First Schedule

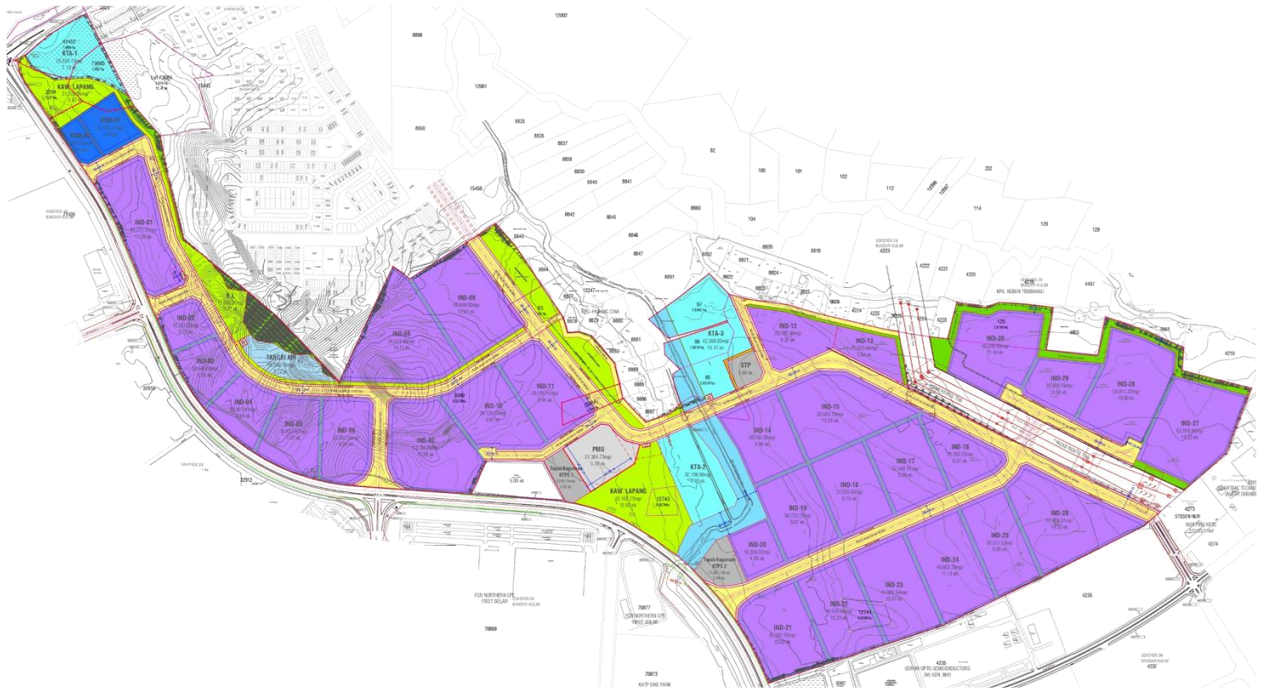
Environmental Impact Assessment Report

Volume I

Proposed Infrastructure Development at Industrial Zone Phase 5, Kulim Hi-Tech Park on Lot 73665, 3569, 12743, 12744, 83, 95, 96, 97, 125, 91 at Bandar Kulim, Kulim and Lot 2204 and 61452, at Bandar Lunas, Kulim, Kedah Darul Aman

Project Proponent:

Perbadanan Kemajuan Negeri Kedah



January 2026

Prepared by:

AGV Environment Sdn. Bhd.

AGV ENVIRONMENT

ENVIRONMENTAL SOLUTIONS SPECIALIST

First Schedule

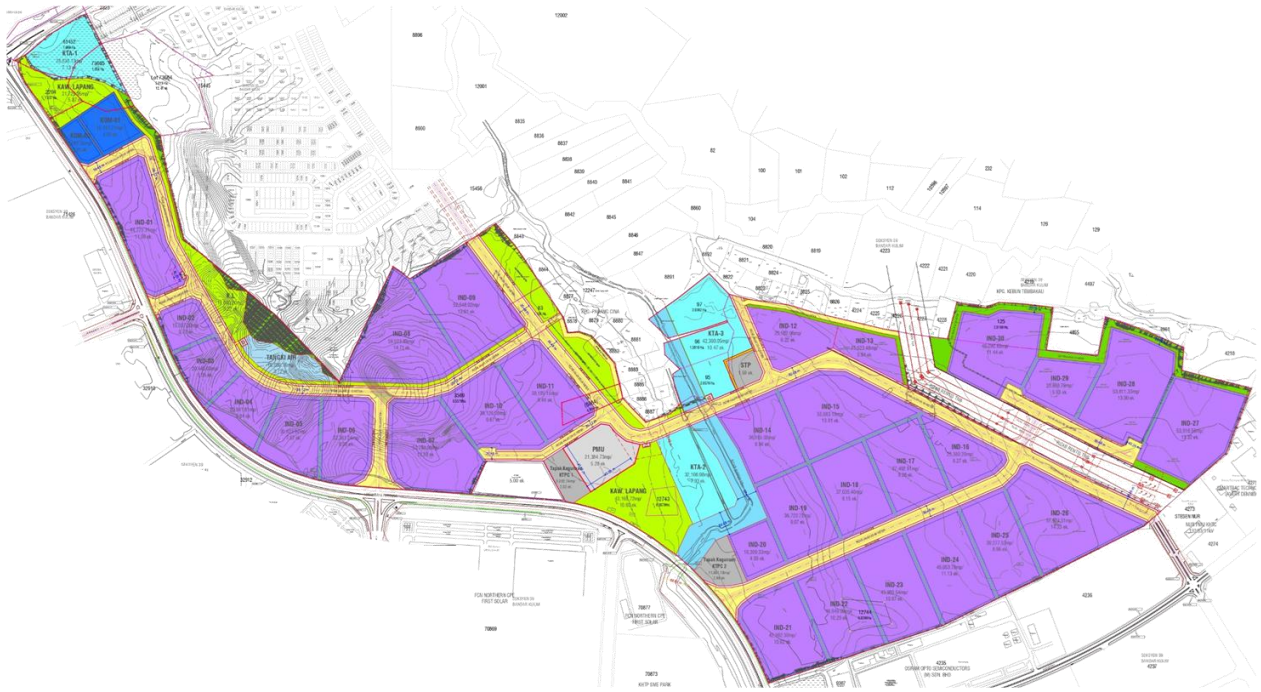
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Volume II

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Project Proponent:

Perbadanan Kemajuan Negeri Kedah



January 2026

Prepared by:

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AGV ENVIRONMENT
ENVIRONMENTAL SOLUTIONS SPECIALIST

PERBADANAN KEMAJUAN NEGERI KEDAH
Kedah State Development Corporation
ARAS 14, WISMA PKNK,
JALAN SULTAN BADLISHAH, PETI SURAT 140,
05000 BANDARAYA ALOR SETAR, KEDAH DARUL AMAN
MALAYSIA.

Telefon : 604 -729 7000
Laman Web : www.pknk.gov.my

(22) dlm. PKN(K) 38/TEK

29 JAN 2026

Project Proponent's Environmental Pledge

I hereby declare that the entire EIA report is the product of the Qualified Person (i.e.,the EIA Consultant) engaged by my company and all the facts stated in the report and the accompanying information are to the best of my knowledge and belief true and correct, and that I have not withheld or distorted any materials facts. I agree and I undertake the responsibility to implement all the pollution prevention and mitigation measures (P2M2s) described in the EIA report, in the Environmental ManagementPlan (EMP) and in the LD-P2M2 as proposed by the EIA Consultant. I have allocated sufficient funds for the above purpose.

Name of Project Proponent : Hj. Muhammad Zuhairi Bin Dato' Wira Hj. Muhamad Nor

NRIC Number : 790823-02-5903

Designation : Senior Manager, Technical Division, PKNK

Signature :

Date : 30 January 2026

Company Stamp :

PERBADANAN KEMAJUAN NEGERI KEDAH
PKNK

Untuk Kemajuan Iktisad Rakyat

قرباذن بهكماجوان كرزي قدح
PERBADANAN KEMAJUAN NEGERI KEDAH
Kedah State Development Corporation
ARAS 14, WISMA PKNK,
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29 JAN 2026

DECLARATION BY PROJECT PROPONENT / AUTHORISED PERSON

I certify that the Land Disturbing Pollution Prevention Mitigation Measures (LD-P2M2) report has been prepared with my knowledge and I shall undertake the responsibility to ensure the actions / plans and pollution prevention and mitigation measures (P2M2) stated in the LD-P2M2 report will be implemented. I have provided sufficient allocation for the implementation of the P2M2.

PROJECT TITLE:

Proposed Infrastructure Development at Industrial Zone Phase 5, Kulim Hi-Tech Park on Lot 73665, 3569, 12743, 12744, 83, 95, 96, 97, 125, 91 at Bandar Kulim, Kulim and Lot 2204 and 61452, at Bandar Lunas, Kulim, Kedah Darul Aman

PROJECT ADDRESS / LOCATION:

Lot 73665, 3569, 12743, 12744, 83, 95, 96, 97, 125, 91 at Bandar Kulim, Kulim and Lot 2204 and 61452, at Bandar Lunas, Kulim, Kedah Darul Aman

Name : Hj. Muhammad Zuhairi Bin Dato' Wira Hj. Muhamad Nor
Designation : Senior Manager, Technical Division, PKNK
Date : 30 January 2026
Company Stamp:

PERBADANAN KEMAJUAN NEGERI KEDAH ★ PKNK

Untuk Kemajuan Iktisad Rakyat

Environmental Impact Assessment Report for the
Proposed Infrastructure Development at Industrial Zone Phase 5, Kulim Hi-Tech Park on Lot 73665, 3569, 12743, 12744, 83, 95, 96, 97, 125, 91 at Bandar Kulim, Kulim and Lot 2204 and 61452, at Bandar Lunas, Kulim, Kedah Darul Aman

Qualified Person's Declaration

I declare that the entire EIA report is the product of my own work and the work of my team members (i.e., other consultants who are also Qualified Persons) who worked under my supervision and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct and that I have not withheld or distorted any material facts. I have briefed the Project Proponent on the content of the Report and highlighted to him all the pollution prevention and mitigation measures (P2M2s) described in the Environmental Management Plan (EMP), and in the LD-P2M2, and the Project Proponent has agreed to implement them (i.e., P2M2).

EIA Consultant Team Leader	:	Putri Zulaikha Binti Md Bakri
NRIC Number	:	890307-43-5074
Designation	:	EIA Team Leader
Signature	:	
Date	:	29 January 2026
Company's stamp	:	

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Project Proponent

Perbadanan Kemajuan Negeri Kedah

Address : Wisma PKNK, Tingkat 14, Jalan Sultan Badlishah, Bandar Alor Setar, 05000 Alor Setar, Kedah
Telephone : 04-729 7000
Contact Person : Hj. Muhammad Zuhairi bin Dato' Wira Hj. Muhammad Nor
Email : zuhairi@pknk.com.my

EIA Consultant

AGV Environment Sdn. Bhd.

Address : Level 3A, Tower B, Atwater Corporate Office, Jalan Prof Diraja Ungku Aziz, 46300 Petaling Jaya, Selangor
Telephone : 03-7931 1455
Contact Person : Datin Dr. Vijayalakshmi Samuel
Email : vijayalakshmi@agvenvironment.com

Overview

LEGAL REQUIREMENT

Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015

First Schedule

Activity 13: Development in Slope Area

Development or land clearing less than 50 percent of an area with slope greater than or equal to 25° but less than 35°.

Activity 17: Industrial Estate Development

Development of industrial estate covering an area of 20 hectares or more

PROJECT OVERVIEW

Fifth expansion of Industrial Zone at Kulim Hi-Tech Park (KHTP).

Key Components:

- Industrial Lots
- Commercial Plot
- Infrastructure and utilities

Statement of Need



Conformance to Government Policies and Plans

The Project is in line with the following policies and plans at national, state and local levels:

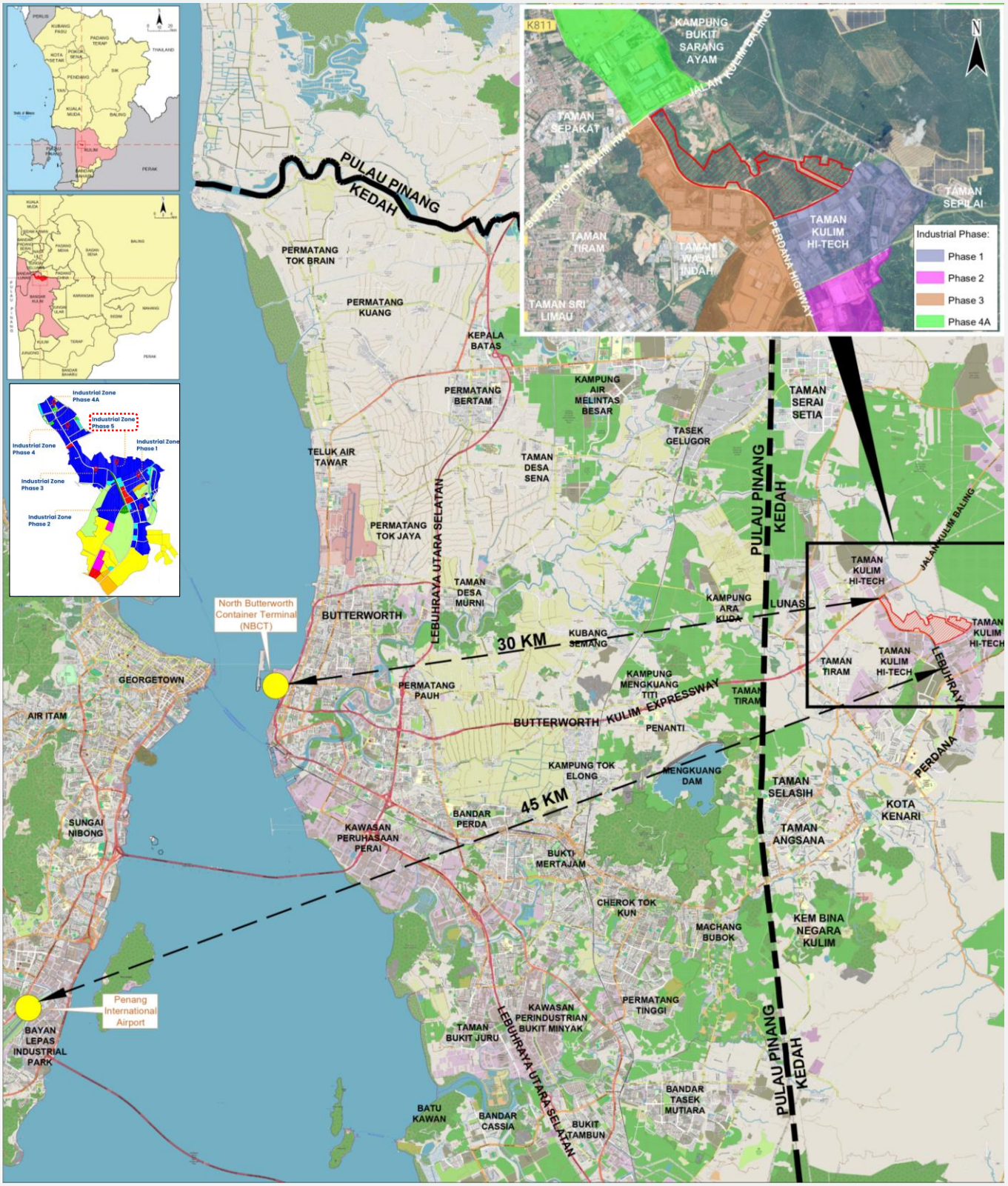
- United Nations Sustainable Development Goals, Agenda 2030
- Thirteenth Malaysia Plan, 2026 – 2030
- Fourth National Physical Plan (2021 – 2040)
- National Policy on Industry 4.0 (Industry4WRD)
- National Industrial Master Plan 2030
- *Rancangan Tempatan Daerah Kulim 2035*
- *Pelan Tindakan Bandar Pintar Kulim (2022-2035)*
- *Rancangan Struktur Negeri Kedah 2035 (RSN Kedah 2035)*

Environmental Benefits	Social Benefits	Economic Benefits
• Promotes sustainable industrial practices. • Potential integration of renewable energy sources, reducing the carbon footprint of industrial operations.	• Creates job opportunities for skilled and semi skilled workers. • Improves infrastructure within the community and provides access to modern technology.	• Stimulates local and regional economic growth. • Boosts industrial productivity and supports the development of competitive industrial clusters.

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

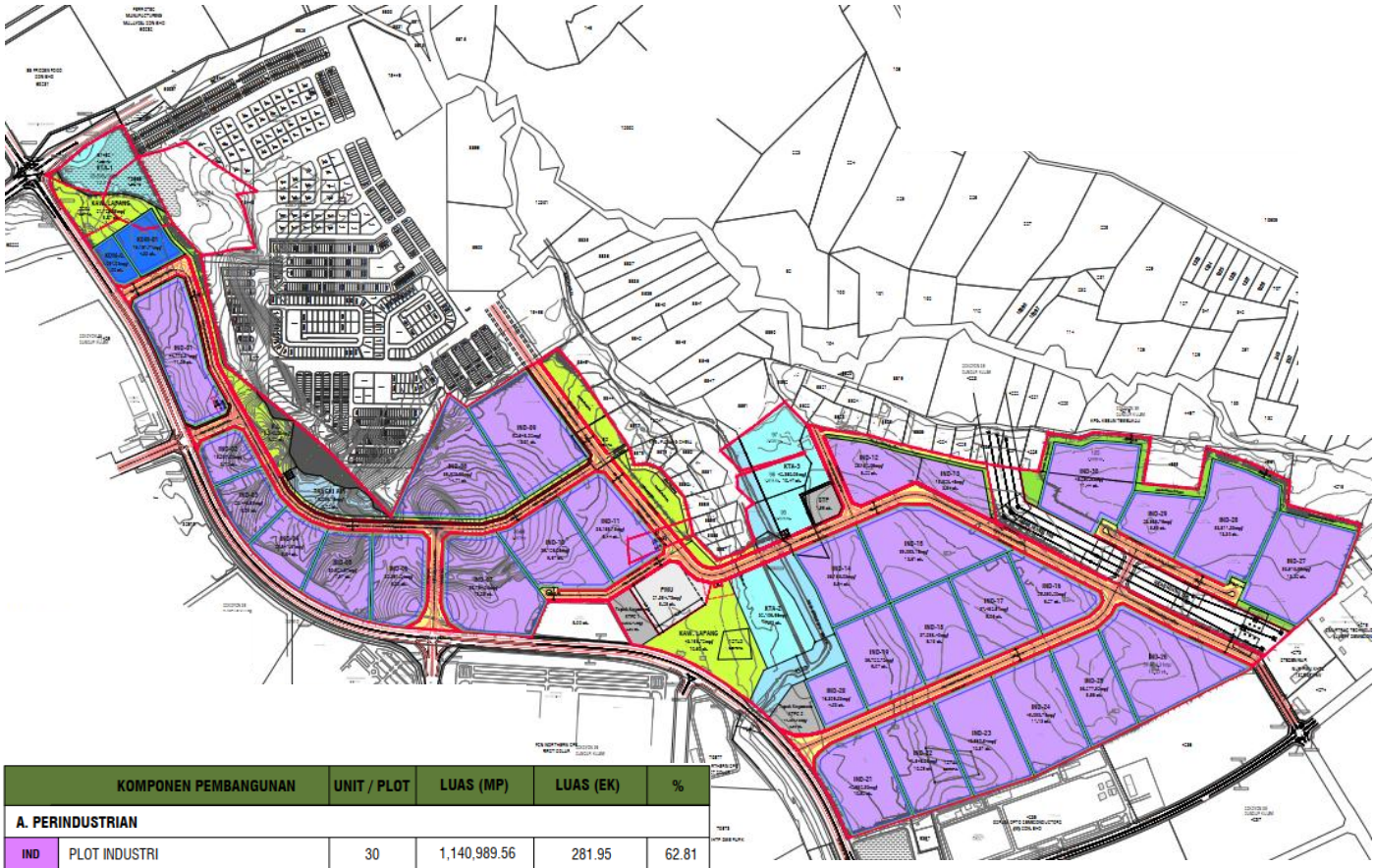
Project Location



EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Project Layout and Development Components

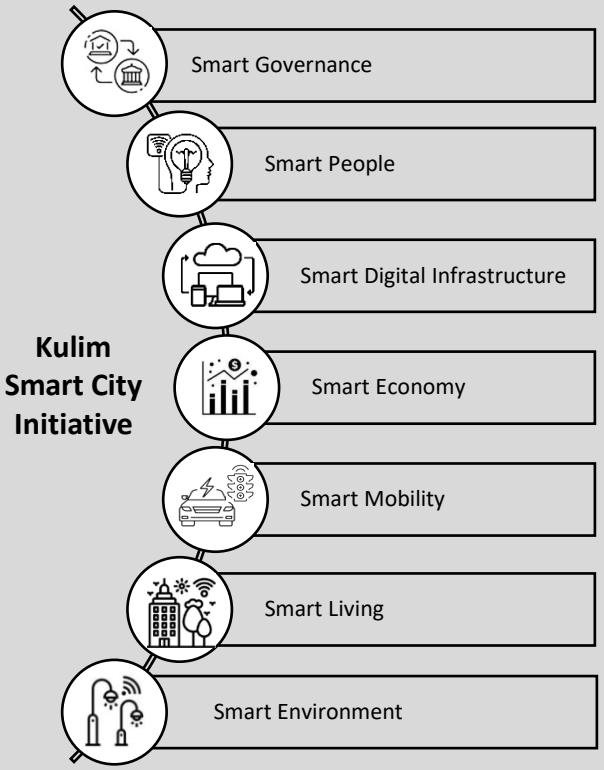


	KOMPONEN PEMBANGUNAN	UNIT / PLOT	LUAS (MP)	LUAS (EK)	%
A. PERINDUSTRIAN					
IND	PLOT INDUSTRI	30	1,140,989.56	281.95	62.81
JUMLAH A		30	1,140,989.56	281.95	62.81
B. PERNIAGAAN					
KOM	PLOT PERNIAGAAN	2	24,272.74	6.00	1.34
JUMLAH B		**2**	24,272.74	**6.00**	**1.34**
(EFISIENSI TANAH) JUMLAH A+B		**32**	**1,165,262.31**	**287.94**	**64.14**
C. KAWASAN HIJAU					
	KAWASAN LAPANG	-	128,165.61	31.67	7.06
	ZON PENAMPAN / CERUN	-	57,968.01	14.32	3.19
JUMLAH C		**-**	**186,133.62**	**45.99**	**10.25**
D. INFRASTRUKTUR & UTILITI					
	TAPAK KEGUNAAN KTPC 1	1	9,392.74	2.32	0.52
	TAPAK KEGUNAAN KTPC 2	1	11,661.18	2.88	0.64
KOM	PENCAWANG MASUK UTAMA (PMU)	1	21,384.73	5.28	1.18
SC	PENCAWANG ELEKTRIK PADAT (5M x 7M)	2	657.60	0.16	0.04
STP	LOJI RAWATAN KUMBAHAN	1	6,444.61	1.59	0.35
TA	TANGKI AIR	1	15,036.16	3.72	0.83
KTA	KOLAM TAKUNGAN AIR	3	103,305.16	25.53	5.69
	RIZAB SUNGAI	-	48,926.98	12.09	2.69
	RIZAB UTILITI - 5 METER	-	59,491.68	14.70	3.27
SPR	SISTEM PAM RANGKAIAN (SPR)	2	400.00	0.10	0.02
	RIZAB JALAN	-	188,517.85	46.58	10.38
JUMLAH D		**12**	**465,218.67**	**114.96**	**25.61**
JUMLAH KESELURUHAN (A+B+C+D)		**44**	**1,816,614.60**	**448.90**	**100.00**

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Project Concept



Smart City Applications

Sustainable development encompassing safe, smart and green city applications:

- LoRaWAN IoT Network (923 MHz) for sensor data
- EV charging stations
- Sustainable dashboard
- Smart street lighting system
- Water pressure monitoring system
- Smart façade lighting system
- Smart pedestrian crosswalk
- Geotechnical sensor network system

Project Activities

Pre-Construction	Construction Phase	Operational Phase
• Survey works and utilities mapping • Engagement and liaison with authorities and stakeholders • Soil Investigation (SI) works and related studies • Planning works	**Package 1 (Earthwork Phase 1)** • Erosion and sediment control • General site clearing • Site preparation and temporary facilities • Earthwork for Package 1 (1 phase) • Earthwork for road surrounding up to 50mm from subgrade level • Utilities reserve up to FL **Package 2 (Earthwork Phase 2 – 6)** • Erosion and sediment control • General site clearing • Earthwork for Package 2 (in 5 phases) • Geotechnical treatment works • Construction of infra and utilities • Utilities relocation works • Installation of Smart City Applications • Landscape works	• Industrial and business operation • STP and sewage reticulation operation • Water reticulation operation • Infra and utility maintenance

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Existing Environment

Geology

- **Regional setting**: Sandstone, mudstone, and shale (Semanggol Formation)
- Terrain: Gentle undulations with residual soils derived from sedimentary rocks
- Zones of saturated silty soils and weathered sandstone/siltstone at transition zones above bedrock

Soil

- **General:** Red-Yellow Podzolic & Brown Lateritic soils
- Generated from acid to intermediate igneous rocks, arenaceous, argillaceous and mixed sediments
- **Groundwater:** 0.00 – 12.23 m bgl

Topography

- Consists mostly of flat land with some hilly and slopy areas.
- Average elevation: 15.7 – 74.45 m msl (flat and hilly areas)
- Highest elevation: Area in the northwest of the site
- Lowest elevation: Area at the west boundary of the site

Slope Gradient

Slope Gradient Classification

- Class I (<15%): 91.14%
- Class II (15°-25°): 6.84%
- Class III (25°-35°): 1.94%
- Class IV (>35°): 0.08%

Hydrology

- Sg Ayer Merah flows through Project site.
- Sg Jarak located along northern boundary of Project site
- Wastewater and industrial effluent is discharged into Sg Jarak.
- Project site is near a flood-prone area (high risk of flood)

Traffic

- Peak hours: 7–8 am & 5.30–6 pm
- Main access: BKE & LP
- Operational performance of all existing roads (J1 – J8) in the region (2025) has a LOS that ranges from LOS B to LOS F

Climate & Meteorology

- Equatorial-monsoon climate (NE: Nov–Mar; SW: May–Sep)
- Mean temperature: 28.0 °C
- Relative Humidity: 79.5%
- Rainfall: 186.7 mm/month; rain days: ~1 to 27 days monthly
- Winds: avg 2.2 m/s; prevailing E (27.2%)

Land Use

- Site is gazetted as 'Industrial' under RTD Kulim 2035 (*Pengubahan 8*)
- Project site is predominantly surrounded by residential, commercial and institutional
- River at Project site is classifies as ESA.

Ecology

- **Terrestrial**: Not rich in biodiversity. Mostly abandoned palm oil plantation. No rare or threatened species.
- **Aquatic**: Low aquatic biodiversity. No rare or threatened species. High count of an alien species, *Oreochromis niloticus* was present.

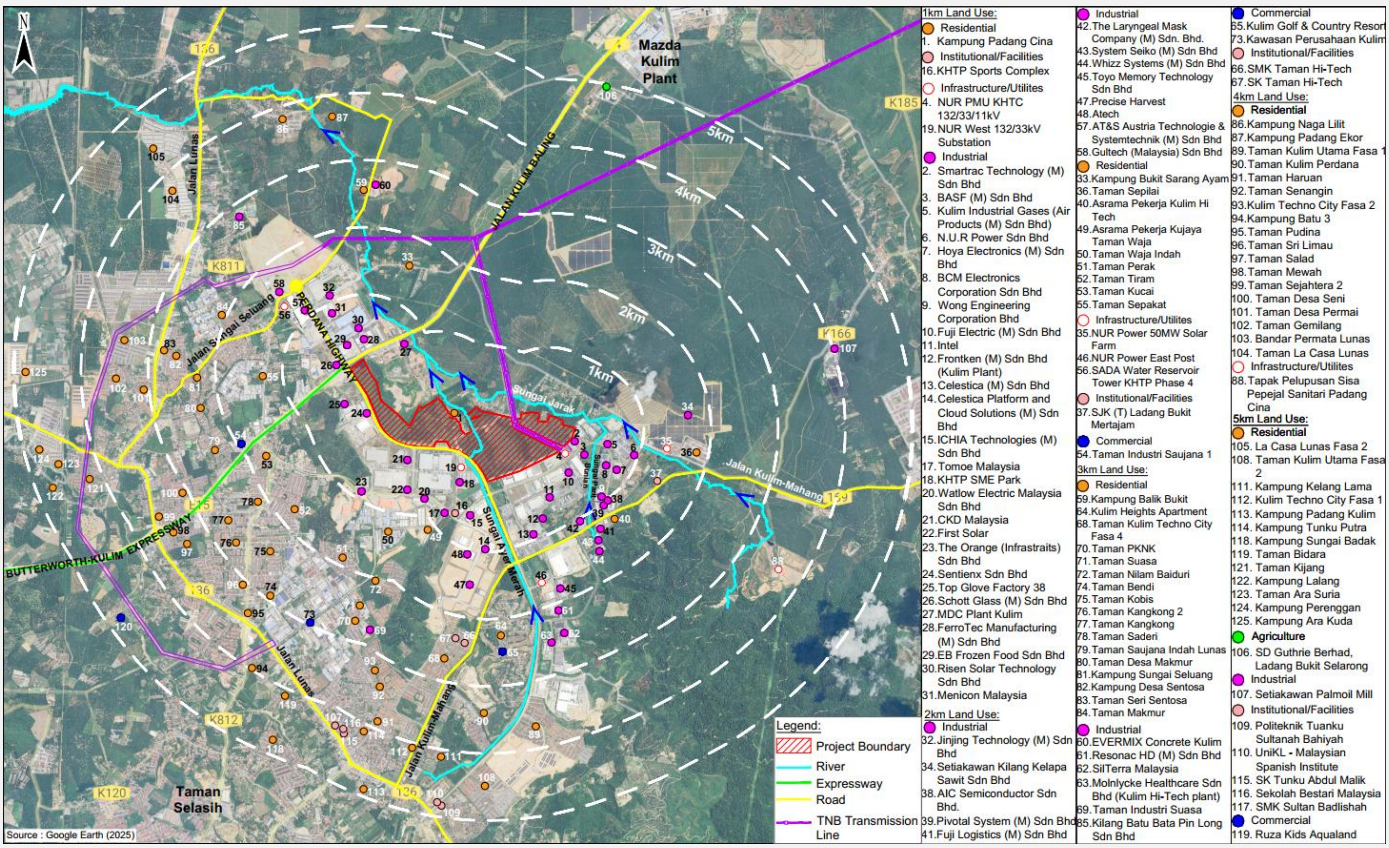
Socio-Economy

- **Engagement:** Household Surveys and Interviews with Industrial Representatives
- **Summary:**
  - Industrial Representative: Traffic issue, hostel management for foreign workers
  - Household Survey: Traffic issue, environmental pollution (water and air), concern regarding influx of foreign workers & strong overall perception and support for the proposed project.

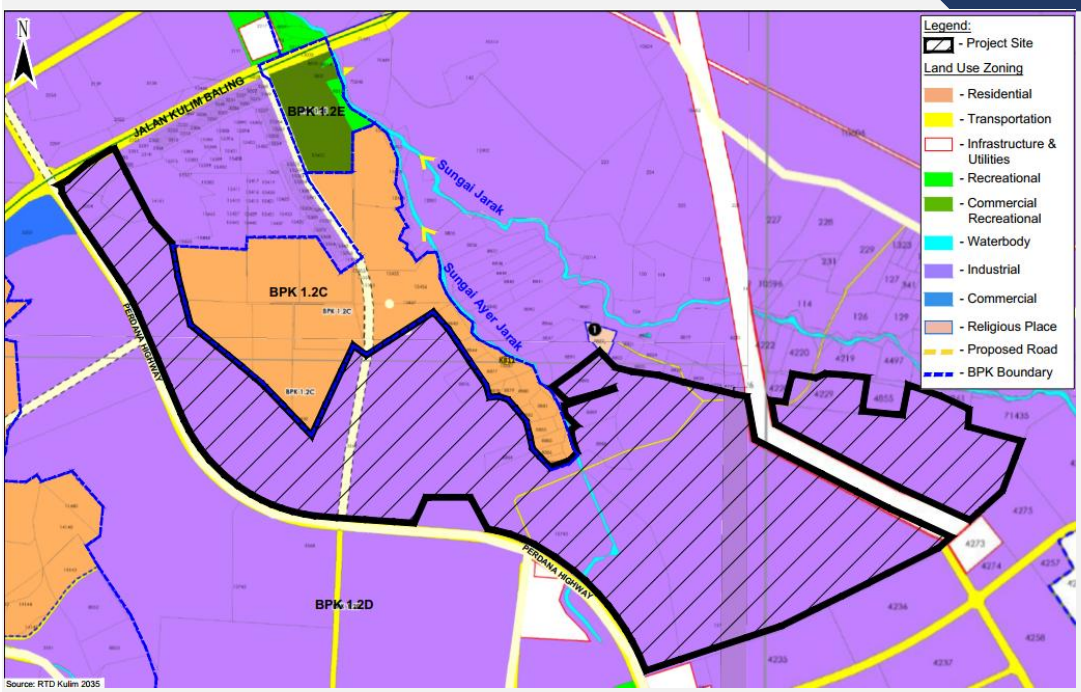
EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Surrounding Land Use



Zoning Land Use



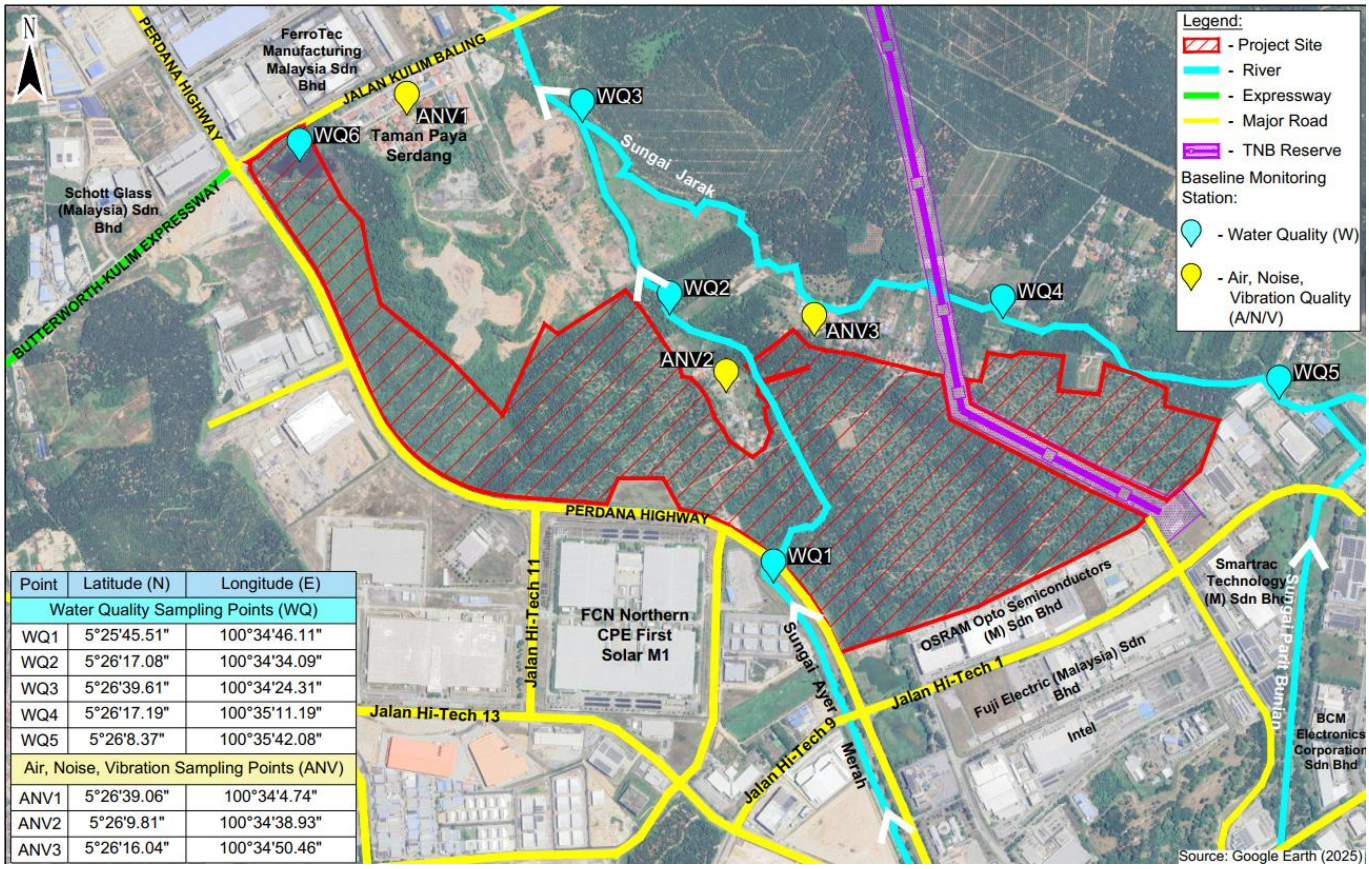
- Based on RTD Kulim 2035 (*Pengubahan 8)* the zoning is industrial.
- Land uses within a 5-km radius mainly consists of residential areas, industrial, commercial areas, institutional areas with minor land uses for infrastructure and utilities areas

Adapted from Rancangan Tempatan Daerah (RTD) Kulim 2035 (Pengubahan 8)

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Environmental Baseline Sampling



Point	Latitude (N)	Longitude (E)
Water Quality Sampling Points (WQ)		
WQ1	5°25'45.51"	100°34'46.11"
WQ2	5°26'17.08"	100°34'34.09"
WQ3	5°26'39.61"	100°34'24.31"
WQ4	5°26'17.19"	100°35'11.19"
WQ5	5°26'8.37"	100°35'42.08"
Air, Noise, Vibration Sampling Points (ANV)		
ANV1	5°26'39.06"	100°34'4.74"
ANV2	5°26'9.81"	100°34'38.93"
ANV3	5°26'16.04"	100°34'50.46"

River Water Quality

- Six (6) locations monitored (WQ1–WQ6)
- Flow rate was measured at the sampling locations, while collected water samples were submitted to the laboratory and analysed for thirty five (35) parameters
- Water samples were compared against Class IIB limits

Exceedance at each sampling point:

(1) WQ1: DO, AN, COD, BOD, NO_3, P; (2) WQ2: DO, AN, COD, BOD, NO_3, P; (3) WQ3: DO, AN, COD, BOD, NO_3, P; (4) WQ4: DO, AN, COD, BOD, NO_3; (5) WQ5: DO, AN, COD, BOD, NO_3; (6) WQ6: DO, COD, BOD, NO_3, P

Ambient Air Quality

- Three (3) locations monitored (A1 – A3) for PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO dan O_3
- All complied with against New Malaysia Ambient Air Quality Standard (MAAQS), 2020
- SO_2, CO, and O_3 not detected at all locations

Noise Level

- Three (3) locations monitored (N1 – N3)
- All Complied with permissible sound level, LAeq of 'First Schedule: Recommended Permissible Sound Level (LAeq) By Receiving Land Use For New Development (Industrial Zones)' in "Guidelines for Environmental Noise Limits and Control (2019)"
- Daytime LAeq at all stations complied with 65 dBA limit (daytime) and 60 dBA (nighttime)

Vibration Level

- Three (3) locations monitored (V1 – V3)
- All complied with 'Third Schedule: Recommended Vibration Limits For Human Response And Annoyance From Intermittent Vibrations (Industrial)' in "Guidelines For Environmental Vibration Limits And Control (2019)" (RMS: 3.2 mm/s)

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Impact Assessment

Geotechnical Considerations

CONSTRUCTION PHASE

- Situated on gently undulating terrain historically utilised as a palm plantation.
- Ground elevations vary moderately, with subtle rises and depressions.
- No prominent hills or steep escarpments are present within the immediate development.
- Shale and siltstone lithologies are highly susceptible to several types of landslides due to their fine-grained composition and tendency to weather into clay-rich soils when exposed to water.

OPERATIONAL PHASE

- Prolonged or intense rainfall potential for elevated pore water pressures, which may pose a risk to drainage structures and building foundations.

Soil Erosion & Sedimentation

CONSTRUCTION PHASE

Soil Erosion Modelling

- Assessment conducted using RUSLE under three (3) scenarios: Existing Condition, Worst-Case (without mitigation), and With Mitigation Measures.
- Overall soil loss for all six (6) phases:
  - Existing: 179.61 t/ha/yr; Worst-Case: 1,478.33 t/ha/yr; With Mitigation: 26.88 t/ha/yr

Sediment Yield

- Overall sediment yield calculation by scenario:
  - Existing: 2,331.11 tonnes; Worst-Case: 6,584.14 tonnes; With Mitigation: 408.74 tonnes

Water Quality

CONSTRUCTION PHASE

- Removal of secondary vegetation and undergrowth result in exposed soil surfaces which causes soil erosion.
- Surface runoff from material stockpile areas, excavated areas and temporary drainage channels will contain increased sediments and other pollutants.
- Improper sewage management causing water and groundwater contamination, which leads to disease outbreak.
- WQM for TSS distributions for Sg. Ayer Merah and Sg. Jarak within NWQS Class I - II limits.

OPERATIONAL PHASE

- Increased surface runoff; conveyed via storm drains into KTA, which will subsequently directed into Sg. Ayer Merah and Sg. Jarak.
- Potential impacts through leakage of sewage piping system or STP failure.
- IETS discharge will increase the load of contaminants into the receiving rivers.
- WQM for BOD, COD and NH_3-N distributions for Sg. Ayer Merah and Sg. Jarak indicate that variations are minimal under normal STP operating conditions.

Air Quality

CONSTRUCTION PHASE

- Wind-blown dust from exposed areas – periodic (dry and windy) and limited distance (6 -9 m).
- Fugitive dust emissions from transportation activities – limited distance (<200 m).
- Vehicle/ Equipment Exhaust Emission – (minor and intermittent/ transient).
- Air dispersion modelling is conducted using AERMOD air quality model for three (3) identified ASRs.

OPERATIONAL PHASE

- Airshed modelling using AERMOD from eight (8) operational plots for five (5) ASRs
- Lower loading of PM_{10}, SO_2, NO_2, and CO: Plots C, D, G and H
- Higher loading: Plots A, B, E and F

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Impact Assessment

Noise Generation

CONSTRUCTION PHASE

- Transportation-related noise: confined to roads leading to/from the construction site.
- Construction-related activities: operation of machinery during land clearing, earthwork, unloading works, concrete works, etc.

Noise Level Simulation

- Noise level simulation at three (3) NSRs for unmitigated, partial and mitigated scenarios compared against Schedule of Permissible Sound Levels, Sixth Schedule – all within limits of 70 dB(A) for L_{max} .
- The anticipated community response to noise due to the Project was "None" to "Medium".

OPERATIONAL PHASE

- Minimal noise impact on surrounding settlements due to buffers provided.
- Noise from increased traffic movement confined to peak hours.

Vibration

CONSTRUCTION PHASE

- Vibration impact assessed using FTA 2018 and DOE Guidelines 2021.
- The typical vibration generating equipment (e.g. pile drivers, rollers) & the distance of impact is assessed.
- Sensitive receptors are not within the ZOI of 15 mm/s and 10 mm/s.
- Immediate proximity may experience perceived vibration level (<10 m/s) that can be tolerated.

OPERATIONAL PHASE

- Traffic induced ground-borne vibrations only occur in very extreme circumstances.
- No ground-borne vibration impacts anticipated.

Waste Generation

CONSTRUCTION PHASE

- Waste types: Biomass (total 14,000 – 21,000 MT), construction debris, general waste, and scheduled wastes.
- Improper waste management: attract disease-carrying rodents and insects, elevated flood risk, and soil, groundwater and odour pollutions.

OPERATIONAL PHASE

- Waste types: general waste, sewage waste and scheduled waste from manufacturing, packaging, and maintenance activities.
- Improper waste management: elevated flood risk, proliferation of pests, and soil, surface water and groundwater quality contamination.

Traffic

CONSTRUCTION PHASE

- Offsite transport of materials by large and slow-moving heavy vehicles:
  - Cause inconvenience to other commuters and also pose a safety risk.
  - Prolonged and repeated overloading causing breakages and potholes on road surface.
  - Spillage of materials on public roads.

OPERATIONAL PHASE

- Forecast of total future traffic conducted to predicted growth for year 2028 (OY) and 2038 (IAY):
  - Forecasted LOS for S1 (Perdana Highway) ranged from C to E
  - Forecasted LOS for S2 (Jalan Hi Tech 1) ranged from A to B
  - Increase in traffic worsens the traffic congestion along S1 and at the affected junctions between J1 to Junction J4 , causing unstable traffic flow during the peak hours.

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Impact Assessment



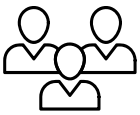
Ecology

CONSTRUCTION PHASE

- No sighting of significant wildlife at the Project site – presence of exotic or endangered flora and fauna is unlikely.
- Direct migration of fauna from the Project site into the neighbouring green areas.
- Small animals such as monkeys may be nuisance to surrounding settlements.

OPERATIONAL PHASE

- No significant ecological impact foreseen as the area will be cleared of the existing vegetation.
- Potential human-wildlife conflicts such as monkeys.



Socio-Economy

CONSTRUCTION PHASE

- Positive impacts: providing job and business opportunities; boost local and regional economy.
- Negative impacts:
  - Disturbance due to environmental impacts related to water, air, and noise pollutions.
  - Potential health issues due to increased dust, noise, and traffic movement.
  - Encroachment of animals into nearby areas.
  - Social issues caused by influx of foreign workers.
  - Congestion and affected traffic flow due to limited parking, slower-moving vehicles on routes leading to the construction site, and increased vehicle numbers.

OPERATIONAL PHASE

- Positive impacts: providing job and business opportunities; boost local and regional economy.
- Negative impacts:
  - Potential air, water, and noise pollution depending on the type and scale of industries .
  - Potential health issues particularly if emissions, waste generation, or occupational hazards are not adequately managed by individual operators.
  - Social issues caused by influx of foreign workers.
  - Potential safety concerns due to increased movement of workers and vehicles.
  - Increased workforce commuting and frequent movement of heavy vehicles leading to traffic congestion.



Public Health and Safety

CONSTRUCTION PHASE

- Health risks by vector-borne diseases when monitoring and controls are not in place.
- Worker's camps will be situated within the Project site could further cause public health concern.
- Mobilisation of construction machineries on public roads may impose road safety hazards.
- Utilisation of lifting machineries produce substantial occupational hazards and risk to public.

OPERATIONAL PHASE

- High-tech industries often adopt Industry 4.0 safety technologies and the risks are highly dependent on the type of production; impacts are considered negligible.

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Mitigation Measures

CONSTRUCTION PHASE

- Drainage control measures for reducing water infiltration and minimising risk of slope instability.
- Slope erosion controls – vegetative stabilisation, guniting on steep or exposed slopes, and erosion control mats or synthetic turf reinforcement mats.
- Slope stability controls – soil nailing combined with horizontal drainage, geogrid reinforced slope, and structural slope support (where required).

OPERATIONAL PHASE

- Constructed areas have been stabilised, paved, concrete-lined or landscaped with proper slope reinforcement works, thus minimising any potential geotechnical hazard.
- Slope erosion controls – vegetative stabilisation.
- Continuous slope monitoring to track slope stability, ground movement, or other geotechnical parameters.
- Regularly inspect and maintain retaining walls, gabions, or other stabilisation structures.
- Conduct geotechnical inspections of the road and slope areas to identify any signs of erosion, instability, or other geotechnical issues.



Geotechnical Considerations

CONSTRUCTION PHASE

- The risk of soil erosion and sedimentation will be minimal with the implementation of Best Management Practices (BMPs) as per ESCP and LD-P2M2:
  - Use of construction markers and perimeter benchmarking.
  - Planning and phasing of land clearing and earthworks.
  - Drainage and surface runoff controls.
  - Proper storage, transport and disposal of soil material.
  - Apply protective covers on exposed areas.
  - Sediment controls on access routes – temporary culverts, paving, surface spraying, wash through/ wheel washing facilities , etc.
  - Regular inspection and maintenance of sediment control structures, turfed slopes and drains.

OPERATIONAL PHASE

- Construction of proper drainage system and grass turfing.
- Routine inspection and maintenance of stabilised slopes.
- Monitoring of special measures by specialised firm or competent environment personnel.



Soil Erosion & Sedimentation

CONSTRUCTION PHASE

- Erosion and sediment controls with the implementation of BMPs as per ESCP and LD-P2M2 (as per soil erosion and sedimentation).
- Proper management of stockpiles.
- Proper fuel and chemical management.
- Proper waste management.
- Develop periodic internal environmental auditing and monitoring.

OPERATIONAL PHASE

- Water detention ponds will be constructed before the final discharge point to collect/intercept surface runoff.
- Regular STP maintenance and continuous monitoring of STP discharge to ensure compliance with minimum Standard B limits.
- Medium industries generating industrial effluent shall provide individual in-¬house WWTP/IETS
- WWTP/IETS influent and effluent monitoring shall be conducted.



Water Quality

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Mitigation Measures

Air Quality

CONSTRUCTION PHASE

- Air quality impacts will be minimised through BMPs for dust suppression, wind erosion controls, and management of stockpiles and loose materials.
- Burning of residual construction materials is strictly prohibited.
- Use of fuel-efficient and well-maintained construction vehicles to reduce exhaust emission.
- All BMPs will comply with DOE's guidelines on fugitive emissions.
- Regular ambient air monitoring.

OPERATIONAL PHASE

- Maintain good LOS of roads and junctions even after the development completion.
- Landscaping of trees and shrubs as natural buffers.

Noise Generation

CONSTRUCTION PHASE

- Adopt BMPs for noise controls and abide to "Environmental Noise Limits and Control (2021); Annex E: Guidance on Noise Control".
- Use of proper personal protective equipment (PPE).
- Adhere to permissible exposure limits set by Occupational Safety and Health (Noise Exposure) Regulations, 2019, and Environmental Quality (Motor Vehicle Noise) Regulation, 1987.
- Regular ambient noise monitoring.

OPERATIONAL PHASE

- Maintain good LOS of roads and junctions even after the development completion.
- Landscaping of trees and shrubs as natural buffers.

Vibration

CONSTRUCTION PHASE

- Abide guidelines for "Environmental Vibration Limits and Control (2021); Annex E: Management and Mitigation of Vibration in The Environment", includes:
  - **Layout**: Adequate distance between source and vibration-sensitive receptors, usage and designation of buffer zones.
  - **Engineering measure**: Use of alternative methods, reduction of energy inputs, containment of vibration generated, protection of adjacent buildings.
  - **Administrative measures**: Restrict the operating time of vibration sources.
- Monitor vibration during intensive activities.

OPERATIONAL PHASE

- Maintain good LOS of roads and junctions even after the development completion.
- Landscaping of trees and shrubs as natural buffers.

Waste Generation

CONSTRUCTION PHASE

- Biomass waste: left as mulch, cut into manageable sizes before disposal, salvage reusable timber.
- Excavated material: supervised earthworks, restrict earthworks during rainy season, reuse soils for restoration works and landscaping, disposal at the approved landfill.
- Construction and general wastes: material segregation and proper storage, reuse and recycling, provide sufficient bins, disposal at approved inert landfill.
- Scheduled waste management in accordance to the DOE's "Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia (2014)", and compliance with the Environmental Quality (Scheduled Wastes) Regulations, 2005.

OPERATIONAL PHASE

- General wastes: will be collected from the respective lots at the scheduled collection.
- Scheduled waste management in accordance to the DOE's "Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia (2014)", and compliance with the Environmental Quality (Scheduled Wastes) Regulations, 2005.

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Mitigation Measures

Traffic

CONSTRUCTION PHASE

- Control of traffic volumes and implementing traffic safety measures:
  - Identify traffic routes and scheduling to avoid peak traffic periods.
  - Ensure no blind view near road junctions.
  - Impose speed limits and safety measures during transportation along public roads.
  - Vehicles and heavy machineries operated by licensed and competent drivers and operators.

OPERATIONAL PHASE

- S1 (Perdana Highway) – OY in 2028: Upgrade from a Four-Lane Single Carriageway to a Six -Lane Dual Carriageway (3.5 m for a lane and 2.5 m for median) and maintained until 2038.
- S2 (Jalan Hi Tech 1) – current road configuration can be maintained until 2038.

Ecology

CONSTRUCTION PHASE

- Prohibit burning of biomass to prevent uncontrollable bush fire incident.
- Reduce human-wildlife encounters.
- Compliance with the Wildlife Conservation Act, 2010.
- Phasing of site clearing and earthworks to allow sufficient time for migration.

OPERATIONAL PHASE

- During human-wildlife encounters PERHILITAN must be engaged to enable safe relocation.
- To minimise deterioration towards the aquatic ecology, the respective tenants should conduct water quality modelling for their drainage and effluent discharges.
- No direct effluent discharges into the rivers; must go through the detention ponds.

Socio-Economy

CONSTRUCTION PHASE

- **Influx of foreign workers:** safe and hygienic accommodations; valid work permits; on the socio-cultural aspects of the local communities.
- **Affected settlements and neighbouring community:** close liaison; record and resolve complaints; inform in advance of any traffic changes or construction schedules.
- **Limited parking facilities:** implement a staggered work schedule; encourage carpooling, shuttle services or public transport.
- **Health and safety for construction workers:** provide PPE; safe routes; certified machinery and operated by trained personnel; health screening; emergency response.

OPERATIONAL PHASE

- **Influx of foreign workers:** safe and hygienic accommodations; valid work permits; on the socio-cultural aspects of the local communities.
- **Affected settlements and neighbouring community:** maintain strong collaboration between the PP, local communities, and local authorities/agencies ; record and resolve complaints.

Public Health and Safety

CONSTRUCTION PHASE

- Foreign workers to undergo a proper pre-employment health assessment through FOMEMA.
- Practice good housekeeping and provide sanitation facilities.
- Schedule movement of construction vehicles on the public roads to avoid peak periods.
- Implement signage, signals, and speed limit; ensuring clear visibility at all times.
- Certified machinery and operated by trained personnel.
- Control entry and exit – install signages and hoarding fence, appoint security personnel.

OPERATIONAL PHASE

- Prepare ERP and perform regular emergency response drills.
- Undertake regular maintenance of process equipment according to manufacturer's guidelines.
- Adherent to the guidelines by DOE and DOSH.

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED INFRASTRUCTURE DEVELOPMENT AT INDUSTRIAL ZONE PHASE 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Proposed Environmental Monitoring Program

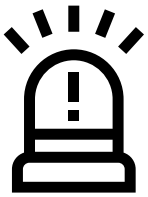


COMPLIANCE MONITORING (CM)

- Ensures compliance with EIA approval conditions and P2M2 requirements
- Sampling and analysis by SAMM-accredited laboratory

ENVIRONMENTAL COMPLIANCE AUDIT

- Environmental Audit by a registered environmental auditor
- Possess Certified Erosion, Sediment and Storm Water Inspector (CESSWI) or Malaysian Certified Inspector of Sediment and Erosion Control (MY-CISEC) Qualifications
- Best Management Practices (BMPs) will be adopted



PERFORMANCE MONITORING (PM)

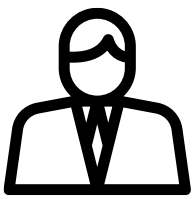
- Evaluate effectiveness of on-site pollution control measures.
- Conducted by the EO.

BASELINE MONITORING

General indication of the baseline environmental conditions at the time of reporting

ENVIRONMENTAL MONITORING PROGRAM

- Provides database of environmental impacts
- Early indicator of environmental impacts



IMPACT MONITORING (IM)

- Ensures effectiveness of pollution control systems and mitigation measures
- EO to carry out PM on site

SELF-REGULATORY MONITORING

- Ensures effectiveness of mitigating measures and compliance towards environmental regulations
- Carried out by EO

MONITORING	FREQUENCY
Performance Monitoring	
As per LD-P2M2	• Weekly • After heavy rainfall (>12.5 mm as measured by rain gauge)
Slope Maintenance and Instrumentation Monitoring • Inclinometer (cut slopes, fill slopes, and retaining wall) • Standpipe piezometer • Displacement, wall and rod settlement markers	• During construction: weekly • After completion: monthly • Standpipe piezometer: ➢ During fieldworks: daily ➢ After fieldworks: daily for first two weeks, then as required
Compliance Monitoring	
Sediment Basin and Silt Trap Discharge Outlets	• Monthly
Impact Monitoring	
Construction Phase	
• Water quality (11 stations) • Ambient Air, Noise & Vibration (3 stations each) • Aerial Survey (by drone)	• Monthly
Operational Phase	
• Detention Ponds • Effluent from STP discharge	• Monthly

Emergency Response Plan

EMERGENCY RESPONSE TEAM

- A team of qualified individuals with specific roles and responsibilities to carry out during an emergency.
- Responsible for executing the following procedures:



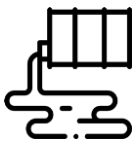
ACCIDENTS
Procedure for emergency response and reporting of major incidents.



FIRE EMERGENCY RESPONSE
Execution of evacuation procedure and fire response coordination.



ESCP FAILURE RESPONSE
Immediate reporting, rectification, and review of erosion control measures.



HAZARDOUS MATERIALS SPILLAGE RESPONSE
Evacuation, containment, and decontamination following hazardous material spills.



MEDICAL EMERGENCY RESPONSE
Immediate notification of emergency services and safe first aid by trained personnel.

Conclusion

The Project poses low environmental impacts limited during construction phase. All expected impacts can comply with stipulated limits, and can be effectively mitigated.

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Penggerak Projek

Perbadanan Kemajuan Negeri Kedah

Alamat : Wisma PKNK, Tingkat 14, Jalan Sultan Badlishah, Bandar Alor Setar, 05000 Alor Setar, Kedah
No. Telefon : 04-729 7000
Wakil : Hj. Muhammad Zuhairi bin Dato' Wira Hj. Muhammad Nor
Emel : zuhairi@pknk.com.my

Perunding EIA

AGV Environment Sdn. Bhd.

Alamat : Level 3A, Tower B, Atwater Corporate Office, Jalan Prof Diraja Ungku Aziz, 46300 Petaling Jaya, Selangor
No. Telefon : 03-7931 1455
Wakil : Datin Dr. Vijayalakshmi Samuel
Emel : vijayalakshmi@agvenvironment.com

Gambar Keseluruhan

KEPERLUAN UNDANG-UNDANG
Kualiti Alam Sekeliling (Aktiviti Yang Ditetapkan) (Penilaian Kesan Kepada Alam Sekeliling) Perintah 2015

Jadual Pertama
Aktiviti 13: Pembangunan di Kawasan Cerun
Pembangunan atau pembersihan tanah yang meliputi kawasan yang kurang daripada 50 peratus kawasan cerun yang berkecerunan melebihi atau sama dengan 25° tetapi kurang daripada 35°
Aktiviti 17: Pembangunan Estet Industri
Pembangunan estet perindustrial yang meliputi kawasan selluas 20 hektar atau lebih

GAMBARAN KESELURUHAN PROJEK

Perkembasngan Zon Perindustrian kelima di Kulim Hi-Tech Park (KHTP).

Komponen Utama
- Lot Industri
- Lot Komersial
- Infrastruktur dan utiliti

Pernyataan Keperluan



Pematuhan terhadap Dasar dan Rancangan Kerajaan

Projek ini adalah selaras dengan dasar dan rancangan di peringkat kebangsaan, negeri, dan tempatan seperti berikut:

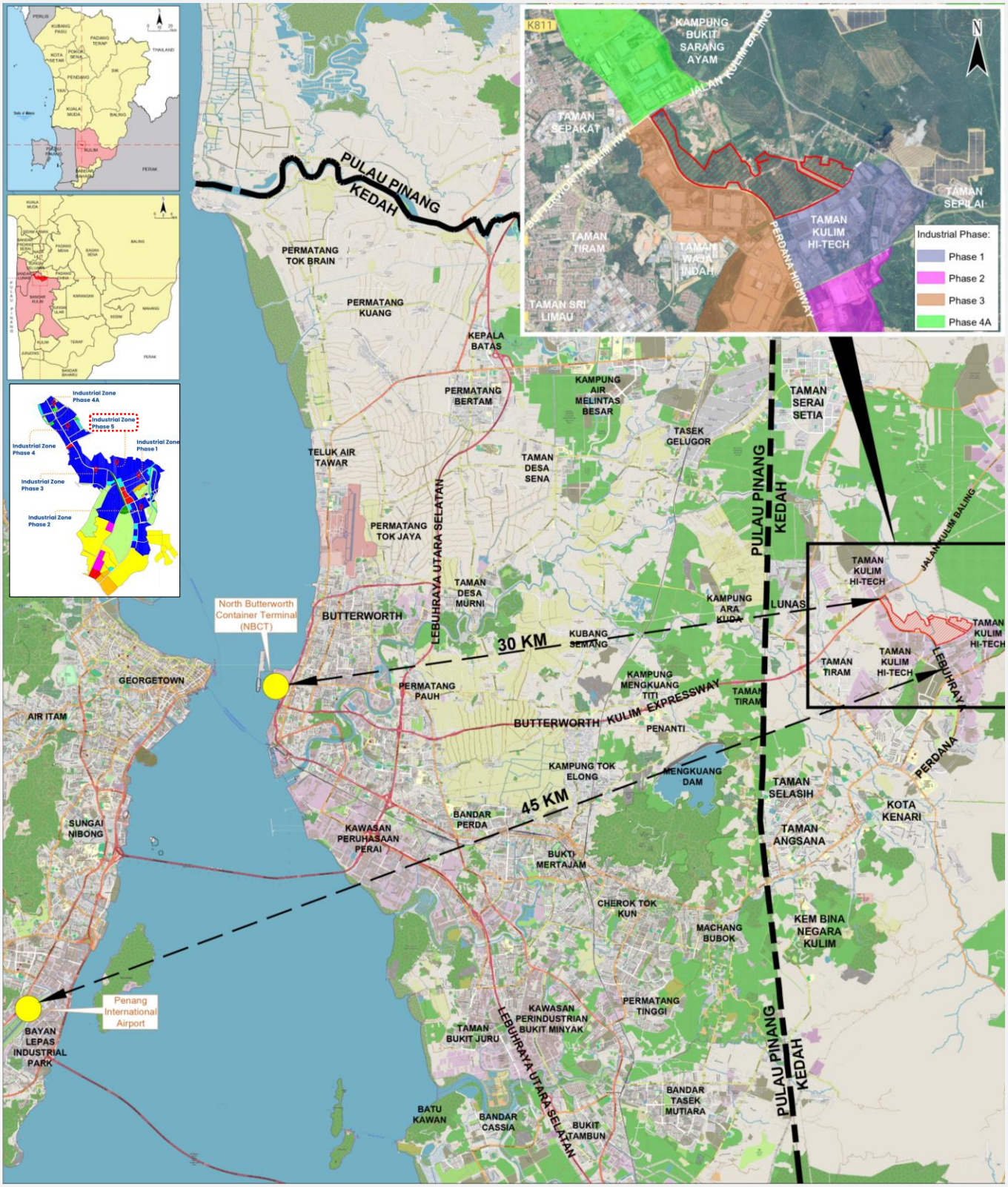
- *United Nations Sustainable Development Goals, Agenda 2030*
- *Thirteenth Malaysia Plan, 2026 – 2030*
- *Fourth National Physical Plan (2021 – 2040)*
- *National Policy on Industry 4.0 (Industry4WRD)*
- *National Industrial Master Plan 2030*
- Rancangan Tempatan Daerah Kulim 2035
- Pelan Tindakan Bandar Pintar Kulim (2022-2035)
- Rancangan Struktur Negeri Kedah 2035 (RSN Kedah 2035)

Manfaat Alam Sekitar	Manfaat Sosial	Manfaat Ekonomi
• Menggalakkan amalan industri yang mampan. • Potensi integrasi sumber tenaga boleh diperbaharui, mengurangkan jejak karbon operasi perindustrian.	• Mewujudkan peluang pekerjaan untuk pekerja mahir dan separa mahir. • Memperbaiki infrastruktur dalam komuniti dan menyediakan akses kepada teknologi moden.	• Merangsang pertumbuhan ekonomi tempatan dan serantau. • Meningkatkan produktiviti perindustrian dan menyokong pembangunan kelompok industri yang berdaya saing.

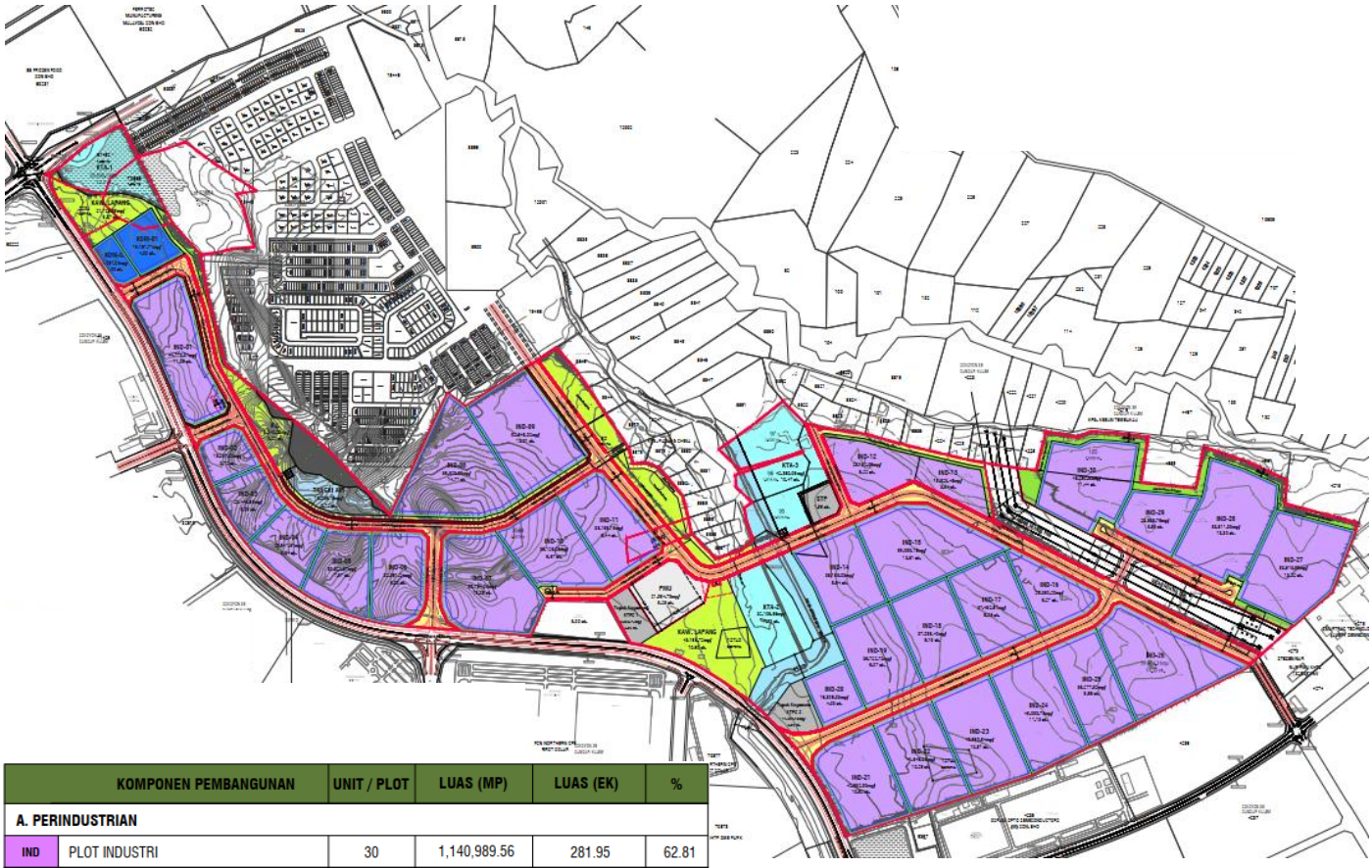
RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Lokasi Projek



Pelan Susun Atur dan Komponen Projek

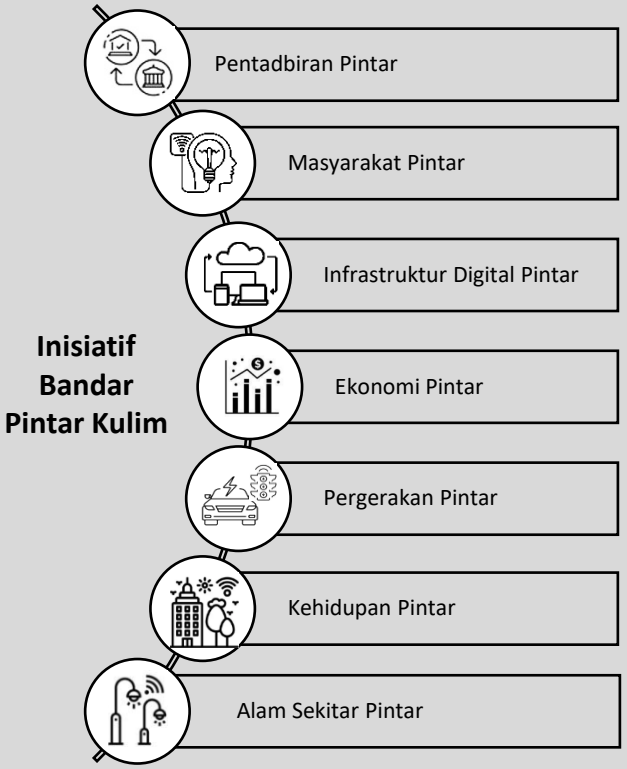


	KOMPONEN PEMBANGUNAN	UNIT / PLOT	LUAS (MP)	LUAS (EK)	%
A. PERINDUSTRIAN					
IND	PLOT INDUSTRI	30	1,140,989.56	281.95	62.81
JUMLAH A		30	1,140,989.56	281.95	62.81
B. PERNIAGAAN					
KOM	PLOT PERNIAGAAN	2	24,272.74	6.00	1.34
JUMLAH B		**2**	24,272.74	**6.00**	**1.34**
(EFISIENSI TANAH) JUMLAH A+B		**32**	**1,165,262.31**	**287.94**	**64.14**
C. KAWASAN HIJAU					
	KAWASAN LAPANG	-	128,165.61	31.67	7.06
	ZON PENAMPAN / CERUN	-	57,968.01	14.32	3.19
JUMLAH C		**-**	**186,133.62**	**45.99**	**10.25**
D. INFRASTRUKTUR & UTILITI					
	TAPAK KEGUNAAN KTPC 1	1	9,392.74	2.32	0.52
	TAPAK KEGUNAAN KTPC 2	1	11,661.18	2.88	0.64
KOM	PENCAWANG MASUK UTAMA (PMU)	1	21,384.73	5.28	1.18
SC	PENCAWANG ELEKTRIK PADAT (5M x 7M)	2	657.60	0.16	0.04
STP	LOJI RAWATAN KUMBAHAN	1	6,444.61	1.59	0.35
TA	TANGKI AIR	1	15,036.16	3.72	0.83
KTA	KOLAM TAKUNGAN AIR	3	103,305.16	25.53	5.69
	RIZAB SUNGAI	-	48,926.98	12.09	2.69
	RIZAB UTILITI - 5 METER	-	59,491.68	14.70	3.27
SPR	SISTEM PAM RANGKAIAN (SPR)	2	400.00	0.10	0.02
	RIZAB JALAN	-	188,517.85	46.58	10.38
JUMLAH D		**12**	**465,218.67**	**114.96**	**25.61**
JUMLAH KESELURUHAN (A+B+C+D)		**44**	**1,816,614.60**	**448.90**	**100.00**

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Konsep Projek



Aplikasi Bandar Pintar

Pembangunan pintar merangkumi aplikasi bandar selamat, pintar dan hijau:

- LoRaWAN IoT Network (923 MHz) untuk data sensor
- Stesen pengecas EV
- Papan maklumat kelestarian
- Sistem lampu jalan pintar
- Sistem pemantauan tekanan air
- Sistem pencahayaan fasad pintar
- Laluan lintasan kaki pintar
- Sistem rangkaian penderia geoteknikal

Aktiviti Projek

Pre-Construction	Construction Phase	Operational Phase
• Kerja-kerja ukur tanah dan pemetaan utility • Penglibatan dan perhubungan dengan pihak berkuasa serta pihak berkepentingan • Kerja-kerja Siasatan Tanah (SI) dan kajian berkaitan • Kerja-kerja perancangan	**<u>Pakej 1 (Kerja Tanah Fasa 1)</u>** • Kawalan hakisan dan pemendapan sedimen • Kerja pembersihan tapak secara am • Kerja-kerja penyediaan tapak dan penyediaan kemudahan sementara • Kerja-kerja tanah bagi Pakej 1 (1 fasa) • Kerja-kerja tanah bagi pembinaan jalan sehingga 50 mm dari aras subgred • Kawasan rizab utiliti sehingga aras FL **<u>Pakej 2 (Kerja Tanah Fasa 2-6)</u>** • Kawalan hakisan dan pemendapan sedimen • Kerja pembersihan tapak secara am • Kerja-kerja tanah bagi Pakej 2 (5 fasa) • Kerja-kerja pembetulan geoteknikal • Kerja-kerja pembinaan infra dan utiliti • Kerja-kerja pengalihan utiliti • Pemasangan Aplikasi Bandar Pintar • Kerja-kerja landskap	• Operasi perindustrian dan perniagaan • Operasi loji rawatan kumbahan (STP) dan sistem retikulasi kumbahan • Operasi sistem retikulasi air • Penyelenggaraan infra dan utiliti

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Persekitaran Sedia Ada

Geologi

- **Tetapan serantau:** Batu pasir, batu lumpur dan syal (Pembentukan Semanggol)
- Rupa bumi: Kawasan beralun lembut dengan sisa tanah yang diperoleh daripada batuan enapan
- Zon tanah berkelodak tepu dan batu pasir/batu lodak terluluhawa di zon peralihan di atas batuan dasar

Tanah

- **Umum:** Tanah Podzolik Merah-Kuning dan Laterit Coklat
- Terhasil daripada batuan igneus berasid hingga sederhana, serta sedimen arenaseus, argilaseus dan campuran
- Air bawah tanah: berada pada kedalaman antara 0.00 – 12.23 m dari paras tanah (bgl)

Topografi

- Kebanyakannya terdiri daripada tanah rata dengan beberapa kawasan berbukit dan bercerun.
- Purata ketinggian: 15.7 – 74.45 m msl (kawasan rata dan berbukit)
- Ketinggian tertinggi: Kawasan di barat laut tapak
- Ketinggian terendah: Kawasan di sempadan barat tapak

Gradien Cerun

Klasifikasi gradien cerun

- Kelas I (<15%): 91.14%
- Kelas II (15°-25°): 6.84%
- Kelas III (25°-35°): 1.94%
- Kelas IV (>35°): 0.08%

Hydrologi

- Sungai Ayer Merah mengalir di tapak Projek.
- Sg Jarak terletak di sepanjang sempadan utara tapak Projek
- Air sisa dan efluen industri dibuang ke Sg Jarak.
- Tapak projek berhampiran kawasan mudah banjir

Trafik

- Waktu puncak: 7–8 am & 5.30–6 pm Akses utama: BKE & LP
- Prestasi operasi bagi semua jalan sedia ada (J1 – J8) di sekitar (tahun 2025) mempunyai LOS B hingga LOS F

Iklim & Meteorologi

- Iklim khatulistiwa–monsun (NE: Nov–Mac; SW: Mei–Sep)
- Suhu purata: 28.0 °C
- Kelembapan relatif: 79.5%
- Hujan tahunan: 186.7 mm/bulan; hari hujan: ~1–27 hari/bulan
- Angin: purata 2.2 m/s; arah utama E (27.2%)

Guna Tanah

- Tapak diwartakan sebagai Perindustrian di bawah RTD Kulim 2035 (Pengubahan 8)
- Tapak projek kebanyakannya dikelilingi oleh kediaman, komersial dan institusi
- Sungai di tapak Projek diklasifikasikan sebagai ESA.

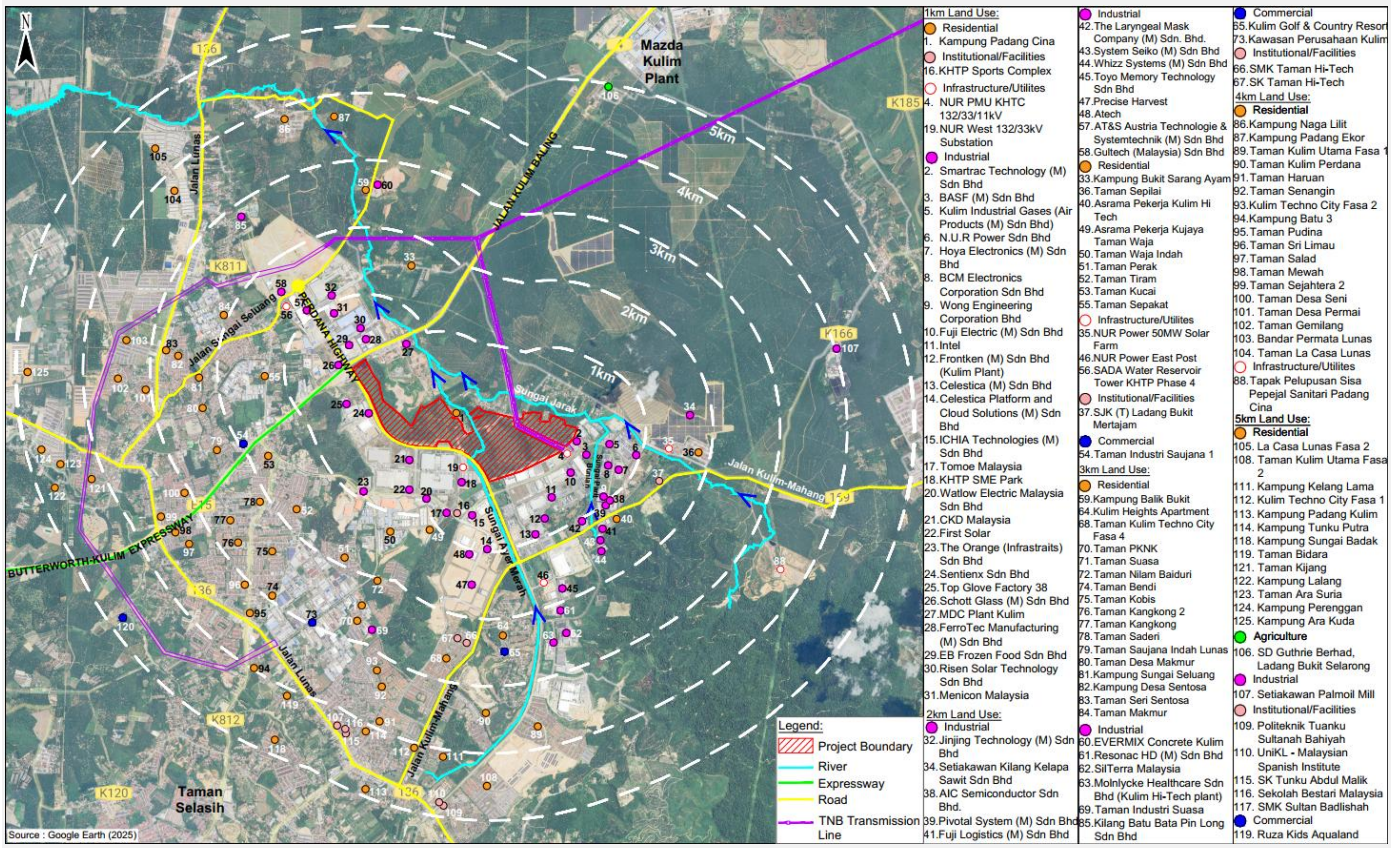
Ekologi

- **Daratan**: Tidak kaya dengan biodiversiti. Kebanyakan ladang kelapa sawit terbiar. Tiada spesies yang jarang atau terancam.
- **Akuatik**: Kepelbagaian biologi akuatik yang rendah. Tiada spesies yang jarang atau terancam. Kiraan tinggi spesies asing, *Oreochromis niloticus* hadir.

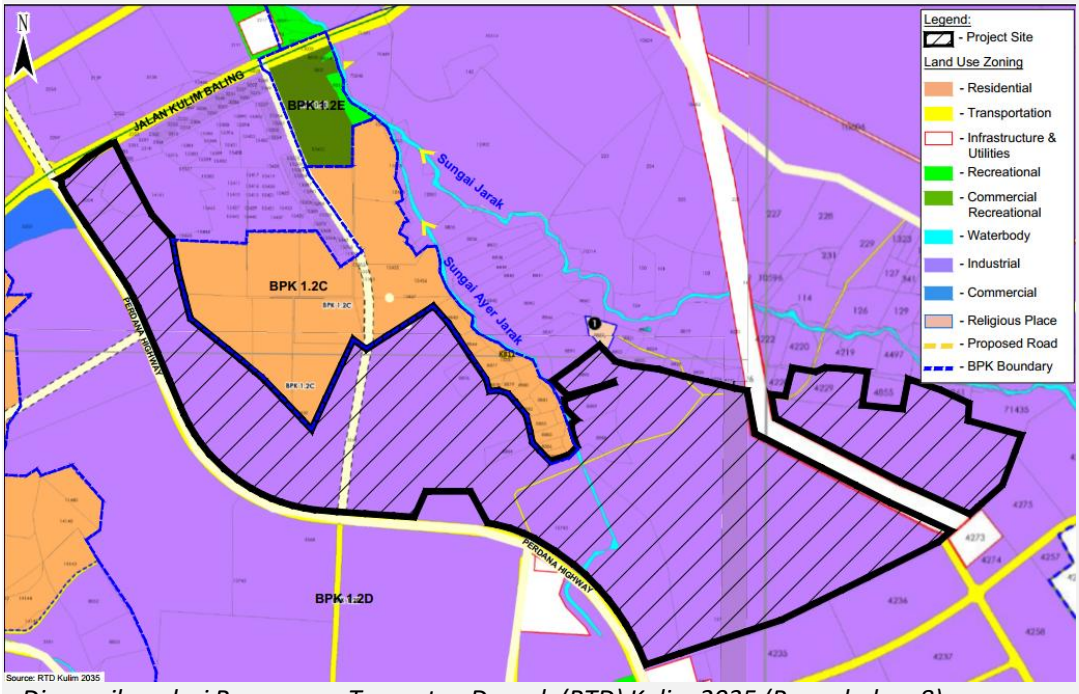
Socio-Ekonomi

- **Libat Urus:** Tinjauan Isi Rumah dan Temu Bual dengan Wakil Perindustrian
- **Ringkasan:**
- **Wakil Perindustrian:** Isu trafik, pengurusan asrama untuk pekerja asing
- **Tinjauan Isi Rumah:** Isu lalu lintas, pencemaran alam sekitar (air dan udara), kebimbangan mengenai kemasukan pekerja asing & persepsi dan sokongan keseluruhan yang kukuh untuk projek yang dicadangkan.

Persekitaran Sedia Ada



Zon Guna Tanah



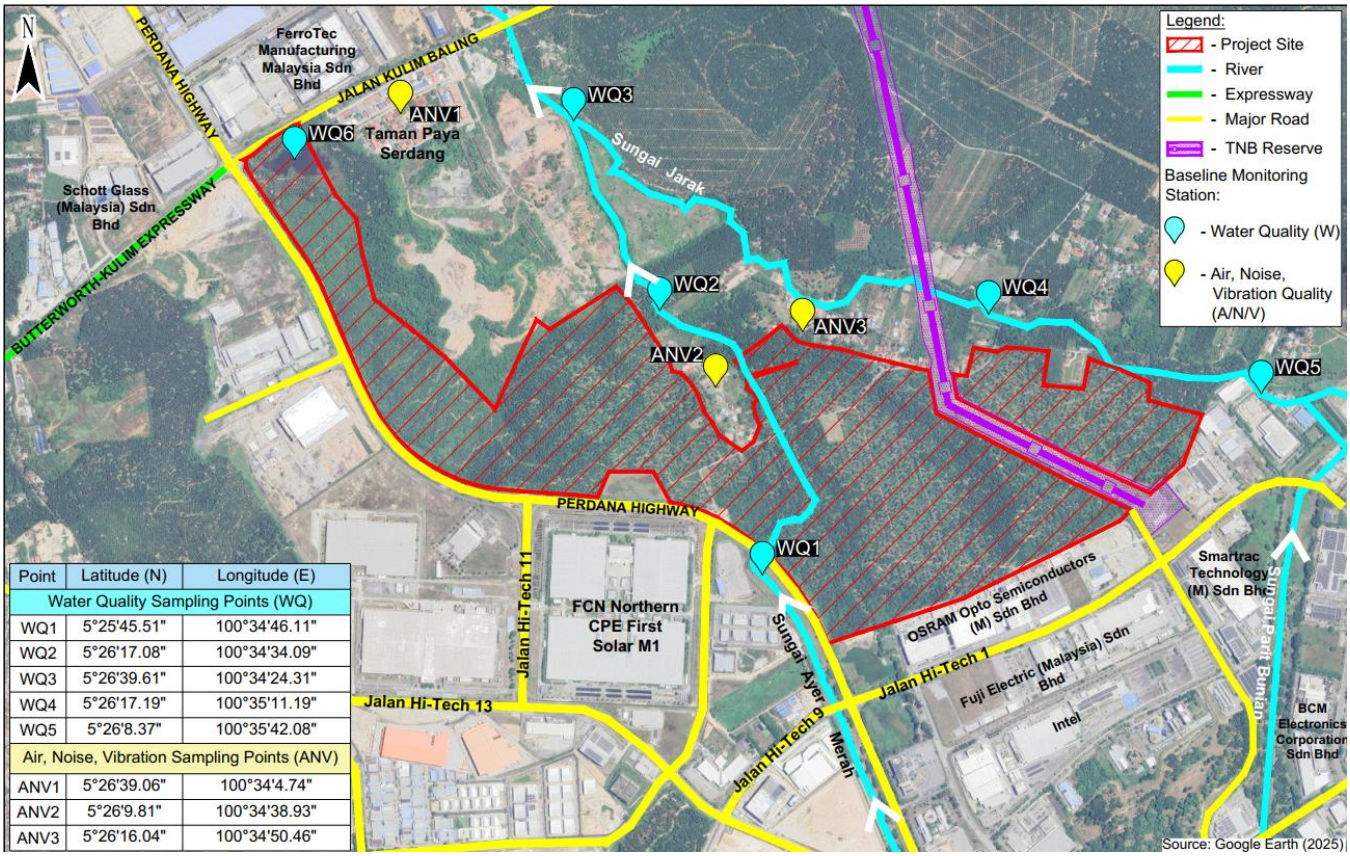
- Berdasarkan RTD Kulim 2035 (Pengubahan 8) pengezonan adalah perindustrian.
- Penggunaan tanah dalam radius 5-km terutamanya terdiri daripada kawasan perumahan, kawasan perindustrian, komersial, kawasan institusi dengan penggunaan tanah kecil untuk kawasan infrastruktur dan utiliti.

Disesuaikan dari Rancangan Tempatan Daerah (RTD) Kulim 2035 (Pengubahan 8)

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Persampelan Garis Dasar Alam Sekitar



Point	Latitude (N)	Longitude (E)
Water Quality Sampling Points (WQ)		
WQ1	5°25'45.51"	100°34'46.11"
WQ2	5°26'17.08"	100°34'34.09"
WQ3	5°26'39.61"	100°34'24.31"
WQ4	5°26'17.19"	100°35'11.19"
WQ5	5°26'8.37"	100°35'42.08"
Air, Noise, Vibration Sampling Points (ANV)		
ANV1	5°26'39.06"	100°34'4.74"
ANV2	5°26'9.81"	100°34'38.93"
ANV3	5°26'16.04"	100°34'50.46"

Kualiti Air Sungai

- Enam (6) lokasi pemantauan (WQ1–WQ6) telah dijalankan
- Kadar aliran air diukur di setiap lokasi persampelan, manakala sampel air yang dikumpul telah dihantar ke makmal untuk analisis bagi tiga puluh lima (35) parameter
- Keputusan sampel air telah dibandingkan dengan had Kelas IIB
- Paras melebihi had di setiap lokasi persampelan adalah seperti berikut:
- ((1) WQ1: DO, AN, COD, BOD, NO_3, P; (2) WQ2: DO, AN, COD, BOD, NO_3, P; (3) WQ3: DO, AN, COD, BOD, NO_3, P; (4) WQ4: DO, AN, COD, BOD, NO_3; (5) WQ5: DO, AN, COD, BOD, NO_3; (6) WQ6: DO, COD, BOD, NO_3, P

Kualiti Udara Ambien

- Tiga (3) lokasi pemantauan (A1 – A3) dijalankan bagi parameter PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO dan O_3
- Semua keputusan mematuhi *Malaysia Ambient Air Quality Standard (MAAQS), 2020*
- SO_2, CO, and O_3 tidak dikesan di semua lokasi pemantauan

Tahap Bunyi

- Tiga (3) lokasi pemantauan (N1 – N3) telah dijalankan
- Semua keputusan mematuhi had bunyi dibenarkan, LAeq seperti yang dinyatakan dalam '*First Schedule: Recommended Permissible Sound Level (LAeq) By Receiving Land Use For New Development (Industrial Zones)'* dalam "*Guidelines for Environmental Noise Limits and Control (2019)"*
- Bacaan LAeq siang hari di semua stesen mematuhi had 65 dBA (siang) dan 60 dBA (malam).

Tahap Getaran

- Tiga (3) lokasi pemantauan (V1 – V3) telah dijalankan
- Semua keputusan mematuhi '*Third Schedule: Recommended Vibration Limits For Human Response And Annoyance From Intermittent Vibrations (Industrial)'* dalam "*Guidelines For Environmental Vibration Limits And Control (2019)*" (RMS: 3.2 mm/s)

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Kajian Impak

Pertimbangan Geoteknikal

FASA PEMBINAAN

- Terletak di atas bentuk muka bumi yang beralun lembut dan di ladang kelapa sawit.
- Ketinggian tanah berbeza secara sederhana, dengan sedikit kawasan tinggi dan rendah.
- Tiada bukit yang ketara atau tebing curam dalam kawasan pembangunan terdekat.
- Litologi syal dan batu lodak terdedah kepada beberapa jenis tanah runtuh disebabkan oleh sifat butiran halus serta cenderung untuk melapuk menjadi tanah liat apabila terdedah kepada air.

FASA OPERASI

- Hujan yang berpanjangan atau lebat berpotensi meningkatkan tekanan air liang, yang boleh menimbulkan risiko kepada struktur saliran dan asas bangunan.

Hakisan Tanah & Pemendapan

FASA PEMBINAAN

Pemodelan Hakisan Tanah

- Penilaian dijalankan menggunakan RUSLE di bawah tiga (3) senario: Keadaan Sedia Ada, Senario Terburuk (tanpa mitigasi), dan Dengan Langkah Mitigasi.
- Kehilangan tanah keseluruhan bagi kesemua enam (6) fasa:
  - Sedia Ada: 179.61 t/ha/thn; Terburuk: 1,478.33 t/ha/thn; Dengan Mitigasi: 26.88 t/ha/thn.

Hasil Sedimen

- Pengiraan jumlah hasil sedimen keseluruhan mengikut senario:
  - Sedia Ada: 2,331.11 tan; Terburuk: 6,584.14 tan; Dengan Mitigasi: 408.74 tan

Kualiti Air

FASA PEMBINAAN

- Pembuangan vegetasi sekunder dan tumbuhan bawah menyebabkan permukaan tanah terdedah, seterusnya mengakibatkan hakisan tanah.
- Larian permukaan dari kawasan longgokan bahan, kawasan pengorekan dan saluran saliran sementara akan mengandungi peningkatan sedimen serta bahan pencemar lain.
- Pengurusan kumbahan yang tidak sempurna boleh menyebabkan pencemaran air permukaan dan air bawah tanah, yang seterusnya membawa kepada penularan penyakit.
- WQM bagi taburan TSS di Sg. Ayer Merah dan Sg. Jarak berada dalam had Kelas I - II NWQS.

FASA OPERASI

- Peningkatan larian permukaan disalurkan melalui sistem perparitan ribut ke dalam KTA, yang seterusnya akan dialirkan ke Sg. Ayer Merah dan Sg. Jarak.
- Potensi impak dari kebocoran sistem paip kumbahan atau kegagalan STP.
- Pelepasan IETS akan meningkatkan beban bahan pencemar ke dalam sungai penerima.
- WQM bagi taburan BOD, COD dan NH_3-N di Sg. Ayer Merah dan Sg. Jarak menunjukkan variasi minimum di bawah keadaan operasi STP yang normal.

Kualiti Udara

FASA PEMBINAAN

- Habuk tiupan angin di kawasan terdedah – berlaku secara berkala (semasa cuaca kering dan berangin) dan dalam jarak terhad (6–9 m).
- Pelepasan habuk terampai daripada aktiviti pengangkutan – dalam jarak terhad (<200 m).
- Pelepasan ekzos kenderaan/peralatan – kecil serta berkala/sementara.
- Pemodelan penyebaran udara telah dijalankan menggunakan model kualiti udara AERMOD bagi tiga (3) ASR yang dikenal pasti.

Pemodelan Kualiti Udara

- Pemodelan *airshed* menggunakan AERMOD bagi lapan (8) plot operasi untuk lima (5) ASR.
- Beban lebih rendah bagi PM_{10}, SO_2, NO_2 dan CO: Plot C, D, G dan H.
- Beban lebih tinggi: Plot A, B, E dan F.

RINGKASAN EKSEKUTIF

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Kajian Impak

Penjanaan Bunyi Bising

FASA PEMBINAAN

- Bunyi bising pengangkutan: terhad kepada jalan yang menghala ke/dari tapak pembinaan.
- Aktiviti pembinaan: melibatkan operasi jentera semasa kerja pembersihan tapak, kerja tanah, kerja pemunggahan, kerja konkrit, dll.

<u>Simulasi Tahap Bunyi</u>

- Simulasi paras bunyi di tiga (3) NSR bagi senario tanpa mitigasi, mitigasi separa, dan mitigasi penuh telah dibandingkan dengan Jadual Tahap Bunyi Dibenarkan (Jadual Keenam) – semua berada dalam had 70 dB(A) bagi $L._{max}$
- Jangkaan tindakbalas komuniti terhadap bunyi bising Projek adalah "Tiada" hingga "Sederhana".

FASA OPERASI

- Bunyi bising minimal terhadap penempatan sekeliling akibat penampan yang disediakan.
- Bunyi bising daripada peningkatan pergerakan trafik yang terhad kepada waktu puncak.

Getaran

FASA PEMBINAAN

- Kesan getaran dinilai menggunakan FTA 2018 dan Garis Panduan JAS 2021.
- Peralatan yang biasanya menghasilkan getaran (e.g. pemacu cerucuk dan penggelek) serta jarak kesannya telah dinilai.
- Penerima sensitif tidak berada dalam Zon Pengaruh (ZOI) bagi had 15 mm/s dan 10 mm/s.
- Kawasan dalam jarak dekat (<10 m) mungkin mengalami aras getaran yang dapat dirasai, namun masih berada pada tahap yang boleh diterima.

FASA OPERASI

- Getaran tanah akibat trafik hanya berlaku dalam keadaan yang amat ekstrem.
- Tiada kesan getaran tanah dijangka berlaku.

Janaan Sisa

FASA PEMBINAAN

- Jenis sisa: Biojisim (jumlah 14,000 – 21,000 MT), sisa pembinaan, sisa pepejal umum, dan sisa buangan terjadual.
- Pengurusan sisa yang tidak sempurna: tarikan kepada vector pembawa penyakit, risiko banjir meningkat, serta pencemaran tanah, air bawah tanah dan bau.

FASA OPERASI

- Jenis sisa: sisa am, sisa kumbahan dan sisa terjadual daripada aktiviti pembuatan, pembungkusan dan penyelenggaraan.Pengurusan sisa yang tidak sempurna boleh meningkatkan risiko banjir, pembiakan perosak, serta pencemaran kualiti tanah, air permukaan dan air bawah tanah.

Trafik

FASA PEMBINAAN

- Pengangkutan bahan di luar tapak oleh kenderaan berat yang besar dan bergerak perlahan:
  - Menyulitkan pengguna jalan raya lain serta menimbulkan risiko keselamatan.
  - Beban yang berterusan dan berulang boleh membuatkan jalan rosak dan berlubang.
  - Tumpahan bahan di jalan awam.

FASA OPERASI

- Unjuran jumlah trafik masa hadapan bagi meramal pertumbuhan trafik pada tahun 2028 (OY) dan 2038 (IAY):
  - Ramalan LOS untuk S1 (Lebuhraya Perdana) dari C ke E.
  - Ramalan LOS untuk S2 (Jalan Hi Tech 1) dari A ke B.
  - Peningkatan trafik memburukkan kesesakan lalu lintas di sepanjang S1 dan di persimpangan terjejas antara J1 ke J4, menyebabkan aliran trafik tidak stabil semasa waktu puncak.

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Kajian Impak



Ekologi

FASA PEMBINAAN
- Tiada penemuan hidupan liar yang signifikan di tapak Projek – kehadiran flora dan fauna eksotik atau terancam adalah tidak mungkin.
- Terdapat perpindahan terus fauna dari tapak Projek ke kawasan hijau berhampiran.
- Haiwan kecil seperti monyet berkemungkinan mengganggu penempatan berdekatan.

FASA OPERASI
- Tiada jangkaan kesan ekologi yang signifikan kerana kawasan tersebut akan dilapangkan daripada tumbuh-tumbuhan sedia ada.
- Terdapat potensi konflik antara manusia dan hidupan liar, terutamanya monyet.



Socio-Ekonomi

FASA PEMBINAAN
- Impak positif: menyediakan peluang pekerjaan dan perniagaan; meningkatkan ekonomi tempatan dan serantau.
- Impak negatif:
  - Gangguan akibat impak alam sekitar berkaitan pencemaran air, udara, dan bunyi.
  - Masalah kesihatan berpotensi akibat peningkatan habuk, bunyi bising, dan pergerakan trafik.
  - Kemasukan haiwan ke kawasan berhampiran.
  - Isu sosial akibat kemasukan pekerja asing.
  - Kesesakan dan aliran trafik terjejas akibat ruang parkir terhad, kenderaan bergerak perlahan di laluan menuju tapak pembinaan, dan peningkatan jumlah kenderaan.

FASA OPERASI
- Impak positif: menyediakan peluang pekerjaan dan perniagaan; meningkatkan ekonomi tempatan dan serantau.
- Impak negatif:
  - Potensi pencemaran udara, air, dan bunyi bergantung kepada jenis dan skala industri.
  - Potensi masalah kesihatan terutamanya jika pelepasan, penghasilan sisa, atau risiko pekerjaan tidak diuruskan dengan baik oleh setiap pengendali.
  - Isu sosial akibat kemasukan pekerja asing.
  - Potensi kebimbangan keselamatan akibat peningkatan pergerakan pekerja dan kenderaan.
  - Peningkatan pergerakan pekerja dan kekerapan kenderaan berat yang menyebabkan kesesakan lalu lintas.



Kesihatan dan Keselamatan Awam

FASA PEMBINAAN
- Risiko kesihatan akibat penyakit bawaan vektor boleh berlaku sekiranya pemantauan dan kawalan tidak dilaksanakan.
- Kem pekerja yang akan ditempatkan di dalam tapak Projek juga boleh menimbulkan kebimbangan terhadap kesihatan awam.
- Pergerakan jentera pembinaan di jalan awam boleh menimbulkan bahaya keselamatan jalan raya.
- Penggunaan jentera angkat boleh menyebabkan risiko keselamatan pekerjaan yang tinggi serta bahaya kepada orang awam.

FASA OPERASI
- Industri berteknologi tinggi sering menggunakan teknologi keselamatan Industri 4.0, dan risiko sangat bergantung kepada jenis pengeluaran; kesannya dianggap boleh diabaikan.

Langkah Mitigasi

FASA PEMBINAAN

- Langkah kawalan saliran untuk mengurangkan penyerapan air dan meminimumkan risiko ketidakstabilan cerun.
- Kawalan hakisan cerun – penstabilan vegetatif, semburan konkrit (*guniting*) pada cerun curam atau terdedah, serta tikar kawalan hakisan atau tikar penguat sintetik.
- Kawalan kestabilan cerun – pemasangan "*soil nailing*" digabungkan dengan saliran mendatar, cerun diperkuat dengan geogrid, dan sokongan struktur cerun (jika diperlukan).

FASA OPERASI

- Kawasan yang dibina telah distabilkan, diturap, dilapisi konkrit, atau di landskap beserta kerja pengukuhan cerun yang sesuai, sekali gus meminimumkan sebarang potensi risiko geoteknikal.
- Kawalan hakisan cerun – penstabilan vegetatif.
- Pemantauan cerun secara berterusan untuk menjejaki kestabilan cerun, pergerakan tanah, atau parameter geoteknikal lain.
- Pemeriksaan dan penyelenggaraan berkala terhadap tembok penahan, gabion, atau struktur pengukuhan lain.
- Melakukan pemeriksaan geoteknikal terhadap jalan dan kawasan cerun untuk mengenal pasti sebarang tanda hakisan, ketidakstabilan, atau isu geoteknikal lain.



Pertimbangan Geoteknikal

FASA PEMBINAAN

- Risiko hakisan tanah dan pemendapan adalah minimal dengan pelaksanaan Amalan Pengurusan Terbaik (BMP) seperti yang dinyatakan dalam ESCP dan LD-P2M2:
  - Penggunaan penanda pembinaan dan penandaan perimeter.
  - Perancangan dan pelaksanaan berfasa bagi kerja-kerja pembersihan tanah dan kerja tanah.
  - Kawalan saliran dan aliran air permukaan.
  - Penyimpanan, pengangkutan dan pelupusan bahan tanah yang betul.
  - Gunakan penutup pelindung pada kawasan yang terdedah.
  - Kawalan mendapan di laluan masuk – e.g. culvert sementara, turapan, semburan permukaan, kemudahan pencucian tayar/kenderaan, dll.
  - Pemeriksaan dan penyelenggaraan berkala.

FASA OPERASI

- Pembinaan sistem saliran yang sempurna dan penanaman rumput.
- Pemeriksaan dan penyelenggaraan rutin terhadap cerun yang telah distabilkan.
- Pemantauan langkah khas oleh firma pakar atau personel alam sekitar yang berkelayakan.



Hakisan Tanah & Pemendapan

FASA PEMBINAAN

- Kawalan hakisan dan mendapan dengan pelaksanaan BMP seperti yang dinyatakan dalam ESCP dan LD-P2M2 (berdasarkan hakisan tanah dan pemendapan).
- Pengurusan penyimpanan bahan binaan yang betul.
- Pengurusan bahan api dan bahan kimia yang betul.
- Pengurusan sisa yang betul.
- Laksanakan pengauditan dan pemantauan alam sekitar dalaman secara berkala.

FASA OPERASI

- Kolam tadahan air akan dibina sebelum titik pelepasan akhir untuk mengumpul/menahan larian permukaan.
- Penyelenggaraan berkala STP dan pemantauan berterusan pelepasan STP untuk memastikan pematuhan dengan had minima Standard B.
- Industri sederhana yang menghasilkan efluen industri perlu menyediakan WWTP/IETS dalaman masing-masing.
- WWTP/IETS hendaklah dilakukan pemantauan influent dan effluent.



Kualiti Air

RINGKASAN EKSEKUTIF

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Langkah Mitigasi

FASA PEMBINAAN

- Kesan terhadap kualiti udara akan diminimumkan melalui pelaksanaan BMP bagi kawalan habuk, hakisan angin serta pengurusan penyimpanan bahan binaan dan bahan longgar.
- Pembakaran bahan binaan baki adalah dilarang sama sekali.
- Penggunaan jentera cekap bahan api dan diselenggara baik bagi mengurangkan pelepasan ekzos.
- Semua BMP akan mematuhi garis panduan JAS berkaitan pelepasan pelarian.
- Pemantauan kualiti udara ambien akan dijalankan secara berkala.

FASA OPERASI

- Kekalkan LOS jalan dan persimpangan yang baik walaupun selepas pembangunan siap.
- Landskap dengan penanaman pokok dan pohon renek sebagai penampan semula jadi.



Kualiti Udara

FASA PEMBINAAN

- Laksanakan BMP bagi kawalan bunyi bising dan patuhi garis panduan "*Environmental Noise Limits and Control (2021); Annex E: Guidance on Noise Control*".
- Gunakan peralatan perlindungan diri (PPE) yang sesuai.
- Patuhi had pendedahan bunyi yang dibenarkan seperti yang ditetapkan di bawah Peraturan-Peraturan Keselamatan dan Kesihatan Pekerjaan (Pendedahan Bunyi Bising), 2019, dan Peraturan Kualiti Alam Sekeliling (Bunyi Bising Kenderaan Bermotor), 1987.
- Laksanakan pemantauan bunyi ambien secara berkala.

FASA OPERASI

- Kekalkan LOS jalan dan persimpangan yang baik walaupun selepas pembangunan siap.
- Landskap dengan penanaman pokok dan pohon renek sebagai penampan semula jadi.



Penjanaan Bunyi Bising

FASA PEMBINAAN

- Patuhi garis panduan "*Environmental Vibration Limits and Control (2021); Annex E: Management and Mitigation of Vibration in The Environment*", yang merangkumi:
  - **Susun atur**: Jarak yang mencukupi antara punca getaran dan penerima sensitif terhadap getaran, serta penggunaan dan penetapan zon penampan.
  - **Langkah kejuruteraan**: Penggunaan kaedah alternatif, pengurangan input tenaga, pengawalan getaran yang dihasilkan, serta perlindungan terhadap bangunan bersebelahan.
  - **Langkah pentadbiran**: Menghadkan masa operasi sumber getaran.
- Pantau getaran semasa aktiviti berintensiti tinggi dijalankan.

FASA OPERASI

- Kekalkan LOS jalan dan persimpangan yang baik walaupun selepas pembangunan siap.
- Landskap dengan penanaman pokok dan pohon renek sebagai penampan semula jadi.



Getaran

FASA PEMBINAAN

- Sisa biojisim: disungkup, dipotong kepada saiz mudah urus sebelum dilupuskan, dan simpan kayu yang boleh digunakan semula.
- Bahan korekan: kerja tanah dijalankan di bawah penyeliaan, hadkan semasa musim hujan, gunasemula untuk kerja pemulihan dan landskap, pelupusan di tapak yang diluluskan.
- Sisa binaan dan umum: pengasingan bahan dan penyimpanan yang betul, guna dan kitar semula, sediakan tong sampah mencukupi, pelupusan di tapak pelupusan sisa lengai yang diluluskan.
- Pengurusan sisa terjadual mengikut "Garis Panduan untuk Pembungkusan, Pelabelan dan Penyimpanan Sisa Terjadual di Malaysia (2014)" oleh Jabatan Alam Sekitar (JAS), serta mematuhi Peraturan-Peraturan Kualiti Alam Sekeliling (Sisa Terjadual), 2005.

FASA OPERASI

- Sisa umum: akan dikutip dari lot masing-masing mengikut jadual kutipan yang ditetapkan.
- Pengurusan sisa terjadual mengikut "Garis Panduan untuk Pembungkusan, Pelabelan dan Penyimpanan Sisa Terjadual di Malaysia (2014)" oleh Jabatan Alam Sekitar (JAS), serta mematuhi Peraturan-Peraturan Kualiti Alam Sekeliling (Sisa Terjadual), 2005.



Janaan Sisa

RINGKASAN EKSEKUTIF

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Langkah Mitigasi

Trafik

FASA PEMBINAAN

- Kawalan jumlah trafik dan pelaksanaan langkah keselamatan jalan raya:
  - Kenal pasti laluan trafik dan jadual perjalanan bagi mengelakkan waktu puncak.
  - Pastikan tiada kawasan pandangan terhalang berhampiran persimpangan jalan.
  - Tetapkan had laju dan langkah keselamatan semasa aktiviti pengangkutan di jalan awam.
  - Kenderaan dan jentera berat hendaklah dikendalikan oleh pemandu dan operator yang berlesen serta kompeten.

FASA OPERASI

- S1 (Lebuhraya Perdana) – OY 2028: Dinaiktaraf dari Jalan Satu-Lorong Empat-Lajur menjadi Jalan Dua-Lorong Enam-Lajur (3.5 m setiap lorong dan 2.5 m median) dan kekalkan sehingga 2038.
- S2 (Jalan Hi Tech 1) – konfigurasi jalan semasa boleh dikekalkan sehingga 2038.

Ekologi

FASA PEMBINAAN

- Larangan pembakaran biojisim bagi mengelakkan kejadian kebakaran hutan yang tidak terkawal.
- Kurangkan pertembungan antara manusia dan hidupan liar.
- Patuhi Akta Pemuliharaan Hidupan Liar, 2010.
- Kerja pembersihan tapak dan kerja tanah secara berfasa bagi memberi masa yang mencukupi untuk penghijrahan hidupan liar.

FASA OPERASI

- Semasa pertemuan antara manusia dan hidupan liar, PERHILITAN mesti dihubungi untuk membolehkan pemindahan yang selamat.
- Bagi meminimumkan kemerosotan terhadap ekologi akuatik, penyewa masing-masing perlu menjalankan pemodelan kualiti air bagi saliran dan pelepasan efluen mereka.
- Tiada pelepasan efluen terus ke sungai; semua pelepasan mesti melalui kolam tadahan.

Socio-Ekonomi

FASA PEMBINAAN

- **Kemasukan pekerja asing**: penyediaan penginapan yang selamat dan bersih; permit kerja yang sah; mengambil kira aspek sosio-budaya komuniti setempat.
- **Penempatan dan komuniti berdekatan yang terjejas**: menjalinkan hubungan rapat; rekod dan selesaikan aduan; maklumat awal mengenai perubahan trafik atau jadual pembinaan.
- **Kemudahan parkir terhad**: melaksanakan jadual kerja bergilir; menggalakkan perkongsian kereta, perkhidmatan *shuttle* atau pengangkutan awam.
- **Kesihatan dan keselamatan pekerja pembinaan**: menyediakan PPE; laluan selamat; jentera yang diperakui dan dikendali oleh orang terlatih; saringan kesihatan; tindak balas kecemasan.

FASA OPERASI

- **Kemasukan pekerja asing**: penyediaan penginapan yang selamat dan bersih; permit kerja yang sah; mengambil kira aspek sosio-budaya komuniti setempat.
- **Penempatan dan komuniti berdekatan yang terjejas**: menjalin kerjasama erat antara PP, komuniti setempat, dan pihak berkuasa/agensi tempatan; rekod dan selesaikan aduan.

Kesihatan dan Keselamatan Awam

FASA PEMBINAAN

- Pekerja asing perlu menjalani pemeriksaan kesihatan pra-pekerjaan melalui FOMEMA.
- Amalkan pengurusan kebersihan yang baik dan sediakan kemudahan sanitasi yang mencukupi.
- Jadualkan pergerakan kenderaan pembinaan di jalan awam bagi mengelakkan waktu puncak.
- Laksanakan pemasangan papan tanda, isyarat dan had laju, serta pastikan pandangan jelas pada setiap masa.
- Jentera yang diperakui dan dikendali oleh orang terlatih.
- Kawal masuk dan keluar – pasang papan tanda dan penghadang, lantik anggota keselamatan.

FASA OPERASI

- Menyediakan ERP dan melaksanakan latihan tindak balas kecemasan secara berkala.
- Melakukan penyelenggaraan berkala peralatan proses mengikut garis panduan pengeluar.
- Mematuhi garis panduan yang ditetapkan oleh JAS dan DOSH.

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Cadangan Program Pemantauan Alam Sekitar



PEMANTAUAN PEMATUHAN
- Memastikan syarat kelulusan EIA dipatuhi oleh Pemaju Projek
- Dijalankan oleh makmal yang bertauliah

AUDIT PEMATUHAN ALAM SEKITAR
- Audit dilakukan oleh juruaudit alam sekitar yang berdaftar
- Memiliki kelayakan *Certified Erosion, Sediment and Storm Water Inspector* (CESSWI) atau *Malaysian Certified Inspector of Sediment and Erosion Control* (MY-CISEC)
- Amalan Pengurusan Terbaik (BMP) akan diguna pakai



PEMANTAUAN PRESTASI
- Memastikan keberkesanan sistem kawalan pencemaran dan langkah-langkah mitigasi
- Dilakukan oleh EO di tapak

PEMANTAUAN GARIS DASAR

Indikasi umum kepada garis dasar keadaan alam sekitar semasa laporan

PROGRAM PEMANTAUAN ALAM SEKITAR
- Menyediakan pengkalan data impak alam sekitar
- Indikasi awal kepada impak alam sekitar



PEMANTAUAN IMPAK
- Memastikan impak yang berpotensi seperti yang dinyatakan semasa penyediaan EIA adalah tepat
- Memastikan kaedah mitigasi dilaksanakan secara terurus

PEMANTAUAN KAWAL SELIA
- Memastikan keberkesanan langkah-langkah mitigasi dan pematuhan terhadap peraturan alam sekitar
- Dijalankan oleh EO

PEMANTAUAN	KEKERAPAN
Pemantauan Prestasi	
Berdasarkan pelan LD-P2M2	• Mingguan • Selepas hujan lebat (>12.5 mm seperti diukur oleh tolok hujan)
Penyelenggaraan Cerun dan Pemantauan Instrumentasi • Inklinometer (cerun potongan, cerun tambakan, dan benteng) • Piezometer jenis *standpipe* • Penanda anjakan, dinding dan rod pemendapan	• Semasa pembinaan: mingguan • Selepas tamat: bulanan • Piezometer jenis *standpipe*: ➢ Semasa kerja lapangan: setiap hari ➢ Selepas kerja lapangan: setiap hari untuk dua minggu pertama, seterusnya mengikut keperluan
Pemantauan Pematuhan	
Titik pelepasan perangkap kelodak dan kolam sedimen	• Bulanan
Pemantauan Impak	
Fasa Pembinaan	
• Kualiti air (11 stesen) • Udara ambien, Bunyi dan Getaran (3 stesen setiap satu) • Tinjauan Udara (dengan dron)	• Bulanan
Fasa Operasi	
• Kolam Takungan Air • Efluen daripada lepasan STP	• Bulanan

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN INFRASTUKTUR DI ZON INDUSTRI FASA 5, KULIM HI-TECH PARK KULIM, KEDAH DARUL AMAN

Pelan Respon Kecemasan

PASUKAN RESPON KECEMASAN

- Pasukan yang dianggotai oleh individu berkelayakan dengan peranan dan tanggungjawab yang spesifik semasa kecemasan
- Bertanggungjawab untuk melaksanakan prosedur tersebut:



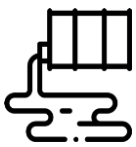
KEMALANGAN
Prosedur tindak balas kecemasan dan pelaporan insiden besar.



RESPON KECEMASAN KEBAKARAN
Pelaksanaan prosedur evakuasi dan penyelarasan respon kebakaran.



RESPON KEGAGALAN ESCP
Pelaporan segera, pembetulan dan kajian semula langkah-langkah kawalan hakisan.



RESPON TUMPAHAN BAHAN KIMIA
Pemindahan, pembendungan dan penyahcemaran berikutan tumpahan bahan merbahaya.



RESPON KECEMASAN PERUBATAN
Pemberitahuan segera perkhidmatan kecemasan dan pertolongan cemas selamat oleh kakitangan terlatih.

Rumusan

Projek ini menimbulkan impak alam sekitar yang rendah. Semua impak yang dijangkakan boleh mematuhi had yang ditetapkan, dan boleh dikurangkan dengan berkesan.

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List of Abbreviations

µS/cm	microsiemens per centimeter
ALARP	As low as reasonably practicable
AN	Ammoniacal Nitrogen
APHA	American Public Health Association
ASR	Air Sensitive Receptor
BKE	Butterworth–Kulim Expressway
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BP	*Blok Perancangan*
BPK	*Block Perancangan Kluster*
CC	Classified Counts
CEMS	Continuous Emission Monitoring Systems
CePBFO	Certified Environmental Professional in Bag Filter Operation
CePEOEIA	Certified Professional for Environmental Officer in EIA
CePSO	Certified Environmental Professional in Scrubber Operation
CEPSWaM	Certified Environmental Professional in Scheduled Waste Management
CESSWI	Certified Erosion, Sediment and Storm Water Inspector
CFU/100mL	Colony-Forming Units per 100 milliliters
CIDB	Construction Industry Development Board
CISEC	Certified Inspector of Sediment and Erosion Control
CLQ	Centralised Labour Quarters
CM	Compliance Monitoring
CO	Carbon Monoxide
COA	certificates of analysis
COD	Chemical Oxygen Demand
CSU	Compact Substation Unit
CTMP	Construction Traffic Management Plan
DID	Department of Irrigation and Drainage
DO	Dissolved Oxygen
DOE	Department of Environment
DOSH	Department of Occupational Safety and Health
DSM	Department of Standards Malaysia
E&E	Electric and electronic
EA	Extended Aeration
EF	Emission Factor
EGiM	Environmental Impact Assessment Guidelines in Malaysia
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EiMAS	Environmental Institute of Malaysia
EMP	Environmental Management Plan
EMR	Environmental Monitoring Reports
EMT	Environmental Mainstreaming Tools
EO	Environmental Officer
EPMD	Environmental Performance Monitoring Document
EQA	Environmental Quality Act
ERP	Emergency Response Plan

ERT	Electrical Resistivity Tomography
ERT	Emergency Response Team
ES	Environmental Scoping
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
FDT	Field Density Test
FIRST	Financing, Infrastructure, Regulatory support, Skills, and Technology
FOMEMA	Foreign Workers' Medical Examination Monitoring Agency in Malaysia
FOS	Factor of Safety
GAR	Geotechnical Assessment Report
GDP	Gross Domestic Product
GLC	Ground Level Concentration
GSR	Guided Self-Regulation
GTM	Geological Terrain Report
HDD	Horizontal Directional Drilling
IAY	Impact Analysis Year
IETS	Individual Effluent Treatment System
IM	Impact Monitoring
IND	Industrial Plot
IR4WRD	National Policy on Industry 4.0
IUCN	International Union for Conservation for Nature
IWK	Indah Water Corporation
IZP	Industrial Zone Phase
JKR	*Jabatan Kerja Raya* / Public Works Department
JMG	*Jabatan Mineral Dan Geosains*
JPS	*Jabatan Pengairan dan Saliran*
JPSPN	*Jabatan Pengurusan Sisa Pepejal Negara*
Kg.	Kampung
KHTP	Kulim Hi-Tech Park
KIG	Kulim Industrial Gases
KM	*Kebenaran Merancang*
KOM	Commercial Plot
K-State	Knowledge State
KTA	*Kolam Takungan Air* / Water Detention Pond
KTPC	Kulim Technology Park Corporation Sdn Bhd
L_{Aeq}	Equivalent Continuous Noise Level
LC	Least Concern
LD-P2M2	Land Disturbing Pollution Prevention and Mitigating Measures
L_{max}	Maximum Noise Level
L_{min}	Minimum Noise Level
LOS	Level of Service
LP	Perdana Highway
LSANK	*Lembaga Sumber Air Negeri Kedah*
MAAQS	Malaysian Ambient Air Quality Standards
MAIC	Maximum Average Incremental Concentration
MC	Main Contractor
mg/L	Miligrams per litre

mm/s	Milimeter per second
MMD	Malaysian Meteorological Department
MMKN	*Majlis Mesyuarat Kerajaan Negeri*
MOH	Ministry of Health
MP	Malaysia Plan
MPFN	*Majlis Perancang Fizikal Negara*
MPI	Medium Polluting Industry
MPKK	*Majlis Perbandaran Kulim Kedah*
MSIG	Malaysian Sewerage Industry Guidelines
MSMA	Urban Storm Water Management
MY-CISEC	Malaysia Certified Inspector of Sediment and Erosion Control
NASA	National Aeronautics and Space Administration
NBCT	North Butterworth Container Terminal
NCER	Northern Corridor Economic Region
ND	Not Detected
NE	Not Evaluated
NECD	National Emission Ceilings Directive
NEMA	National Electrical Manufacturers Association
NH_3-N	Ammoniacal Nitrogen
NIMP	New Industrial Master Plan
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NPP4	National Physical Plan 4
NPS	Network Pumping Station
NSR	Noise Sensitive Receptor
NTU	Nephelometric Turbidity Unit
NWQSM	National Water Quality Standards for Malaysia
O&G	Oil & Grease
O_3	Ozone
OY	Opening Year
P.E.	Population Equivalent
P.Geol.	Professional Geologist
PBT	*Pihak Berkuasa Tempatan*
PCO	Pest Control Officer
PCU	passenger car units
PEPC	Professional Engineer with a Practice Certificate
PGA	peak ground acceleration
PKNK	*Perbadanan Kemajuan Negeri Kedah*
PM	Performance Monitoring
PM_{10}	Particulate Matter ≤10 microns
$PM_{2.5}$	Particulate Matter ≤2.5 microns
PMR	Performance Monitoring Report
PMU	*Pencawang Masuk Utama* / Transmission Main Intake
PPE	Personal Protective Equipment
PPIS	Pollution Prevention in Industrial Siting
PPV	Peak Particle Velocity
R&D	research and development
RC	Reinforced Concrete

RMS	Root Mean Square
RORO	Roll-on Roll-off
ROW	Right-of-Way
RSN	*Rancangan Struktur Negeri*
RSNK	*Rancangan Struktur Negeri Kedah*
RTD	*Rancangan Tempatan Daerah*
RTDK	*Rancangan Tempatan Daerah Kulim*
SADA	*Syarikat Air Darul Aman*
SAMM	Skim Akreditasi Makmal Malaysia
SBW	Standard Specifications for Building Works
SDG	Sustainable Development Goals
SEA	Socio-Economic Assessment
Sg.	Sungai
SI	Soil Investigation
SIA	Social Impact Assessment
SME	Small and Medium Enterprise
SMP	Systematic Management Plan
SMS	Systematic Management Plan
SO_2	Sulphur Dioxide
SOP	Standard Operating Procedure
SPAN	*Suruhanjaya Perkhidmatan Air Negara*
SPC	State Planning Committee
SPEIA	*Sistem Pemantauan EIA*
SPT	standard penetration test
SRTM	Shuttle Radar Topography Mission
SS	Suspended Solids
STP	Sewage Treatment Plant
SW	Scheduled Waste
TDM	Travel Demand Management
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
TNB	Tenaga Nasional Berhad
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USLE	Universal Soil Loss Equation
USM	Unsuitable soil material
V/C	volume-to-capacity
WCA	Wildlife Conservation Act
WQI	Water Quality Index
WRS	Water Recovery System
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
ZOI	Zone of Influence
ZOS	Zone of Study