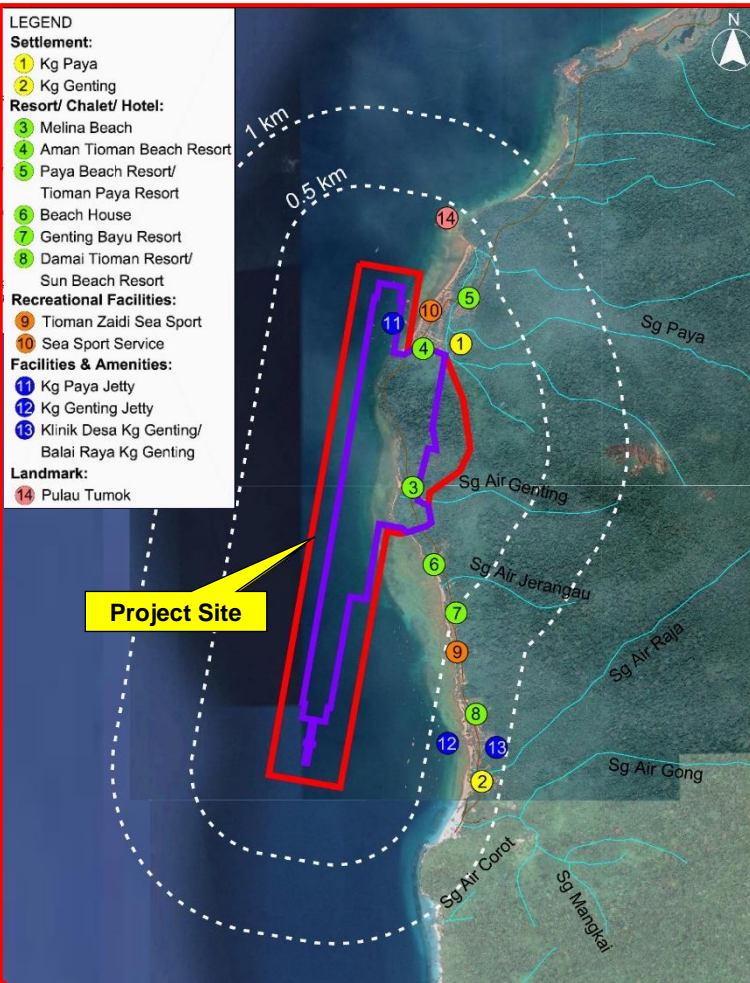
Asia Pacific Environmental Consultants Sdn Bhd



- The New Tioman International Airport (NTIA) covers an area of 186.36 ha (460.50 ac), of which 76% (142.70 ha) will be reclaimed from the sea.
- The NTIA is for Code 4C aircrafts with a flight range of 5,100 – 6,100 km.
- The site lies off the coast between Kg Paya and Kg Genting that is separated by a low hillock.
- The Project site has already received approval from:



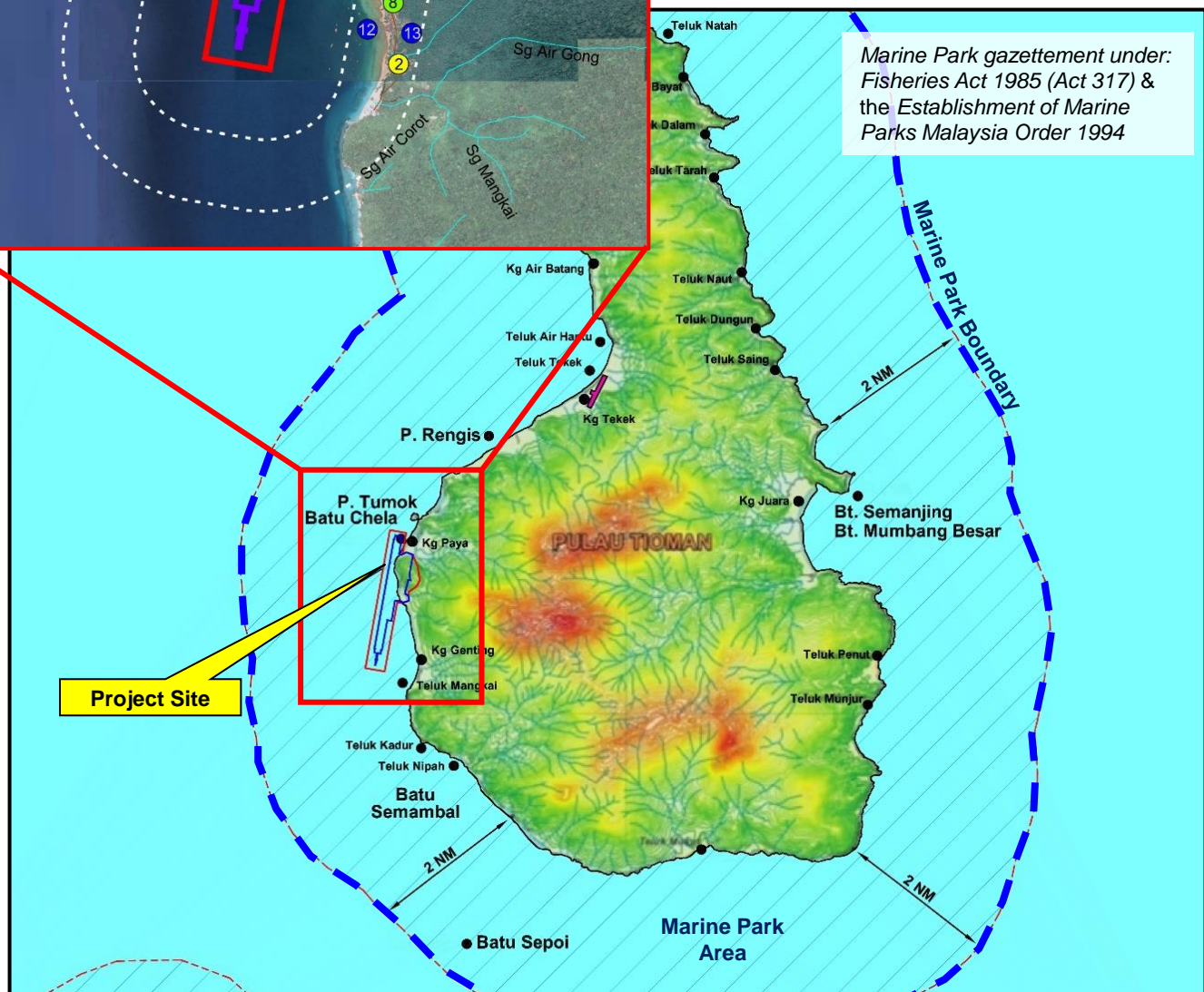
PROJECT LOCATION AND ACCESSIBILITY



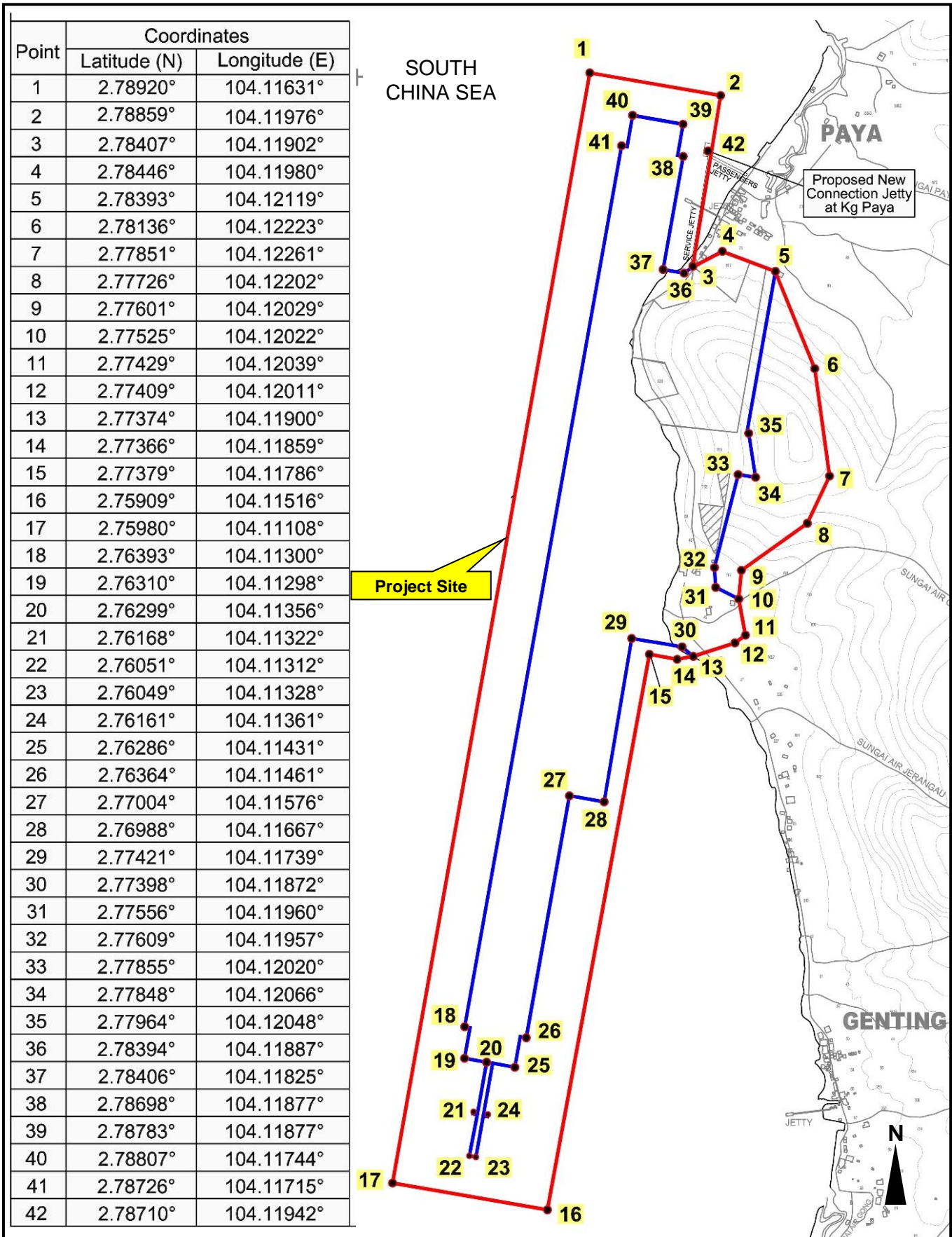
- The Project site is located within the gazetted Marine Park.

- **Closest Receptors:**
 1. Kg Paya (~60 m north).
 2. Genting Jetty (~1-km south).

- **Access:**
 1. By sea from Mersing Jetty (Johor) or Teluk Gading Jetty (Pahang).
 2. By flight from Tekek Airport—small aircraft by SKS Airways to Subang.

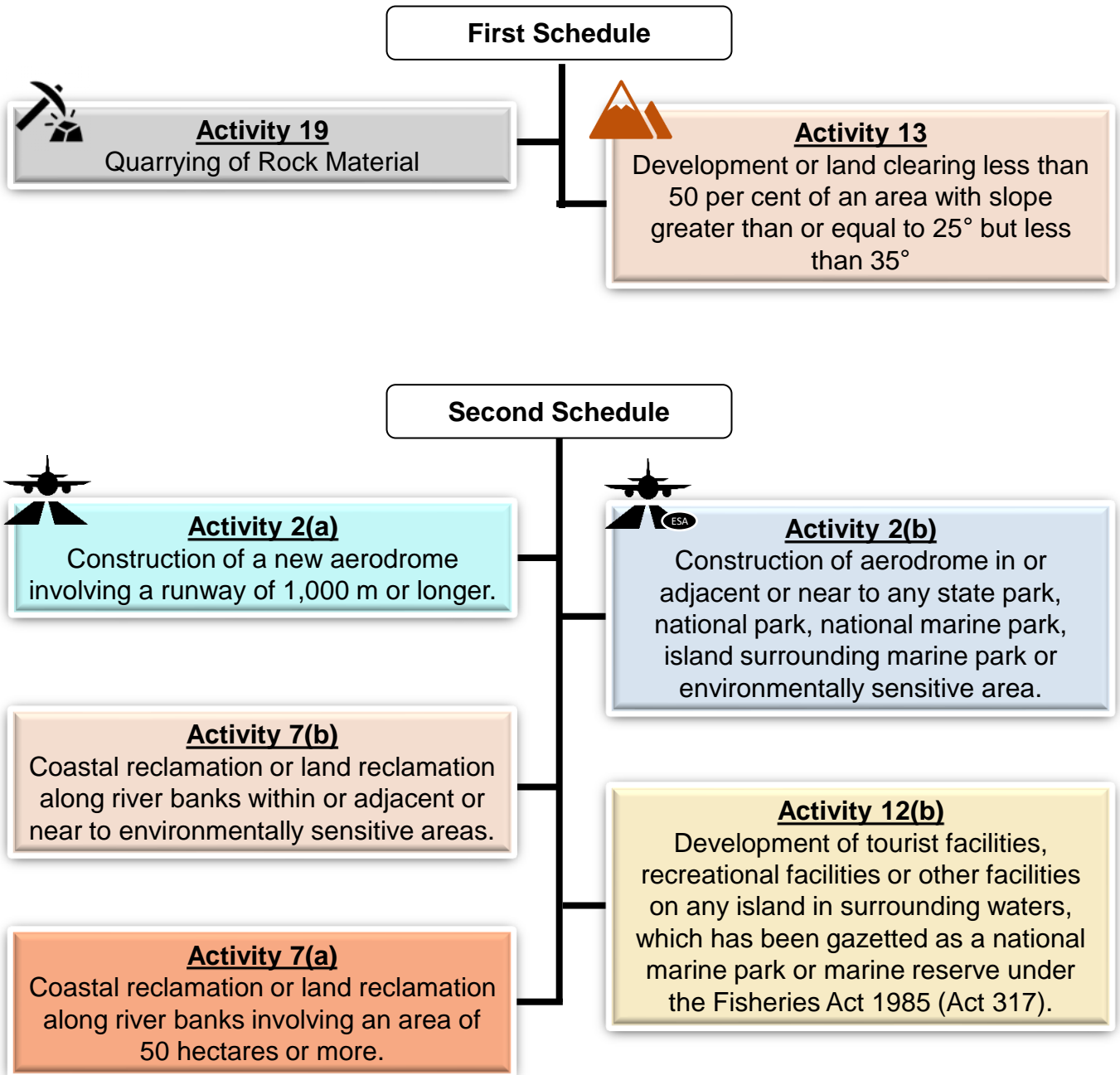


PROJECT BOUNDARY COORDINATES



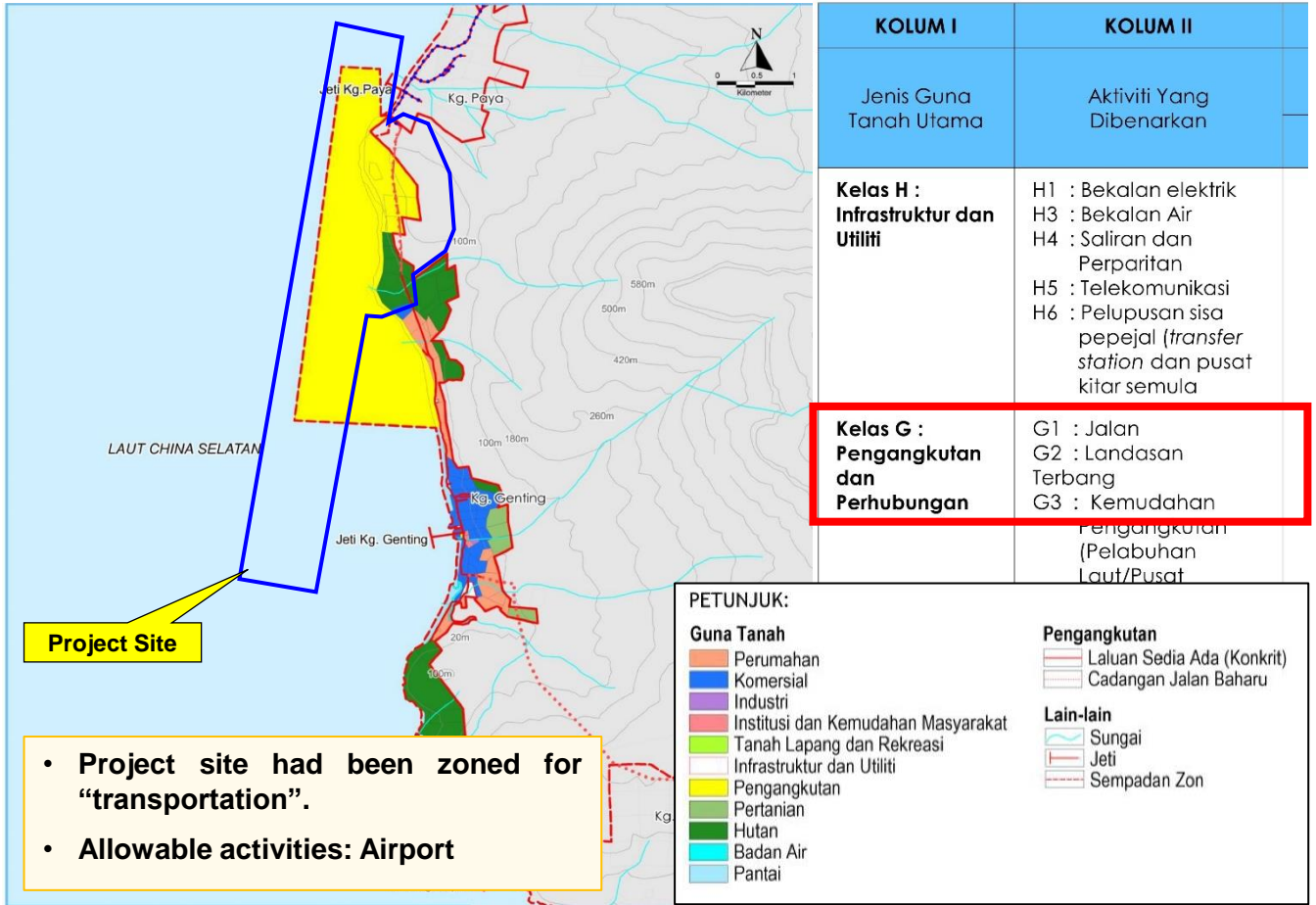
STATUTORY REQUIREMENT

- The Project development and its associate activities are subject to the following prescribed activities of *Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015*. A Second Schedule EIA is therefore carried out.



POLICY CONFORMANCE

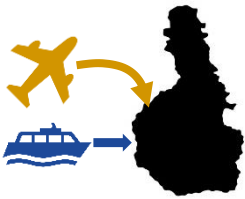
- ✓ Rancangan Kawasan Khas (RKK) Gugusan Pulau Tioman 2030 (gazetted on 22 December 2022; gazette no. 3182):



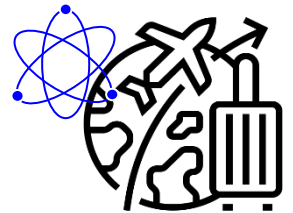
- Project site had been zoned for “transportation”.
- Allowable activities: Airport

STATEMENT OF NEEDS

1. Increase accessibility



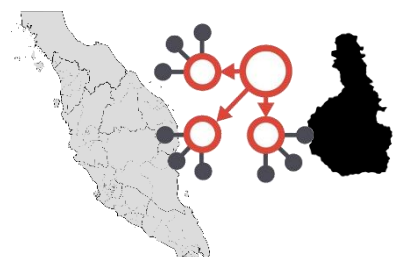
2. Catalyst for Local post-COVID Tourism Sector



3. Meet the development objectives of RKK Gugusan Pulau Tioman



4. Multiplier effects on the local and State development and socio-economic



PROJECT CONCEPT

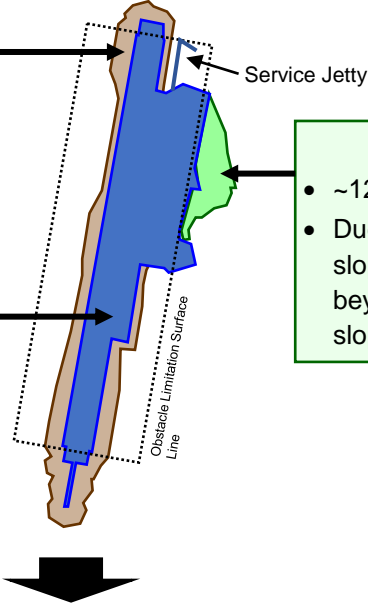
- **Airfield design:** Code 4C aircraft.
- **Flight range:** 5,100 to 6,100 km.
- **Covers direct flight from:** ASEAN countries, Southern China, Eastern India, Western Australia.
- **Design standard:**
 1. International Air Transport Association (IATA) Airport Development Reference Manual/
 2. International Civil Aviation Organisation (ICAO)
- **Runway length and width:** 2.5 km x 45 m



Conceptual perimeter bund

- ~47.35 ha (117.00 ac)
- Perimeter bund slope design is 1:3 (average 60 m from head to toe) is required to ensure reclamation platform stability

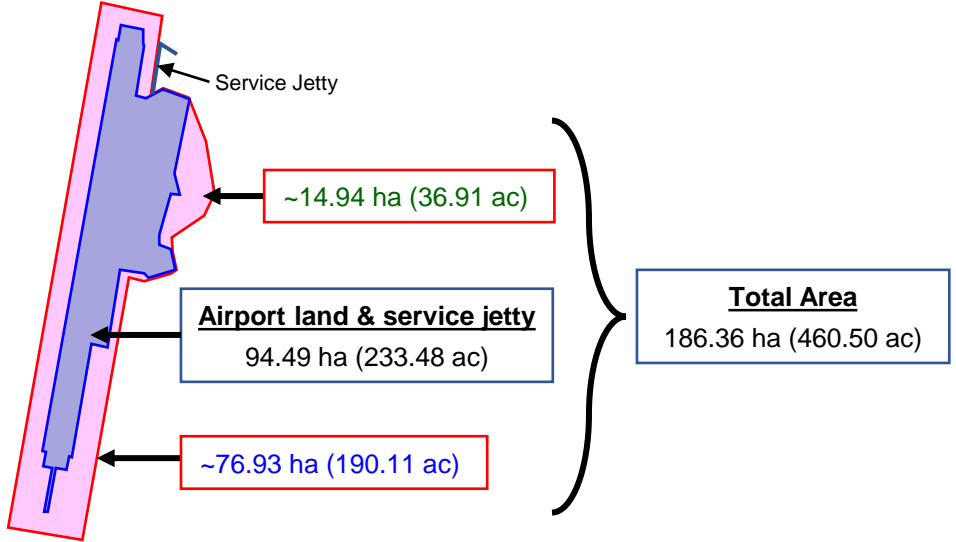
Airport land & service jetty
94.49 ha (233.48 ac)



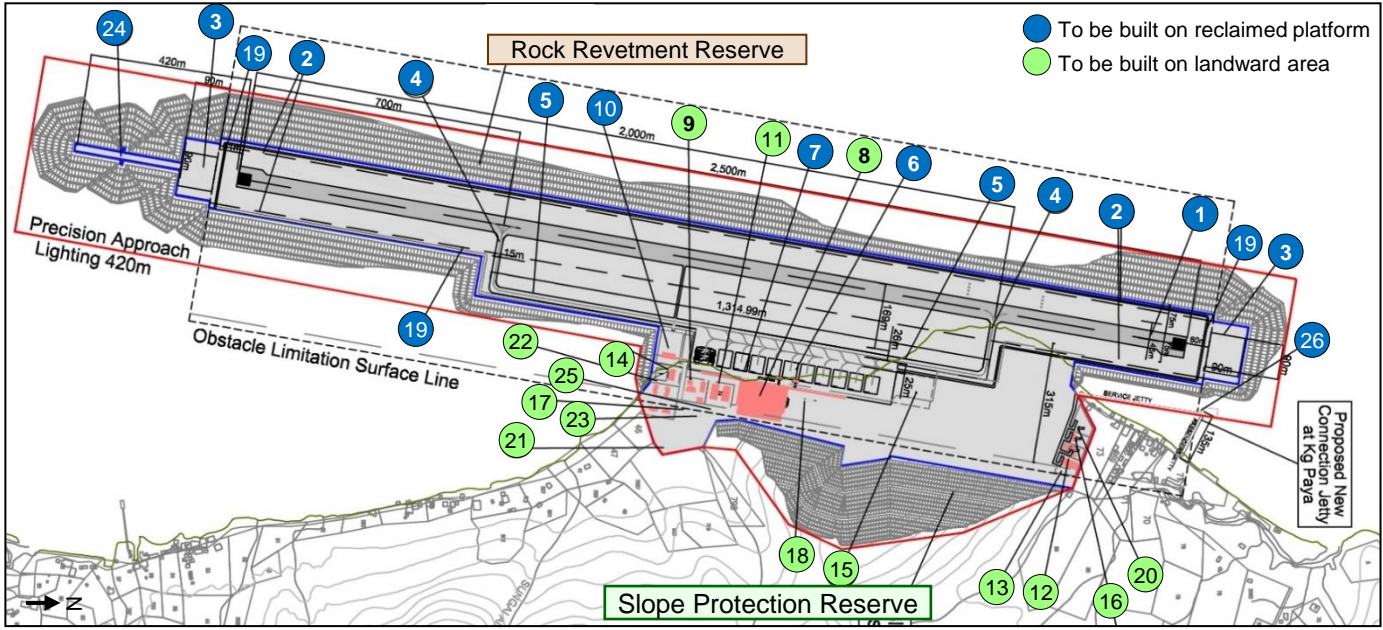
Conceptual slope cut

- ~12.49 ha (30.86 ac)
- Due to OLS requirement, the cut slope (1V:7H) will be extended beyond the airport plinth to ensure hill slope stability.

• To take into account any change during detailed design on cut slope & perimeter bund, a bigger reserve area will be included in the study.

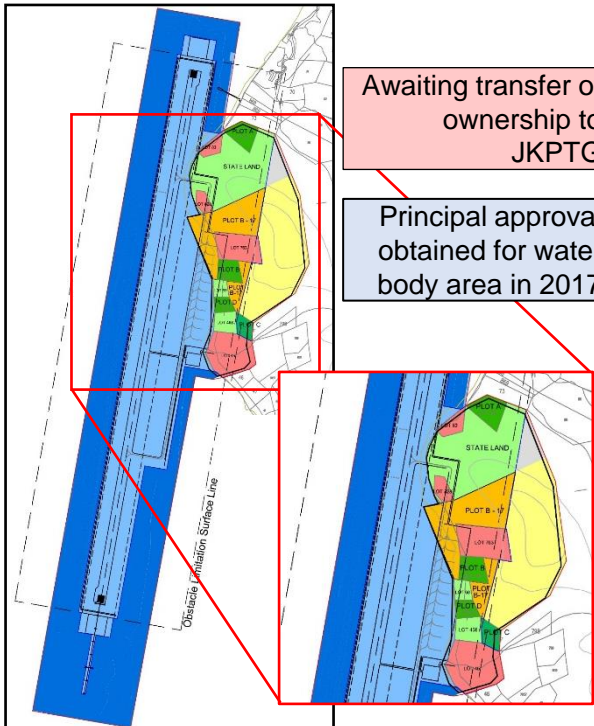


PROJECT COMPONENT



- | | | |
|---------------------------------|--------------------------------|----------------------------------|
| 1 Runway (2.5 km x 45 m) | 10 Airport Fire Rescue Service | 19 Airport Boundary Road |
| 2 Runway Strip | 11 Central Utility Building | 20 Municipal Waste Disposal |
| 3 Runway End Safety Area (RESA) | 12 Water Tank | 21 Connection Road to Airport |
| 4 Connecting Taxiway | 13 Sub-station | 22 Staff Quarters |
| 5 Parallel Taxiway | 14 Meteorological Station | 23 Airline Office/Flight Service |
| 6 Apron | 15 Fuel Facilities | 24 Precision Approach Lighting |
| 7 Service Road | 16 STP | 25 Future Commercial Office |
| 8 Passenger Terminal Building | 17 Future Engineering Workshop | 26 Service Jetty |
| 9 Admin Building & ATC Tower | 18 Public Parking Bays | |

LAND STATUS



| NO. | LAND OWNERSHIP | ACTIVITY | NO. LOT | AREA | |
|---|--|------------------------------|------------|--------|--------|
| | | | | (AC) | (HA) |
| 1. | STATE LAND (ACQUIRED BY FEDERAL GOVERNMENT) | VACANT | 83 | 1.72 | 0.70 |
| 2. | | | 828 | 1.37 | 0.55 |
| 3. | | | 763 | 6.21 | 2.51 |
| 4. | | | 45 | 8.96 | 3.63 |
| SUM TOTAL AREA | | | | 18.26 | 7.39 |
| 5. | STATE LAND | VACANT | WATER BODY | 162.51 | 65.76 |
| 6. | | | HILL | 24.14 | 9.77 |
| 7. | | | VACANT | 68 | 1.31 |
| 8. | | CHALET | 468 | 2.63 | 1.15 |
| SUM TOTAL AREA | | | | 190.79 | 77.21 |
| 9. | TIOMAN HILL RESORT SDN BHD (THRSB) | VACANT | PLOT B-17 | 17.33 | 7.01 |
| SUM TOTAL AREA | | | | 17.33 | 7.01 |
| 10. | PRIVATE LAND | RESIDENTIAL/ WOODEN HOUSE | PLOT A | 3.06 | 1.24 |
| 11. | | | PLOT B | 1.45 | 0.58 |
| 12. | | | PLOT C | 0.07 | 0.03 |
| 13. | | | PLOT D | 2.52 | 1.02 |
| SUM TOTAL AREA | | | | 7.10 | 2.87 |
| TOTAL AREA (AIRPORT LAND & SERVICE JETTY) | | | | 233.48 | 94.48 |
| 14. | STATE LAND | VACANT | WATER BODY | 190.11 | 76.93 |
| | | | HILL | 3.28 | 1.33 |
| 15. | TIOMAN HILL RESORT SDN BHD (THRSB) | VACANT | PLOT B-17 | 31.94 | 12.93 |
| 16. | PRIVATE LAND | VACANT | PLOT C | 1.69 | 0.68 |
| TOTAL AREA (SLOPE PROTECTION AND ROCK REVETMENT RESERVE AREA) | | | | 227.02 | 91.87 |
| GRAND TOTAL AREA | | | | 460.50 | 186.35 |

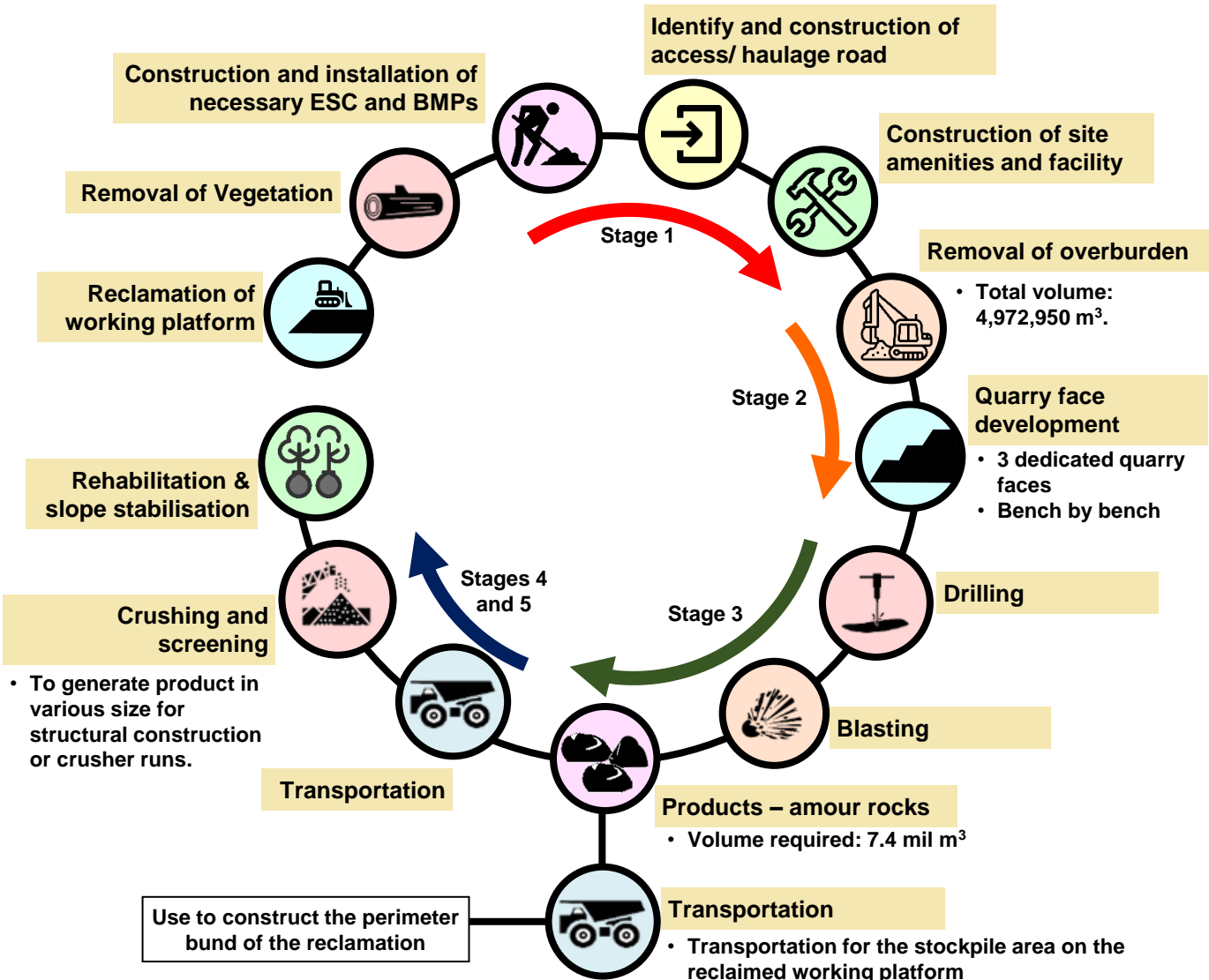
MAIN PROJECT ACTIVITIES



QUARRY WORKS AND ROCK EXTRACTION

- **Main objective:** Slope cut of the hillock is required to comply with strict Obstacle Limitation Surface (OLS) safety standards imposed by ICAO.
- Slope cut involves rock cutting and the rock material could be reused for reclamation and construction; thus, rock extraction and quarry works are part of the Project activities.
- **Summary of details:**

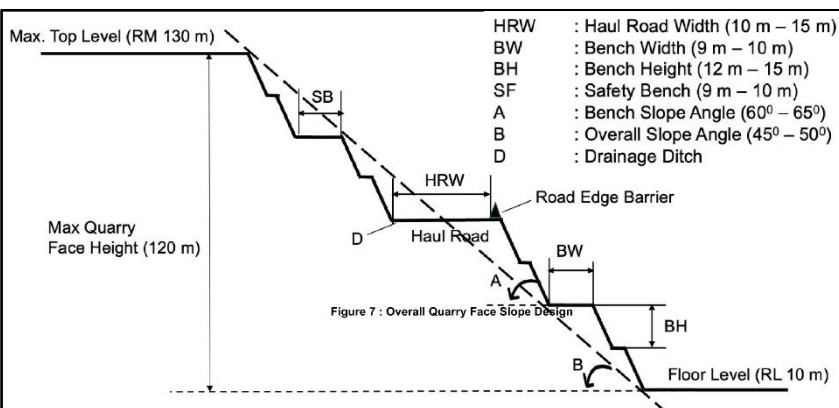
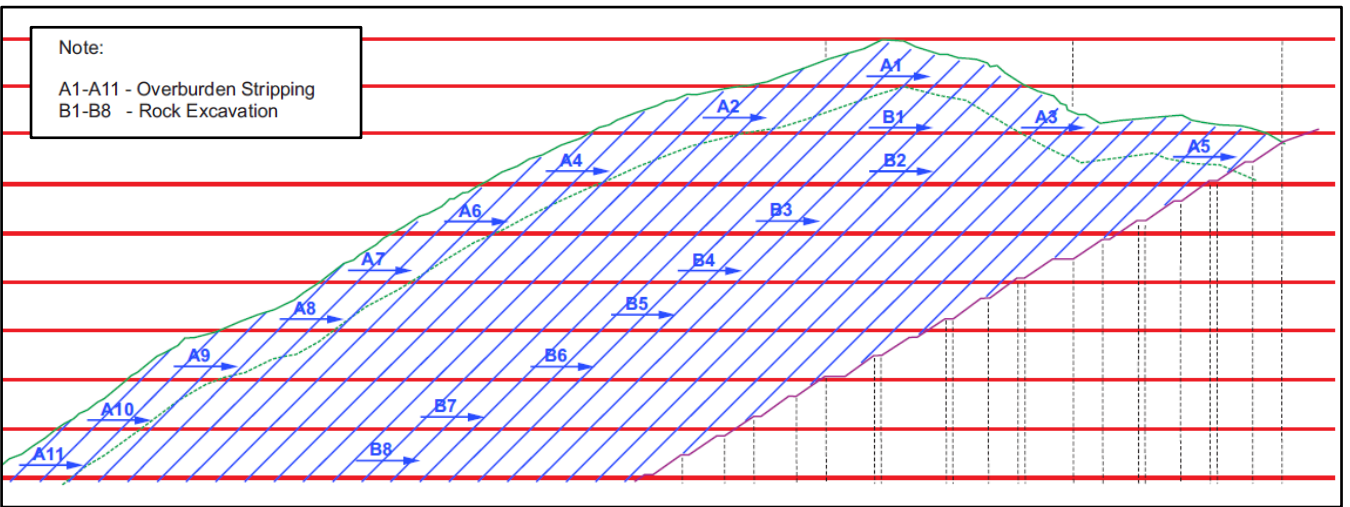
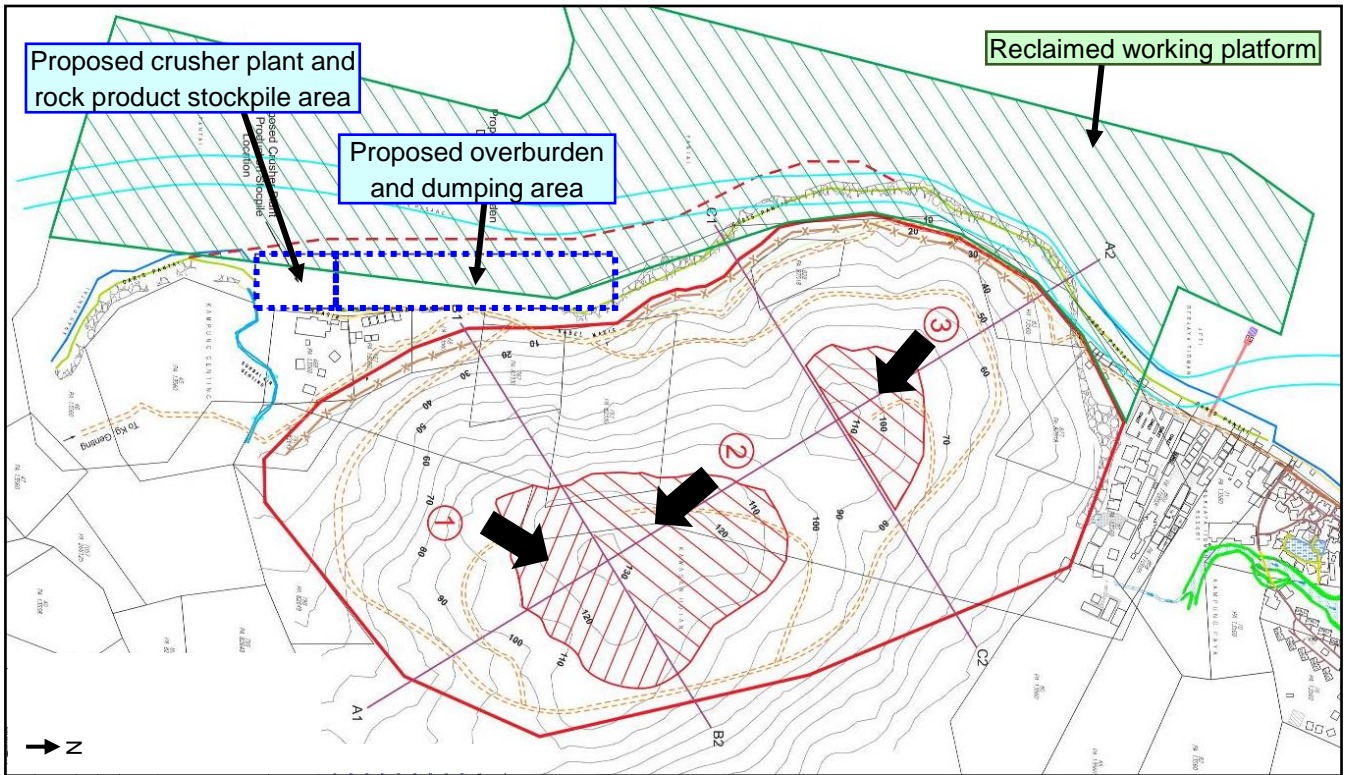
| Item | Estimated Values |
|---|------------------|
| Estimated Area (ha) | 33.153 |
| Estimated Volume of Rock and Overburden (m ³) | 19,214,455 |
| Stripping Ratio (Overburden: Rock) | 1 : 2.86 |
| Estimated Volume of Overburden (m ³) | 4,972,950 |
| Estimated Volume of Rock (m ³) | 14,241,505 |
| Estimated Tonnage of Rock (tonnes) | 30,761,651 |



MAIN PROJECT ACTIVITIES



QUARRY WORKS AND ROCK EXTRACTION



- Three quarry faces will be worked concurrently by three licensed quarry team.
- Rock extraction bench by bench from top downwards.
- Quarry timeline:
 1. Preparation: 7 months
 2. Actual quarry work: 4.5 years

MAIN PROJECT ACTIVITIES



RECLAMATION WORKS

Sand Sourcing

- Sand volume required: 10.1 mil m³.
- Potential sand source:

1. Off Kuantan Coast

- Sand availability: 180 mil m³
- EIA approval ✓

2. Off Pekan Coast

- Sand availability: 87.2 mil m³
- EIA approval ✓

3. Off Kuantan Port Coast

- Sand availability: 300 mil m³
- EIA: on-going

Delivery vessel and methods

- Two types of dredgers or equivalent:

1. Trailer Suction Hopper Dredger (TSHD)

- 3 in 1 function: sand dredging, transportation and unloading.

2. Trailer Suction Dredger (TSD)

- 2 in 1 function: sand dredging and unloading.
- Require other barge to carry sand to Project site.

- Dredger's capacity: 20,000 – 30,000 m³

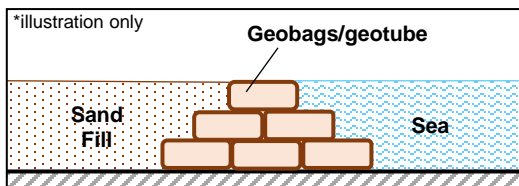
- No. of dredgers: six units during peak reclamation.

Construction of perimeter bunds

- Two types of containments:

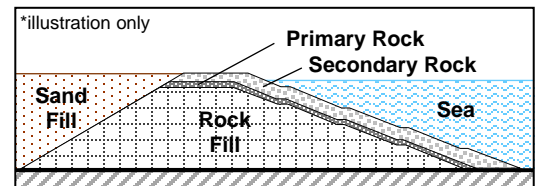
1. Temporary perimeter bunds

- Using geobags/ geotubes, for working platform



2. Permanent perimeter bunds

- Using amour rocks, for rock revetment of actual reclamation



- Placement method: Split barge, flat top barge or crane barge depending on the site condition (i.e depth).

- Rock volume required for rock revetment: 7.4 mil m³

Reclamation works & ground improvement

- Sand filling methods:

- Sand volume required:

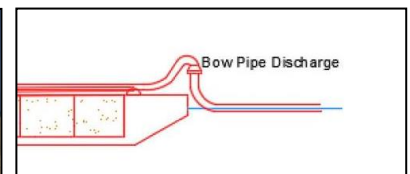
10.1 mil m³

- Sand filling step:

1. Unloading at designated area within the perimeter bund.



1. **Conveyor belt**



2. **Bow pipe discharge**

2. Excavators, dump trucks and bulldozers to shift and spread sand over the reclamation area.

3. Installation of PVD/ Vibro Compaction for ground improvement works. Surcharge if necessary.

MAIN PROJECT ACTIVITIES



AIRPORT OPERATION

- **Design standard:** Civil Aviation Authority of Malaysia Act 2017, in particular, Section 16 (3) (b) that forms part of the regulations to maintain a safe flight environment
- **To comply to obstacle Limitation Surface (OLS) requirement:**
 1. 315-m both side of the runway strip is dedicated as transition surface, with slope ratio of 1:7.

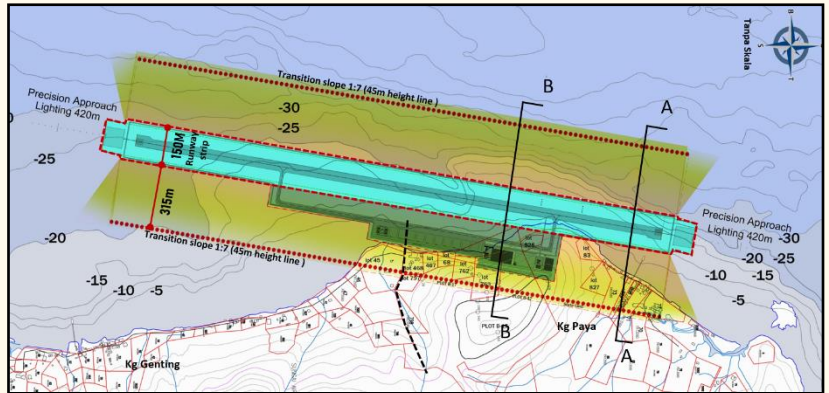
2. Area of concern:

Kg Paya

- Comply to the OLS requirement; no alternation needed on the existing buildings at Kg Paya

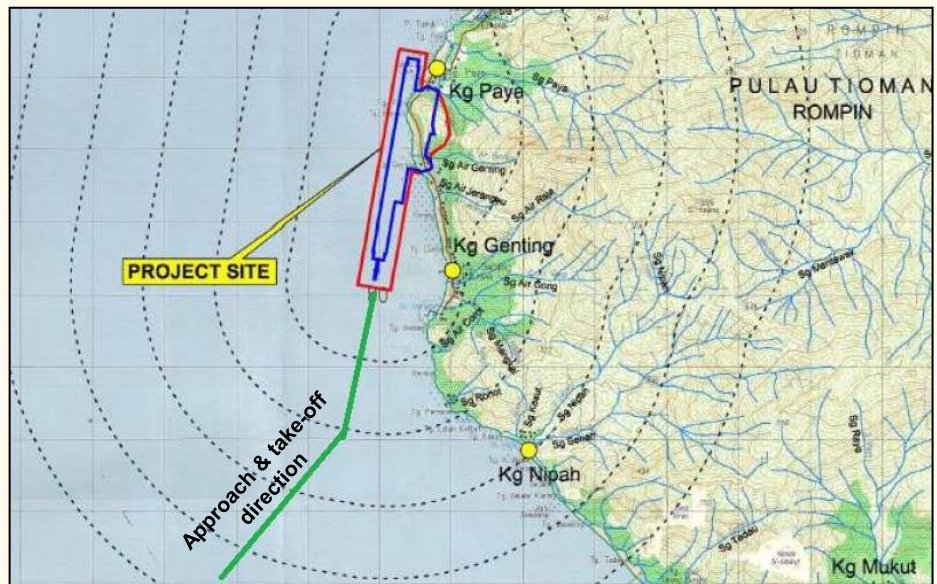
Hillock within Project boundary

- Cutting of hillock backward is required to fulfil the requirement.



- **Flight path:**

Single direction approach and take off



- **Project Daily Aircraft Traffic:**

| Aircraft Type | | Arrival | | | Departure | | | Total |
|---------------|--------|-----------|----------|----------|-----------|----------|----------|-----------|
| | | Day | Evening | Night | Day | Evening | Night | |
| Turboprop | ATR 72 | 2 | 4 | 0 | 2 | 4 | 0 | 12 |
| Narrow Body | A320 | 14 | 2 | 0 | 14 | 2 | 0 | 32 |
| Totals | | 16 | 6 | 0 | 16 | 6 | 0 | 44 |

PROJECT IMPLEMENTATION SCHEDULE

- The Project is planned for development within a period of seven (7) years, 2024 to 2030.

| Stage | Development Stages | Year | Proposed Timeline | |
|---|--|-----------|-------------------|---------------|
| | | Timeline | Start | Complete |
| 1 (Preliminaries and Site Preparation) | Authorities & Relevant Agencies Clearance | 12 months | Y0 2Q 2023 | Y1 1Q 2024 |
| | Coral Relocation and Transplanting | 12 months | Y1 1Q 2024 | Y1 4Q 2024 |
| | Mobilization, Survey & Site Setting Up | 6 months | Y1 1Q 2024 | Y1 2Q 2024 |
| | Forming of Temporary Berthing & Work Areas | 15 months | Y1 3Q 2024 | Y2 3Q 2025 |
| | Construction of Jetty | 18 months | Y1 3Q 2024 | Y2 4Q 2025 |
| 2 (Earthwork & Rock Mining) | Phase 1: Earthwork & Rock Mining | 48 months | Y1 3Q 2024 | Y5 2Q 2028 |
| | Phase 2: Earthwork & Rock Mining | 48 months | Y1 4Q 2024 | Y5 3Q 2028 |
| | Phase 3: Earthwork & Rock Mining | 48 months | Y2 1Q 2025 | Y5 4Q 2028 |
| 3 (Reclamation) | Forming Parameter Bund | 21 months | Y2 2Q 2025 | Y3 4Q 2026 |
| | Placement of Reclamation Fill | 12 months | Y4 1Q 2027 | Y4 4Q 2027 |
| | Ground Improvement/ Settlement | 6 months | Y5 1Q 2028 | Y5 2Q 2028 |
| 4 (Top Side Development) | Top Side Development | 24 months | Y5 3Q 2028 | Y7 2Q 2030 |
| | Completion & Handover | 3 months | Y7 3Q 2030 | Y7 3Q 2030 |
| | Operation | Q4 2030 | Y7 4Q 2030 | - |

Y: Year

Q: Quarter

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Topography, Slope & Geology

Existing Environment

Topography

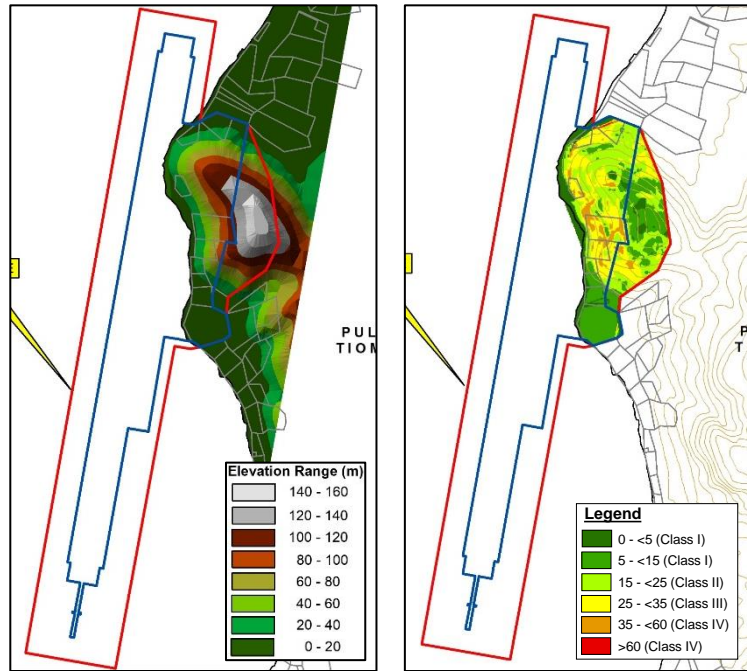
- Generally, flat along the exposed coast, with a narrow beach front (~8 to 10 m wide)
- Undulating hillock: 1 – 160 m MSL.

Slope

- Slopes: 70.29% (30.69 ha) of the landward site – Class I and II slope.

Geology

- Granitic rocks are on 70% of the Island.
- Small dykes and veins discerned.
- Onshore site Geology:
 - Granitic bedrock underlies the ridge.
 - Silty to sandy surface soils present.



- Offshore site Geology:
 - Sea floor north of Tg Paya: loose to medium dense and dense sands.
 - Coral was encountered overlying weathered granitic core-boulders at sea.

Potential Impact

Geology impact:

| Phase/Location | Onshore | Offshore |
|---------------------|---|---|
| Pre-construction | <ul style="list-style-type: none"> • Surface runoff & soil erosion. • Rise in dust & sediments from transport sediments. | <ul style="list-style-type: none"> • Disturbed sea floor increases turbidity of seawater. |
| During construction | <ul style="list-style-type: none"> • Rise in noise, ground vibrations and dust. • Rise in air blast and fly rocks. • Surface runoff & soil erosion. • Increase in sediment loads and decrease in water quality. • Impeded drainage, ponding and flash floods. • Increase air pollution. | <ul style="list-style-type: none"> • New loading conditions on the subsurface earth materials. • Increase of spread sediment plume. |
| Post construction | <ul style="list-style-type: none"> • Permanent topographic and landscape change. • Instability of former quarry slopes. • Exposed granitic bedrock on former quarry floor. • Alteration of surface drainage pattern. | <ul style="list-style-type: none"> • Permanent topographic and landscape change. |

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Topography, Slope & Geology

Potential Impact

Erosion and Sediment Yield

- Result from RUSLE and MUSLE analyses:

| Scenarios | | Average Annual Erosion (t/ha/yr) | Soil Erosion Risk Class* |
|---------------------------|---|----------------------------------|--------------------------|
| Project Site | Construction – Quarrying and Reclamation Phase | Without Mitigations | High |
| | | With Mitigations | Moderate |
| | Construction – Post-Reclamation and Structural Construction Phase | Without Mitigations | Moderate |
| | | With Mitigations | Low |
| Overburden Stockpile Area | Construction Phase | Without Mitigations | High |
| | | With Mitigations | Moderate |
| | Closure | Without Rehabilitation | Moderate |
| | | With Rehabilitation | Low |

Mitigation Measures

Erosion & Sedimentation Control

- **Runoff management:** earth drains connecting to sediment basin; check dam; water bars/rolling dips; silt fence.
- **Erosion control:** Land clearing by phases, protect stockpile soil; stabilise exposed areas, physical markers to retain vegetation buffer.
- **Sediment control:** install sediment basin; construct sump; stockpile sited 20 m away from waterways.
- **Slope stabilisation:** close turfing; install erosion control maps; berm drains; slope drains.
- **Sediment plume:** construct perimeter bund; install silt curtains.
- **Rehabilitation upon completion:** proper drainage system; install geotextile and geomats; apply closed turfing.

Geology

- Implementation of P2M2s sedimentation and erosion control on site to an acceptable level.
- Permanent drainage system and landscapes is established and properly maintained.
- The cut/quarried slope that have been rehabilitated and provided with slope stabilisation must be maintained properly.
- The cut and filled slope should be inspected regularly.



EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Hydrology

Existing Environment

Rainfall and Surface Hydrology

- Average annual rainfall: 2,500 – 2,750 mm.
- Annual potential evapotranspiration: 1,500 mm – 1,600 mm.
- Potential runoff: ~1,000 mm.

Groundwater

- Low aquifer potential region.
- One active groundwater well- northeast vicinity of the Project site (outside project site).

River Basin

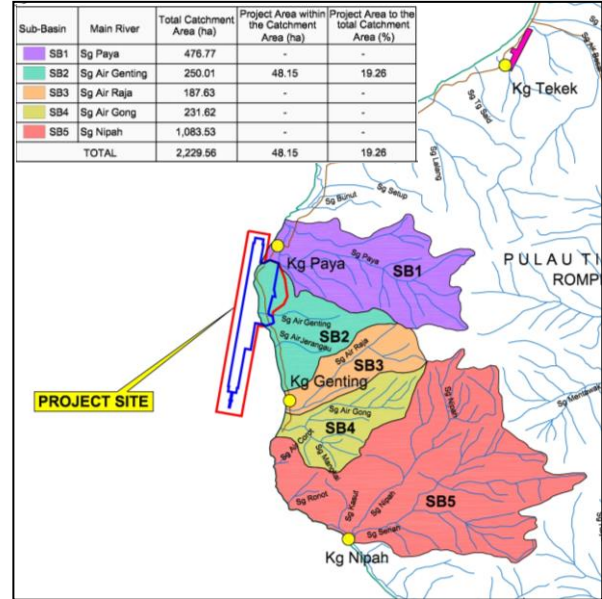
- Project site is located at the north-western parts of Sg Air Genting.

Flood Hazard

- Flash floods event in 2018 at Kg Tekek, northeast of the Project ZOS.
- During the 2023 wet season, there was no recorded flooding on the Island in the news.

Water Intake Point (WIP)/ Water Treatment Plant (WTP)

- Only existing WIP/WTP along Sg Batang Sabut located 6.5km upstream.
- Located in different river basin, hence will not be affected by project development.



Potential Impact

Construction Phase

- Stormwater runoff during rainfall events.
- Rivers may be silted up from soil erosion and improper overburden and stockpile management.
- Change in the patterns of the river flows.

Operations Phase

- Stormwater discharge would increase soil erosion.
- Overflows or localized flooding may occur if drainage systems are clogged.

Mitigation Measures

| Construction/ Reclamation Phase | Operations Phase |
|--|---|
| Construct temporary drainage system & earth drain | Install permanent drainage system to channel runoff to on-site detention pond (OSD) |
| All exposed areas to be turfed to reduce soil erosion | Frequent desilting work for the OSD |
| Construct earth drains, silt trap, sediment basins & silt fences | Construct concrete sumps & outlet protection structures |
| All drainage lines & sediment basin after a rain event to be inspected by the Environment Officer (EO) | Regular inspection and maintenance of the drainage system |

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Water Quality

Existing Environment

River Water Quality

- Baseline sampling: Three (3) locations within 5-km ZOS (RW1, RW3 and RW4).
- RW1, RW3 and RW4 : Class II ('Clean') status (ebb and flood tide).
- All sampling points: AN, Cu and Faecal Coliform exceeded NWQS.
- RW1 and RW4 : Boron concentrations exceeded NWQS (flood tide).
- All other parameters results were below the allowable values indicated in the NWQS.



Marine Water Quality

- Baseline sampling: 11 sampling points.
- MW2, MW10 and MW11: 'Excellent' and 'Good' status for both tides of Spring and Neap tides.
- MW1 and MW11 during ebb tide (shallow): 'Moderate' status and 'Excellent' flood tide (Mid-water Spring tide).
- Other tides and depths MW1 and MW11: 'Excellent' and 'Good' status.
- Heavy metal analysis: All below Innervation Values.



Potential Impact

Reclamation/ Construction Phase:

- Increase silt and sediments.
- Sediment spillage.
- Improper management of stockpiles; overburden; fuel and chemical and waste disposal (solid waste, scheduled waste, sewage and sullage).
- Potential oil spills/leaks and indiscriminate waste disposal

Operations Phase:

- Improper effluent discharge and waste disposal including biomass, solid waste, scheduled waste, sewage, sullage can deteriorate water quality.

Mitigation Measures

Reclamation/ Construction Phase:

- Implement sediment & erosion control measures.
- Proper fuel & chemical management.
- Implement proper waste management.
- Proper stockpile management.
- Vessel discharge management

Operations Phase:

- Proper waste management.
- Implement proper fuel & chemical management.
- Proper effluent discharge management.
- Regular water quality monitoring.



Perimeter Bund & Silt Curtains



Vessel Discharge Management (MARPOL 73/78)



No direct discharge of sewage to the sea/waterways



Periodic Water Sampling & Monitoring

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Air Quality

Existing Environment

- **Baseline sampling:** Four (4) identified sensitive receptor areas.
- **Compliance:** All **complied** with the *Malaysian Ambient Air Quality Standards (MAAQS) 2020*.



Potential Impact

Construction Phase

- Dust, smoke and odour from illegal open burning.
- Wind blown dust during dry periods.
- Dust from moving vehicles within the Project site.
- Emissions from construction machinery, equipment and vessels.
- Dust from the sand loading and unloading during reclamation.
- Air Dispersion Modelling results indicate that, if no mitigation measures, PM_{2.5} and PM₁₀ at all the air sensitive receptors (ASRs) are found to have exceeded the MAAQS limits (i.e. 100 µg/m³ and 35 µg/m³, respectively).
- With mitigation measures, Kg Paya located close proximity to the Project site will still experience residual dust nuisance.

Operations Phase

- Combustion gases from aircraft movement, particularly during landing and take-off (LTO) cycle.
- Emission from ground support equipment and vehicular traffic.
- Air Dispersion modelling results indicate that contribution of combustion gases from the aircraft movement is minimal.
- Kg Paya may perceive low level of fuel combustion smell; it may be nuisance for some.

Mitigation Measures

Construction Phase

- Minimise the disturbed surface area by phasing out the construction work.
- Limit dusty work on windy days.
- Apply dust suppression measures when needed.
- Grow vegetative ground cover.
- Use wind erosion controls, e.g. wind-breaks, hoarding.
- Pave haul roads and storage areas.
- Enclose storage, handling areas.
- Dampen and cover the earth stockpile.
- Reduce speed of heavy vehicles with the site.
- Open burning is strictly prohibited at site.
- Regular maintenance of construction machinery, equipment, vehicles and vessels.

Operations Phase

- Implement air quality mitigation measures as guided by the ICAO's guidance document entitled *Document 9889: Airport Air Quality Manual*, i.e.:
 - Engine emission standard.
 - Auxiliary power unit (APU) operating restriction.
 - Motorised vehicle emission standards for ground support equipment.
 - Emission standards for facilities with emissions.

Additional Recommendation

- Permanent ambient air quality monitoring system comprising the MAAQS criteria air pollutants and total volatile organic compounds (TVOC) to be installed at the suitable locations in Kg Paya, for real-time monitoring throughout construction and operation phases.

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Noise

Existing Environment

Ambient Noise

- Baseline sampling: Four (4) identified sensitive receptor areas.
- Compliance: All **exceeded** DOE permissible limits **except** N3 (Genting Bayu Chalet at night time).
- Source: Naturally occurring noise such as breaking waves and some anthropogenic noises.



Potential Impact

Construction Phase

- Noise generated from the construction activities and blasting may cause disruption and nuisance to the noise sensitive receptors (NSR).
- Simulation results concluded that the predicted cumulative L_{max} levels at all NSRs are within the recommended limits as stipulated in the DOE's guideline, except for N1: Kg Paya.
- The community response on the construction noise, especially at near N1: Kg Paya to be significant.
- If controlled blasting, as designed by the mining consultant, the airblast noise level were within the adopted DOE recommended limits [≤ 115 dB(Z)] at all NSRs, except from N1: Kg Paya [122.03 and 124.04 dB(Z)].

Operations Phase

- Noise generated from the start-of-takeoff-roll, acceleration down the runway and thrust reversal prior to take-off.
- Predicted cumulative L_{aeq} levels at the identified NSRs are within the recommended levels, except for Kg Paya.
- L_{max} predicted at Kg Paya during operations was about 90 dB(A).

Mitigation Measures

Construction Phase - General

- Erection of temporary noise barrier at active work areas.
- Construction activities involving heavy machineries with high noise shall be carried out during the day time only (7 am to 7 pm).
- Equipment and machineries shall be well-maintained to prevent emitting excessive noise.
- Comply with *Occupation Safety and Health (Noise Exposure) Regulations 2019* and *Environmental Quality (Motor Vehicle Noise) Regulation 1987*.
- Provide PPE for workers.
- Regular ambient noise monitoring at identified sensitive areas.
- Proactive communication protocol among the community.

Operations Phase

- Implement air quality mitigation measures as guided by the ICAO's guidance document entitled *Document 9829: Guidance on the Balanced Approach to Aircraft Noise Management*, i.e.:
 - Reduction of noise at source.
 - Land-use planning and management.
 - Noise abatement operation procedures.
 - Operating restrictions.



Mobile noise barriers

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Vibration

Existing Environment

Vibration

- Baseline sampling: Four (4) identified sensitive receptor areas.
- Compliance: All **complied** with the recommended vibration limit, **except** at V1, V2 and V4 (day time).
- Source: Boat activities near sampling locations.



Potential Impact

Construction Phase

- Predicted blasting vibration from the blasting area were within the DOE recommended limits (≤ 5 mm/s) at all identified sensitive receptors, except for Kg Paya (6.33 mm/s).
- The community at Kg Paya will likely raise complaints if prior warning and explanation were not given to the residents during blasting activities.
- For piling activities at the jetty area, the zone of influence will be 12.3 m from the pile point; which will impact the Kg Paya or likely to be impacted.

Operations Phase

- The building at Kg Paya may occasionally experience vibration, i.e. rattling of window due to start-of-takeoff-roll, acceleration down the runway, and thrust reversal which will generate high levels of Low Frequency Noise.
- Annoyance and nuisance to the people living around the airport.

Mitigation Measures

Construction Phase - blasting

- To incorporate safety margin:
 - Design blast to minimise environmental effects.
 - Check the setting out of holes and record any deviation.
- To limit over pressure:
 - Avoid use of surface detonating cord and secondary blasting, where possible. If it has to be used, cover it adequately.
 - Avoid blasting in adverse weather conditions, especially wind blown from the site toward the sensitive receptors.
 - Consider an appropriate orientation of the working face.

Construction Phase – blasting (cont')

- To limit flyrock:
 - Inspect the boulder for natural joint, voids and other weaknesses.
 - Design blast in accordance to regulation.
 - Use screen nets when in doubt.
- Safety in Blasting:
 - Notify the site worker and local community on the time of blasting.
 - Clear the area that is identified as danger zones.

Operations Phase

- Recommended to address the low frequency noise from the airport during the detailed airport design.

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Hydraulic and Hydrodynamic

Existing Environment

Bathymetry

- The depths of the site ranged between -5 m and -30 m below Admiralty Chart Datum (ACD)

Tide

- The tidal range (difference between MHHW and MLLW) : 2.79 m.
- Maximum tidal range (difference between HAT and LAT) : 3.68 m

Wind

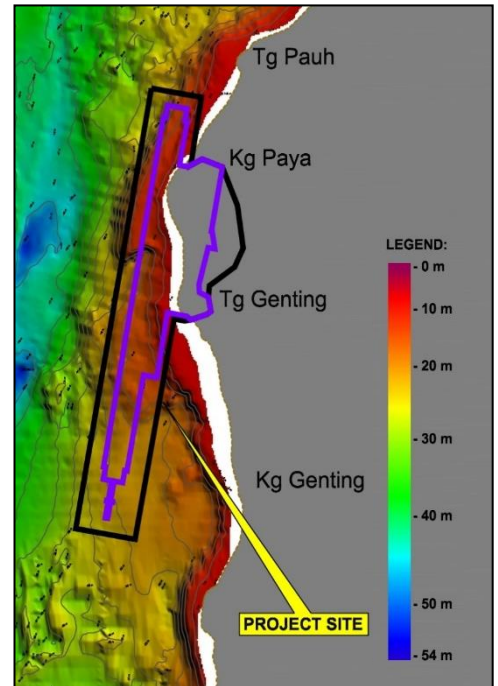
- Surface wind was mostly blowing from the southwest (28.5%), followed by the north (15.1%) and northeast (12.0%) directions

Waves

- This area rarely had speeds of more than 5.5 m/s, the resulting wind generated waves were not high.

Shoreline

- The sandy beaches of Pulau Tioman were mainly crenulated shape bays flanked by rocky outcrops. The crenulation could be quite pronounced depending on the orientation of the bays.



Potential Impacts

Change in current flow

- Existing & temporary working area: Influenced by bathymetry; current flows increase in deeper water & decrease around shallow water nearshore.
- **Project site:** A reduction in the current speed within the shoreline behind southern part of the reclaimed site.

Wave analysis

- The reclamation is seen to be sheltering the shoreline.
- Sheltered areas will create calm sea (low wave heights) making it a safe area for boats, jetties and water activities.

Suspended sediments

- Disperses northwards during ebb, and southwards during flood.

Mitigation Measures

Construction Phase

- Proper drainage systems; storm attenuation measures; detention pond & river basins.
- Implement proper river mouth improvement works and river reserves as per ESCP.
- Construct perimeter bunds.
- Implement regular shoreline monitoring

Operation Phase

- Implementation of proper stormwater drainage systems & on-site stormwater detention facilities based on engineering designs.
- Implement soil and erosion measurements.
- Regular inspection and maintenance of STP discharge.

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Terrestrial Ecology & Biodiversity

Existing Environment

Flora

- 116 species from 53 families recorded.
- Disturbed forest with mixed regeneration species.

Mammals

- 12 species recorded
- 3 totally protected (TP) & 5 protected (P) species
- Threatened species: Island Flying Fox (NT) & Black Giant Squirrel (NT)

Avifauna

- 38 species recorded. Threatened species:
- Black Hornbill (VU)

Herpetofauna

- 13 species recorded. Threatened species:
- Boo-liat's Kukri Snake (CR) & Tioman Bent-toed Gecko (NT)



Island flying fox
(*Pteropus hypomelanus*)

Bakau Minyak
(*Rhizophora apiculata*)



Saffron bellied frog
(*Chaperina fusca*)

Collared kingfisher
(*Todiramphus chloris*)



Potential Impacts

FLORA:

Construction Phase

- Loss of vegetation
- Potential of landslide
- Reduced carbon sequestration
- Affect marine life and resources

Operations Phase

- Land clearing by locals and outsiders

FAUNA:

Construction Phase

- Habitat loss and fragmentation
- Human-wildlife conflict (HWC)
- Noise and light pollution
- Introduced species

Operations Phase

- Illegal wildlife trade
- Oil spill/ air pollution
- Bird strike

Mitigation Measures (P2M2s)

FLORA:

Construction Phase

- Proper removal and reduce incidental damage
- Control landslides and erosion
- Minimise land surface temperature
- Preserve soil quality

Operations Phase

- Enhance natural vegetation regeneration
- Implement invasive species control
- Utilise soil amendments (fertilizer, etc.)

FAUNA:

Construction Phase

- Adopt ESAs guidelines
- Minimise biodiversity loss
- Implement noise/light pollution control
- Prevention and response to oil spill on wildlife
- Enforce wildlife monitoring and patrolling

Operations Phase

- Habitat rehabilitation and reconciliation
- Remove wildlife from conflict area
- Prevent wildlife hazard at airport

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Marine Ecology & Biodiversity

Existing Environment

Corals

- 120 hard coral & 12 soft coral species recorded.
- 2 Critically Endangered (CR), 1 Endangered (EN) & 19 Vulnerable (VU) species.

Fishes

- 125 species from 24 families with 1,371 hits/ ind.
- No conservation concern species (not exceed LC)
- 2 density range due to very low fish count
- Fish landing in Rompin district (2015-2020): 7,534 – 43,279 MT

Macroinvertebrates

- 100 species recorded. 5 species VU and 1 EN.
- 620 hits/ ind. Not exceed UM study (>14,000 hits)



Large and bent branch coral (*Acropora cervicornis*) (CR)



Blue spotted grouper (*Cephalopholis cyanostigma*)



Black teatfish (*Holothuria nobilis*) (EN)



Loggerhead turtle (*Caretta caretta*) (VU)

Seagrass, Seaweed and Algae

- 22 species from 15 families. Low count with patchy distribution.

Planktons and Benthic Macrofauna

- Phytoplankton: 47 families (96.96%)
- Zooplankton: 19 families (3.04%)
- 104 families of benthic macrofauna identified. Dominated by epibenthic with 93 genera (52%).

Marine Mammal & Turtle

- Green and hawksbill known to roam and nest around Tioman island. Over 165,000 egg collected and 80,000 hatchlings released since 2006.
- One (1) Loggerhead turtle was recorded.
- 7 species marine mammal could be found around Tioman waters.

Potential Impacts

Quarry and Reclamation Phase

- Physical damage and habitat loss for marine life – loss of ecosystem services.
- Increased sediment and turbidity – TSS block feeding tentacles hence reduce nutrient and oxygen intake for corals.
- Oil spill/leakage – toxicity and deplete DO.

Construction Phase

- Noise and vibration pollution – stress and alter behavioral response.
- Water pollution from oil and grease spillage.

Operations Phase

- Artificial lighting disrupt coral photosynthetic activities.
- Water pollution.
- Alteration of hydrodynamic patterns.
- Habitat and biodiversity recovery.

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES

Marine Ecology & Biodiversity

Mitigation Measures (P2M2s)

Quarry and Reclamation Phase

- Implement marine conservation and rehabilitation plan (MCRP) – coral relocation and propagation.
- Reduce sediment and erosion – phasing, ESCP, buffer areas, silt curtain.

Construction Phase

- Apply noise and vibration control.
- Proper water pollution/ stormwater management.

Operation Phase

- Establish light-controlled environment – low-intensity lighting, only operate during day.
- Shoreline monitoring and evaluation.
- Implement spill prevention and response plan (SPRP).
- Proper sewage and stormwater management.
- Continuation of MCRP.

Coral Relocation Programme

Off-set Consideration

- Prioritise coral with high conservation concern (e.g VU, EN, CR) for relocation.
- Pulau Jahat and Pulau Rengis shall be avoided for off-set intentions and Pulau Soyak, ~7.42 km from the Project site shall be considered.
- 4 relocation sites and 2 coral farms were proposed.

Procedure of Relocation

1. Re-examine relocation site and coral farm in arid condition interval and before wet monsoon season.
2. Coral pot is fabricated using PVC pipe and acrylic for base, then will be placed at the coral farm.
3. Coral rubble from Project site is collected and added to surrounding of pot to create substrate.
4. The targeted corals will either a) fragmented at the base or, b) entirely shifted to new site by winch. The corals will be placed on the prepared pot.
5. Pot will be maintained for 3-6 months, followed by bi-annual size measurement.
5. Only viable-sized coral with growth ~1.105x from original size will be relocated to relocation sites.

Timeline For Relocation

Before commencement of ANY construction works

Confidence Implication

Option 1 (Coral Farm)

- Relocation is considered sustainable with >90% confidence in recruitment and survival of coral reefs.

Option 2 (Conventional)

- The confidence is 60% pertaining efforts in maintenance, technology upkeep, expertise diligence and sustained provision of utilities.



Proposed Coral Farms Location and Relocation Sites

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Landuse and Heritage

Existing Environment

Within Project site

- Located between Kg Paya (to the north) and Kg Genting (to the south) with settlements concentrated along the coast; with the hinterlands covered by forest vegetation.
- Categorised as Level 1 ESAs with surrounding waters gazetted as the *Marine Park under the Fisheries Act 1985 (Act 317) and the Establishment of Marine Parks Malaysia Order 1994*.

Landuse within 5-km ZOS

- Residential; resort/chalet/hotel; recreational facilities; amenities; & landmarks.
- Wildlife reserve area gazetted by the Pahang State Government.
- Historical site: *Makam Tun Muhammad Tun Abdul Majid* (Makam Bendahara Pahang Ke-enam), which is categorised as ESA Level 3.

Environmentally Sensitive Areas

- Seaward: Gazetted as the *Marine Park under the Fisheries Act 1985 (Act 317) and the Establishment of Marine Parks Malaysia Order 1994*.
- Landward side: Wildlife Reserve in the *Warta Kerajaan Pahang Jilid 25 No.405*.
- *Pulau Tokong Burung* is an Important Bird Area (IBA).

Heritage Zone

- Project site: under the National Heritage Act 2005 (Act 645).
- Historical site found within 5-km ZOS: *Makam Tun Muhammad Tun Abdul Majid* (Makam Bendahara Pahang Ke-enam)

Potential Impact

Impacts

- Permanent landuse change from sea to land.
- Environmental impacts on the surrounding landuse during construction and indirectly affect the socio-economic.
- Foresee more business and tourist at other settlement during construction, instead of Kg Paya and Kg Genting
- Upon completion, the nearest settlement can expect better infrastructure, utilities and amenities and influx of tourists.
- No impact on the *Makam Tun Muhammad Tun Abdul Majid*.

Mitigation Measures

| Pre-construction/ reclamation | Construction/ Reclamation | Operations |
|--|--|---|
| <ul style="list-style-type: none"> • Land acquisition to reduce encumbrances of development | <ul style="list-style-type: none"> • Carry out Heritage Impact Assessment (HIA) as required. • Implemented proposed P2M2 and BMPs to reduce environmental impact ; thus, minimise the effect to the surrounding landuse. | <ul style="list-style-type: none"> • Improved roads, utilities, amenities, and services. • Increase employment & business opportunities |

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Socio-economic

Existing Environment

SOCIAL SURVEY

- **Sampling frame:** 804 respondents within 5-km ZOS [(1) households – 300 samples, (2) business operators – 69 samples, (3) 8 stakeholder groups in other settlements – 283 samples and (4) offshore fishermen – 100 samples].
- **Level of acceptance:** 54% (households), 42% (business operator) agreed with the Project.
- **Main concerns:** Impacts towards loss of beach, marine water pollution, increased marine traffic, marine ecosystem and influx of migrant.
- **Field studies and samplings:** (Households & Business) 21 to 26 June 2019; (8 Stakeholders) 17 to 21 August 2020; (Offshore Fishermen) 5 to 8 April 2021; and (Cross-check) in September 2022.

FOCUS GROUP DISCUSSION (FGD)

WITH STAKEHOLDERS

- **No. of FGD:** 1st FGD on 6th August 2019 – ADUN Pulau Tioman, Penghulu & Ketua Kampung, 2nd FGD on 7th August 2019 – Local Agencies i.e. DOF, BPEN etc., 3rd FGD on 1st September 2020 – Local Agencies i.e. MOTAC, TDA etc.
- **Major concerns:** Affecting the marine ecosystem, safety risks of marine users, pollution, livelihood of local business activities and the necessity of road linking villages and airport.



Potential Impact

Impacts

- Construction: Potential degradation of the marine ecosystem and biodiversity especially off Kg Paya - Kg Genting coasts will reduce tourists to the area, causing hardships to resort and local business communities.
- Construction: Affected physical environment can compromise the local socio-economy, in terms of lower tourist arrivals and businesses, which are the buttress of the local socio-economy.
- Operation: Expected 'spin-off' businesses for the local economy especially for the local business, tourism and service providers.
- Operation: The nearby settlement may anticipate better utilities, infrastructure, and facilities once construction is complete.

Mitigation Measures

| Pre-construction/ Reclamation | Construction/ Reclamation | Operations |
|---|--|--|
| <ul style="list-style-type: none"> • It is recommended that incentives be offered in the form of tourist tax reductions to all resort operators and related businesses for at least the next five (5) years. | <ul style="list-style-type: none"> • Physical Environment: Implementation of mitigation measures is compulsory. • Safety, Health & Environment: Establishment of ERP and conduct disease prevention measures regularly. • New Employment & Business Opportunity: Setup "local labour desk" for local employment opportunity and local contract appointment. | <ul style="list-style-type: none"> • Environment Pollution: Comply with all the proposed mitigation measures. • Loss of beach: The runway will form a good barrier against any rough seas and high tides. • Influx of migrant: Compulsory to follow entry procedures with work permits and undergo health checks. |

EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Marine Traffic and Risk

Existing Environment

Port limit

- The Project site is located within the Port Limit under *Merchant Shipping Ordinance 1952*.

Regular marine traffic flow

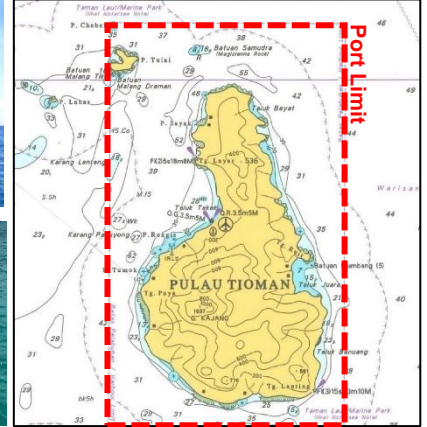
- Made of passenger ferry, cargo boat, garbage boat and small/leisure watercraft.
- Estimated daily traffic flow (existing):

Existing Jetty in Tioman

- 6 jetties, i.e. Kg Genting, Kg Paya, Kg Tekek, Kg Air Batang, Kg Salang, Teluk Juara.

Existing Threats and Incidents

- Common incident report in SE Asia are robbery onboard and hijacking; not prevalent in vicinity of Pulau Tioman for some years.



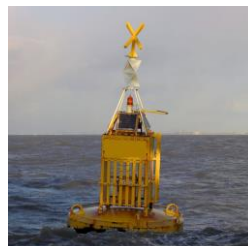
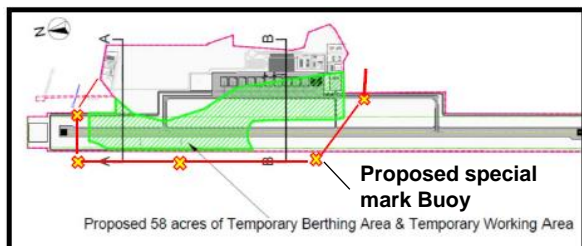
| Description | Frequency (Trip/Day) |
|---|----------------------|
| Ferry – From Tg Gading (formerly called Tg Gemok) | 5 |
| Ferry – From Mersing | 5 |
| Cargo – From Tg Gemok | 1 |
| Cargo – From Mersing | 1 |
| Garbage – Inter Tioman | 1 |
| Small Craft for Diving | 80 |
| Small Craft Water Taxi | 40 |

Potential Impact

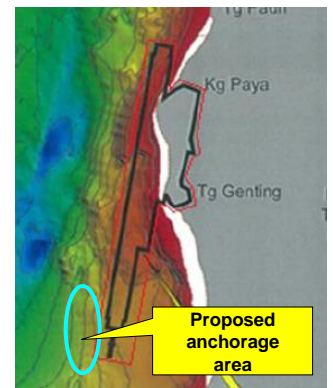
- Vessel collision with the Rock Bund or Pipeline - causes severe damage to keel plate.
- Vessel running over the silt curtain - causes minor damage to small boat and silt curtain.
- Vessel running aground on sand bund - causes minor damage to keel plate.
- Short dumping in bad weather - causes minor damage to environment.
- Severe weather - unsafe anchorage.

Mitigation Measures

- Mark the boundary of work areas.
- Establish 24/7 marine traffic management service or Marine Operation Control Centre (MOCC).
- Mark the bund, silt curtain and pipeline.
- Install Dredging and Dumping Monitoring System (DDMS).
- Fit all marine equipment with operational Automatic Identification System (AIS) minimum class B.
- Designated anchorage area during severe weather.



Special mark Buoy



EXISTING ENVIRONMENT, IMPACT ASSESSMENT & MITIGATION MEASURES



Infrastructure and Utilities

Existing Environment

Transportation around the island

- Mainly depending on the boats, ferries and water taxis.
- Only one dual carriageway connecting Kg Tekek to Berjaya Beach Resort; Hilly road to Kg Juara. Others are narrow roads used for motorcycles and tricycles.

Electricity/ power supply

- 3 diesel generating power stations (by TNB), located at Kg Tekek, Kg Genting and Kg Salang; private entities by BCB Berhad.
- Total capacity: 11.9 MW .

Water Supply

- A water treatment plant (WTP) at Kg Tekek.
- Capacity: 6,000 m³/day.

Sewerage System

- Most toilets in Tioman using “soakaway” system.
- Only 1 IWK sewage treatment plant (STP) in Tioman, serving PPR Tekek Makmur.

Waste Management

- Incinerator located at Kg Tekek, serving Kg Tekek area.
- Capacity: 15 tonnes/day.
- Other settlements, dispose their waste locally through burial, burning.
- Solid wastes from Pulau Tioman are sent out to the mainland by barges for disposal at licensed landfills.



Walkway in Kg Genting



Walkway in Kg Genting



WTP in Kg Tekek



Kg Paya Jetty

Potential Impact

- Kg Paya jetty will be affected; new jetty will be built to replace the operations of the existing jetty.
- The existing small road connecting Kg Paya and Kg Genting will be used as a construction road during the construction. Road damage and spillage may occur and pose safety risks to road user.
- New access road from Kg Tekek, Kg Paya and Kg Genting is required by MPFN; thus, provide better accessibility once operational.
- Significant long-term increase in electricity demands, especially during operation. Total electricity demand of Project: 3.5 MW i.e. still within the current power supply capacity.
- The Kg Tekek WTP (upon upgrading) will be able to cater to the increase of the water demand during Project operation.
- Proper sewage treatment system is required to cater to the sewerage from Project operation.

Mitigation Measures

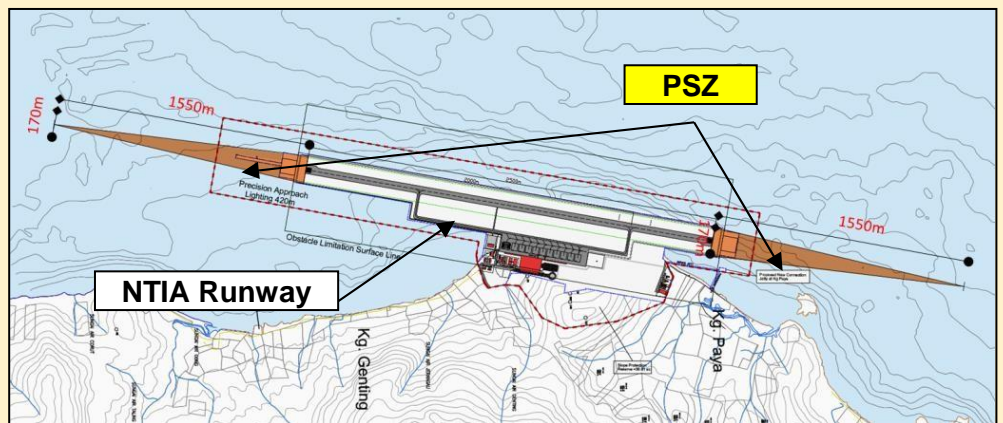
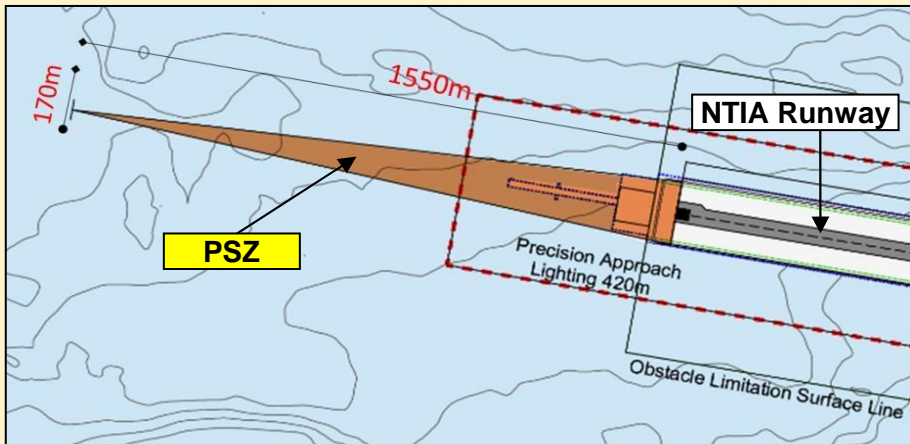
- The new jetty should be built prior to the reclamation work to ensure transportation to/from Kg Paya will not be affected.
- Any damage to the existing small road should be maintained immediately.
- Any road or infrastructure upgrading works which entail closing of any parts of the existing road, shall need the prior approval from JKR.
- A new main water pipe connection should be applied from PAIP to cater to the Project demand in various stage.
- An efficient traffic circulation system from the Project site to Kg Paya, Kg Genting and Kg Tekek should be provided prior to the operations of the airport.

PUBLIC SAFETY ZONE ANALYSIS

- Public Safety Zone (PSZ) study was carried out to determine the shape and size of the PSZ surrounding NTIA Airport in order to mitigate risk of an aircraft crash to the population living, working, or congregating near the airport.
- It was examined using the risk assessment method established by the National Air Traffic Services, UK. It calculated individual risk surrounding the NTIA location based on crash frequency, location and consequence model.
- The PSZ area as shown below shall be positioned at the end of both runways.

Shape: Triangle – 1,550 m (L) and 170 m (W)

Total area: 226,600 m² (26.66 ha)



- Since the PSZ region is located at the sea area, its establishment **will not affect** the existing residential areas and commercial activities (such as business lots, resorts, or transport terminals) in the vicinity of the Project site.
- In future, if the PSZ region is reclaimed for development, the following PSZ development policies can be enacted:
 - Only low occupancy development is permitted, such as long-stay car park (min 6 hrs, unattended plant or machinery golf course, etc).
 - The construction of new buildings is permitted but only with a low population density.

CARRYING CAPACITY & ECONOMIC EVALUATION

Projected Carrying Capacity of Pulau Tioman

| Item | Carrying Capacity (2030) |
|---|--|
| Population (person) | 4,340 |
| Tourists (arrival) | 555,986 |
| Divers (person) | 100,077 - 161,236 |
| Tourist Carrying Capacity (person) | 77,895 upper class tourists 141,626 middle class tourists |
| Coral Carrying Capacity (person/ diving area/ year) | 5,000 |
| Physical Carrying Capacity (person/day) | 23,242 |
| Utility Carrying Capacity – 6JLH water (person/day) | 22,807 |
| Beach Carrying Capacity (person/ day) | 21,440 - 45,943 |

Projected Tourist Arrival by 2030: 555,986 tourist with 5.0% annual growth (RKK-GPT 2030). To cater for the tourist, 88 initiatives under respective dimension of carrying capacity (CC) have been proposed, as follows.

PHYSICAL TOURISM CC

- **Boost Tourism Product:** Activities that interest international and regional tourist including reef check conservation tour, jungle trekking, hiking, scuba diving, snorkeling, trip to waterfall.
- **Tourism Accommodation :** If local population increase to 4,340 and no. of tourist per day is 2059 by 2023, total no. of person on island is 6,399 (within threshold limit of 23,242 person/day).
- **Marine Tourism:** The Island has 28 scuba diving site. Each diving site could cater to 5,000 divers/day. At one time, the total will be 140,000 divers (within limit 100,077 – 161,236 divers).
- **Proposed Infrastructure Initiatives:** Construct new jetty terminal, upgrade Kg Tekek drainage system, introduce minivan ecotourism services and upgrading of existing roads.

SOCIO-CULTURAL CC

- To ensure no conflict or adverse impact of tourism to residents, workers and tourists.
- **Initiatives proposed:** Enforcement of tourist and operator's code of conduct, launching resident awareness programs and community training centre.

ECOLOGICAL CC

- To avoid tourism-induced damage to Tioman's marine ecosystem.
- **Initiatives proposed:** Biodiversity conservation and pollution prevention, preserving endemic and rare species and establish research centre for terrestrial and marine life.

ECONOMIC CC

- In 2017, there were 2,206 rooms with average occupancy of 71%.
- Additional 1,107 rooms are needed by 2030, totaling to 3,166 to cater for 2,059 tourist/day.
- **Initiatives proposed:** Introduction of Tioman cultural village, boost adventure tourism and provide hospitality skills training.

Institutional Capacity Enhancement:

- **Initiatives proposed:** Explore the function of the Pahang Marine Conservation Zone (PMCZ), strengthen TDA's manpower and enhance role of PERHILITAN to administer land-based ecotourism.

CONSTRUCTION PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Impact Monitoring

Marine Water Quality

No. of Points

10

Parameters

Temperature, pH, DO, Salinity, Conductivity, TSS, PO₄, NO₃, NO₂, Ammonia (unionised) Ammoniacal Nitrogen, Hg, Cd, Cr⁶⁺, Cu, As (III), Pb, Zn, CN, Phenol, O&G, TBT, Faecal Coliform, PAHs, Enterococci, Cyanobacteria.

Standards

Class 1, MMWQS

Frequency

Monthly by EnvMC

River Water Quality

No. of Points

2

Parameters

Temperature, pH, DO, TSS, BOD, COD, Turbidity, Salinity, Conductivity, AN, O&G, Al, As, Cd, Cr³⁺, Cr⁶⁺, Cu, Mg, Ni, Ag, Sn, Zn, B, Pb, CN, Fe, Mn, NO₃, PO₄ Phenol, TBT, Faecal Coliform.

Standards

Class IIA, NWQS

Frequency

Monthly by EnvMC

Ground Vibration

No. of Points

4

Parameters

Velocity (mm/s),
Frequency (Hz)

Standards

Guidelines for Environmental Vibration Limits and Control, Third Edition (2021)

Frequency

Real-time monitoring at receptor
&
Ground vibration & air blast monitoring near blasting point

Air Quality

No. of Points

4

Parameters

NO₂, SO₂, CO, O₃,
PM_{2.5}, PM₁₀

Standards

Standard 2020, Malaysian Ambient Air Quality Standards

Frequency

Monthly by EnvMC

Noise Level

No. of Points

3

Parameters

L_{eq}, L₁₀, L₅₀, L₉₀, L_{min}, L_{max}

Standards

Guidelines for Environmental Noise Limits and Control, Third Edition (2021)

Frequency

Monthly by EnvMC

Terrestrial Ecology

Parameters

Fauna

Charismatic, threatened, endangered and rare fauna species as indicated in the survey.

Flora

Vegetation conditions and assessment of damage and change.

Location

Within and along the perimeter/ boundary of Project site

Standards

Compare with baseline

Frequency

Yearly by EnvMC/ Specialist



CONSTRUCTION PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Impact Monitoring

Marine Ecology

Parameters

Macrobenthos, phytoplankton and zooplankton

No. of Points

15 points – Macrobenthos,
5 points – phytoplankton and zooplankton

Standards

Maintain baseline result

Frequency

Quarterly by EnvMC

Parameters

Live coral cover, species changes, coral bleaching, algae growth, invasive species, signs of damage or stress

Points

11 line transects within zone of impacts

Standards

Benchmark against baseline

Frequency

Quarterly by specialist

Parameters

Marine turtles and mammals sighting around Project site

Monitoring Location

Within the Project ZOI

Compliance Requirement

Sighting and incident reporting

Frequency

Report on any incident or sighting

Shoreline Monitoring

Extend of Survey

- Shoreline Length: 6 km
- Seaward length from shoreline:
 - 1.5 km at the north.
 - 2 km at the south.
- Interval: 100 m.
- Spot level interval: 10 m

Compliance Requirement



DID Malaysia requirements as approved in the Hydraulic Study Report

Frequency

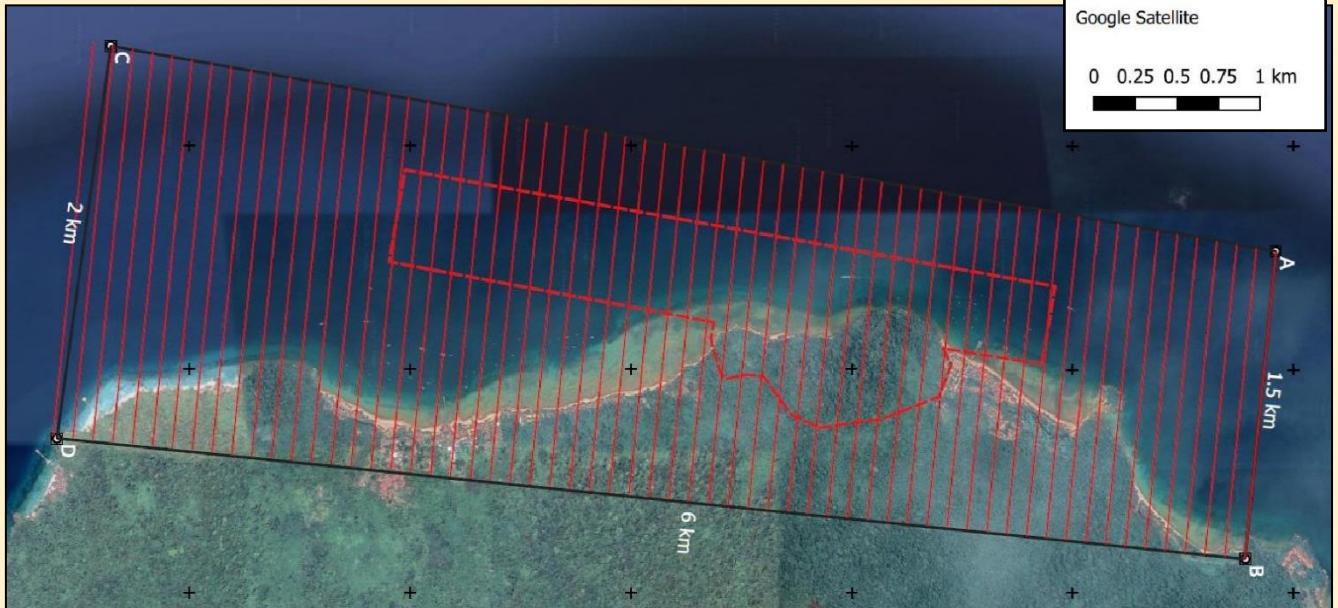
Quarterly during construction phase

Monitoring Location

| Name | x | y |
|------|---------|-------|
| A | 104.115 | 2.799 |
| B | 104.128 | 2.798 |
| C | 104.106 | 2.746 |
| D | 104.123 | 2.744 |

-  Project Boundary
 -  Shoreline Monitoring
- Google Satellite

0 0.25 0.5 0.75 1 km

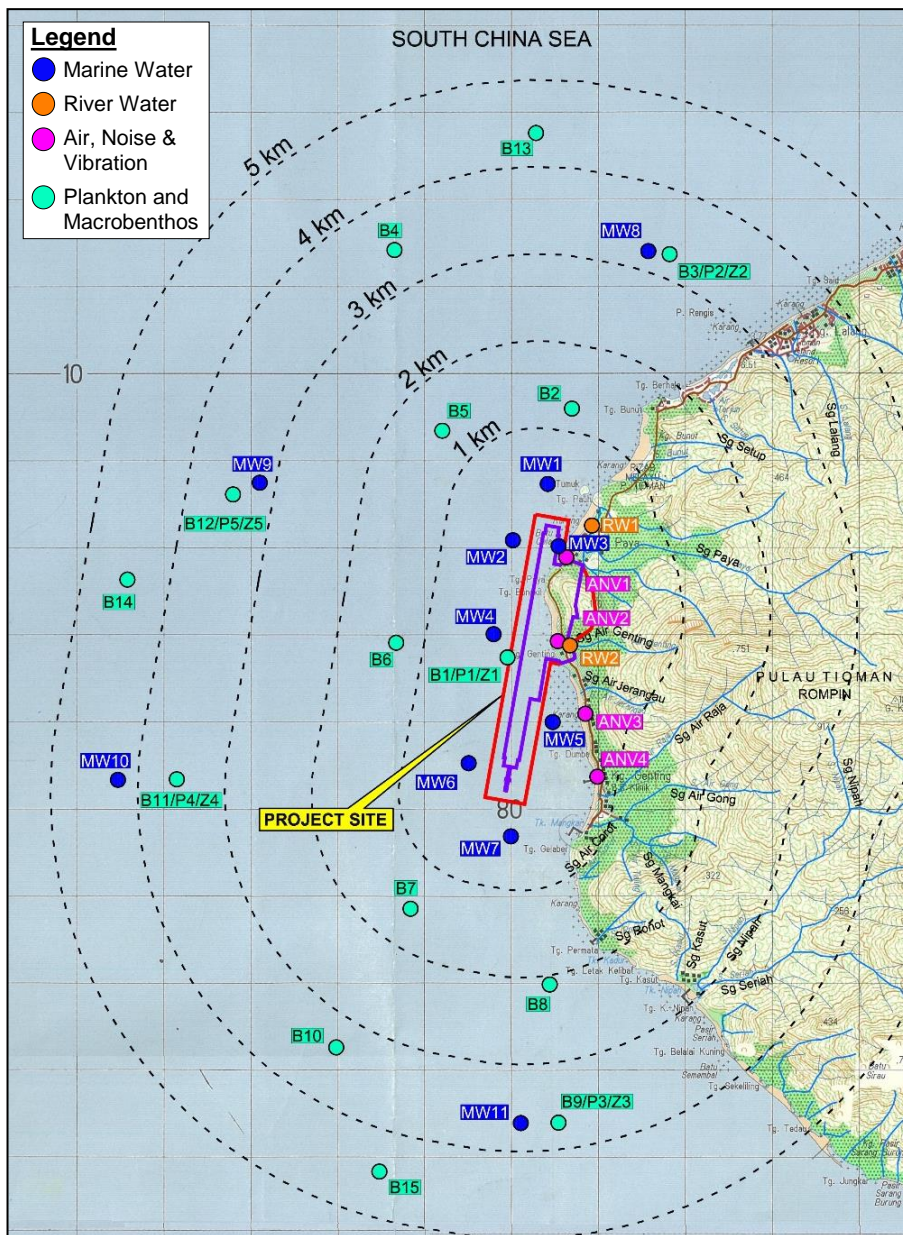


CONSTRUCTION PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Compliance Monitoring & Performance Monitoring

| Component | Compliance Requirement | Location | Frequency |
|---|--|---|--|
| Compliance Monitoring | | | |
| Water discharge quality from sediment basin | <ul style="list-style-type: none"> TSS <25 mg/L. Turbidity <100 NTU. COAs (if any) | Outlets of proposed sediment basins | <ul style="list-style-type: none"> After every rain event ≥ 12.5 mm by EO. Monthly by EnvMC. |
| Marine Water Quality | <ul style="list-style-type: none"> Class I, MMWQS COAs (if any) | MW3 | Monthly by EnvMC. |
| Solid Waste management | <ul style="list-style-type: none"> EQA 1974. Solid Waste and Public Cleansing Management Act 2007. Local Government Act 1976, Section 69 – 71. COAs (if any) | <ul style="list-style-type: none"> Project site. Site office. Storage/disposal area. Vessels. | <ul style="list-style-type: none"> Daily by EO. Monthly by EnvMC. |
| Scheduled Waste Management | <ul style="list-style-type: none"> EQA 1974. Environmental Quality (Scheduled Wastes) Regulations 2005. Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia. COAs (if any) | <ul style="list-style-type: none"> Storage areas for scheduled wastes. Active work areas. Workshop. | <ul style="list-style-type: none"> Daily by EO. Monthly by EnvMC. |
| Safety and Health | <ul style="list-style-type: none"> Occupational Safety and Health Act 1994. Guidelines for Public Safety and Health at Construction Sites (1st Revision) (DOSH, 2007). | <ul style="list-style-type: none"> Project site. Vessels | <ul style="list-style-type: none"> Daily by SHO. Monthly by EnvMC. |
| Performance Monitoring | | | |
| Functionality of P2M2 for Erosion and Sediment Control | <ul style="list-style-type: none"> LD-P2M2 Plan approved by DOE. ESCP Layout and report approved by DID. COAs (if any). | <ul style="list-style-type: none"> All BMPs proposed in approved LD-P2M2 Plan and ESCP. | <ul style="list-style-type: none"> Daily by EO. After every heavy rain by EO. Monthly by EnvMC. |
| Sewage (if cumulative P.E. < 150) and sillage | <ul style="list-style-type: none"> SPAN specifications. Environmental Quality (Sewage) Regulations 2009. COAs (if any). | <ul style="list-style-type: none"> Within the Project site. | <ul style="list-style-type: none"> Daily by EO. Monthly by EnvMC. |
| Sewage Effluent from Septic Tank (if the cumulative P.E. ≥ 150). | <ul style="list-style-type: none"> Environmental Quality (Sewage) Regulations 2009. COAs (if any). | <ul style="list-style-type: none"> Cumulative septic tank's effluent discharge point. | <ul style="list-style-type: none"> Monthly by EnvMC. |
| Perimeter bund and silt curtain | COAs (if any). | <ul style="list-style-type: none"> Along perimeter bund and silt curtain. | <ul style="list-style-type: none"> Weekly inspection by EO. After severe storms. Monthly by EnvMC. |
| Discharge outflow to the sea | <ul style="list-style-type: none"> TSS <25 mg/L. Turbidity <100 NTU. COAs (if any). | <ul style="list-style-type: none"> At the discharge outflow to the sea. | <ul style="list-style-type: none"> Real-time monitoring throughout the sand filling activities. |

CONSTRUCTION PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Compliance Monitoring & Performance Monitoring

| Component | Compliance Requirement | Location | Frequency |
|--|--|--|---|
| Compliance Monitoring | | | |
| Performance Monitoring | | | |
| Perimeter bund and silt curtain | COAs (if any). | <ul style="list-style-type: none"> Along perimeter bund and silt curtain. | <ul style="list-style-type: none"> Weekly inspection by EO. After severe storms. Monthly by EnvMC. |
| Discharge outflow to the sea | <ul style="list-style-type: none"> TSS <25 mg/L. Turbidity <100 NTU. COAs (if any). | <ul style="list-style-type: none"> At the discharge outflow to the sea. | <ul style="list-style-type: none"> Real-time monitoring throughout the sand filling activities. |



OPERATIONS PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Impact Monitoring

Marine Water Quality

No. of Points

7

Parameters

Temperature, pH, DO, Salinity, Conductivity, TSS, PO₄, NO₃, NO₂, Ammonia (unionised) Ammoniacal Nitrogen, Hg, Cd, Cr⁶⁺, Cu, As (III), Pb, Zn, CN, Phenol, O&G, TBT, Faecal Coliform, PAHs, Enterococci, Cyanobacteria.

Standards

Class 1, MMWQS

Frequency

Monthly by EnvMC

River Water Quality

No. of Points

2

Parameters

Temperature, pH, DO, TSS, BOD, COD, Turbidity, Salinity, Conductivity, AN, O&G, Al, As, Cd, Cr³⁺, Cr⁶⁺, Cu, Mg, Ni, Ag, Sn, Zn, B, Pb, CN, Fe, Mn, NO₃, PO₄ Phenol, TBT, Faecal Coliform.

Standards

Class IIA, NWQS

Frequency

Monthly by EnvMC

Ecology

Parameters

Macrobenthos, phytoplankton and zooplankton

No. of Points

5 points – Macrobenthos,
5 points – phytoplankton and zooplankton

Standards

Maintain baseline result

Frequency

Half-yearly by EnvMC

Air Quality

No. of Points

4

Parameters

NO₂, SO₂, CO, O₃,
PM_{2.5}, PM₁₀

Standards

Standard 2020, Malaysian Ambient Air Quality Standards

Frequency

Monthly by EnvMC

Noise Level

No. of Points

3

Parameters

L_{eq}, L₁₀, L₅₀, L₉₀, L_{min}, L_{max}

Standards

Guidelines for Environmental Noise Limits and Control, Third Edition (2021)

Frequency

Monthly by EnvMC

Parameters

Live coral cover, species changes, coral bleaching, algae growth, invasive species, signs of damage or stress

Points

11 line transects within zone of impacts

Standards

Benchmark against baseline

Frequency

Quarterly by specialist

Shoreline Monitoring

Extent of Survey

Similar to the monitoring during construction

Compliance Requirement

DID Malaysia requirements as approved in the Hydraulic Study Report

Frequency

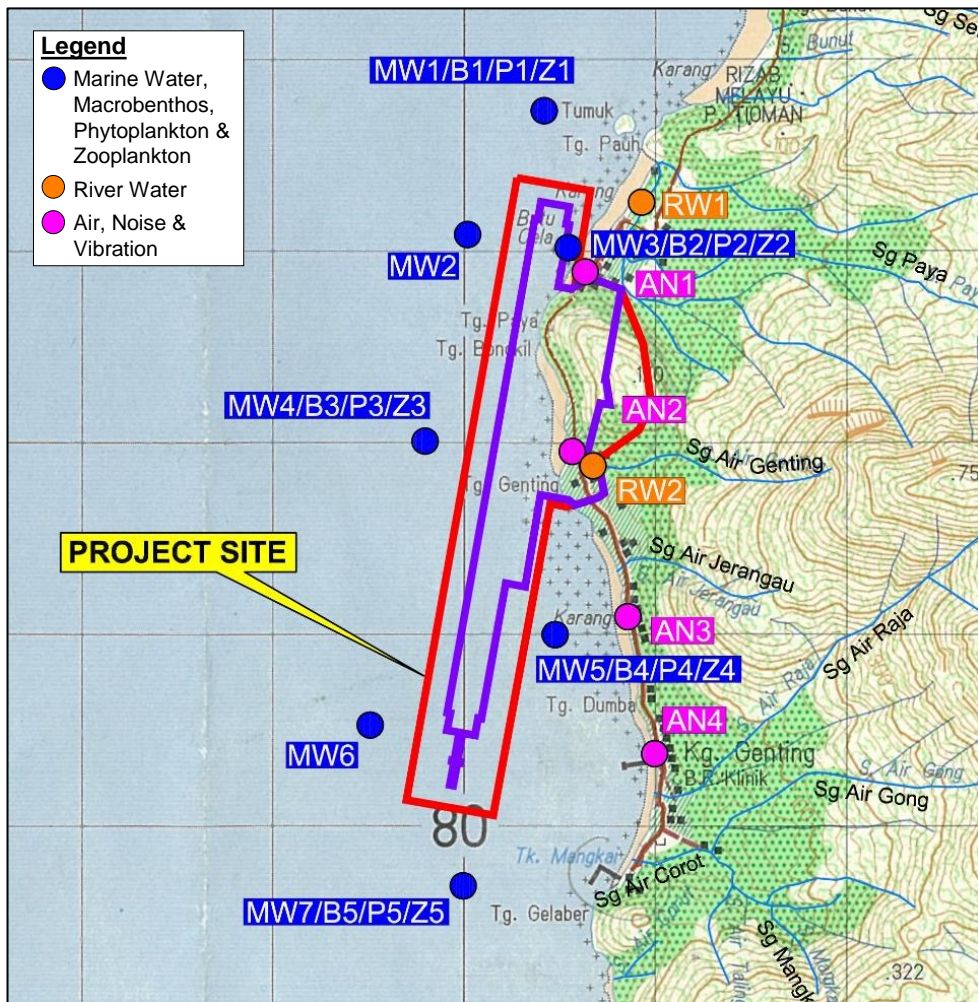
Quarterly during construction phase



OPERATIONS PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Compliance Monitoring & Performance Monitoring

| Component | Compliance Requirement | Location | Frequency |
|------------------------------------|--|---|--|
| Compliance Monitoring | | | |
| Effluent Discharge from STP | <ul style="list-style-type: none"> Compare with the performance data for each unit operation designed by the STP Consultant | Each operation unit | <ul style="list-style-type: none"> Real-time monitoring using remote monitoring system. |
| Performance Monitoring | | | |
| Effluent Discharge from STP | <ul style="list-style-type: none"> Standard A, Second Schedule, Environmental Quality (Sewage) Regulations 200. COAs (if any). | At the discharge outlet of STP before entering the piping for underwater discharge. | <ul style="list-style-type: none"> Weekly by competent person. |

OPERATIONS PHASE – ENVIRONMENTAL MONITORING PROGRAMME - Proposed Monitoring Points



STUDY FINDING

Identified Impact and its significance:

| Environmental Impact | During Construction | During Operation |
|------------------------------------|---------------------|--------------------------------|
| Soil Erosion and Sedimentation | - 3 | - 0 |
| Geology and soils | - 3 | - 0 |
| Air quality | - 3 | - 1 (especially at Kg Paya) |
| Ambient Noise | - 2 | - 1 (especially at Kg Paya) |
| Vibration | - 2 | - 1 |
| Water quality | - 3 | - 1 |
| Hydrology and Drainage | - 2 | - 1 |
| Hydraulic and Hydrodynamic | - 1 | - 1 |
| Terrestrial Ecology and Resources. | - 2 | - 1 |
| Marine Ecology and Resources | - 3 | - 2 |
| Landuse and Heritage | - 2 | - 1/ + 1 |
| Socio-economy | - 2 | + 2 |
| Marine Traffic and Risk Assessment | - 2 | NA |
| Waste Management | - 1 | - 1 |
| Infrastructure and Utilities | - 1 | - 1/ +1 |

Note:

"-" = negative impact; "+" = positive impact/beneficial.

Level of significant: 0 = Not significant; 1 = Little significance; 2 = Significant; 3 – Very significant.

NA = Not applicable or irrelevant.

Mitigation measures, best technological and management practices were provided to mitigate the adverse impacts. Residual impacts are expected during the Project development.

CONCLUSION

- The development of the Project will cause both positive and negative impacts, as it is large and sensitive, not only to the local communities, but also to the environment because it is located in a marine park.
- With judicious adoption of the recommended mitigation measures and Best Management Practices (BMPs), together with constant monitoring supported by proactive actions recommended in this DEIA, the adverse impacts can be controlled.
- On the positive side, there will be jobs of all skills and business opportunities available during all phases of development to the local communities, especially at this period when the whole economy is recovering from the unprecedented aftermath of the Covid-19 lockdown, both locally and worldwide.