



Proposed Iron Ore Mining Operation on Lots 112750 & 112751 (ML. 6/2020) and Lots 60241 & 60242 (ML. 7/2020), Total Area of 92.082 Ha (227.54 Ac.), Locality of Bukit Besi, Mukim Jerangau and Jengai, District of Dungun, Terengganu Darul Iman

EXECUTIVE SUMMARY

PROJECT PROPONENT

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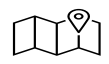


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PROJECT OVERVIEW

Project Location



Lots 112750 & 112751 (ML. 6/2020) and Lots 60241 & 60242 (ML. 7/2020), Total Area of 92.082 Ha (227.54 ac.),
 Locality of Bukit Besi, Mukim Jerangau and Jengai,
 District of Dungun, Terengganu Darul Iman



Mining Lease Duration

Total area: 92.082 Ha (227.54 ac)
 5 years (until 10th October 2025)

Environmental Sensitive Area
Stage 2

Phasing

Proposed Working Area
Phase 1: 14.94 Ha
Phase 2: 7.19 Ha
Phase 3: 12.05 Ha



Zoning



Agriculture Zone and Besul Forest Reserve (Additional),
 within the Blok Perancangan Kecil (BPK) 9.2 at
 Mukim Jerangau and Jengai.

STATEMENT OF NEEDS

Economic Benefit



In 2013, Malaysia exported a total of 12,429,184 tonnes (RM 1.44 billion) of high-grade iron ore mainly to China and followed by Indonesia, Hong Kong, Singapore and Brazil. In Terengganu, the production of iron ore is about 939,197 tonnes from 13 operating mines.

State Taxes and Royalties



- Royalty 5% of the market value to the State based on Terengganu Mineral Enactment 2002.
- Royalty 10% to Lembaga Tabung Amanah Warisan Negeri Terengganu (LTAWNT)

Socio – Economic Benefit



Employment opportunities

Local Planning Strategy

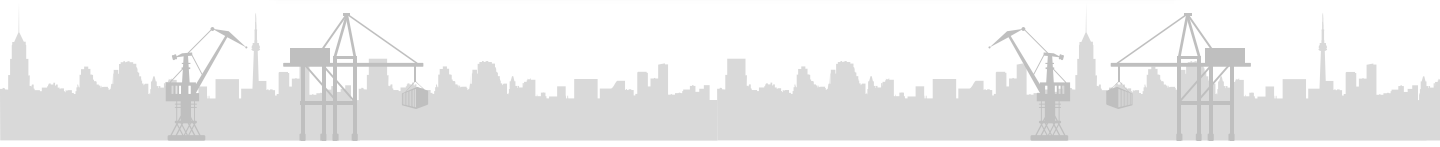


Thrust 1: Expansion of Mineral Sector of the NMP2



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EXECUTIVE SUMMARY



PROJECT CONCEPT



Open-cast Mining (Dry)

Internal Ore Haulage

Ore Processing (Wet)

IRON ORE RESERVES AND MINE OPERATIONAL LIFE

Estimated Mining Area (Phases 1, 2 & 3)	Iron Ore Reserves	Operational Mine Life
34.6 Ha	1,979,120 T	16 years



Open-cast Mining Operation

1. Excavation of the reserves around 2 m to 5 m (overburden and ores).
2. Hauling of excavated ores (ROM) to the processing plants.
3. Transporting excavated overburden to dry-dump area for temporary stockpiling and re-use in reclamation.
4. Ore processing.
5. Tailing pond maintenance and monitoring.
6. Reclamation of completed mine sites will run concurrently to ore excavation in new area.
7. Drying and stockpiling of product (high-grade iron).



Tailing Pond Water Recycling for ore processing

1. Closed circuit water recirculation
2. There will be no effluent discharge
3. Desilting of the ponds will be carried out periodically to restore the tailing pond retention capacity.



Production Capacity

**13,000 T/month
≈ 156,000 T/year**

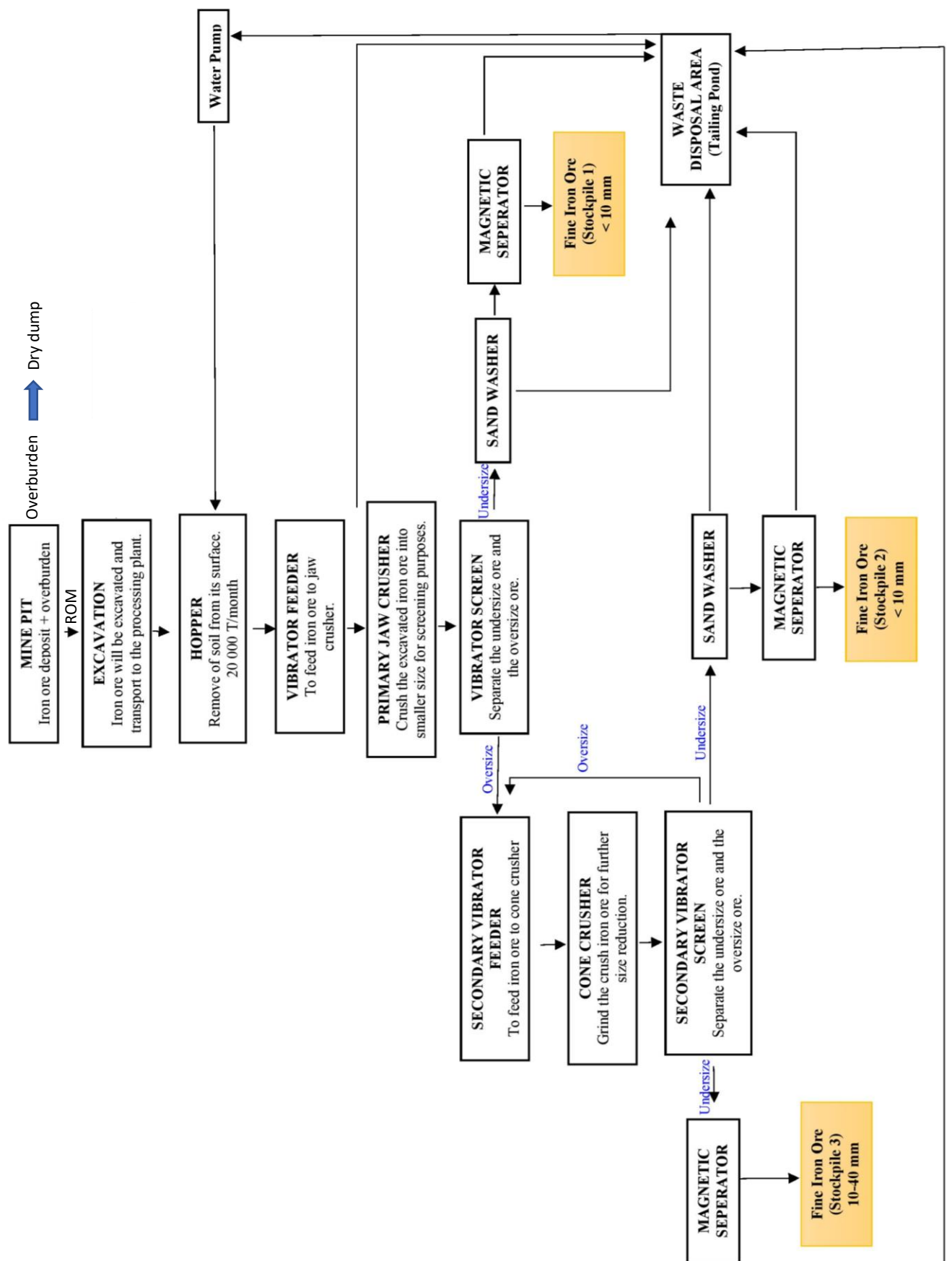


Transportation Product

Final product (high-grade iron) with granular size < 10 mm and between 10 mm and 40 mm (on average with 65 % high grade Fe) will be transported to Eastern Steel Sdn. Bhd.



FLOWCHART



PROJECT ACTIVITIES

BEFORE OPERATION

EXPLORATION AND INVESTIGATION

- Exploration of mineral deposits

BEFORE OPERATION

DEVELOPMENT AND PLANNING

- Demarcation of boundary and setting-out survey
- Mobilization of manpower, machineries and materials for construction
- Land clearing of areas for mine pit, processing plant and infrastructures.
- Internal haulage road construction
- Construction of tailing ponds
- Constructions of P2M2 and Best Management Practices (BMPs) structures (sediment ponds, drains etc.)
- Mobilization and fabrication equipment for processing plant
- Construction of Infrastructures & facilities
 - *Site office and facilities for employees*
 - *Procurement of utilities (power and water supply)*
 - *Diesel storage facility*
 - *Sewerage*
 - *Solid waste & scheduled waste*
 - *Perimeter fence, entrance gate/guard post and workshop*
 - *Washing bay*

DURING OPERATION

MINING AND PROCESSING

- Ore excavation
- Overburden dumped at dry dump area
- Haulage of ROM to the processing plant
- Ore Processing
- Stockpiling of processed ores (products)
- Tailing and tailing ponds management
- P2M2 / BMPs maintenance
- Maintenance of haulage and access road
- Transportation of product

AFTER OPERATION

REHABILITATION & ABANDONMENT

- Execution of Plan for mine closure
- Decommissioning
- Reclamation and backfilling
- Rehabilitation



EXISTING ENVIRONMENT



Land Use

- Immediate surrounding :combination of forest and secondary vegetations.
- Existing iron ore mines (total of 8 active mines) located to the east side of project site.
- Nearest settlement:Bandar Bukit Besi (2.8 km-east). Other settlements/ receptors are all located beyond the 3 km radius Zone of Study (ZoS).

Topography

- Hilly
- The highest elevation is about 100m and the lowest is 40m.
- Range of slope gradient.

Soil Characteristic

- Mainly under soil series of Mined Land (MLD).
- The soils at Bukit Besi are developed on granite.
- The soils are characterized by clayey structure texture with large amounts of course and medium sand.

Surface Hydrology

- Proposed development area lies within the Sg. Dungun River Basin.
- Tributaries of Sg. Cemuak run through the project site area.
- Three (3) WTPs located nearest to Project Site, which are Tepus WTP, Kemudi WTP and Serdang WTP. Water intake is from Sg. Dungun (downstream).

Site Geology

- Site is underlain by the Permian-Triassic granite of the Eastern Belt which commonly found in shale, and some were found in limestone skarn and granite.

Climate and Meteorology



Rainfall

Highest : December (679 mm)
Lowest : March (43.1 mm)

Temperature

Highest : April (28.9^o C)
Lowest : January (25.8^o C)

Relative Humidity

Highest : November (84.7%)
Lowest : July (62%)

Rain Days

Highest = December (21 days)
Lowest = March & April (7 days)

Wind Speed

Highest : Northeast (NE) and Southeast (SE) (2.6 m/s)
Lowest : Northwest (NW) (1.3 m/s)

EXISTING ENVIRONMENT

Water Quality

- Eleven (11) sampling points.
- Water Quality Index (WQI) for most sampling points classify as Class II except from W4, W7 and W9 under Class III.
- River water status for all sampling points is considered as “slightly polluted”.

Groundwater Quality

- Three (3) sampling points.
- Most of the parameters are well below the Environmental Standards except for COD, manganese (Mn) and aluminium (Al).
- Groundwater Quality Index (GWQI) for GW1 is 74.62 (Good), GW2 is 73.56 (Moderate) and GW3 is 73.08 (Moderate).

ENVIRONMENTAL QUALITY

Air Quality

- Five (5) monitoring stations.
- NO₂, SO₂, O₃ are not detected at all stations.
- All PM₁₀, PM_{2.5} and CO are within the permissible limits as per Malaysia Ambient Air Quality Standards (Standard value by 2020) (MAAQS).

Noise Level

- Five (5) monitoring stations.
- Daytime period level: 58.3 to 59.4 dB(A)
Nighttime period level: 49.4 to 50.0 dB(A)
- Noise level were below the limit under Schedule 1 (Sub-urban) of 60 dB(A) for daytime and 55 dB(A) for nighttime.
- Noise sources are from vehicles passing by, raining, people talking, birds and insects.

Geotechnical

- Terrain classification based on the site survey plan.

Terrain Classes	Area (m ²)	Percentage (%)
Class 1: 0° - < 15°	611,740.26	63
Class 2: ≥ 15° - < 25°	250,195.98	26
Class 3: ≥ 25° - < 35°	87,226.06	9.4
Class 4: ≥ 35°	15,727.70	1.6

Terrain at Proposed Site
CLASS II

EXISTING ENVIRONMENT

Terrestrial Fauna (Wildlife)

- Mammalia -66 mammalian species.
- Birds - 166 species of birds.
- Amphibians- 29 species of frogs.
- Reptiles - 45 species of reptiles (22-lizards, 19-snakes and 4-turtle).

Species	Protection Status										Red List of Mammals for Peninsular Malaysia					
	Wildlife Conservation Act 2010 (Act 716)			IUCN Red List of Threatened Species (2020)							Red List of Mammals for Peninsular Malaysia (2017)					
	TP	P	NP	CR	EN	VU	NT	LC	DD	CR	EN	VU	NT	LC	DD	
Mammalia	18	11	37	1	4	6	7	48	-	1	4	3	13	43	2	
Birds	143	13	10	-	0	0	19	147	-	-	-	-	-	-	-	
Amphibians	0	5	24	-	1	0	2	25	1	-	-	-	-	-	-	
Reptiles	2	25	18	-	1	2	1	41	-	-	-	-	-	-	-	

(TP) Totally Protected (P) Protected (NP) Not Protected (EN) Endangered (VU) Vulnerable
 (NT) Near Threatened (LC) Least Concern (CR) Critically Endangered (DD) Data Deficient

Terrestrial Flora

- Categorized as lowland forest.

Plant Habit	Number of species
Tree(T)	149
Shrub (S)	13
Herbaceous (H)	38
Fern (F)	10
Palm (P)	6
Climber (C)	42

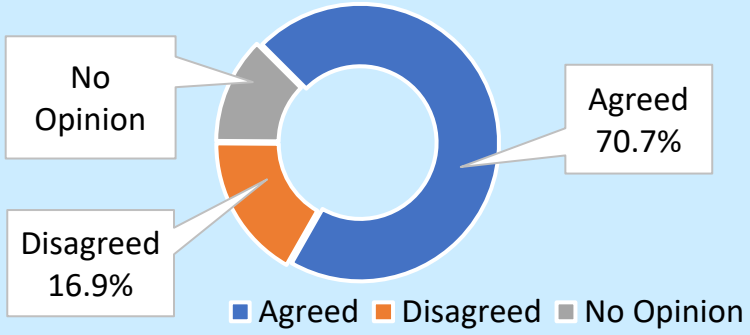
EXISTING ENVIRONMENT

Socio-economic

Total Respondent: 178

Respondents' Acceptance toward Proposed Project

- Bandar Bukit Besi
- Kg. Tersusun Rantau Panjang

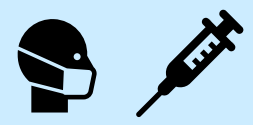


High percentage of acceptance among the locals are influenced by the good performance of existing mining operations that take place in Bukit Besi area.

Disagreed: Negative impacts such noise annoyance and vibration due to the previous existing mining operation cases.

Community Health

Existing Burden Disease at KK Bukit Besi and Dungun District (Incidence as per 100,000 population)



Dungun District

Vector Borne Disease

- Dengue Cases (Incidence rate 13.0)
- Malaria Cases (Incidence rate 1.0)
- Filariasis Cases (Incidence rate 1.0)

Food-water Borne Disease

- Food Poisoning Cases (Incidence rate 47.0)
- No cases of Cholera, Dysentery, Hepatitis A and Typhoid

Other Diseases

- Tuberculosis Cases (Incidence rate 47.0)
- Leptospirosis Cases (Incidence rate 33.0)
- Influenza Cases (incidence rate 22.0)
- Covid-19 Cases (Incidence rate 116.0)

KK Bukit Besi

Air pollution-related Diseases

- URTI (Incidence rate 13,040)
- Tuberculosis (Incidence rate 80.0)
- Pneumonia (Incidence rate 30.0)
- Conjunctivitis (Incidence rate 10.0)

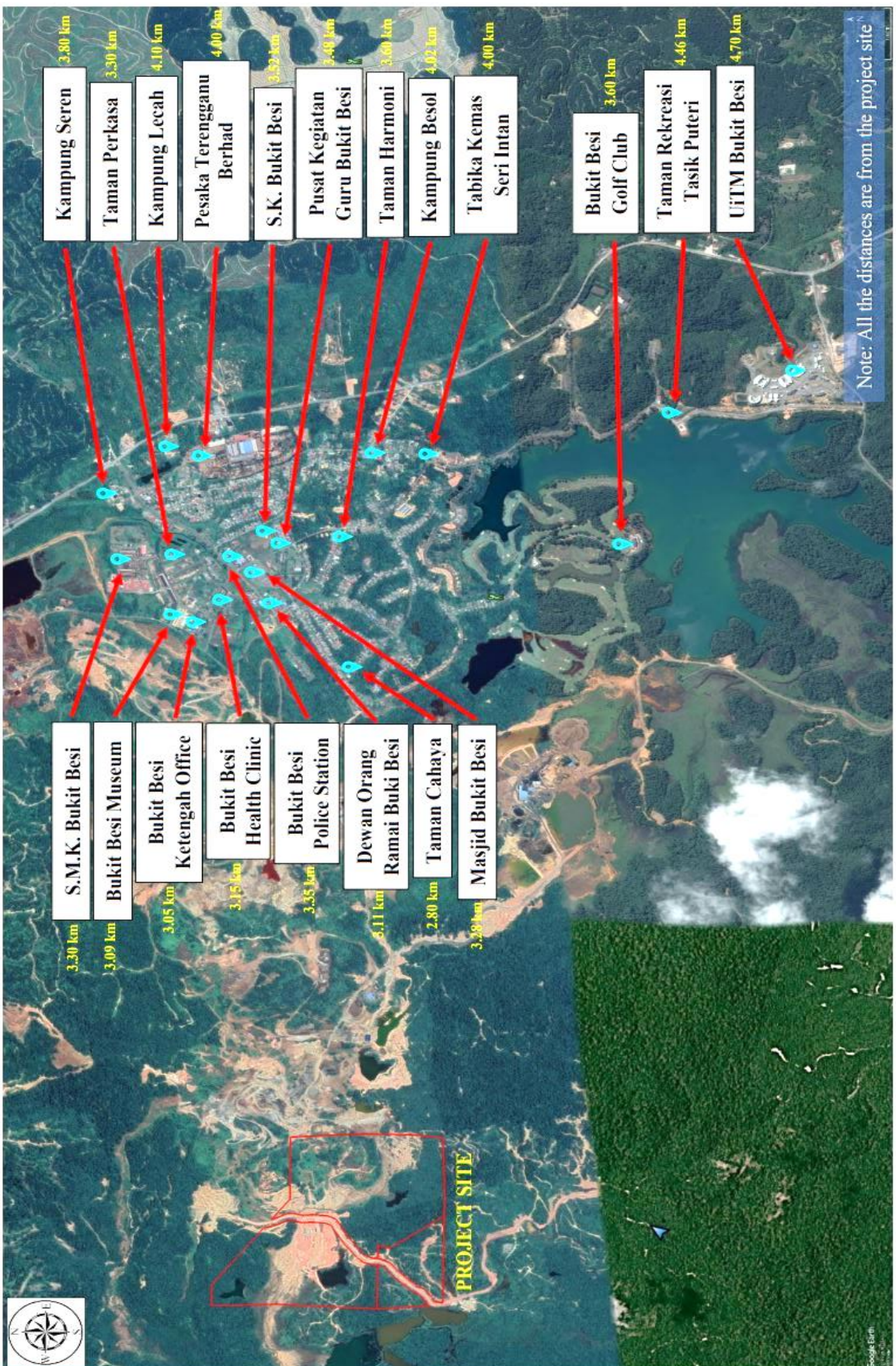
Skin Diseases

- Cellulitis (Incidence rate 10.0)
- Psoriasis (Incidence rate 10.0)
- Urticaria (Incidence rate 190.0)

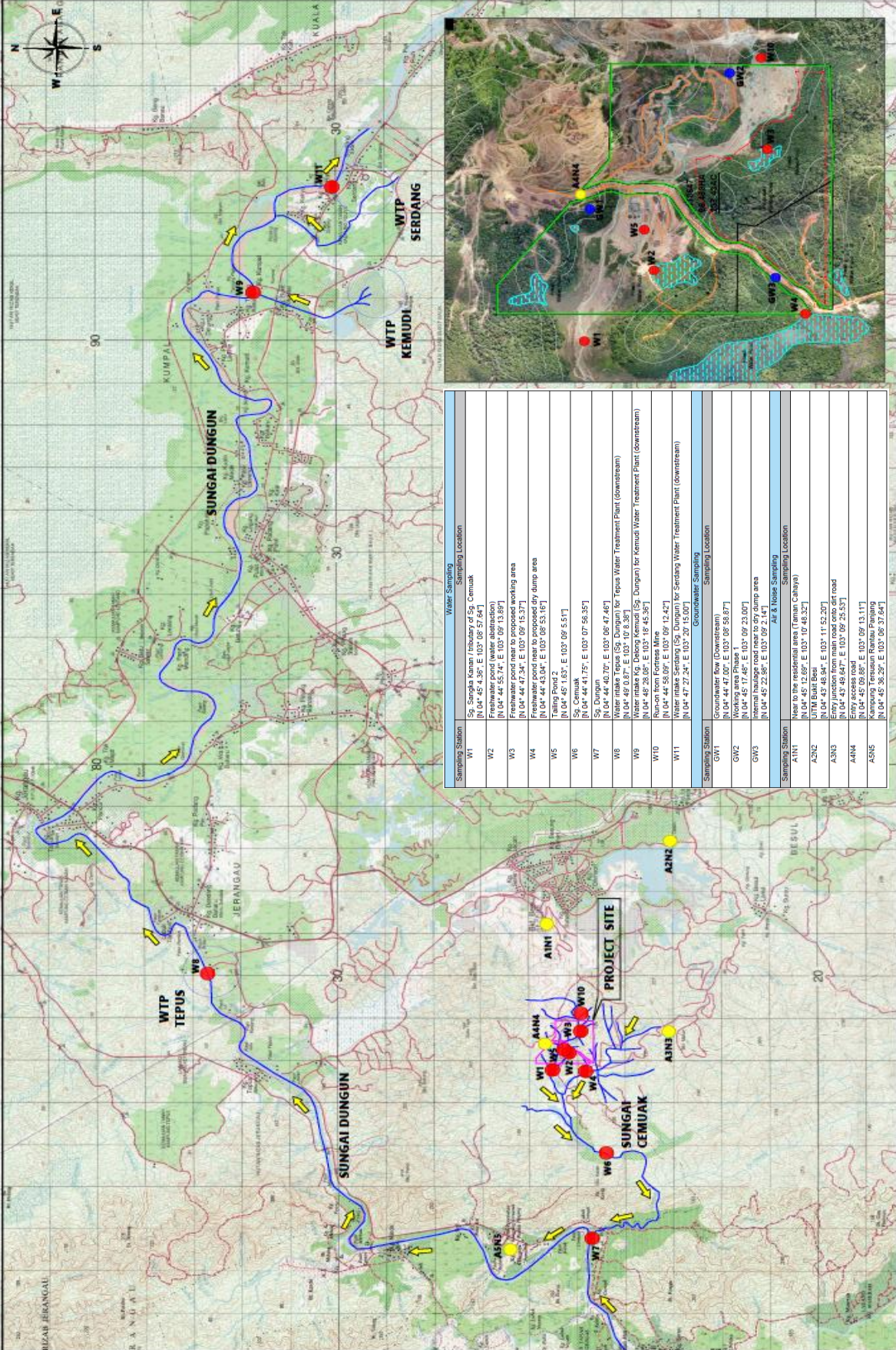
SENSITIVE RECEPTORS (5 KM ZOS)



SENSITIVE RECEPTORS (BUKIT BESI TOWNSHIP)



WATER, GROUNDWATER, AIR & NOISE SAMPLING POINT



Sampling Station	Water Sampling	Sampling Location
W1	Sg. Sungai Kawan / tributary of Sg. Cempuak	(N 04° 45' 4.38" E 103° 08' 57.84")
W2	Freshwater point (water abstraction)	(N 04° 44' 55.74" E 103° 09' 13.89")
W3	Water abstraction area	(N 04° 44' 47.34" E 103° 09' 15.37")
W4	Freshwater pond (near to proposed dry dump area)	(N 04° 44' 43.04" E 103° 08' 53.16")
W5	Tailing pond 2	(N 04° 45' 1.83" E 103° 09' 55.17")
W6	Sg. Cempuak	(N 04° 45' 7.75" E 103° 07' 58.35")
W7	Sg. Dungun	(N 04° 44' 40.70" E 103° 06' 47.46")
W8	Water intake Tapas (Sg. Dungun) for Tapas Water Treatment Plant (downstream)	(N 04° 49' 0.87" E 103° 10' 8.38")
W9	Water intake Kemudi (Sg. Dungun) for Kemudi Water Treatment Plant (downstream)	(N 04° 48' 26.08" E 103° 16' 46.25")
W10	Run-on from Foresea Mine	(N 04° 44' 58.09" E 103° 09' 12.42")
W11	Water intake Serdang (Sg. Dungun) for Serdang Water Treatment Plant (downstream)	(N 04° 47' 24.7" E 103° 20' 15.00")
Sampling Station	Groundwater Sampling	Sampling Location
GW1	Groundwater flow (downstream)	(N 04° 44' 47.00" E 103° 09' 58.87")
GW2	Working area (near to proposed dry dump area)	(N 04° 44' 40.70" E 103° 06' 47.46")
GW3	Internal haulage road (near to dry dump area)	(N 04° 45' 22.86" E 103° 09' 2.14")
Sampling Station	Air & Noise Sampling	Sampling Location
A1N1	Near to the residential area (Taman Cahaya)	(N 04° 45' 12.69" E 103° 10' 48.32")
A2N2	UTM Bukit Besi	(N 04° 42' 48.94" E 103° 11' 52.20")
A3N3	Access road (near to proposed dry dump area)	(N 04° 43' 48.62" E 103° 09' 22.52")
A4N4	Entry access road	(N 04° 45' 09.85" E 103° 09' 13.17")
A5N5	Kampung Terusan Rantau Panjang	(N 04° 45' 38.29" E 103° 08' 37.84")

DETAILED ENVIRONMENTAL MONITORING LOCATIONS

LEGEND

-  MINING LEASE AREA
-  WATER SAMPLING
-  GROUNDWATER SAMPLING
-  AIR & NOISE SAMPLING
-  RIVER FLOW DIRECTION

PROPOSED IRON ORE MINING OPERATION ON LOTS 112750 & 112751 (ML. 6/2020) AND LOTS 60241 & 60242 (ML. 7/2020), AN AREA 92.082 HA (227.54 AC.), LOCALITY OF BUKIT BESI, MUKIM JERANGAU AND JENGAI, DISTRICT OF DUNGUN, TERENGGANU DARUL IMAN FOR SHARIKAT SUMBER JAYA SDN. BHD.

MODELING RESULTS

WATER QUALITY ANALYSIS - QUAL2K MODELING

Scenario 1: Existing Condition (Baseline)

Scenario 2: Development Phase (Land Clearing) (Without Mitigation Measures)

Scenario 3: Development Phase (Land Clearing) (With Mitigation Measures)

Scenario 4: Operation Phase (with Tailing Pond Outburst Condition)

Scenario 5: Operation Phase (with Tailing Pond Overflow Condition)

Baseline Analysis [Scenario 1]:

- Most of the values at Sungai Dungun comes under the Class I (natural condition with no pollution) except for BOD (Class III to V), Fe (Class V), and Al (Class V).
- Whereas TSS, BOD, Fe, and Al are high at Sg. Cemuak.
- It shows that in present condition, high concentration sources are from nearby mining activities at Locality of Bukit Besi, Dungun, Terengganu.

Worst Case [Scenario 2], Tailing Pond Outburst [Scenario 4] and Tailing Pond Overflow [Scenario 5] Analysis:

- TSS concentration at Sg. Dungun and Sg. Cemuak is high only during pond outburst (Scenario 4) and pond overflow (Scenario 5).
- DO and BOD values are high during worst case scenario (scenario 2), pond outburst (scenario 4), and pond overflow (scenario 5).
- Even during the mining, iron concentration not effected in worst case (Scenario 2) but comes under Class V during pond outburst (Scenario 4).
- Ammoniacal nitrogen are under control at Sg. Dungun in all scenarios. But the concentration is high during worst case scenario (scenario 2), pond outburst (scenario 4), and pond overflow (scenario 5) at Sg. Cemuak.

With Mitigation Analysis [Scenario 3]:

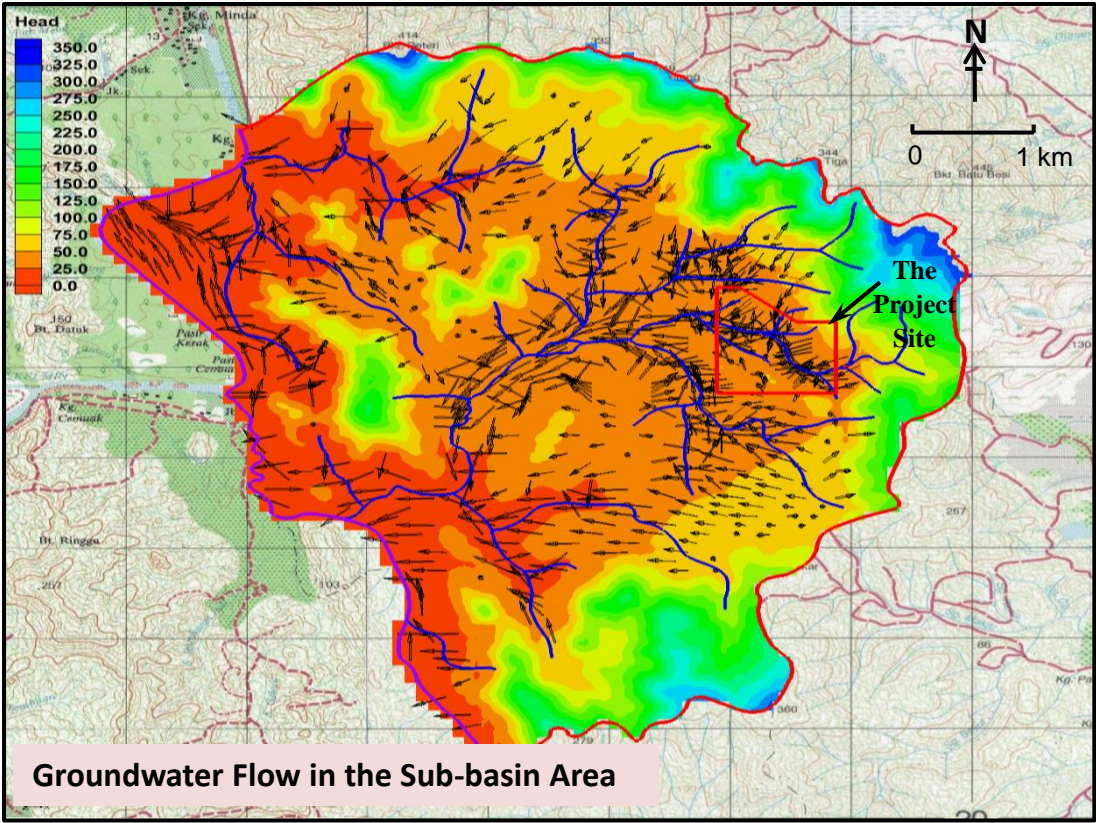
- It shows that with proper mitigation measures (BMPs, sedimentation ponds, silt traps, etc.) and on-site treatment (phytoremediation, etc.), all the water quality parameters can be controlled during the mining activities.

Water Quality Analysis at Nearest Water Treatment Plants (WTPs)

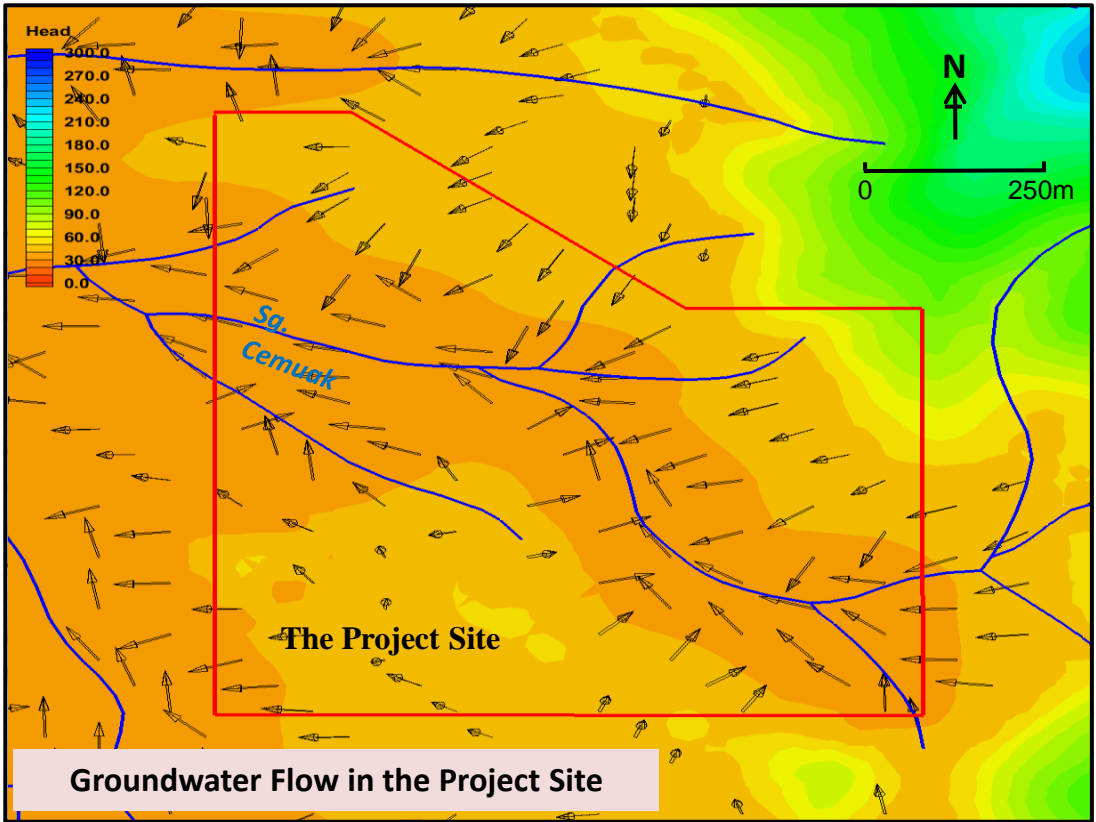
- No significant effect in terms of any parameter during mining with proper mitigation measures.
- WI Tepus, WI Kemudi and WI Serdang will be affected during worst case scenario (scenario 2), pond outburst (scenario 4), and pond overflow (scenario 5) for some parameters, BOD, COD, TSS, Cu, Mn, Fe, Al and Ammoniacal Nitrogen.

MODELING RESULTS

GROUNDWATER FLOW MODELING



Direction of groundwater flow in Layer 1



Direction of groundwater flow in Layer 1 at the Project site

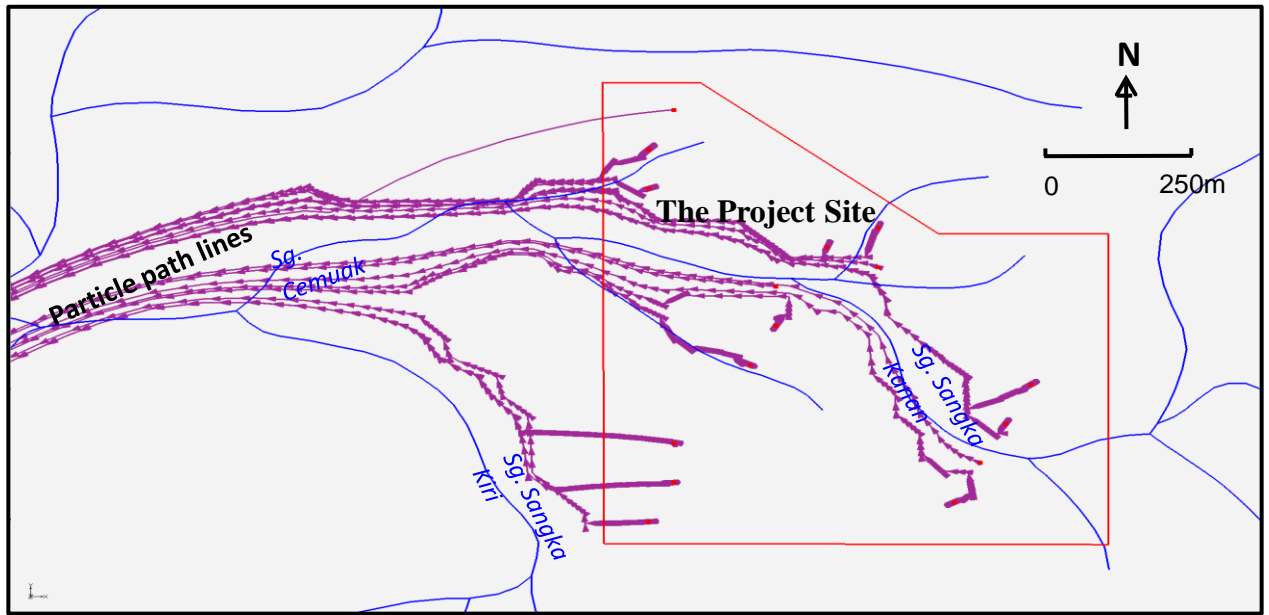
Groundwater Flow in the Sub-basin Area

Groundwater Flow in the Project Site

MODELING RESULTS

GROUNDWATER FLOW MODELING

Simulated particle path line of potential contaminant at the Project site



Contaminant element for groundwater contaminant transport modelling

No.	Source/ Location of Contaminant	Elements	Concentration (mg/L)	Main Characteristic
1	Tailing pond & processing plant	Iron	3.0	Conservative migration

AIR POLLUTION DISPERSION MODELING – AERMOD MODEL

Modeling Study Analysis:

- Incremental air pollution (PM₁₀ and PM_{2.5}, NO₂, SO₂ and CO) concentrations.
- Worst-case scenario shows the concentration within 3 km is above the MAAQS 2020.
- Concentrations at sensitive receptors are below the **MAAQS 2020** during the pre-operation and post-operation stages.
- However, during the operation stage, the concentrations of PM₁₀ and PM_{2.5} exceeded the Standard at sensitive receptors.
- The concentration would reduce by implementing Best Management Practices (BMP).

EVALUATION OF POTENTIAL IMPACT

HYDROLOGY

- Land clearing could increase the frequency of flash flood at the downstream.
- Land use changes in the upstream results in tremendous increase in surface runoff.
- Extensive flooding affect the property damage and loss of lives is imminent.

SOIL EROSION AND SEDIMENTATION

- Removal of ground cover will expose surface soil to erosion. The eroded soil or sediments carried in the surface runoffs will enter the river and affect the water quality and siltation.
- High rainfall intensity (direct impact on ground) will increase the volume of surface runoffs with higher sediments, leading to an increase in sediment deposition in rivers.
- Excess sediments will affect the aquatic life and habitat.
- Modification of surface may result in drying and flooding.

OVERBURDEN STRIPPING

- Overburden mounds may be exposed to soil erosion. Surface runoffs carrying sediments from the mounds into nearby rivers.
- Dumping mound is unsightly, and more importantly, pose safety hazard to workers if landslide occur.
- Activities carried out during the drier period can cause problems with air pollution.

RIVERINE RIPARIAN ZONE

- Clearing of vegetations from riverbanks will leave the area and river unprotected from erosion and sedimentation respectively. Causing a decrease in water quality through the loss of filtration effects.
- Clearing also leads to loss of critical species habitat. A river buffer zone of 25 m or more, will be kept along the rivers/streams.

EVALUATION OF POTENTIAL IMPACT

WATER QUALITY

- Water quality in mines are indirectly affected by soil erosions that carry sediments and these sediments are not controlled or managed well.
- Release of sediments into rivers will impact the water quality : turbidity, total suspended solids , and mineral contaminants.
- Fine silt increases the suspended solids and turbidity of the water bodies and can be detrimental to aquatic life.
- The use of machinery and equipment on site may lead to water pollution through leakage of oil, grease, and fuel into the water courses.

GROUNDWATER QUALITY

- Potential changes in groundwater condition with respects to its level and flow in particular.
- Potential flooding of pits, uncontrolled discharges and collapse of the allied dams.
- Potential change in groundwater levels and flow.
- Potential groundwater contamination and contaminant movement.

AIR QUALITY

- Dust dispersion due to vehicular movement especially on dry days may lower air quality.
- Fume emission and dust dispersion from haul road, process plant and stockpile.
- Types of air quality impacts: dust (total suspended particulate TSP, PM₁₀, PM_{2.5}) and vehicles (gaseous: CO).
- Elevation, wind direction, and wind speed greatly influence the dispersion of air pollutants with hotspots mainly lying downwind of the dominant wind directions.

EVALUATION OF POTENTIAL IMPACT

TERRESTRIAL FLORA

- The loss of tree species due to timber extraction and subsequently the other vegetation due to mining activities is critical impacts on flora diversity.
- Wildlife natural habitats and their source of food would be severely affected.
- Removal of vegetation could increase water runoff and siltation during rain which affect the water quality in nearby water source and stream.

TERRESTRIAL FAUNA (WILDLIFE)

- Loss of habitat, species and impact on forest edge.
- Human-wildlife conflict and food shortage.
- The presence of workers post threat to the wildlife through illegal hunting.
- Noise will directly or indirectly cause a disturbance to the existing mammal community.

NOISE QUALITY

- The main source of operating noise is primarily from equipment and machinery.
- Excessive and prolonged exposure to noise can cause disruption and cause high noise levels, potentially causing hearing problems.
- Cumulative impact can significantly affect humans and wildlife and create annoyance to the local community.

SOLID & HAZARDOUS WASTE

- Significant amount of solid waste (tree trunks, branches, shrubs, and green vegetative material) will be generated due to the clearing and site preparation.
- Poor storage and handling of general refuse resulting in odor problems and attraction of pest, disease vectors and scavenging animals (insects, rodents etc.) to the site.
- Scheduled wastes (lubricating oils, diesel and hydraulic fluids) spill may affect the surface quality and aquatic ecology if they infiltrate to the surrounding water bodies.

EVALUATION OF POTENTIAL IMPACT

SEWERAGE

- If the domestic sewage is not well designed and maintained, odor and diseases might be triggered.
- Organic matter, coliform bacteria and suspended solids is the primary contaminants in sanitary effluents which will result in decreasing dissolved oxygen content elevated organic and coliform levels in downstream watercourses.
- Bad odor will cause lost in appetite, impaired respiration, nausea, vomiting and mental perturbations.

SOCIO-ECONOMIC

Potential Negative Impact:

- Mining presence disturb communities' daily life.
- Noise annoyance exposure.

Potential Positive Impact:

- Increased job opportunities to locals.
- Enhanced local's economic growth.
- Improve locals' socio-economic.

COMMUNITY HEALTH

- Air pollution and elevated noise levels might have greater impact on workers but minimal impact on community.
- Water and groundwater pollution can affect the workers and the community.
- Biological hazards, such as dengue and leptospirosis, may become an issue if no proper care is taken to manage the vectors.

MITIGATION MEASURES

HYDROLOGY

- The sediment basins (trap sediment) during clearing works will be converted to flood detention pond.
- Provide temporary storage for the excess runoff during storm event. Detention pond consists of storage area, inlet to the pond and outlet of the pond.
- Build sufficient diversion and earth drains and other BMPs on site to direct the surface runoff flows to sedimentation ponds, or silt ponds.
- The design storm should accommodate storm of 50-year ARI with enough storage to control flood, while its spillway should be able to cater for 100-year storm.

SOIL EROSION & SEDIMENTATION

- Control stormwater flows onto, through, and from the site in stable drainage structures.
- Install perimeter runoffs controls.
- Stabilize and covering disturbed land areas promptly in a timely manner to minimize the exposure to rain.
- Protect steep slopes.
- Use sediment controls to prevent off-site damage.
- Protect inlets, storm drain outfalls, and culverts.
- Provide access and general construction controls.
- Inspect and maintain control measures.

OVERBURDEN

- Dispose of the overburden at the designated dumping site as identified in the plant layout plan.
- Install silt fence at the base of the mounds.
- Diversion of surface runoffs into drains and silt ponds.
- Surplus excavated material will be disposed of in suitable identified areas.
- Dumping areas will be biologically reclaimed.
- Proper drainage facilities shall be provided surrounding the overburden dump sites.

MITIGATION MEASURES

RIVERINE RIPARIAN ZONE

- No clearing of vegetation from stream banks to prevent soil erosion and decrease in water quality through the loss of filtration services and the loss of critical species habitat.
- Maintenance of riparian reserve to ensure no disturbance to the natural vegetation.
- No mining or other activities to be conducted within the restricted stream/river buffer zones.

WATER QUALITY

- Implementation of water management techniques.
- Preservation and stabilization of drainage and waterways.
- Minimize the extent and duration of disturbance.
- Control of runoff flows into, through and from the site via stable drainage structures.
- Installation of perimeter controls (silt fence, perimeter drains, etc.)
- Fuel, grease, and engine oil storage must be carefully sited to avoid contamination of the surface waters.
- Proper drainage and sanitation facilities.
- Ensure minimum sediment discharge. Provide vegetated filter strips between exposed soil surfaces and receiving waters.
- Protect inlets, storm drain outfalls and culverts.
- Inspect and maintain BMPs for control measures.
- Streams must be protected with a vegetated buffer zone.
- Prepare an emergency plan on used oil spills and pond overflow.

GROUNDWATER QUALITY

- Regular monitor and maintenance of groundwater monitoring well.
- Mining operation (excavation for the extraction of minerals) in the working areas will be performed sequentially in order to minimize the accumulative impacts to the groundwater system.
- A continuous monitoring of groundwater conditions in the Project site and the surrounding shall be performed after the mine closure

MITIGATION MEASURES

AIR QUALITY

- Open burning within or outside mining site is strictly prohibited.
- Periodically maintenance on engines of machinery and vehicles to prevent excessive emission and particulates.
- Vehicle speed restrictions shall be imposed to reduce dust generation and dispersion.
- Frequent spraying of water on the exposed surface (stockpiles of loose materials) especially during dry seasons.
- Implement all construction vehicles to go through the washing bay after tire washing from the quarry site before exiting the site.
- Good housekeeping and usage of appropriate equipment.
- Develop and retain existing trees, vegetation, and bushes as natural buffer zone

NOISE QUALITY



- All machinery should be properly checked and maintained during the operation.
- Impose and enforce a speed limit on all vehicles at maximum of 30 km/h.
- Heavy vehicles moving in the path that will cause minimal interruption.
- Install effective noise suppression systems.
- Noise level can be reduced by undertaking the mining activity on phase by phases basis
- Restricted the hours of operation.
- Provide workers with earplugs or earmuffs.
- Carry out a noise monitoring program.

SEWERAGE

- Use of septic tanks. The septic tanks must be maintained by regular desludging, and it will be prohibited from throwing used oil down the toilets or sinks.
- No direct discharge is allowed from any toilet facility to rivers or streams.

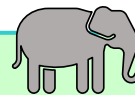
MITIGATION MEASURES

TERRESTRIAL FLORA



- Only vegetation directly in the path of the proposed access roads to be removed.
- Vegetation on higher elevation and steep slope will be left undisturbed to minimize soil erosion and filter the run-off during rainy days.
- Vegetation strips shall be planted in around ponds and waterways to create buffer and filter the net delivery of silt during runoff from higher ground area to the lower areas.
- Progressive rehabilitation of affected areas to restore ecosystem function, where possible with fast growing trees and leguminous creeper species.
- Any major removal of plants will be directed towards the adjacent forested area to facilitate fauna movement.

TERRESTRIAL FAUNA (WILDLIFE)



- Mining operations should not infringe upon protected areas or other critical or sensitive ecological areas.
- Include wildlife awareness information in regular safety and environmental inductions.
- Mining in an orderly sequence to minimize habitat disruption and facilitate gradual movement of wildlife away from the mining areas.
- Site clearing direction must be towards the forest reserve
- Placed warning signs at specific locations to reduce road kills.
- Advise mining workers to not interfere or harass wildlife.
- No hunting by project personnel permitted while working or residing on site.
- Any sightings of wildlife especially endangered mammals need to be reported by workers to the authority (PERHILITAN) for further action. Seek the assistance and advice of PERHILITAN on how to handle wildlife and human conflicts.
- Project site security shall not exit the project compound.
- Proper signage on prohibition of bird hunting or trapping.
- No domesticated animal in the project site and in the surrounding area to stop the possible spread of Canine Distemper Disease to the local wildlife.

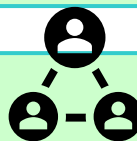
MITIGATION MEASURES

DOMESTIC SOLID WASTE



- To be segregated and disposed appropriately so as not to create potential vector source.
- No haphazard disposal on site or off site.
- No open burning can be carried out at all (strictly prohibited) within and outside the mining site area.
- A good solid waste management system is to be provided. All wastes (non-scheduled) are to be disposed at approved dumping ground.
- The domestic solid waste from the basecamp and site office can be either dumped at designated area within the mining site.
- Provide dust bin and to ensure all workers on-site will involve in regular housekeeping exercise.
- A proper signage shall be made in order to create awareness among the workers in term of good waste management within the mining site area.
- A comprehensive waste management shall be prepared by project proponent before execution of the mining activity.

SOCIO-ECONOMIC



- The mining operator is advised to conduct a Grievance Management Plan and Procedure as a platform for information and complaint channels for surrounding communities
- Project Proponent is advised to carry out a suitable continuous Company Social Responsibility (CSR) in effort to build trust and responsibility to the surrounding community.
- Project Proponent shall comply with any mitigation measures suggested in P2M2 in reducing the impacts that may disrupt the community surrounding.
- If there are any issues regarding natural disasters and damage during the development and operation of the project such as flooding, operator shall coordinate with **National Disaster Management Agency (NADMA)** and **Department of Social Welfare (JKM)**.
- Project Proponent and mining operator are recommended in giving priority to locals in filling the job vacancies that generate during the construction period

MITIGATION MEASURES

SAFETY AND HEALTH



- Vector control through elimination of breeding sites and fogging to avoid any vector-borne and zoonotic diseases.
- Practise good sanitation including hygienic toilets, clean and safe water supplies, and proper solid waste disposal to avoid food and waterborne diseases.
- The workers safety, security and health are governed by the Occupational Safety and Health Act, 1994 (OSHA, 1994), Factories and Machinery Act, 1967 (FMA, 1967), Employee Social Security Acts, 1969, and Workmen's Compensation Act, 1952.
- Encourage workers to be vaccinated against vaccine-preventable diseases such as COVID-19, Hepatitis B, and influenza.
- Proper and suitable personal protective equipment are required for workers when the hazards are above the permissible exposure limits.
- Seek medical consultation immediately if the workers are sick and separate them from the healthy workers.
- Proper handling, transportation, storage and disposal of solid and scheduled wastes, if any, to avoid any accidents
- Conduct health surveillance if necessary.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

PERFORMANCE MONITORING (PM)

LD-P2M2	PM Parameters	Recommended Limits	Frequencies
Silt Trap	Silt marker	-	Weekly or after rain event
Sediment Basin	Silt marker	-	
Earth Drains	Sediment level		Quarterly
Earth Bund	Diverts Overland Flow	-	
Silt Fence	Control silt transport in overland flow	-	
Roadside Drain	Performance	-	
River Riparian Buffer Zone	River water Quality	25 m at both sides	

COMPLIANCE MONITORING (CM)

Item	Monitoring Frequency	Environmental Quality Standards
Water Quality	Once a month	<ul style="list-style-type: none"> i. National Water Quality Standards (NWQS). ii. Mineral Development (Effluent) Regulations 2016
Air Quality	Once a month	<ul style="list-style-type: none"> i. Malaysia Ambient Air Quality Standards (Standard value by 2020).
Ground water Quality	Twice a year	<ul style="list-style-type: none"> i. National Standard for Drinking Water Quality (Revised December 2000), Second Version (MOH, 2004). ii. Malaysia Groundwater Quality Standards and Index – for Conventional use of Raw Water Treatment (Drinking Water) (DOE, 2019).
Noise Level	Once a month Daytime 15 hours (from 7.00 am to 10.00 pm) Nighttime 9 hours (from 10.00 pm to 7.00 am)	<ul style="list-style-type: none"> i. Guidelines for Environmental Noise Limits & Control, Third Edition (DOE, 2019), First Schedule of Permissible Sound Levels.

IMPACT MONITORING (IM)

Item	Impact Monitoring
<p>Water Quality</p>	<ul style="list-style-type: none"> i. Continuous water quality monitoring for turbidity and total suspended particulates. ii. If silt trap/sediment containment structure is employed to contain the resuspended particulates, this must be regularly monitored for tear and displacement from the intended location. iii. Even with a silt trap/sediment containment structures in place, the water quality beyond the silt trap/sediment must be sampled for turbidity. iv. Records regular maintenance of the drainage structure provided on site and ensure there is no blockage to the water flow or excessive siltation.
<p>Groundwater Quality</p>	<ul style="list-style-type: none"> i. Continuous groundwater quality monitoring. ii. Records the measured water level. iii. Records regular maintenance of monitoring well to prevents well water quantity and quality deteriorating in longer term.
<p>Air Quality</p>	<ul style="list-style-type: none"> i. Records to show regular maintenance of equipment, machineries and vehicles used for this project development. ii. Records of provision of adequate dust protective device to workers working in dusty areas. iii. Records of provision of dust suppression facilities such as water bowser. iv. Records on air quality monitoring results. v. Checking on the soil surface to ensure proper soil compaction is practiced onsite especially on exposed area.
<p>Noise Level</p>	<ul style="list-style-type: none"> i. Records to show regular maintenance of equipment, machineries and vehicles used for this project development. ii. Records of provision of adequate noise protective device to workers working in high noise level areas. iii. Schedule of working hours, transportation in and out of the project site showing the type of loading and maintenance tasks carried out for vehicles.

CONCLUSIONS

The major activities that can potentially spawn impacts : Site clearing, Ore excavation, Ore haulage and Ore processing.

The aspects of the activities annexed to impacts: Dust formation (air quality), Noise generation (noise level), Soil erosion and river sedimentation (water quality).

The major impacts ensuing these aspects; Air pollution (PM₁₀, PM_{2.5}, etc.), Noise pollution (increase dBA) and Water pollution (turbidity, total suspended solids, DO and metal contaminants).

Abatement of impacts:

- Pollution prevention and impact mitigating measures on land disturbance, operations and post operation.
- Maintenance and Monitoring of BMPs
- Environmental Management Plan
- Environmental Auditing
- Self Regulation
- Rehabilitation program.

The proposed project of iron ore mining at Locality of Bukit Besi will not incur significant impacts if appropriate mitigating measures especially for air, noise, water and groundwater quality control are employed followed by rigorous environmental management plan, environmental monitoring and environmental auditing.